



Grid reference table showing coordinates for various locations: TAY RIVER, SHELDON LAKE, LITTLE NAHANNI RIVER, QUIET LAKE, THIS MAP, FRANCES LAKE, TESLIN, WOLF LAKE, WATSON LAKE.

INTRODUCTION

New geochemical data from re-analysis of archived stream sediment samples have been assessed using weighted sums modeling and catchment basin analysis, as described in the methodology report that accompanies this map (Mackie et al., 2015). Both commodity and pathfinder element abundances are evaluated to highlight areas that show geochemical responses consistent with a variety of base- and precious-metal mineral deposit types. The results of modeling, completed using two approaches, are presented as a series of catchment maps and associated data files. This release is part of a regional assessment of stream sediment geochemistry that covers a large part of Yukon.

SAMPLING AND ANALYSIS PROGRAMS

Regional stream sediment and water samples from the Finlayson Lake map area (105G) were collected at a reconnaissance scale in 1987 as part of the National Geochemical Reconnaissance program. Field data for 914 sites and initial geochemical data were released in Geological Survey of Canada ("GSC") Open File 1648 (Friske and Hornbrook, 1988). In 2008, new geochemical data (ICP-MS) was released in GSC Open File 5696 (Friske et al., 2008a) and Yukon Geological Survey ("YGS") Open File 2008-3 (Friske et al., 2008b). The reader is referred to these open files for details regarding sampling techniques, analytical procedures and quality control and assurance. While the database contains information for 914 sample sites, only 871 have been included in this assessment as catchment basins (provided by the YGS) were only generated for those samples that could be reasonably assigned to a specific stream polyline. This unusually high proportion of 'omitted' sample sites is due to the difficulty of defining drainage basins in regions of subdued topography.

MINERAL OCCURRENCES

A variety of types of base and precious-metal mineralization have been documented in the map sheet as summarized in Table 1 (Yukon MINFILE, 2015). Several volcanogenic massive sulphide deposits have been discovered and encompass the Finlayson Lake VMS district. Various sub-classes or types have been documented including: volcanoclastic-hosted Wolverine-Lynx (Fetish Occurrence), Kuroko-type Kudze Kayah (Tag Occurrence) and GP4F deposits, Besshi-type Fyre Lake deposit and Cyprus-type Ice deposits. Other notable occurrences in the region include the Tintina (105G), Groundhog, Ketzakey and Stumpy (105F) polymetallic Ag-Pb-Zn deposits (105G), Ketsa River Au deposit (105F), Anvil district Pb-Zn-Ag SEDEX (105K) and Grew Creek epithermal Au-Ag deposits (105K).

WEIGHTED SUMS MODELING

As described in the report accompanying this map (Mackie et al., 2015), two approaches have been used to subdue the influence of background lithological variation and secondary absorption on the composition of stream sediments. One uses data levelled by the dominant geology mapped within

each catchment. The other uses residuals calculated from regression against selected principal components. Weighted sums models (WSM) have been generated using the processed data. Importance rankings used in the WSM for a variety of deposit types are summarized in Table 2. Each model is optimized for a specific deposit type however multiple deposit types may be represented in a given model due to similarities in elemental abundances and associations. A WSM model is also presented for potential hydromorphic anomalies related to scavenging of metals by secondary Fe and Mn-oxides.

Exploratory data analysis of both raw element data and principal components indicates that the distribution of many commodity and pathfinder elements is strongly controlled by lithological variation. The first principal component, accounting for ~30% of the total variation, shows high positive loadings for Cd, Se, Sb, Hg, Ba, Ag, Mo and Zn, and forms a coherent spatial trend that follows stratigraphy (i.e., Earn, Askin and Jones Lake groups). The second principal component with high positive loadings in Ni, Cr, Co, Mg and Cu matches the distribution of mafic and ultramafic rocks. Regression analysis of selected metals against the relevant principal component(s) effectively removes these terrane-effects while preserving and in some cases enhancing, responses related to known occurrences. Leveling by dominant mapped lithology has a more subtle effect on filtering these the interpreted lithological control for certain elements (e.g., Ag, Cd, Sb, Hg, Ba and Mo). In order to reduce this impact in the WSM these elements were given low importance rankings (or were omitted) for certain deposit types. Additionally, strong responses for Zn, Pb and Ag related to VMS and polymetallic Ag-Pb-Zn vein mineralization prevented using these elements as pathfinders for other deposit types. Negative rankings were assigned to certain variables to help differentiate deposit types with similar metal associations. For example, negative rankings for Pb and Zn are used in the WSM for Epithermal Au-Ag in order to reduce the contribution of Ag related to VMS mineralization.

The effectiveness of historical sampling coverage has been assessed empirically using graphs of WSMs plotted against catchment surface area to determine the ideal maximum catchment size (10 km²). Catchments that cover larger areas (shown on the map with bold outlines) are interpreted to have been under-sampled and thus require further sampling to properly evaluate the area for geochemical anomalies. Given the likelihood that a mineralization 'signal' would be progressively diluted with increasing catchment size, marginally high WSM scores for samples in large catchments are also of interest.

Table 2: Importance rankings for weighted sums models using data levelled by dominant mapped geology.

Table with 18 columns: Target Deposit Type*, Other Deposit Types*, Mn, Fe, Co, Ni, Cu, Mo, Zn, Pb, Ag, Au, As, Ba, Cd, Sn, Sb, Te, Hg, Tl, Bi, W. Rows include VMS (Zn-rich), VMS (Cu-rich), Epithermal Au-Ag, Porphyry Cu-Mo, and Hydromorphic Anomaly.

*Polymetallic Ag-Pb-Zn type includes vein and mantle styles; SEDEX = sedimentary exhalative; VMS = volcanoclastic-hosted/associated massive sulphide deposits

¹ Au data are not levelled by dominant geology, instead log₁₀ transformed raw data are used.

LEGEND

- Town
▲ Mineral Occurrence
— Road
— Contour
— Water Body
— Wetland
• Sample Location
— Catchment
— Catchment > 10 km²

REFERENCES

Friske, P.W. and Hornbrook, E.H., 1988. National Geochemical Reconnaissance Stream Sediment and Water Geochemical Data, South-Central Yukon (NTS 105G). Geological Survey of Canada, Open File 1648.
Friske, P.W.B., Hornbrook, E.H.W., McCurdy, M.W., Day, S.J.A. and McNeil, R.J., 2008a. Regional stream sediment and water geochemical data, Finlayson Lake area, southeastern Yukon (NTS 105G). Geological Survey of Canada, Open File 5696.
Friske, P.W.B., McCurdy, M.W., Day, S.J.A. and McNeil, R.J., 2008b. Regional stream sediment and water geochemical data, Finlayson Lake area, southeastern Yukon Territory (NTS 105G). Yukon Geological Survey, Open File 2008-3.

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Yukon MINFILE, 2015. Yukon MINFILE - A database of mineral occurrences. Yukon Geological Survey, www.data.geology.gov.yk.ca, accessed May 2015.

RECOMMENDED CITATION

MACKIE, R., ARNE, D. AND PENNIMPEDE, C., 2015. Weighted sums model for VMS Cu-rich deposits levelled by geology. In: Enhanced interpretation of stream sediment geochemical data for NTS 105G. Yukon Geological Survey, Open File 2015-26, scale 1:250 000, sheet 7 of 17.

Catchment basin polygons generated by the Yukon Geological Survey (J. O. Bruce). Any revisions or additional geological information noted to the user would be welcomed by the Yukon Geological Survey.

Paper copies of this map and the accompanying report may be purchased from the Yukon Geological Survey, Energy, Mines and Resources, Government of Yukon, Room 102-300 Main St., Whitehorse, Yukon, Y1A 2B5. Ph. 867-867-3201, Email geology@gov.yk.ca.

A digital PDF (Portable Document File) file of this map may be downloaded free of charge from the Yukon Geological Survey website: http://www.geology.gov.yk.ca.

Table 1: List of Mineral Occurrences for NTS map sheet 105G (Yukon MINFILE, 2015)

Table with 5 columns: Number, Name, Type, Status, Commodities. Lists 151 mineral occurrences with details on their names, types, and associated commodities.

Yukon Geological Survey Energy, Mines and Resources Government of Yukon Open File 2015-26

Weighted sums model for VMS Cu-rich deposits levelled by geology (NTS 105G) Sheet 7 of 17

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