Yukon Geological Survey

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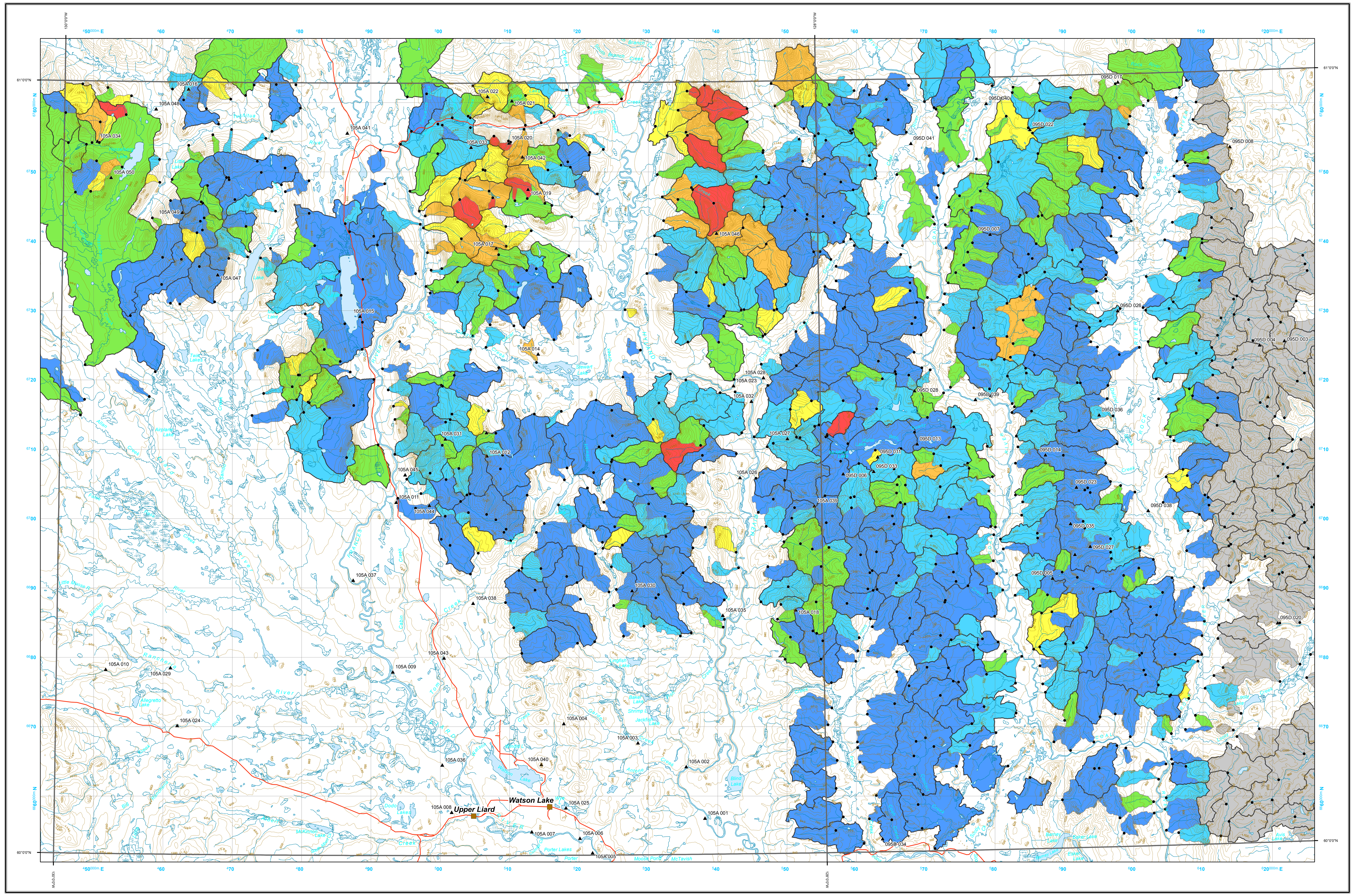

INTRODUCTION

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 Watson Lake and Coal River areas (NTS 105A and 95D, respectively) were collected at a reconnaissance scale in 1995 as part of the Canada-Yukon Mineral Resource Development Cooperation Agreement (Friske *et al*., 1996). Field descriptions and initial geochemical data for 1117 sites were released in Geological Survey of Canada (GSC) Open File 3293. New geochemical data from the re-analysis of archive sample material from 824 sites were released in Yukon Geological Survey (YGS) Open File 2012-10 (Jackaman, 2012). The reader is referred to these reports for detailed descriptions of sampling techniques, analytical procedures, and quality control measures. The current assessment includes only those samples that have been re-analyzed by Inductively Coupled Plasma Mass Spectrometry (ICP-MS) and as such, the eastern half of NTS map sheet 95D is excluded.

MINERAL OCCURRENCES

A variety of types of base and precious-metal mineralization are known to occur in the Watson Lake and Coal River area as shown in Table 1 (Yukon MINFILE, 2015). The most significant deposits are classed as intrusion-related gold (Hyland Deposit), Polymetallic Ag-Pb-Zn manto (past producing Mt. Hundere Mine & McMillan deposit) and W-Skarn (Bailey deposit). Other types of mineralization include various Pb-Zn deposits and prospects such as the Ritco (Skarn), Balon (SEDEX), Jeri and Jeri-North (SEDEX or MVT), and Sambo (VMS). The volcanic and sedimentary package that hosts VMS mineralization in the Finlayson Lake district extends into the Watson Lake map area indicating a high prospectivity for this style of mineralization.

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 secondary absorption on the composition of stream sediments. 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.

Weighted sums models were not generated for porphyry Cu-Mo and epithermal Au-Ag deposit types because no such deposits are known to exist in the region and exploratory data analysis revealed no obvious anomalies in the expected commodity and pathfinder elements. Similarly, given a lack of evidence for scavenging of metal ions by secondary Fe or Mn-oxides a WSM for hydromorphic anomalies was also not produced.

Exploratory data analysis using both raw element data and principal components indicate that the distribution of many commodity and pathfinder elements is strongly influenced by lithological variation. The first principal component accounts for ~27% of the total geochemical variation and shows high positive loadings for Cd, Se, Sb, Ba, Hg, Zn and Ag; and negative loadings for, amongst other elements, Rb, Al, Sn, La, Ce and K. Respectively, these groupings form spatial patterns that match the distribution of chert and clastic sedimentary rocks of the Rabbitkettle Formation and intermediate intrusive rocks of the Hyland Suite. The second principal component, accounting for ~13% of the total variation, shows high positive loadings for Co, Fe and Cu, and high negative loadings for Tl, Nb, Ca, Ti, Na and Sr, and forms domains matching the mapped distribution of clastic sedimentary rocks of the Hyland Group and the carbonate rocks of the Rabbitkettle Formation, respectively. Regression analysis of selected metals against the relevant principal component(s) effectively filters these terrane-effects while preserving responses related to known occurrences. Levelling by mapped geology has a more subdued effect on filtering the interpreted lithological control on the distribution of certain pathfinder elements (*e.g.,* Sb, Ba and Cd). In order to reduce the impact this has on the WSM using this approach, certain elements were given low importance rankings or, in some cases, were omitted for certain deposit types.

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 (15 km^2). 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 anomalism. 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 1: List of Mineral Occurrences for NTS map sheet 105A/95D (Yukon MINFILE, 2015)

Number	Name	Type	Status	Commodities
095D 001	TOOBALLY	Unknown	Anomaly	
095D 002	GUSTY	Volcanogenic Sulphide - type not determined	Showing	Copper
095D 003	RA	Unknown	Unknown	
095D 004	AR	Unknown	Unknown	
095D 005	MEL	Sediment hosted Mississippi Valley-Type Pb-Zn (MVT)	Deposit	Barite, Zinc, Lead, Copper
095D 006	MCMILLAN	Manto Polymetallic Ag-Pb-Zn	Deposit	Lead, Zinc, Silver
095D 007	CHU	Skarn Pb-Zn	Showing	Lead, Zinc
095D 008	GABE	Volcanogenic Sulphide - type not determined	Showing	Copper
095D 011	HYLAND GOLD	Plutonic Related Au	Deposit	Gold, Silver, Bismuth, Lead, Arsenic
095D 012	SOWDEN	Unknown	Unknown	
095D 013	HULSE	Manto Polymetallic Ag-Pb-Zn	Prospect	Lead, Silver, Zinc
095D 014	WATSIT	Unknown	Anomaly	Zinc
095D 016	ASBURY	Unknown	Anomaly	Zinc, Lead
095D 017	SPORK	Unknown	Unknown	
095D 018	OUDDER	Skarn W	Anomaly	Tungsten
095D 019	SERAPHIM	Unknown	Anomaly	Zinc
095D 020	LOOTZ	Volcanogenic Sulphide - type not determined	Anomaly	Lead, Zinc
095D 021	KRONIG	Unknown	Anomaly	Barite, Zinc, Lead
095D 022	HERPES	Skarn W	Unknown	Tungsten
095D 023	QUO	Unknown	Anomaly	Gold
095D 026	SULPETRO	Coal	Deposit	Coal
095D 027	JONI	Sediment hosted Mississippi Valley-Type Pb-Zn (MVT)	Showing	Barium, Lead, Zinc, Silver
095D 028	PLAY	Unknown	Unknown	
095D 032	JERI	Sediment hosted Sedimentary Exhalative Zn-Pb-Ag (Sedex)	Drilled Prospect	Zinc, Lead
095D 033	CUZ	Vein Au-Quartz	Showing	Antimony, Arsenic, Bismuth, Gold
095D 034	JP	Unknown	Anomaly	Lead, Silver
095D 035	JERI-NORTH	Sediment hosted Mississippi Valley-Type Pb-Zn (MVT)	Drilled Prospect	Zinc
095D 036	ZIEL	Unknown	Anomaly	Lead, Zinc
095D 037	GUSTY	Unknown	Anomaly	
095D 038	BLOOD	Unknown	Anomaly	
095D 039	FERRICRETE	Unknown	Anomaly	
095D 040	ARGIL	Unknown	Anomaly	Copper, Molybdenum, Nickel, Manganese
095D 041	TOE-IN	Skarn	Anomaly	
105A 001	HY	Unknown	Unknown	
105A 002	IT	Unknown	Unknown	
105A 003	GARDEN	Unknown	Unknown	
105A 004	WINDFALL	Unknown	Unknown	
105A 005	WATSON	Vein Polymetallic Ag-Pb-Zn±Au	Drilled Prospect	Lead, Zinc, Silver
105A 006	NAZO	Vein Polymetallic Ag-Pb-Zn±Au	Drilled Prospect	Barite, Copper, Zinc, Silver, Lead
105A 007	CAROL	Coal	Drilled Prospect	Coal
105A 008	ALBERT	Coal	Drilled Prospect	Coal
105A 009	SAWMILL	Coal	Showing	Coal
105A 010	RANCH	Unknown	Unknown	
105A 011	CARNEGIE	Unknown	Anomaly	
105A 012	MT. HUNDERE	Manto Polymetallic Ag-Pb-Zn	Past Producer	Lead, Zinc, Silver, Fluorite
105A 013	SA DENA HES	Skarn Pb-Zn	Past Producer	Lead, Zinc, Silver
105A 014	RALPH	Unknown	Unknown	
105A 015	SIMPSON	Unknown	Staked - No Work Recorded	
105A 016	HEISZ	Unknown	Unknown	
105A 017	BAILEY	Skarn W	Deposit	Tungsten, Tungsten Trioxide, Copper, Molybdenum
105A 018	BALON	Sediment hosted Sedimentary Exhalative Zn-Pb-Ag (Sedex)	Prospect	Cadmium, Zinc, Lead, Copper, Gold
105A 019	CANADA	Skarn W	Showing	Tungsten
105A 020	MURRAY	Porphyry Mo (Low F-Type)	Showing	Gold, Molybdenum, Tungsten
105A 021	NOTT	Vein Polymetallic Ag-Pb-Zn±Au	Drilled Prospect	Copper, Lead, Gold, Zinc, Tungsten, Silver
105A 022	BOURGET	Unknown	Anomaly	Copper, Tungsten
105A 023	WARBURTON	Vein Polymetallic Ag-Pb-Zn±Au	Showing	Copper, Silver, Gold, Lead
105A 024	OLGA	Unknown	Unknown	
105A 025	MYMRYK	Unknown	Unknown	
105A 026	HYLAND	Unknown	Anomaly	Zinc
105A 027	ANGUS	Unknown	Anomaly	Zinc
105A 028	SHALE	Unknown	Unknown	Zinc
105A 029	ALLEGRETTO	Unknown	Unknown	
105A 030	LINGFISH	Unknown	Anomaly	Lead, Zinc
105A 031	PLAN	Unknown	Unknown	
105A 032	GREEN	Vein Polymetallic Ag-Pb-Zn±Au	Showing	Copper, Gold, Lead, Silver
105A 033	KLUNK	Unknown	Unknown	
105A 034	HOWARD	Unknown	Unknown	
105A 035	TILL	Unknown	Anomaly	
105A 036	DODO	Coal	Prospect	Coal
105A 037	MIDDLE CANYON	Coal	Showing	Coal
105A 038	SHELL	Unknown	Anomaly	
105A 039	AURUM	Manto Polymetallic Ag-Pb-Zn	Anomaly	Copper, Zinc, Gold, Silver
105A 040	SKIHILL	Unknown	Unknown	
105A 041	PUG	Unknown	Unknown	
105A 042	SLEET	Unknown	Unknown	
105A 043	GLIMMER	Unknown	Anomaly	
105A 044	HIGHWAY	Unknown	Anomaly	
105A 045	JEWEL	Unknown	Unknown	
105A 046	TAFFIE	Porphyry Mo (Low F-Type)	Anomaly	Molybdenum
105A 047	SAMBO	Volcanogenic Massive Sulphide (VMS) Kuroko Cu-Pb-Zn	Prospect	Copper, Zinc, Gold, Silver, Lead
105A 048	ITCH	Unknown	Anomaly	
105A 049	LITTLE JIMMY	Volcanogenic Sulphide - type not determined	Showing	Copper, Zinc, Lead, Silver
105A 050	BART	Unknown	Anomaly	Copper, Zinc, Gold, Lead

Table 2: Importance rankings for weighted sums models using residuals on principal components.

Target Deposit Type	Other Deposit Types	Mn	Fe	Co	Ni	Cu	Mo	Zn	Pb	Ag	Au[1]	As	Ba	Cd	Sn	Sb	Te	Hg	Tl	Bi	W
Polymetallic Ag-Pb-Zn	SEDEX, VMS (Zn-rich), MVT, Pb-Zn skarn							2	4	2		1			1	1			-2		
VMS (Zn-rich)	SEDEX, Pb-Zn skarn, MVT, VMS (Cu-rich), Polymetallic Ag-Pb-Zn					2		4	3	1			1	1					1		
VMS (Cu-rich)	Cu skarn			2		3			-1	-1											
Porphyry Mo	Porphyry Cu					2	4	-1		1			-2	-1						1	1
W skarn	Porphyry Mo						2													1	3
Intrusion-related Au	Epithermal Au-Ag										3	3				1				1	

[a]Polymetallic Ag-Pb-Zn type includes vein and manto styles; SEDEX = sedimentary exhalative Pb-Zn-(Ag); VMS = volcanic-hosted/associated massive sulphide deposits; MVT = Mississippi Valley-type Pb-Zn deposits

[1]Raw data following a log_{10} transformation

LEGEND

- Town
- Mineral Occurrence
- Road
- Contour
- River
- NTS map sheet
- Water Body
- Wetland
- Sample_Location
- Catchment
- Catchments >15 km^2

Weighted sums model (PC residuals)

W skarn 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., 2015. Weighted sums model for W skarn deposits using principal component residuals. In: Enhanced interpretation of stream sediment geochemical data for NTS 95D and 105A. Yukon Geological Survey, Open File 2015-30, scale 1:250 000, sheet 12 of 13.

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 purchased 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) of this map may be downloaded free of charge from the Yukon Geological Survey website: http://www.geology.gov.yk.ca.

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Friske P.W.B., McCurdy M.W., Balma R.G., Day S.J.A., Lynch J.J. and Durham C.C., 1996. Regional Stream Sediment and Water Geochemical Data, Southeastern Yukon (Parts of NTS 95D and 105A). Geological Survey of Canada, Open File 3293.

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Open File 2015-30

Weighted sums model for W skarn deposits using principal component residuals (NTS 95D and 105A) Sheet 12 of 13

by

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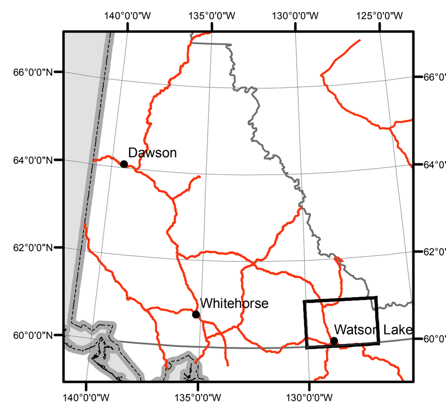


1:250 000-scale topographic base data produced by CENTRE FOR TOPOGRAPHIC INFORMATION, NATURAL RESOURCES CANADA

ONE THOUSAND METRE GRID
Universal Transverse Mercator Projection
North American Datum 1983
Zone 9

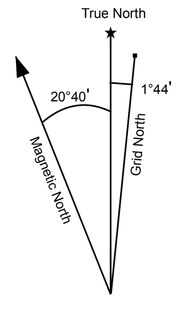
CONTOUR INTERVAL 100 FEET
Elevations in metres above Mean Sea Level

W skarn Deposits
Weighted sums model
(Principal Component Residuals)
Sheet 12 of 13

SCALE 1:250 000

0 1 2 3 4 5

kilometres



Use diagram only to obtain numerical values
APPROXIMATE MEAN DECLINATION 2015
FOR CENTRE OF MAP

105G FINLAYSON LAKE	105H FRANCES LAKE	095E FLAT RIVER
105B WOLF LAKE	105A THIS MAP	095D THIS MAP
104P MCDAME	094M RABBIT RIVER	094N TOAD RIVER