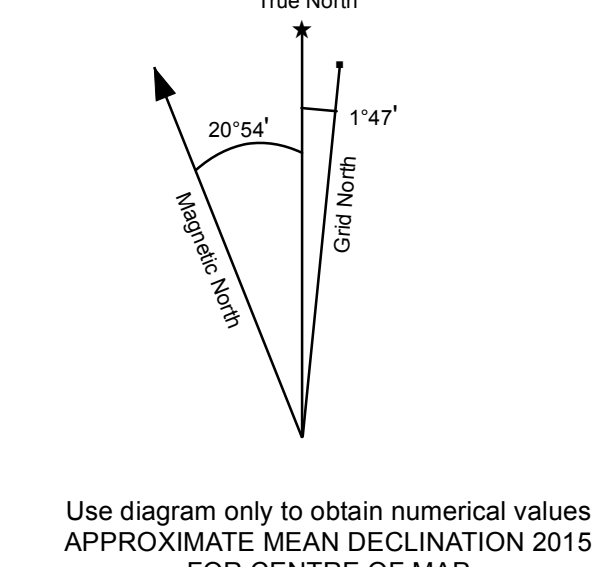


1:250 000-scale topographic base data produced by CENTRE FOR TOPOGRAPHIC INFORMATION, NATURAL RESOURCES CANADA. Copyright Her Majesty the Queen in Right of Canada. ONE THOUSAND METRE GRID Universal Transverse Mercator Projection North American Datum 1983 Zone 8. CONTOUR INTERVAL 100 FEET Elevations in metres above Mean Sea Level.

**Polymetallic Ag-Pb-Zn Weighted sums model (Principal Component Residuals) Sheet 7 of 11**  
 SCALE 1:250 000  
 kilometres



110B	116A	100D
DAWSON	LARSEN CREEK	NASH CREEK
115O	115P	105M
STEWART RIVER	<b>THIS MAP</b>	MAYO
115J	115I	105L
STEVENS RIDGE	CARMACKS	GLENYON

**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**

Stream sediment and water samples from the McQuesten area (NTS 115P) were collected at a reconnaissance scale in 1987 as part of the Canada - Yukon Mineral Development Agreement (Hornbrook & Friske, 1988). Field descriptions and initial geochemical data for 841 sites were originally released in Geological Survey of Canada (GSC) Open File 1650. New geochemical data from the re-analysis of archive sample material were released in Yukon Geological Survey (YGS) Open File 2016-31 (Jackman, 2012). The reader is referred to these reports for detailed descriptions of sampling techniques, analytical procedures and quality control measures.

**MINERAL OCCURRENCES**

Various types of base and precious-metal mineralization have been identified in the McQuesten area as listed in Table 1 (Yukon MINFILE, 2015). The most significant deposits are classed as intrusion-related Au (Hobo, Pukelman and Highet prospects), polymetallic Ag-Pb-Zn vein (Quest, East Ridge, May Creek and Hawthorne prospects), W skarn/porphyry (Rhosgobel and Scheelite Dome prospects) and Sn-Ag vein/greisen (Zeta deposit and Jabberwock prospect). The Nucleus-Revenue Cu-Mo porphyry and Minto Cu deposits occur in the adjacent NTS map area to the south supporting the prospectivity of the region for these types of deposits.

**WEIGHTED SUMS MODELING**

As described in the methodology report (Mackie et al., 2015), two approaches have been used to subdue the influence of background lithological variation and effects of secondary absorption. One uses data levelled by the dominant geology mapped within each catchment, while the other uses residuals calculated from regression against selected principal components. Weighted sums models (WSM) have been generated using the processed

data. The importance rankings used in WSMs are summarized in Table 2. Each model is optimized for a target deposit type however other deposit types may be represented in a given model due to similarities in elemental abundances and associations. The model for Porphyry Cu-Mo deposits could not be validated as no occurrences of this deposit type exists in the map area.

Exploratory data analysis using both raw element data and principal components indicate that lithological variation exhibits a significant control on the distribution of many commodity and pathfinder elements. Importantly, for this map area, much of the variability is linked to mineralization. The first component (PC1) accounts for ~25% of the total geochemical variation and has high positive loadings in Na, Ti, Sc, V, Nb and Ca; and high negative loadings in Pb, Bi, Li, Zn, La and As. Positive PC1 generally corresponds to felsic intrusive rocks of the Sulphur Creek Suite that dominate the southern part of the map area. Negative responses of PC1 are related to polymetallic Ag-Pb-Zn occurrences in the northern part of the map area and therefore is interpreted to represent a mineralization signal. The second component, with high loadings of Cd, Se, loss-on-ignition, Ca, Sr, Cu and Sb, corresponds to areas of carbonate bedrock and low-lying topography. The third component with high loadings in Ni, Fe, Mg, Co, Cu and Cr shows elevated responses associated with ultramafic intrusions and, sporadically, within areas mapped as Hyland group sedimentary rocks.

Regression analysis of selected metals against the relevant principal component(s) effectively filters the interpreted lithological control and consequently enhances responses related to known mineral occurrences. Leveling by mapped geology is less effective at filtering the lithological control for certain elements however given the strength of the mineralization signal the models generated using the two approaches are quite similar.

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 (14 km<sup>2</sup>). 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 in large catchments may also be of interest.

**Table 2: Importance rankings for weighted sums models using residuals calculated from regression against selected principal components.**

Target Deposit Type <sup>a</sup>	Other Deposit Types <sup>a</sup>	Mn	Fe	Co	Ni	Cu	Mo	Zn	Pb	Ag	Au	As	Ba	Cd	Sn	Sb	Te	Hg	Tl	Bi	W <sup>b</sup>
Polymetallic Ag-Pb-Zn	SEDEX; VMS; Pb-Zn skarn; Pb-Zn skarn							2	3	3		1		1	1						
SEDEX Pb-Zn	Polymetallic Ag-Pb-Zn; VMS; Pb-Zn skarn							3	3				1	1				1			-2
Intrusion-related Au	Epithermal Au-Ag; Polymetallic Ag-Pb-Zn								-2	1	4	3				1					2
Porphyry Cu-Mo	Intrusion-related Au; Cu skarn; Porphyry Mo								-1	1	1	2									
W skarn	Porphyry W; Sn skarn/greisen; Porphyry Mo						1						1		2						2 4

<sup>a</sup> Polymetallic Ag-Pb-Zn type includes vein and manto styles; SEDEX = sedimentary exhalative; VMS = volcanic-hosted/associated massive sulphide.  
<sup>b</sup> For heavily censored elements and those not strongly controlled by geology as interpreted from principal component analysis, raw data are used following a log<sub>10</sub> transformation.

**LEGEND**

- Town
  - Mineral Occurrence
  - Road
  - Contour
  - River
  - Water Body
  - Wetland
  - Sample Location
  - Catchment >14 km<sup>2</sup>
- Weighted sums model (PC residuals)**  
**Polymetallic Ag-Pb-Zn deposits**
- incomplete element suite
  - 0-50th percentile
  - 50-75th percentile
  - 75-90th percentile
  - 90-95th percentile
  - 95-98th percentile
  - 98-100th percentile

**RECOMMENDED CITATION**

MACKIE, R., ARNE, D. AND PENNIMPEDE, C., 2016. Weighted sums model for Polymetallic Ag-Pb-Zn deposits using principal component residuals. In: Enhanced interpretation of stream sediment geochemical data for NTS map sheet 115P, Yukon Geological Survey, Open File 2016-31, scale 1:250 000, sheet 7 of 11.

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

Paper copies of this map and the accompanying report may be obtained from the Yukon Geological Survey, Energy, Mines and Resources, Government of Yukon, Room 102-300 Main St., Whitehorse, Yukon, Y1A 2B5. Ph. 867-667-3201, 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>.

**REFERENCES**

Hornbrook, E.H.W. and Friske, P.W.B., 1988. Regional Stream Sediment and Water Geochemical Data, central Yukon (NTS 115P and part of 105M). Geological Survey of Canada, Open File 1650.  
 Jackman, W., 2012. Regional Stream Sediment Geochemical Data, McQuesten area, central Yukon (NTS 115P). Yukon Geological Survey, Open File 2012-9.  
 Mackie, R., Arne, D. and Brown, O., 2015. Enhanced interpretation of regional stream sediment geochemistry from Yukon: catchment basin analysis and weighted sums modeling. Yukon Geological Survey, Open File Report 2015-10.  
 Yukon MINFILE, 2015. Yukon MINFILE - A database of mineral occurrences. Yukon Geological Survey, [www.data.geology.gov.yk.ca](http://www.data.geology.gov.yk.ca), accessed May 2015.

Yukon Geological Survey  
 Energy, Mines and Resources  
 Government of Yukon

Open File 2016-31

**Weighted sums model for Polymetallic Ag-Pb-Zn deposits using principal component residuals (NTS 115P) Sheet 7 of 11**

by  
 Rob Mackie, Dennis Arne,  
 and Chris Pennimpede