Technical Memorandum

Date: 19 June 2007

To: **Louise Grondin, Agnico-Eagle Mines Ltd.**

Cc: **Roy Lindsay (AE), Laurier Roy (AE), Paul-Henri Girard (AE), Stéphane Robert (AE), Harvey Blouin (Nuna), Wes Danielson (Nuna), Len McHale (Nuna)**

From: **Gary Mann and Duane Hudd (North/South)**

RE: **AWPAR Mitigation Update 19 June 2007**

This technical memorandum provides an update on mitigation efforts to address the priority issues identified in the AWPAR Stream Crossing Monitoring Reconnaissance conducted on 15 June 2007. Any ***new issues*** identified since the reconnaissance are highlighted in bold italicized font.

General Conditions Update – Stream flows increased steadily over the past five days as freshet conditions strengthen. There are indications that we are nearing peak conditions, as water level increases appeared to have slowed. As previously, unseasonably cool temperatures continue to moderate melting rates. Stream flows have commenced north of the Halfway Hills (e.g., km 40+), so the days of frozen conditions are over and extra care will need to be taken to control sedimentation, particularly at bridge crossings (e.g., R09). likely resulting in a more gradual increase in stream flow and discharge rates. Notwithstanding, discharge and flow rates have risen substantially in only the past two days, particularly at crossing R02. This underscores the importance of timely action to mitigate identified risks in order of priority.

Bridges – Three bridges have been installed to date: R02, R05 and R06.

- **All** – The assessment of abutment and approach (when in stream channel) armouring (i.e., whether armouring meets requirements for peak discharge as estimated by Golder) has not been completed to my knowledge. If placement of larger material (e.g., boulders) is deemed warranted, this mitigation activity should be conducted later in the summer (i.e., outside the critical fishery window) unless road stability was threatened.

  Water quality remains generally good based on continued turbidity monitoring. Downstream conditions have been assessed in detail, with turbid water being found primarily in localized pockets (if present at all) along the channel margins and immediately adjacent to the bridge approaches; these collectively comprise a negligible proportion of the channel and discharge as a whole.

- **R02** – The issues:

  - Stockpiled materials in or immediately adjacent to the currently wetted channel (one U/S N side[1]; two D/S S side) – The two D/S S side stockpiles were excavated with a backhoe on June 16 (see photos). Detailed monitoring was conducted downstream as these stockpiles were right in the channel; water quality findings as described above. Water levels were too

[1] Locations are presented assuming all crossings have upstream (U/S), downstream (D/S), and nominal cardinal direction (north [N] and south [S]) based on general south-to-north alignment of road (i.e., regardless of true orientation, the Baker Lake side of crossings is always S and the Mine side always N).

high to safely access the U/S N stockpile (comprised of primarily of gravel-sized or larger material); this pile was washed downstream by strong flows on June 18.

- Unstable bank/riparian area associated with ice bridge approach (U/S S side) – This area was partially addressed on June 17, with larger materials collected from the D/S stockpiles. Coverage by the larger material was not adequate and placement of large gravel/small cobble material was recommended to fill in the gaps and provide further stabilization. This work was scheduled for completion by June 20.

- Construction-related materials on snow/ice present within the overall confines of the channel (U/S N side; D/S N and S sides) – The D/S S side debris was removed on June 17. Planned removal of the U/S N side (comprised primarily of angular cobbles) was abandoned due to safety concerns with high water. This material was and the D/S N side (comprised of coarse sand, cobble and boulders) was also called off. The snowbridge from the N side had melted away, which would have meant entry of the dozer into the channel for about 50 to 70 m. It was determined that this action would pose greater disturbance to the channel than the debris remaining on the snow/ice.

- ***Seepage through approach on N side of channel*** – This new task was made **high priority** on June 18, when rising water levels were approaching road height. It is clear that this long approach (approximately 80 meters of encroachment into the stream channel) will likely require several culverts to mitigate through-road seepage and associated road stability problems. Several options were considered (raise road level, cut temporary spillway, install culvert), but a combination of all three was selected to maximize road stability and hence provide the greatest control of potential sedimentation. A culvert was installed at slightly below former road height to act as a spillway and the road was built up approximately 0.75 m over the previous height. This work was completed on June 19 and will be monitored for success.

A visual survey of the downstream area will be conducted later in the summer during low water to assess the extent of the introduced material and determine the need for any follow-up work regarding adverse effects.

- **R05** – The unstable bank/riparian area was partially stabilized with boulder-size material. Coverage by the larger material was not adequate (similar to R02) and placement of large gravel/small cobble material was recommended to fill in the gaps and provide further stabilization. This work was scheduled for completion by June 20.

- **R06** – No issues were identified.

Culverts – Issues:

- **Through-road Seepage** – Downstream water continues to flow relatively clear, without significantly increased turbidity. No specific actions are needed unless conditions change and road stability is threatened.

- **Over-road Flows** – R07 was the area with the most significant flows over the road. Road height in this spot is in the process of being raised well above the U/S pooled water; this should be completed by June 20. Water flows appear to have reduced at the other locations, so continued monitoring is all that is recommended at this time.

All culvert locations (planned or new) should be clearly marked and surveyed to ensure that the proper locations are known later in the summer when the installations occur.

AWPAR Mitigation Update – 19 June 2007 - Photos

Photo 1. R02 – Stockpiled materials at stream margin (U/S N side) (15Jun07).

Photo 2. R02 –U/S N side stockpile unreachable due to high water (18Jun07).

Photo 3. R02 – Stockpiles in channel (D/S S side)

Photo 4. R02 – Stockpiles being removed (D/S S side) (16Jun07)

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Photo 5. R02 – Turbidity monitoring downstream during stockpile removal (D/S S side) (16Jun07)

Photo 6. R02 – Shoreline after stockpile and debris removal (D/S S side) (17Jun07)

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Photo 7. R02 – Unstable bank/riparian area (U/S S side) (15Jun07)

Photo 8. R02 – Adding boulders to stabilize unstable bank area (U/S S side) (17Jun07)

Photo 9. R02 – Adding boulders to stabilize unstable bank area (U/S S side) (17Jun07)

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Photo 10. R02 – Road height increase and culvert spillway installation to prevent major instability and erosion on N approach (19Jun07).

Photo 11. R02 – Close up of Photo XX.

Photo 12. R02 – D/S side showing newly added culverts and road material (19Jun07).

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Photo 13. R07 – Flow over-topping road. D/S flow clear, except when vehicles pass (15Jun07)

Photo 14. R07 – Sediment settling pond with silt curtain while road is being raised (18Jun07)

Photo 15. R07 – Settling pond showing clear water (19Jun07)

Photo 16. R07 – D/S water running pretty clear (19Jun07)