ANNEX 2

Advice to the proponent for the Hardrock Gold Mine Project Environmental Impact Statement

Annex 2 contains advice to the proponent from government reviewers. These comments may include guidance or standard advice related to the federal and provincial regulatory processes, supplementary actions for consideration, and editorial comments on the EIS. These comments may be useful in answering some of the Annex 1 IRs, while others may need to be addressed during the federal and provincial regulatory processes, as appropriate.

Advice Number: AD(1)-01

Reference to EIS: Section 1.4.4.2, Table 1-2.

Context and Rationale:

- This section refers to a provincial permit under Ontario's *Fish and Wildlife Conservation Act* for the "Destruction….of nests/eggs of birds wild by nature." This provision does not apply to bird species protected under the federal *Migratory Birds Convention Act, 1994* (MBCA). The MBCA, and the Migratory Bird Regulations under that act, prohibits the killing of listed migratory birds or the destruction of their nests or eggs. A permit cannot be issued for such activities associated with the project that may result in the contravention of the MBCA.

Advice to the Proponent:

A. The province of Ontario's *Fish and Wildlife Conservation Act* does not apply to species protected under the MBCA. The proponent should note that for the harm or killing of migratory birds or the destruction of their nests and eggs a permit cannot be issued.

Advice Number: AD(1)-02

Reference to EIS: Section 10.4.3.2.

Context and Rationale:

- It is unclear if (during the operations phase) treated effluent from the effluent treatment plant (ETP) will be combined with the sewage treatment plant (STP) in a treated effluent discharge pipeline running to an effluent diffuser located in the Southwest Arm of Kenogamisis Lake.
- If this is being considered then the requirements from MMER monitoring should be taken into consideration.

Advice to the Proponent:

A. In order to assess compliance with the MMER it must be possible to sample the effluent from the ETP separately from the combined ETP/STP effluent.

Advice Number: AD(1)-03

Reference to EIS: Appendix F1, Section 7.4; Appendix M6; Appendix M7.

Context and Rationale:

- Compliance with applicable regulations and codes of practice will help to ensure that air and greenhouse gas (GHG) emissions are reduced throughout all phases of the project.

Advice to the Proponent:

A. ECCC recommends that the proponent incorporate the following guidance and code of practice into the final Air Quality and GHG Management Plan for all phases of the project:

- Management practices for reducing GHGs and emissions from mine fleet equipment presented in ECCC's Environmental Code of Practice for Metal Mines (2009) http://www.ec.gc.ca/lcpe-cepa/default.asp?lang=En&n=CBE3CD59-1
- ECCC's guidance document, "Best Practices for the Reduction of Air Emissions from Construction and Demolition Activities" (ChemInfo, 2005). This document is available on request.

Advice Number: AD(1)-04

Reference to EIS: Appendix G1.

Context and Rationale:

- As part of the project, a number of water bodies frequented by fish are proposed to be overprinted by mine waste, including tailings, waste rock, overburden and effluent. Using such water bodies for mine waste disposal requires an amendment to Schedule 2 of the Metal Mining Effluent Regulations (MMER). In order to proceed with the amendment, the proponent must conduct an assessment of alternatives for all mine waste infrastructure that will overprint fish frequented waters. It is strongly recommended that this work be done in accordance with ECCC's Guidelines for the Assessment of Alternatives for Mine Waste Disposal (Guidelines). The proponent has included their assessment of alternatives for mine waste management in Appendix G01 – "Alternative Assessment Report: Hardrock Project – Waste Rock Storage Area and Tailings Management Facility" of the EIS.

Advice to the Proponent:

A. ECCC reviewed the assessment of alternatives against the Guidelines and has substantive comments, an overview of which is provided below.

- Some watercourses appear to be overprinted by mine waste and were not assessed within this report. The proponent must clearly identify which watercourses fall under Schedule 2 of the MMER and for those that do not, the proponent must explain why.
- The current assessment is not adequately justified or documented in order to conclude that the waste disposal alternative selected is the most appropriate one.

ECCC's detailed comments on the assessment of alternatives have been provided directly to the proponent, and this commentary will need to be addressed before ECCC can proceed with the regulatory amendment process.

Advice Number: AD(1)-05

Reference to EIS: Executive Summary, Section 6.1; Section 5.6.1.1; Section. 5.8.2; Appendix M1, Section 4.3; Appendix M1, Section 4.4; Appendix M1, Section 4.5; Appendix M1, Section 4.6; Appendix M1, Section 4.7; Appendix M1, Section 5.1.1.

Context and Rationale:

- It is important to note that the run off from all components within the mine operations must be in compliance with MMER. This also includes (but is not limited to):
- 1) During construction of the process plant area, water from the construction area will be directed to either temporary sediment ponds, or to pond M1 and pond B1.
- 2) The excavation sumps during topsoil and overburden removal, where surface water runoff and seepage will be collected. This collected contact water will be pumped to either: temporary sedimentation ponds and discharged to the environment if discharge criteria are met or to pond M1 for sedimentation and further treatment through the Effluent Treatment Plant prior to discharge to the environment. However, it is unclear where the effluent from the temporary sedimentation pond will be discharged to if water quality criteria are achieved.
- 3) The ponds A1, B1, B2 and D1 where surface runoff and seepage will also be collected.
- 4) The seepage collection toe ditches and collection ponds for the TMF's south cell prior to the development of the seepage collection system. It proposed that runoff from disturbed areas and foundation dewatering during construction will be pumped to temporary sedimentation control features prior to release to the natural environment. Sedimentation control will thereafter be handled by the seepage collection system (Figure 4-5) and released to the natural environment until construction of the south cell dams has been completed. However, it is unclear where these temporary control features will discharge to the environment.
- 5) The haul roads and any mitigation measures applied related to them. While not all of these roads appear to have been identified in the EIS, the report does state that dust suppression water will be obtained from the effluent treatment plant (ETP) and/or potentially the freshwater intake on Kenogamisis Lake. The proponent has indicated it will identify these drainage features for thehaul roads during the detailed designs as required, including culverts, ditching and collection to manage contact and non-contact water. As a result, the specifics of this potential effect and mitigation have not been provided in the EIS.
- The collected water in any and all of these structures will either be discharged to the environment if it meets the regulatory requirements (MMER and the effluent criteria set out in the provincial Environmental Compliance Approval [ECA]) or if the water quality does not meet the effluent criteria it will be treated at the effluent treatment plant (ETP) (construction temporary ETP or operations permanent ETP) prior to discharge to the environment.

Advice to the Proponent:

A. In order to discharge mine effluent to the environment the proponent must identify and use a Final Discharge Point(s) in accordance with the MMER and provide ECCC with appropriate notification.

Advice Number: AD(1)-06

Reference to EIS: Section 9.1.1.2; Section 10.1.1.2.

Context and Rationale:

- It is stated that "because of the similarity between the Canadian Drinking Water Quality Guidelines (CDWQG) and the Ontario Drinking Water Quality Standards (ODWQS) for most parameters, further discussion is limited to the ODWQS and the CDWQG are provided for reference". However, the CDWQGs are lower than the ODWQS for arsenic. Given that arsenic is the key PoPC for this project, it is unclear why the higher standard was chosen.

Advice to the Proponent:

A. Justify the use of the ODWQS of 25 µg/L as the regulatory criteria for arsenic rather than the CDWQG of 10 µg/L.

Advice Number: AD(1)-07

Reference to EIS: Section 10.1.1.3; Section 10.2.1.3, Table 10-5; Section 10.4.3.2, Table 10-26; Section 10.4.3.3, Tables 10-33 to 10-47.

Context and Rationale:

- Although it is stated that "the ODWQS are used where potential effects of surface water on drinking water quality are anticipated", and that "consultation input has confirmed that it is possible Aboriginal persons carrying out traditional activities in the LAA might drink surface water from local streams and lakes", the ODWQS are not:
  - a) referenced in Table 10-5 (water quality standards);
  - b) used as a screening criteria for the initial selection of PoPCs;
  - c) considered for the selection of proposed mine effluent criteria;
  - d) referenced in Tables 10-33 to 10-47 (water quality predictions); or
  - e) used to discuss effects on drinking water sources.

Advice to the Proponent:

A. Include criteria protective of human health in the selection of PoPCs and the proposed mine effluent criteria, given that consultation has confirmed that Aboriginal persons carrying out traditional activities in the LAA may drink surface water from local streams and lakes;

Compare the predicted concentrations to the CDWQG for surface waters that may be used as a drinking water source.

Advice Number: AD(1)-08

Reference to EIS: Appendix F2, Section 2.9.1.1.

Context and Rationale:

- It is acknowledged that the requested information has been provided. However, when the predicted levels are close to the assessment criteria, it may not be appropriate to use a ground absorption coefficient of 0.1 for water, which could potentially lower predicted levels as much as 2 dB. The International Organization for Standardization (ISO) standard 9613-2 indicates an absorption coefficient of 0 is to be used for hard ground, and specifically lists water as an example of hard ground. The ISO standard also indicates that inversion conditions over water may result in higher sound pressure levels than predicted.

Advice to the Proponent:

A. A ground absorption coefficient of 0 can be used for water to make the assessment more conservative, as per ISO 9613-2.

Advice Number: AD(1)-09

Reference to EIS: Appendix F8, Appendix E.

Context and Rationale:

- There appears to be an error in the inhalation TRV value for arsenic presented in the equation on page E.13. It is stated as 1.5E-01 µg/m^3. However, according to Table 4.12, it should be 1.5E-02 µg/m^3.

Advice to the Proponent:

A. Confirm the inhalation TRV for arsenic presented in the equation on page E.13, and revise the calculation accordingly.

Advice Number: AD(1)-10

Reference to EIS: EIS Section 10 Table 10-48.

Context and Rationale:

- Receiving watercourses/waterbodies appear out of order for collection ponds T1, T2 and T3.

Advice to the Proponent:

A. Verify the information provided in Table 10-48.

Advice Number: AD(1)-11

Reference to EIS: Appendix F8, Appendix E.

Context and Rationale:

- Limited information is provided for the equations provided in Appendix E, and worked examples were not provided for all modeling and assessed pathways. The following are examples of information missing to support the assessment:
  - Worked examples were not provided to demonstrate how the dermal chronic daily intakes (CDI) were adjusted for relative bioavailability or absorption when the CDI dermal was compared to an oral TRV;
  - It is not clear if age-specific adjustments for carcinogenic effects were considered in the exposure assessment;
  - Carcinogenic effects via a mutagenic mode of action are not discussed;
  - It is unclear how the partition coefficient (KD) literature value was selected from the US EPA 1999b document referenced;
  - It is unclear how the fraction organic carbon (FOC) values were obtained;
  - No reference for the sediment-to-benthic invertebrate uptake equation or for uptake into the moose were provided;
  - Inconsistencies in the approach taken to calculate a HQs for the Typical Residential Receptor were noted;
  - It is unclear why the exposure point concentration (EPC) for the future case in the worked example (1) on page E.13 only includes Phase 2 of the project; and,
  - It is not clear why the equations to calculate the lifetime average daily doses (LADD) on pages E.19 to E.21 did not include the concentration of arsenic (in each media), exposure frequencies or body weights for each life stage for the typical residential receptor.

Advice to the Proponent:

A. Revise Appendix F8, Appendix E to include the requested information (detailed technical comments can be provided upon request).

Advice Number: AD(1)-12

Reference to EIS: Appendix F8, Section 3.4.1; Appendix F8, Appendix C.

Context and Rationale:

- Appendix F8, Section 3.4.1 indicates that the list of metals evaluated for inhalation health effects was based on the reference “Risk Assessment Guidance for Superfund (RAGS), Volume I, Human Health Evaluation Manual. (TRVs for human health) – threshold and non-threshold approaches” by the United States Environmental Protection Agency (U.S. EPA 1989a). The objective of the screening process, as given in Section 5.9.5 of the U.S. EPA reference, is quoted with attribution in that section of the EIS.
- However, it is unclear whether the method described in Section 5.9.5 of the U.S. EPA reference, including the calculation of individual chemical scores and total chemical scores, was actually used to screen the list of COPCs. There is no discussion of the method or equations used in Appendix F8, Section 3.4.1, and it is unclear how the tables provided in Appendix F8, Appendix C relate to the steps described in the U.S. EPA Reference.
- This information is required to understand potential effects of the project on the health of Aboriginal peoples.

Advice to the Proponent:

A. Describe the method and equations that were used to screen for chemicals of potential concern. Indicate and provide a rationale for any changes from the method described in the 1989 reference from the U.S. EPA;
B. Clarify, using the tables provided in Appendix F8, Appendix C, how the method used in question A was used to screen COPCs.

Advice Number: AD(1)-13

Reference to EIS: Section 10.2.2.8; Section 10.4.3.1, Figure 10-41; Section 10.4.3.1.

Context and Rationale:

- It is stated that As concentrations have remained consistent over the past 40 years. Since 1990, arsenic and phosphorus have routinely exceeded guidelines. Total As loading to the SW Arm is 1.49 kg/d. Arsenic and total phosphorus concentrations are predicted to increase during operation and closure compared to baseline conditions in the SW Arm.

Advice to the Proponent:

A. NRCan recommends the proponent consider passive treatment of the effluent discharging from the pit lake and the WRSA to the SW Arm, as well as any contingency measures that would be required if stratification of the pit lake is not achieved as predicted.

Advice Number: AD(1)-14

Reference to EIS: EIS Appendix E4, Conclusion; Appendix E4, Figures 5-2, 5-11, 5-15 and 5-18.

Context and Rationale:

- In the Executive Summary (pp ii) and the Conclusion (pp 6.1) of Appendix E4, the proponent states that, “Many parameters had their lowest concentrations during spring freshet and increased gradually to a maximum during winter”. However the Proponent also states in Appendix E4 (pp 23) that, “The majority of arsenic was present in the dissolved form, with highest concentrations measured in the summer and fall.”

Advice to the Proponent:

A. As Arsenic is a contaminant of concern, NRCan recommends that the statement “Many parameters had their lowest concentrations during spring freshet and increased gradually to a maximum during winter,” be revised and clarified to explicitly state which parameters are being referenced.

Advice Number: AD(1)-15

Reference to EIS: Appendix E6.2, Section 3.1.3

Context and Rationale:

- In the geochemistry report, the proponent details that overburden were flushed with 0.5L compared to 1L for tailings. For comparative purposes, the same methodology should be used for both humidity cell tests, as a lower flushing volume may not result in the same level of extraction/leaching.

Advice to the Proponent:

A. NRCan requests that the proponent explain why different flushing volumes were used to treat the overburden and tailings samples.

Advice Number: AD(1)-16

Reference to EIS: Appendix E6.2, Section 4.2.1; Appendix M2, Table 3-1

Context and Rationale:

- The proponent reports that “In WR-S2, Sb concentrations decreased by 29% while As and U concentrations increased to similar levels observed in WR-S in 2014. […] It is expected that As concentrations in WR-S2 field bin will also show a decline during the second test year, similar to WR-S.” As is predicted to increase in Pond M1 and in underground workings.

Advice to the Proponent:

A. NRCan recommends that the proponent does not state that the leaching rate of As will decline, as no significant decrease was observed in 2016 for WR-I or WR-S2. Based on the results available to-date, NRCan does not agree that the geochemical testing has demonstrated that loading rates will decline over time.

Advice Number: AD(1)-17

Reference to EIS: Appendix E6.2, Section 4.4

Context and Rationale:

- Cyanide and its breakdown products are chemicals of concern, and their effective removal is important for protection of the environment. The proponent used UV light to mimic cyanide degradation in the environment on two samples subjected to cyanide destruction testing with specific targets.

Advice to the Proponent:

A. NRCan is not aware of any literature to support this method, and requests that the proponent discuss the rationale behind the UV ageing tests for cyanide destruction.

Advice Number: AD(1)-18

Reference to EIS: Appendix E6.3, Section 3.2.

Context and Rationale:

- Appendix E6.3, Section 3.2 indicates that the ABA testing was conducted on samples ground to 0.74 mm.
- The same section also states that the samples were “pulverized to 200 mesh”, which equals 0.074 mm. It is likely this is a typographic error. If not, Grinding to 0.74 mm for ABA and digestion would be insufficient, and would result in underestimation of concentration of the parameters.
- These methods require a finely-ground sample (MEND guidelines, section 10.10.5).

Advice to the Proponent:

A. NRCan requests that the proponent confirm whether the samples were ground to 0.74 mm or 0.074 mm, as the current measurements may be the result of a typographic error. If a grind of 0.74 mm was used, as currently stated in the EIS, NRCan requests that the proponent justify the use of coarse fractions for ABA testing or perform the re-analysis using accepted methods.

Advice Number: AD(1)-19

Reference to EIS: Appendix E6.3, Section 4.3; Appendix M2, Figure 3-1.

Context and Rationale:

- The proponent characterizes the NP of ore, overburden and waste rock based on a siderite-corrected NP (NP_{sid}) instead of the carbonate-NP (NP_{carb}).
- As noted in the MEND Guidelines (p. 17-1), siderite is a mineral phase which contributes to laboratory measurements of acid neutralization but may not provide similar contributions in the field.

Advice to the Proponent:

A. NRCan requests the addition of figures using standard NPR calculations to determine the cut-off for identifying PAG (use of NPR<2 rather than C_{Total}/S_{Total} <0.8). This would provide clarity and consistency as to definition and interpretation of the PAG versus non-PAG.

Advice Number: AD(1)-20

Reference to EIS: Appendix E9, Section 2.2

Context and Rationale:

- In the historic tailings, the ABA testing was used to classify the acid generation potential of both tailings. Results for MacLeod tailings containing up to 30 ppm of As in groundwater were inconclusive and AMD was unlikely. Hardrock tailings shows 24 ppm of As in groundwater and 94 ppm of As in porewater.

Advice to the Proponent:

A. Both tailings discharge about 10 kg/day of As and both surface and groundwater have high As concentrations. NRCan recommends that the proponent compare the Carbon/Sulphur ratio of historic and future tailings, and consider these results in the AMD study conclusion. This ratio would provide additional information on the depletion rate versus acid generation rate of the tailings, and could improve the predictive ability of the AMD study.