

November 3, 1999

Re: Highlights of a visit to the Kemess Mine from October 25 to 28  
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Four days were spent at the minesite, working with Bob Lane, and mine staff, Jacques Houle and Mike Hibbitts, mine geologist. Field investigations were conducted both within the open pit and on adjoining ground with the purpose of resolving specific questions stemming from earlier mapping in the area by the GSB.

#### Geological Results:

- The North Block Fault is a major extensional structure that delimits the orebody in the north. The plane of this structure is currently superbly exposed in bench walls near the northern rim of the pit, where the fault juxtaposes hypogene ore against a footwall block that is composed mainly of differentially deformed Early Permian sedimentary strata. Rocks on both sides of the fault record the strong effects of fault motion, evidenced by breccias and intense fracturing across a zone up to 10 metres wide. The most recent motion on the North Block Fault is late relative to emplacement of the mineralized Maple Leaf Pluton. This is indicated by truncation of protore that has been juxtaposed against unmineralized Permian rocks. Measurements of slickensides on the fault plane indicate that the orebody has moved down and to the east relative to the footwall block north of the fault.

Presently underway is a twelve-hole diamond drill program for geotechnical purposes and high wall re-design. All diamond drill setups are to the north-northwest, perpendicular to the trace of the North Block Fault. This core will provide superb 3-D geological section, both across and along the entire length of the North Block Fault where it transects the open pit.

- North of the North Block Fault the country rocks were revisited in order to draw comparisons with stratigraphy south of the fault and beneath the orebody. This investigation reveals that country rocks north of the fault are composed mainly of augite-bearing basalts of the Upper Triassic Takla Group. In the northeast, relative to the open pit, and immediately across the North Block Fault, strata of the Takla Group have an unconformable lower contact with a distinctive Early Permian sedimentary package composed of medium thickly bedded chert with argillaceous partings. Recent interpretations by other geologists have assigned the basaltic rocks north of the North Block Fault to a younger rock succession and also interpret thrust faulting. This work refutes these interpretations, showing that a simple stratigraphic relationship of Upper Triassic on Early Permian strata exists to the north of the North Block Fault.

Drill core from selected holes that pass through the hypogene zone into underlying country rock was examined in order to characterize alteration zoning patterns and to identify stratigraphic units adjacent to the lower margin of the orebody. Results from this part of the study are far from being conclusive. Intense chloritization affects the lower marginal zone of the mineralized sill-like pluton at Kemess. No evidence of intensive potassium enrichment, in the form of a biotite hornfels, portrayed by previous workers was found in the diamond drill holes examined. Instead chlorite alteration extends into adjacent country rocks beneath the orebody. The protolith of the altered country rocks are basaltic flows which resemble Early Permian or older basaltic rock on the basis of aphanitic texture and absence of relict augite phenocrysts of chloritized pseudomorphs, the latter of which characterize Upper Triassic basalts. The nature of the lower contact separating protore from underlying unmineralized country rock is obscured by the intensive chloritization. Previous works and some Kemess geologists have suggested the possibility of a low angle structure, possibly a thrust fault, at the base of the hypogene zone. In the core examined there is little evidence in the way of increased deformation near the base of the deposit to support a thrust interpretation; however this study is based on only two holes and many more throughout the deposit area require investigation before a reliable interpretation of the contact relationship is known.

- Presently open pit development is confined to the eastern part of the Maple Leaf intrusion where hypogene ore is closest to the surface. Pit development is proceeding to the southwest where contacts with overlying supergene ore and capping volcanoclastic and epiclastic rocks have been particularly well exposed during mining. Knowledge of the timing and development of the deposit has evolved significantly since a synopsis for the Kemess South deposit was first published by Rebagliati and co-

workers in 1995, just prior to inception of work in the area by the GSB. Geochronometry of the Maple Leaf intrusion, which is host for the hypogene gold-copper mineralization, is now precisely dated by the U-Pb method at 199.6±0.6 Ma. This zone is transitional above into oxidized supergene ore, which comprises about 20% of the ore reserve at Kemess South. In turn the mineralized rocks at Kemess are capped by a post-ore volcanoclastic epiclastic sequence, which was previously assigned by Rebagliati and co-workers to the Upper Cretaceous Sustut Group. This capping sequence bears no resemblance whatsoever to the Sustut Group, hence it was reassigned a Jurassic age in this study. A Jurassic age for this succession has been recently affirmed by a U-Pb date of 194.0±0.6 Ma on a vitriclastic tuff member near the base of the unit. These dates bracket the timing of Au-Cu porphyry mineralization at Kemess South roughly between 200 and 194 Ma, a wholly Early Jurassic mineralizing episode that is genetically related to a regional plutonic event represented by the granodiorite and quartz monzonite stocks of the Black Lake plutonic suite.

#### Pending Exploration

- Northgate, new owners of the Kemess Mine, currently hold a large tract of claims adjacent to Kemess South that includes some notable exploration targets such as the Kemess North Au-Cu prospect and Zn-Pb skarn prospects west of Kemess North, on Duncan Ridge. Several developments have taken place since Northgate acquired Royal Oak, events that will shape future exploration in the Toodoggone area. Firstly, the company has closed and vacated Royal Oak's Exploration office in Smithers, moving Jacques Houle, former exploration manager, to the minesite. Jacques is no longer involved in grassroots exploration, but has been reassigned to mill duties at the minesite. Mike Hibbitts the former and present mine geologist at Kemess South now has the added role of overseeing exploration on claims adjacent to the mine. I gathered from my discussions with Mike that the new company will initially focus exploration on the existing claims. One such exploration play that is currently underway is to conduct a winter drill program to test geophysical anomalies located north of the North Block Fault. Plans for future exploration will be focused on evaluating the Kemess North Au-Cu prospect.

#### Production

- Recovery of metals in the mill circuit has significantly improved during the past year to the present target level of 70 to 80 per cent. This can be attributed in part to the addition of several flotation cells salvaged from the Afton mine.
- The weak point in the mill circuit remains at the end of the cycle, preparing and drying the concentrate.
- The mode of shipping of concentrate is another area that will likely be reassessed by the new owners. At present the concentrate is bagged and loaded onto flat bed trailers that are then hauled to a landing on Williston Lake where they are transferred to barge. At Mackenzie the concentrate is transferred to rail for shipment to Vancouver. An alternative mode of shipping may be by truck bulk transport, reducing handling of smaller "bagged" loads. Such systems are presently effectively employed at the Huckleberry Mine and at Eskay Creek.

#### Presentations

- At the mine, a presentation dealing with the style and setting of mineral deposits and implications for exploration in the Toodoggone River and northern McConnell Creek map area was delivered to geological staff. The talk was also attended by Maurice Ethier, the new general manager of the Kemess Mine. Maurice has more than 3 decades of experience managing mines in B.C. and elsewhere in Canada. His most recent assignment was with Gaspé Copper.
- In Smithers, a presentation was delivered to local geologists and prospectors. About 20 persons attended and the talk dealt with the potential for pluton-associated mineralization in north-central B.C., highlighting results from the recent GSB program in the vicinity of the Kemess South deposit.

#### Other Business

- A stop to examine Jurassic strata near the ferry landing at Francois Lake also provided an opportunity to visit with Ralph Keefe a local prospector who resides at Francois Lake. For part of the past summer,

Ralph has been prospecting in the Nechako River map area, specifically near Cheslaslie Arm in 93F/5. Blocks of massive pyrite and minor chalcopyrite have been extracted from a stratiform layer in bleached, layered fine grained *clastic rocks(?)*. The lithology is not readily identifiable owing to the alteration and the setting of this sulphide-rich occurrence is not clear. This new occurrence is unlike any known prospect mapped during the survey in the nearby Fawnie and Nechako ranges. A property visit is required to characterize the style of mineralization and to place it in a regional stratigraphic framework.