Attachment 2-2

SRK Consulting. Tailings and Hydromet Residue Testwork – Update on Sample Selection from 24 Hour Testwork. Memorandum to Jennifer Engstrom, MDNR. January 6, 2006.

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Memo

To:	Jennifer Engstrom, MDNR	**Date:**	January 6, 2006
cc:	John Borovsky, Barr	**From:**	Stephen Day
	Jim Scott, PolyMet		
	Don Hunter, PolyMet		
Subject:	NorthMet Project Tailings and Hydromet Residue Testwork – Update on Sample Selection from 24 Hour Testwork	**Project #:**	1UP005.001

Jennifer

We have now received the 2-hourly tailings total sulfur analyses from the pilot plant testwork. These results allow final recommendations to be made for the selection of samples for tailings and hydrometallurgical testwork.

1 Results and Implications of 2-Hourly Sulfur Analyses

Results of the 2-hourly sulfur analyses are shown by the coloured solid lines in Figure 1. The broken horizontal lines are the concentration of sulfur in the composite tailings samples currently being tested in humidity cells. The sulfur content of the ore composites was very uniform (Parcel 1, 2 and 3, 0.86%, 0.9% and 0.86%, respectively) as shown by the solid black lines in Figure 1.

The trend in sulfur results in tailings is explained by the chronology of the testwork and evaluation of addition of copper sulfate as a reagent:

- Flotation testwork began on July 17 with Parcel 2 without the use of copper sulfate. Parcel 2 was processed entirely without using copper sulfate. As shown, sulfur concentrations varied from 0.05% to 0.25% reflecting adjustment of the process conditions early in the testwork. The average was 0.19%. The composite tailings sample has a sulfur content of 0.2% closely representing the average.

- Testwork continued with Parcel 1 without using copper sulphate. Processing was continuous so one point is shared between Parcel 2 and Parcel 1. The range of sulfur concentrations was 0.19% to 0.28% with an average of 0.24%. The composite sample was 0.23% and is close to the average.

- Pilot plant testwork was suspended on July 19 to allow for further bench scale testing on recovery of metals.

- The pilot plant resumed on August 8 using Parcel 1. Addition of copper sulfate was evaluated. This reagent causes activation of the sulfide mineral surfaces and improves bulk sulfide flotation. The effect of copper sulfate on tailings characteristics was immediately apparent for Parcel 1.

Total sulfur concentrations decreased to a range of 0.09% to 0.13% (average 0.1%) and the resulting tailings composite was 0.1%.

- Processing continued with Parcel 3 using the copper sulfate additive. Sulfur content of the tailings varied over a wider range (0.09% to 0.25%, average 0.18%) though the range was comparable to the total range indicated by processing of other ore packages. The resulting composite had a total sulfur content of 0.15%.

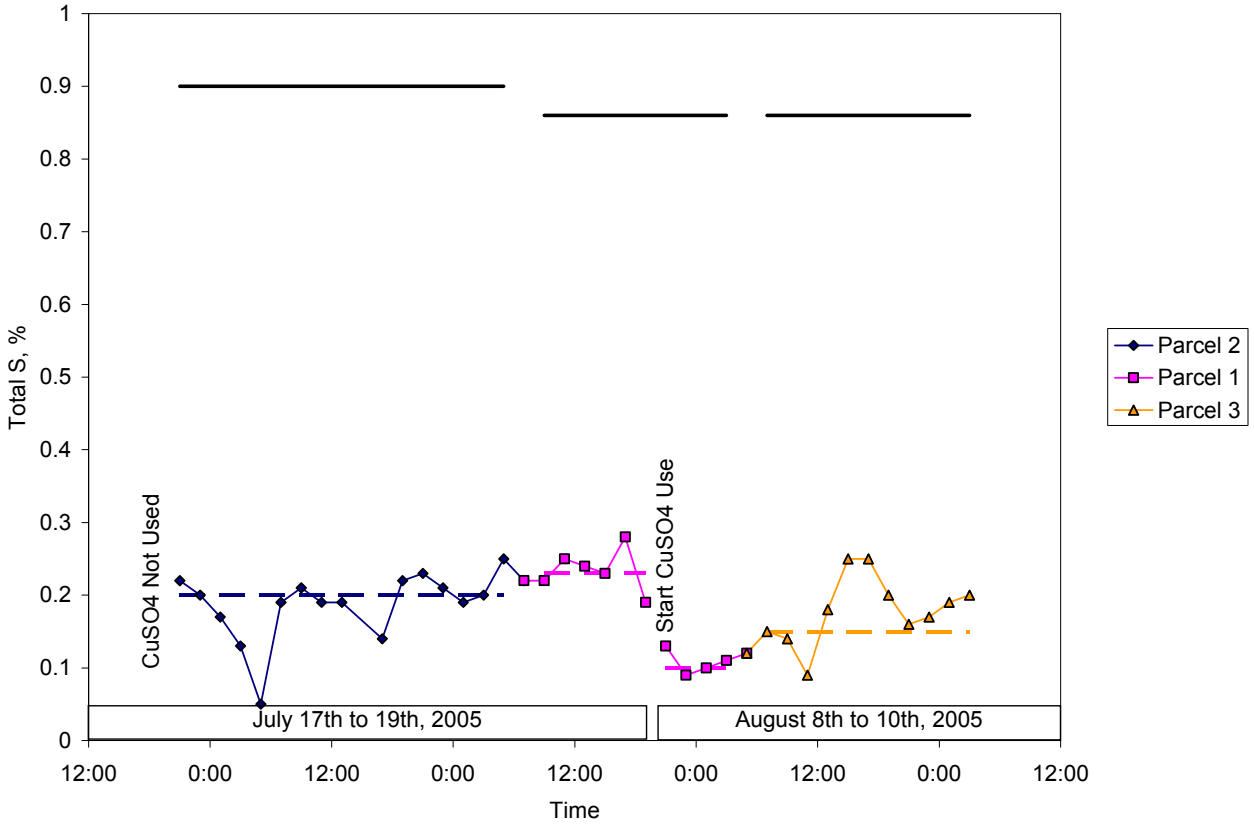

Figure 1. Results of 2-Hourly Total Sulfur Analyses. Solid lines and points connect 2-hourly results. Broken solid lines are sulfur concentrations in composite tailings samples representing each stage of testwork. Solid horizontal lines are the respective ore composite sulfur contents.

Based on the process testwork, Polymet has the made decision to advance the project with the use of copper sulfate to optimize overall sulfide mineral flotation. This decision is beneficial for the tailings since it is expected to lower the overall sulfide content.

The process testwork showed that sulfur concentrations in the tailings can be expected to vary in response to changes in process conditions including the use of copper sulfate. Parcel 3 showed that the use of copper sulfate may not always result in low sulfur content in tailings, and therefore there is need to capture sulfur concentrations approaching 0.25% in the kinetic testwork. The samples generated without copper sulfate provide the required range and can be tested to represent the potential for higher sulfur concentrations in the tailings. The lack of copper sulfate for the Parcel 2 and 1 samples is not expected to have significantly affected the reactivity of the residual sulfide minerals in the tailings:

It is therefore concluded that:

- Kinetic testing of all four tailings samples should be continued.
- No additional samples are needed to represent the range of sulfur content expected in tailings.

2 Testing of HydroMet Residues

2.1 Source of Sulfide Concentrate for Hydromet Process Evaluation

Evaluation of the hydromet process was performed using two bulk sulfide concentrates produced by processing of ore parcels 2 and 1 (without copper sulfate) and ore parcels 1 and 3 (with copper sulfate). The sulfide concentrates contained the following total sulfur concentrations:

- No Copper Sulfate
  - Parcel 2 – 23.6%
  - Parcel 1 – 21.3%
- With Copper Sulfate
  - Parcel 1 – 22.1%
  - Parcel 3 – 21.6%

It is apparent that the sulfur content of the concentrates does not vary significantly though the effect of copper sulfate on concentrate sulfur content for Parcel 1 is apparent and corresponds with the matching decrease in sulfur content of the tailings. Since the decision has been made to proceed with the use of copper sulfate, only the residues produced from sulfide concentrate generated using copper sulfide should be tested.

2.2 HydroMet Residues

All the expected HydroMet Residues were produced by processing of the sulfide concentrate generated using copper sulfate.

A difference exists between the way that the residues were recovered in the pilot test compared to actual operating conditions.

To summarize, the first step in the process is the leaching of the sulfide concentrate to produce a low pH pregnant solution containing all the commodity metals. Subsequent recovery of the metals involves a series of pH adjustments to the leach solution that results in precipitation of products and residues. The products are then refined to recover the contained metals (copper, nickel, cobalt, PGM, zinc). The residues contain entrained leach solutions that have to be recovered to optimize recovery of commodity metals. Under full-scale operating conditions, recovery of the leach solutions from the residues will occur by rinsing the residue cakes with pH-adjusted re-cycled final process water to displace the leach solutions. The pH adjustment is required to ensure that metals in the leach solution are not lost to the solids.

However, under pilot plant conditions, the recycled process water was not available because the processing of the leach solutions occurred in a stepwise rather than continuous fashion. Each metal recovery step was performed and completed before proceeding to the next. The final process solution that will be used for rinsing at full-scale was only generated at the end of the pilot plant and was therefore not available for the residue rinsing steps. The difference between full-scale and pilot plant conditions represents a practicality of metallurgical testing in that operation the pilot plant continuously is not an option with the available quantity feed concentrate.

Residues generated by the pilot plant were rinsed with locally obtained river water. No additional rinsing of the residues is proposed for the dissolution testwork. Rinsing with river water was less aggressive in displacing metal-laden leach solutions than can be expected with pH-adjusted process water. The residues can therefore be expected to contain higher metal content than under operating conditions and indicate greater leachable metals in dissolution tests. The testwork will tend to over-estimate rather than under-estimate water quality for water management planning and impact assessment.

3 Conclusions

The following actions are proposed:

- Kinetic testing of all four existing tailings samples in dissolution tests will continue.
- Testing of residues produced by hydromet testing of sulfide concentrate (with copper sulfate) will be started as described in the "Flotation Tailings and Hydrometallurgical Residue Geochemical Characterization Plan"