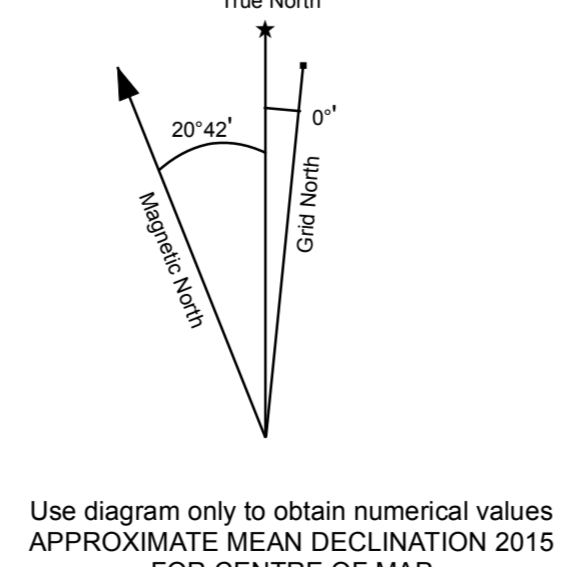
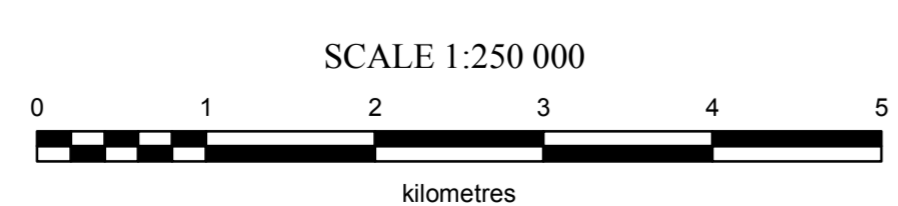


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ONE THOUSAND METRE GRID  
Universal Transverse Mercator Projection  
North American Datum 1983  
Zone 8

CONTOUR INTERVAL 100 FEET  
Elevations in metres above Mean Sea Level

### Polymetallic Ag-Pb-Zn Weighted sums model (Geology Levelled) Sheet 3 of 13



|               |                 |            |
|---------------|-----------------|------------|
| 115I          | 105L            | 105K       |
| CARMAOKS      | GLENLYON        | TAY RIVER  |
| 115H          | 105E            | 105F       |
| AIRBANK LAKE  | <b>THIS MAP</b> | QUIET LAKE |
| 105E          | 105D            | 105C       |
| DEADASH RANGE | WHITEHORSE      | TESLIN     |

#### 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 portion of Yukon.

#### SAMPLING AND ANALYSIS PROGRAMS

Regional stream sediment and water samples from the Lake Laberge map area (NTS 105E) were collected at a reconnaissance scale in 1988 as part of the National Geochemical Reconnaissance program under the Canada-Yukon Minerals Development Agreement (Hornbrook & Friske, 1989). Field descriptions and geochemical data for 908 sites were initially released in Geological Survey of Canada ("GSC") Open File 1960 (Hornbrook & Friske, 1989). As part of the Yukon Database Upgrade Project, archived sample material was re-analyzed by Inductively Coupled Plasma Mass Spectrometry following an aqua regia digestion. The new geochemical data were released in Yukon Geological Survey ("YGS") Open File 2015-7 (Jackman, 2015). The reader is referred to these open files for details regarding sampling techniques, analytical procedures and quality control and assurance.

#### MINERAL OCCURRENCES

A variety of types of base and precious-metal mineralization have been documented in the map area as summarized in Table 1 (Yukon MINFILE, 2015). The most notable occurrences are classed as Cu-Ag-Pb-Zn skarn (Laberge prospect; Dycer and D'Abbadie showings), Polymetallic Ag-Pb-Zn-Au vein (Loon Prospect, RK, Deet, Livingston and Sylvia showings) and Cu-Mo porphyry (TUV Prospect). Additional deposit types include Cu-Ag vein, Mo porphyry, W skarn, Sb-As-Ni-Co and quartz vein Au. Notably, there are no occurrences that are considered 'deposits' within the map area. However, both the Red Mountain Mo porphyry and Whitehorse Cu skarn deposits occur in the adjacent map sheet area, towards the south (105D).

#### 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 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. The ability to validate the models against known occurrences is limited for this map area because it contains relatively few mineral occurrences and drainage basins for several of the more significant occurrences have not been sampled.

Exploratory data analysis of both raw element data and principal components shows that the distribution of many commodity and pathfinder elements is related to lithological variation. For example, the first principal component, accounting for ~27% of the total variation, shows high positive loadings for Sr, Ca, LOI, Se, Hg and Cu, and high negative loadings for Ce, Th, La, Li, Pb and Pb. These element groupings form spatial trends that correspond with clastic and carbonate rocks of the Leves River Group and felsic intrusive rocks of the Cassiar Suite, respectively. The second principal component with high loadings in V, Sc, Co, Fe and Cr matches the distribution of mafic volcanic rocks. The third principal component with high loadings in Ni, As, Ag, Sb, Cd, Mo and Zn corresponds to a package of rocks in the northeastern part of the map area consisting of mafic and ultramafic intrusions, mafic volcanic rocks, graphitic phyllite, argillite and carbonate. Regression analysis of these metals against the relevant principal component effectively subduced these terrane-effects while preserving responses related to known occurrences. Leveling by dominant mapped geology has a more subdued effect on filtering the interpreted geologic control for certain elements (e.g., Bi, Hg). In order to reduce the impact of this on WSM using this approach these elements were given low importance rankings, or were omitted, for certain deposit types. The models generated using the two approaches for a given deposit type show only subtle differences for this map area.

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 (12 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 area, marginally high WSM scores for samples in large catchments could also be of interest.

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

| Number   | Name          | Type                          | Status           | Commodities                                 |
|----------|---------------|-------------------------------|------------------|---|
| 105E 001 | LIVINGSTON    | Vein Polymetallic Ag-Pb-Zn-Au | Showing          | Copper, Silver, Lead, Gold                  |
| 105E 002 | TUV           | Porphyry Cu-Mo-Au             | Drilled Prospect | Fluorite, Gold, Lead                        |
| 105E 003 | LOON          | Vein Polymetallic Ag-Pb-Zn-Au | Showing          | Copper, Gold, Lead, Silver                  |
| 105E 006 | LABERGE       | Skarn Cu                      | Drilled Prospect | Copper                                      |
| 105E 008 | RUTH          | Skarn Cu                      | Showing          | Copper, Silver, Zinc                        |
| 105E 010 | PACKERS       | Skarn Cu                      | Showing          | Copper                                      |
| 105E 011 | CLARE         | Coal                          | Showing          | Coal  |
| 105E 012 | WALSH         | Coal                          | Showing          | Coal  |
| 105E 014 | SEMENOF       | Vein Cu-Ag-Quartz             | Showing          | Copper, Gold, Silver                        |
| 105E 015 | ILLUSION      | Ultramafic-hosted asbestos    | Showing          | Chrysotile                                  |
| 105E 016 | CASSIAR BAR   | Vein Cu-Ag-Quartz             | Showing          | Copper, Silver                              |
| 105E 020 | SYLVIA        | Vein Polymetallic Ag-Pb-Zn-Au | Showing          | Copper, Gold, Zinc, Silver, Lead            |
| 105E 022 | CORDUROY      | Coal                          | Drilled Prospect | Coal  |
| 105E 024 | HK            | Porphyry Alkalic Cu-Au        | Showing          | Copper, Molybdenum                          |
| 105E 025 | LORI          | Porphyry Mo (Low F-Type)      | Showing          | Copper, Molybdenum                          |
| 105E 026 | MUSTARD       | Vein Au-Quartz                | Showing          | Gold  |
| 105E 027 | BACON         | Porphyry Mo (Low F-Type)      | Showing          | Copper, Gold                                |
| 105E 028 | KLUSHA        | Coal                          | Drilled Prospect | Coal  |
| 105E 030 | SALMON        | Skarn W                       | Showing          | Tungsten                                    |
| 105E 031 | HITCHENS      | Skarn W                       | Showing          | Tungsten                                    |
| 105E 039 | AKEL          | Unknown                       | Anomaly          | Gold  |
| 105E 040 | OVOAS         | Unknown                       | Anomaly          | Gold  |
| 105E 041 | ENOF          | Unknown                       | Anomaly          | Gold  |
| 105E 042 | LAKE          | Vein Au-Quartz                | Showing          | Gold  |
| 105E 043 | GERM          | Unknown                       | Anomaly          | Gold  |
| 105E 044 | PRESTON       | Unknown                       | Anomaly          | Gold  |
| 105E 046 | RANKL         | Unknown                       | Anomaly          | Gold  |
| 105E 047 | MAYBE         | Unknown                       | Anomaly          | Gold, Lead                                  |
| 105E 053 | DEET          | Vein Polymetallic Ag-Pb-Zn-Au | Showing          | Antimony, Gold, Arsenic, Lead, Silver, Zinc |
| 105E 057 | MILNER        | Coal                          | Anomaly          | Coal  |
| 105E 061 | BRABURN LIME  | Limestone                     | Drilled Prospect | Limestone                                   |
| 105E 062 | EGYPT         | Unknown                       | Anomaly          | Gold  |
| 105E 034 | RICHTHOFEN    | Unknown                       | Unknown          |   |
| 105E 009 | REEF          | Unknown                       | Drilled Prospect |   |
| 105E 038 | SLINE         | Unknown                       | Anomaly          |   |
| 105E 064 | RK            | Vein Polymetallic Ag-Pb-Zn-Au | Showing          | Bismuth, Cadmium, Silver, Lead              |
| 105E 063 | NICKELINE     | Ultramafic - Nickel           | Showing          | Antimony, Arsenic, Nickel, Cobalt           |
| 105E 065 | DYCKER        | Skarn Cu                      | Showing          | Copper, Tungsten, Lead                      |
| 105E 054 | TREKICE       | Unknown                       | Unknown          |   |
| 105E 037 | CROST         | Unknown                       | Anomaly          |   |
| 105E 005 | NAPUA         | Unknown                       | Unknown          |   |
| 105E 056 | IRENDA        | Unknown                       | Unknown          |   |
| 105E 035 | LITTLE BEAR   | Unknown                       | Unknown          |   |
| 105E 032 | MENDOCINA     | Unknown                       | Unknown          |   |
| 105E 029 | TERAKTU       | Unknown                       | Unknown          |   |
| 105E 059 | FONE          | Unknown                       | Anomaly          |   |
| 105E 050 | DEBICKI       | Unknown                       | Unknown          |   |
| 105E 049 | LITTLE VIOLET | Unknown                       | Unknown          |   |
| 105E 058 | COUGHLAN      | Unknown                       | Unknown          |   |
| 105E 033 | D'ABBADIE     | Skarn Cu                      | Anomaly          |   |
| 105E 036 | AURIER        | Unknown                       | Anomaly          |   |

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

| 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 | U |    |
|----------------------------------|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|----|
| Polymetallic Ag-Pb-Zn            | SEDEX (high Ag); VMS; Pb-Zn skarn                   |    |    |    |    | -1 |    | 1  | 3  | 4  |    | 2  | 1  | 1  |    |    |    |    |    |    |   | -1 |
| VMS (felsic)                     | SEDEX (low Ag); Pb-Zn skarn                         |    |    |    |    | -2 | 2  | 4  | 2  | 1  |    |    | 1  | 1  |    |    |    |    |    | 1  |   | -1 |
| Porphyry Cu-Mo                   | Cu skarn; Porphyry Mo; W skarn                      |    |    |    |    | -2 | 4  | 4  |    | 3  | 1  |    |    |    |    |    |    |    |    | 1  |   |    |
| Intrusion-related Au             | Epithermal Au                                       |    |    |    |    |    |    |    |    | 3  | 2  |    |    |    |    |    | 1  |    |    |    |   | 1  |
| Epithermal Au-Ag                 | Intrusion-related Au; Polymetallic Ag-Pb-Zn W skarn |    |    |    |    |    |    |    |    | 3  | 3  | 2  |    |    |    |    | 1  |    | 1  |    |   | -1 |
|                                  | Sn skarn; Porphyry W                                |    |    |    |    |    |    | 1  |    |    |    |    |    |    |    |    | 1  |    |    |    |   | 2  |

<sup>a</sup> Polymetallic Ag-Pb-Zn type includes vein and manto styles; SEDEX = sedimentary exhalative; VMS (felsic) = Zn-rich volcanic-hosted/associated massive sulphide deposits (i.e., Kuroko type); VMS (mafic) = Cu-rich volcanic-hosted/associated massive sulphide (i.e., Cyprus and Beshli types)

<sup>b</sup> Raw data following a log<sub>10</sub> transformation.

#### LEGEND

- Town
- Mineral Occurrence
- Road
- Contour
- River
- NTS map sheet
- Welland
- Water Body
- Sample Location
- Catchments > 12km<sup>2</sup>

**Weighted sums model (Geology Levelled)**

**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

#### REFERENCES

Hornbrook, E.H. and Friske, P.W., 1989. National Geochemical Reconnaissance stream sediment and water geochemical data, southern central Yukon (105E). Geological Survey of Canada, Open File 1960.

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Yukon MINFILE, 2010. 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.

#### RECOMMENDED CITATION

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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](mailto: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>.

Yukon Geological Survey  
Energy, Mines and Resources  
Government of Yukon

Open File 2016-9

### Weighted sums model for Polymetallic Ag-Pb-Zn deposits levelled by mapped geology (NTS 105E) Sheet 3 of 13

by

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