



Province of
British Columbia

Ministry of
Energy, Mines and
Petroleum Resources

GEOLOGICAL SURVEY BRANCH

MEMORANDUM

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To: Project Geologists, Managers

Date: Dec. 21, 1994

From: Dani Alldrick, Kim Bellefontaine, Dave Lefebure

883603

Re: Highlights from MDRU VMS Update - Dec. 9, 1994 at UBC

Food for thought: The three GSB participants decided to write down the 6-8 "high points" of information that had the most significance and impact for them out of all the data presented at this day-long meeting. Here are the 21 highlights. Note that each geologist selected different "most important" points.

- MDRU is subdividing VMS deposits into two groups: mafic volcanic/sediment hosted and felsic volcanic hosted. First group includes Windy Craggy, Anyox and Granduc and is preferred to "Cyprus-Type" and "Besshi-Type" because there are always sediments in the sequence. Second group includes some deposits that are not "Kuroko-Type" such as Kutcho Creek.
- Granduc 223 Ma (U-Pb), Anyox are Triassic-age VMS deposits.
- Trondjemite body located in the centre of the Anyox pendant has yielded a 364 Ma zircon date (!) This pendant MUST be mapped - it holds 160 Ma of uncorrelated stratigraphy -- and hosts a major VMS camp -- What else does it host???
- Granby Point Quartz veins (and similar veins throughout the Anyox camp) are Tertiary, high temperature veins (>300°C)
- Kutcho Creek is constrained to 249 Ma by U-Pb dates - so lies on the Permo-Triassic boundary. Not Triassic as previously thought.
- The "primitiveness" of the Kutcho Creek deposit is intriguing. Pb isotopes suggest formation in an oceanic environment. However, large amounts of felsic volcanics are anomalous for this type of tectonic setting. So, O1B?
- The geochemistry of the Kutcho formation volcanics show they are tholeiitic, sodic, and have very low concentrations of incompatible elements. Geochemistry supports an oceanic environment but rock types are typical of island arcs. This raises interesting questions about the relationships between rocks of the King Salmon allochthon and Cache Creek terrane.
- Almost all volcanic rocks and associated intrusives at Kutcho Creek are tholeiitic with low values of incompatible elements (Nb, Y, Zn) which are not consistent with a calc-alkaline Kuroko-deposit setting.
- Tulsequah is hosted by proximal felsic volcanics while Big Bull is at roughly the same stratigraphic horizon in distal bedded felsic volcanics with manganese exhalative

Granduc.

Anyox

*Kutcho
Ck.*

*(à la Tulsequah
chert/Myra
falls!)*

*Analogies?
e/sen...?*

*Tulsequah
Chert*

sediments slightly higher in the stratigraphy (Mitch - which way to the felsic volcanic centre?)

- Eskay Ck.*
- 109 zone at Eskay Creek yields fluid inclusion data suggesting boiling has occurred at a depth of ~160 m (this is a maximum depth for sulphide lens deposition).
 - Variations in fluid inclusion chemistry at Eskay Creek suggest that hydrothermal fluids originated as cooler fluids of seawater composition and evolved to hotter fluids with an added component of magmatic water.
 - Eskay Creek ores are atypically low temperature for VMS deposits (reflecting shallow water deposition??)

21A zone	140° - 200°C	stratabound lenses
21B zone	90° - 140°C	stratabound lenses
109 zone	110° - 160°C	stockwork feeder zones
Pumphouse/Pathfinder zones	110° - 170°	stockwork feeder zones

- The Eskay Creek rocks (Mt. Dilworth and Salmon River Fmtns.) also have tholeiitic trends. Another common feature between Kutcho Creek and Eskay Creek is the presence of low Ti-rhyolite.
- Hangingwall strata at Myra Falls, Tulsequah Chief, Kutcho Creek and Eskay Creek all have more primitive geochemical signatures (i.e. Ni, Cr) than their footwall counterparts. Why are the less evolved magmas at the top of the pile?
- Seneca and Battle Zone (Buttle Lake) cited as examples of replacement textures in massive sulphides.
- Although previous workers have argued for 4 periods of deformation to account for all structural features documented at Granduc, all features could be accounted for by a single (Cretaceous?) phase of non-coaxial deformation (major regional shear).
- A minimum displacement of 30 km of sinistral offset on the South Unuk Shear Zone suggests potential areas for Granduc extensions.
- MDRU is using PER (Pearce Element Ratio) "bubble plots" to routinely distinguish highly altered samples from little altered rocks. Several striking examples demonstrate the effects of sericite alteration on volcanic rocks.
- Debris flows and/or clastic sulphides appear to be common at a number of VMS deposits associated with felsic volcanic rocks (Eskay Creek, HW, Tulsequah) which are probably related to paleotopographic features. Are they caldera margins, synvolcanic faults, domes?
- In at least four talks, reference was made to igneous rocks (usually sills) reacting with wet sediments to produce peperite textures - "blobby" fragments with chilled margins. These may be much more common in B.C. than identified to date.
- Harrison Terrane (Harrison Lake Group) is no longer correlated with Stikinia (Hazelton Group). It is now correlated with Wrangellia (Bonanza Group) based on petrochemical affinities.

*Seneca
Myra Falls
Granduc*

*Dec. 2/94
MDRU-VMS meeting Memo*