Attachment 1
Lynn Lake Gold Project
Information Requirements from Environmental Impact Statement Technical Review

On August 26, 2020 the Impact Assessment Agency of Canada commenced the technical review of the Environmental Impact Statement for the Lynn Lake Gold Project. The table below is to assist in the preparation of Information Requests that support full understanding of the Project's potential for significant adverse environmental effects and potential impacts to rights.

Lynn Lake Gold Project - Technical Review Information Requirements August 2020

Reference IR#	Expert Dept. or group	EIS Guideline Reference	EIS Reference	Context and Rationale	The Proponent is Required to …
Groundwater Quantity					
NRCan-01	NRCan	Section 3.2.3 Spatial and Temporal Boundaries	Volume 1, Chapter 8, Section 8.1.4.1 Spatial Boundaries, and Map 8-2	The EIS guidelines require that the rationale will be provided for the selection of the boundaries of the LAA and RAAs. The LAA/RAA for the MacLellan site is shown on Map 8-2, and described in Section 8.1.4.1. The southern boundary of the LAA is described as following a northwestern path from the northern shore of Cockeram Lake to the northern shore of Eldon Lake. This portion of the boundary appears to cut through tributaries to each of the lakes, and hence does not follow surface water divides as the remaining portions of the LAA boundary appears to do. If this LAA/RAA boundary does indeed exclude portions of these tributaries there should be a rationale provided as to why only a portion of a given surface water system was assessed within the groundwater model to ensure adequate representations of potential changes to groundwater surface water interactions.	Provide a rationale for the location of the southern boundary of the MacLellan site LAA/RAA and discuss the potential effect of this location on the assessment of changes to groundwater surface water interactions in these tributaries.

NRCan-02	NRCan	Section 3.2.3 Spatial and Temporal Boundaries	Volume 1, Chapter 8, Section 8.1.4.1 Temporal Boundaries, Volume 5 Appendix F Section 5.4.1, and Appendix G, Section 5.4.1	The EIS Guidelines state that the spatial boundaries should span all phases of the project. Section 8.1.4.1 describes 5 to 6 years of active closure followed by 10 years of post-closure monitoring prior to permanent closure conditions. Given that the results of the closure period assessments described in Volume 5, appendices F and G represent the period when the pit is fully flooded, and pit flooding is expected to take over 21 years at the MacLellan Site, these timelines do not reconcile with the 10 year post-closure duration.	Clarify the time periods and conditions assessed for the decommissioning and closure phases of the project with respect to groundwater quantity. Align these phases with the results presented in the hydrogeological technical assessments in Volume 5 Appendices F and G.
NRCan-03	NRCan	Section 4.3 Study Strategy and Methodology	Volume 1, Chapter 8, Section 8.2.1.2, Volume 5, Appendix F, Table 4-1, and Volume 5, Appendix G Table 4-1	The EIS Guidelines state that all models will be documented such that analyses are transparent and reproducible. Section 8.2.1.2 indicates that the groundwater model domain is terminated at the depth of the open pit for each model. For the Gordon Site, the model is terminated at an elevation of 115 mASL (Appendix F, Table 4-1). For the MacLellan site the model is terminated at a depth of -15 mASL. Based on the pit depth and the topography shown in cross-sections, it is unclear whether the bottom slice of the model exactly coincides with the minimum elevation of the open pit. Although the hydraulic conductivity at the base of the open pits is expected to be low, placement of the model base at the pit floor would indicate that no flow is expected at these depths. This representation may underestimate total inflow to the pit, and change propagation of dewatering induced drawdown. Given the low numerical cost to include additional depth, provide rationale for the location of the lower model boundary, and the anticipated impact on the assessment of groundwater quantity.	Provide rationale for the location of the lower model boundary, and the anticipated impact on the assessment of groundwater quantity.
NRCan-04	NRCan	Section 6.1.2 Geology and Geochemistry	Volume 1, Chapter 8, Section 8.2.2.1	The description of the baseline geological conditions states that bedrock was encountered at depths of up to 10 m at the MacLellan Site. However, throughout the remainder of the documents, the presence of buried valleys at the MacLellan site are discussed, with up to 28 m of overburden overlying the bedrock. These statements should be reconciled for clarity.	Update section 8.2.2.1 with the correct maximum depth to bedrock found through drilling at the MacLellan site.

NRCan-05	NRCan	Section 6.1.2 Geology and Geochemistry	Volume 1, Chapter 8, Section 8.2.2.1, Figure 8-12	The EIS guidelines state that a geological description of the bedrock and host rock should be included. For the Gordon site, two faults (the Wendy and the East Fault) are noted and shown on Figure 8-12. The East Fault is shown to terminate to the east of the historical Wendy Pit. However, based on the trend of the fault it does not appear that either the historical pit, or borehole drilling would confirm the termination of this fault. Given the conceptualized influence of this fault zone on the hydraulic conductivity in the vicinity of the pit, the location of these faults has the potential to have a strong influence on the drawdown and groundwater inflow rates associated with the open pit dewatering.	Provide the rationale used to terminate the East Fault to the east of the Wendy Pit.
NRCan-06	NRCan	Section 6.1.2 Geology and Geochemistry	Volume 1, Chapter 8, Section 8.2.2.1, Figure 8-13, Volume 4, Appendix H, Section 4.2.2.1	The EIS guidelines require geological maps and descriptions of the geology. A feature of the geology of the MacLellan site discussed in Section 8.2.2.1 is the presence of buried valleys. The location of these features is difficult to discern on Map 8-13. As shown on Map 8-13 the bedrock low to the north of Minton Lake (GBHM-14, MWM-03) is interpreted to be distinct from the low to the east of the pit. In the absence of confirmative drilling data, a bedrock high has been inferred to be present between these two lows. The low proximal to the pit is conceptualized as being related to the location of the fault zone, whereas the Minton Lake depression is conceptualized as being a separate buried channel. Given the orientation of the faults, the proximity between the lows, and the lack of confirmatory data, there is a potential continuous buried channel between these two locations. As the bedrock lows tend to be filled with higher permeability material, connectivity of these features has the potential to alter assessment results. Strong rationale for the separation of these features should be provided.	Provide maps showing the variation in overburden thickness across the LAA for both the Gordon and MacLellan site. Provide additional rationale for the separation of the two bedrock lows to the east of the MacLellan pit. Discuss whether the low associated with the fault zone is presumed to be due to increased propensity to erosion within the faulted zone, or due to displacement associated with the faulting.

NRCan-07	NRCan	Section 6.1.5 Groundwater and Surface Water`	Volume 1, Chapter 8, Section 8.2.2.3 Hydraulic Conductivity, Volume 4, Appendix H, Section 4.2.1.3, Volume 4, Appendix H, Section 4.2.2.3 Volume 5, Appendix F, Section 3.3.5, Volume 5, and Appendix G, Section 3.3.5 Bedrock Hydraulic Conductivity	The description of the hydrogeological context of the project should include the delineation of stratigraphic and hydrogeological boundaries and the physical properties of the hydrogeological units. For both sites the bedrock has been subdivided into 4 components. Shallow, Upper, Intermediate and Deep bedrock. The hydraulic properties of these components are based on the results of hydraulic testing within the various depth intervals chosen. For the Gordon site depth intervals of 0 to 50 m, 50 m to 100 m, 100 m to 150m and greater than 150 m below the top of rock define the shallow, upper, intermediate and deep bedrock. For the MacLellan site depth intervals of 0 to 10 m, 10 m to 50 m, 50 m to 200 m and, and greater than 200 m below the top of the rock define the shallow, upper, intermediate and deep bedrock. No rationale has been provided for the selection of these depth zones, or the difference in various depths between the two sites. If these zones were determined based on RQD or fracture frequency, these details should be provided. Figure 8-1, and other similar figures replicated in the appendices cited display horizontal hydraulic conductivity with depth for each site. As several tests span across the hydrostratigraphic divisions within the bedrock, it is not possible to discern which tests are used in which range calculation. For the Gordon site, it is clear that no testing data is available within the deep bedrock zone. For the MacLellan site, it is not clear that there is a reduction in hydraulic conductivity with depth, as tests in the 50 m to 150 m depth range result in lower hydraulic conductivity estimates than tests at depths greater than 200 m. While there is strong evidence of decreasing hydraulic conductivity with depth within the Canadian shield, this decrease can vary with geological setting. The division of the bedrock unit into these depth zones is a controlling factor for the representation of groundwater flow at both sites. The assignment of these parameters strongly affects groundwater flow pathways to receptors, groundwater drawdown, and pit inflows. Rationale to support any conceptualization should be provided and clearly linked to site data.	In figures showing the relationship between depth below the top of bedrock and hydraulic conductivity, indicate which tests are completed in which bedrock zone (shallow, upper, intermediate, or deep). Provide the rationale for the depth selection for each bedrock subdivision. Discuss the lack of testing of the deep bedrock zone at the Gordon site and the potential impact on model results Discuss the results of testing at the MacLellan site in the intermediate and deep bedrock, and the evidence for a reduction in hydraulic conductivity with depth.

NRCan-08	NRCan	Section 6.1.5 Groundwater and Surface Water`	Volume 1, Chapter 8, Section 8.4.2.3 Residual Effects	Maps 8-22 and 8-23 show drawdown contours during the closure phase for the MacLellan site. These figures show negative drawdown (up to 10 m) within the footprint of the open pit indicating a rise in groundwater elevations with the flooded pit relative to baseline conditions. The text does not appear to reflect the results shown on the maps, stating that groundwater elevations near the pit return to baseline conditions.	Confirm whether the drawdown contours shown on Maps 8-22 and 8-23 are correct. Update the text and or figures as required.
NRCan-09	NRCan	Section 6.1.5 Groundwater and Surface Water`	Volume 4, Appendix H, Section 4.2.1.1 Gordon Site Geology and Hydrostratigraphy, and Section 4.2.2.1 MacLellan Site Geology and Hydrostratigraphy	A component of the guidelines is a description of the hydrostratigraphy. This description should include the overall thickness of the overburden units within the LAA. Sections 4.2.1.1 and 4.2.2.1 describe the development of the bedrock topographic surface within the LAA for areas in which borehole drilling has intersected bedrock. For areas of the LAA/RAA for which no depth to bedrock information is available, a general conceptual description of thinning overburden at topographic highs and thickening of overburden at topographic lows is provided. Details of how this conceptualization was applied in the development of the bedrock topographic surface used in the groundwater model was not provided.	Provide the details of the development of the bedrock topographic surface outside of the areas where drilling information was available.
NRCan-10	NRCan	Section 6.1.5 Groundwater and Surface Water`	Volume 4, Appendix H, Section 4.2.1.4	The description of the baseline hydrogeological conditions should include a description of the physical properties including hydraulic conductivity. For the Gordon site, pumping tests were completed in addition to single well response testing to determine the hydraulic conductivity of the bedrock unit. Results from 72 hour pumping tests between the historical pits and the lakes indicate the presence of a higher hydraulic conductivity shallow bedrock zone at 5 to 15 m (GPW-04, Wendy pit/Gordon Lake) and 8 to 15 m (GPW-02 east pit and Farley lake) below the top of the rock. It is inferred that this higher hydraulic conductivity zone may be the result of the blast damaged zone associated with the historical pits, or a fault influenced zone associated with the Wendy and East faults.	Discuss the conceptualization of the fault damaged zone. Provide details on the method used to determine the extent of the fault damaged zone. In discussion of the blast damaged zone from the development of the historical pits, ensure that this zone is limited to within a reasonable distance from the pits.

				Map 4A indicates that GPW-02 is several hundred meters from the historical East pit. Hoek and Karzulovic (2000) estimate that the blast influenced zone from open pit mining may extent at most 2.5 times the bench height of the development. Given this relationship it seems unlikely that GPW-02 would be within the blast influenced zone. Both GPW-02 and GPW-04 also appear to be offset from the delineated faults by several hundred meters. *Hoek and Karzulovic (2000). Rock Mass Properties for Surface Mines, in, Slope Stability in Surface Mining, Society for Mining and Metallurgical Exploration.*	
NRCan-11	NRCan	Section 6.1.5 Groundwater and Surface Water	Volume 4, Appendix H, Section 4.2.1.2, Volume 4, Appendix H, Section 4.2.2.2	The EIS guidelines include a description of groundwater flow patterns and seasonal variability for each hydrostratigraphic unit. Sections 4.2.1.2 and 4.2.2.2 present the groundwater flow patterns for the overburden units, and states that groundwater flow directions and seasonal variations within the shallow bedrock are similar. Given the various descriptions of shallow bedrock for the MacLellan site (top 10 m or top 50 m), it is not clear which wells were used for this comparison. As the majority of the development of the open pit will be through bedrock, understanding of groundwater flow patterns and seasonal response is an important component of the conceptual modelling process.	Discuss the wells, and screen depths used to compare shallow bedrock to overburden groundwater flow. Discuss whether groundwater flow patterns or seasonal variability changes with depth within the bedrock.
NRCan-12	NRCan	Section 6.1.5 Groundwater and Surface Water	Volume 4, Appendix H, Section 4.2.2.2	The EIS guidelines include a description of groundwater flow patterns and seasonal variability for each hydrostratigraphic unit. Section 4.2.2.2 notes that several wells exhibit more than twice the seasonal variability observed across the site. However, there is no conceptualization provided for the cause of this variability. Also noted in Section 4.2.2.2 is the association between artesian conditions and the flanks of topographic highs. However GBHM-18 does not appear to be located in this setting, yet is artesian. The relationship between topographic and hydrostratigraphic conditions and groundwater flow patterns, can be used to infer	Include a discussion of the topographic and hydrostratigraphic conditions that result in greater seasonal variability in groundwater elevations. Provide an assessment and discussion of the topographic and hydrostratigraphic conditions at GBHM-18, and whether these condition may occur elsewhere within the MacLellan site LSA.

				flow conditions where groundwater level information is not available. This information can improve model calibration and assessment results.	
NRCan-13	NRCan	Section 6.1.5 Groundwater and Surface Water	Volume 4, Appendix H, Section 4.2.2.2, and Section 4.2.2.3, Table 5B	Although referenced in the text, no tables were provided summarizing the vertical gradients or hydraulic conductivity testing results for the MacLellan Site.	Provide Table 5B, and/or tables summarizing vertical gradients and hydraulic conductivity testing results for the MacLellan Site.
NRCan-14	NRCan	Section 6.1.5 Groundwater and Surface Water	Volume 1 Chapter 8, Section 8.2.2.3, Volume 4, Appendix H, Section 4.2.2.3, Volume 5, and Appendix G, Section 3.3.5	The description of the baseline hydrogeological conditions should include a description of the physical properties including hydraulic conductivity. In Volume 1, Chapter 8, Section 8.2.2.3 it is noted that hydraulic conductivity tests in the bedrock below the TMF yielded higher values relative to other areas of the site. With the absence of Table 5B it is difficult to discern the number of tests with higher hydraulic conductivity and the degree to which the hydraulic conductivity is higher. Given that regional bedrock mapping presented throughout the EIS indicates a change from metavolcanic to metasedimentary bedrock in the vicinity of the TMF the noted differences in hydraulic conductivity may have a geological control. A zone of increased bedrock hydraulic conductivity has the potential to increase the quantity of seepage from the TMF.	Provide the bedrock hydraulic testing data in the area of the TMF. Discuss differences in rock type and RQD in this area of the MacLellan site LSA. Discuss the rationale for a uniform, vertically variable bedrock unit across the LSA in light of the difference noted near the TMF.

NRCan-15	NRCan	Section 6.1.5 Groundwater and Surface Water	EIS Volume 5, Appendix F, Gordon Lake Hydrogeology Assessment, Maps 5 and 6, and EIS Volume 5, Appendix G, MacLellan Hydrogeology Assessment, Maps 5 and 6	Maps are provided to show the regional surficial and bedrock geology as required under the EIS Guidelines. The scale of these maps is not well suited to displaying conditions within the local study areas, and the spatial relation between project infrastructure and geology.	Include maps showing the bedrock and surficial geology at the LSA scale for both sites.
NRCan-15	NRCan	Section 6.1.5 Groundwater and Surface Water	EIS Volume 5, Appendix F, Gordon Lake Hydrogeology Assessment, Section 3.3.5.1 Map 9	The EIS Guidelines detail the need to include fault zones in the descriptions of site geology. For the Gordon Lake site, a faulted zone associated with the East and Wendy faults is shown on Map 9. Assessment results for groundwater inflow to the open pit, and drawdown associated with the open pit are sensitive to the parameterization of this fault zone. From the faulted zone depicted on Map 9 it is difficult to discern whether this zone extends below Gordon Lake (matching the fault trace), or if it is terminated at the Lake. Limited information is provided on the structure, depth and orientation of the fault zone. While modelled as vertical zone through the upper 50 m of bedrock, no supporting information is provided to confirm the geometry of this zone.	Provide all details on the location and spatial extent of the fault zone. Where available include information from drilling data, surface expression, and the historical pit development. If the vertical and horizontal extents of the fault were investigated through model calibration, include these details.
NRCan-16	NRCan	Section 4.3 Study Strategy and Methodology	EIS Volume 5, Appendix F, Gordon Lake Hydrogeology Assessment, Section 4.1, and Appendix G, MacLellan Hydrogeology Assessment, Section 4.1	The EIS Guidelines state that all models will be documented such that analyses are transparent and reproducible. A component of the groundwater modelling for both sites is the development of a numerical mesh. Mesh discretization can affect model stability and assessment results.	In discussing the development of the numerical mesh for the groundwater models include information on element edge length and areas of refinement.

NRCan-17	NRCan	Section 4.3 Study Strategy and Methodology	EIS Volume 5, Appendix F, Gordon Lake Hydrogeology Assessment, Section 4.3.3, and Appendix G, MacLellan Hydrogeology Assessment, Section 4.3.3	The EIS Guidelines state that all models will be documented such that analyses are transparent and reproducible. This documentation includes the assignment of boundaries to represent groundwater interaction with surface water. The type of boundaries assigned are described in detail in the Assessment Reports; however, the location and head values for the boundaries are not provided. These boundaries influence model calibration, and assessment results.	For both sites provide a map showing the locations of assigned lake/river boundary conditions, and their assigned head values. Where the model domain is terminated at a lakeshore with the lake external to the model (i.e. Simpson and Serge Lake for Gordon, and Cockeram, Arbour, and Burge for MacLellan), provide details on the boundary condition applied on the edge of the model domain.
NRCan-18	NRCan	Section 4.3 Study Strategy and Methodology	EIS Volume 5, Appendix F, Gordon Lake Hydrogeology Assessment, Section 4.4.2, and Appendix G, MacLellan Hydrogeology Assessment, Section 4.4.2	The EIS Guidelines state that all models will be documented such that analyses are transparent and reproducible. A component of the documentation is the presentation of calibration to observed groundwater levels. Calibration results are provided in Table 4-2 of both assessment reports. From these tables it is difficult to determine which unit each well is screened within. Evaluation of the calibration of the model can affect the interpretation of the model results. For the MacLellan model many of the simulated water levels are within several meters of the observed water levels with a bias towards simulated values being higher than observed. However, simulated water levels at three locations (MWM-04, MWM-09A/B, and GBHM-06A) are more than 7 m lower than observed. Two of these locations (MWM-09A/B and GBHM-06A) are within the pit footprint where misfits in model calibration have a greater impact on assessment results.	Include the screened hydrostratigraphic unit in Tables 4-2, and highlight the screened units on the calibration plot. For the MacLellan site provide further rationale (including the hydrostratigraphy and topographic setting) for the wells with larger differences between simulation and observation. Include a discussion of the impact on model results.
NRCan-19	NRCan	Section 6.1.5 Groundwater and Surface Water	EIS Volume 5, Appendix F, Gordon Lake Hydrogeology Assessment, Section 4.4.2, and Appendix G, MacLellan Hydrogeology Assessment, Section 4.4.2	The EIS Guidelines state that an appropriate hydrogeological model should be included in the assessment. Such a model should have the ability to replicate the observed variability in groundwater elevations. A comparison between observed and simulated seasonal changes in groundwater elevations is provided in Section 4.4.2 of the assessment reports for both sites. Neither model appears capable of replicating the higher degree of seasonal variability observed at certain wells.	Provide a discussion of the hydrostratigraphy, topography, groundwater flow regimes, and groundwater-surface water interactions for wells that display seasonal variability in groundwater elevations. Where the groundwater models are unable to simulate the seasonal variability provide a rationale, and discuss how this difference may affect assessment results.

				For the Gordon site the groundwater model was not able to match the magnitude of change in groundwater wells with greater than 1 m of seasonal variability (including MWF-02, MWF-04, GBHF-07, GBHF-09, and GBHF-10). No discussion of factors that lead to this difference are discussed. For the MacLellan site the transient calibration was unable to reproduce the observed seasonal variability in groundwater elevations. It is stated that this discrepancy is likely due to the surface water features being held at a constant elevation through the transient simulation. However, it is not clear whether surface water monitoring would support the degree of elevation change noted in the monitoring wells. For example, GBHM-10 shows a 3 m rise in groundwater elevation during freshet that is not replicated by the model. Given that this location is approximately 1 km from the Keewatin River, it is not clear that would variations in surface water boundary elevations allow the replication of these trends.	
NRCan-20	NRCan	Section 6.1.5 Groundwater and Surface Water	EIS Volume 5, Appendix F, Gordon Lake Hydrogeology Assessment, Section 4.4.3, and Appendix G, MacLellan Hydrogeology Assessment, Section 4.4.3	The EIS Guidelines state that groundwater-surface water interactions should be characterized and included in the hydrogeological model. To assess the ability of the groundwater model to represent observed groundwater surface water interaction, the simulated quantity of groundwater discharge was compared to the total annual surface water flux a one station within each model. The reports note that baseflow can be a difficult parameter to derive from field measurements due to the storage effects of lakes and ponds. If the monitoring stations within the LAAs do not allow calculation baseflow estimates, other surface water monitoring stations within the region may act as useful analogs to estimate of the proportion of total annual streamflow that may be derived from groundwater discharge.	Discuss the availability of data within the region for determination of low flow statistics and the degree to which groundwater may contribute to annual surface water flow quantities. Where reasonable analogs are available, compare those to the groundwater model results.
NRCan-21	NRCan	Section 6.1.5 Groundwater and Surface Water	EIS Volume 5, Appendix F, Gordon Lake Hydrogeology Assessment, Section 4.4.4 Table 4-3, and Appendix G, MacLellan	The EIS Guidelines state that an appropriate hydrogeological model should be included in the assessment, including representation of the hydrostratigraphy. Tables 4-3 present the calibrated hydraulic conductivity for each model. Based on the information presented in these tables all hydrostratigraphic units appear to be assigned isotropic hydraulic conductivities. Anisotropy in hydraulic conductivity can have a strong influence on groundwater flow directions and the propagation of drawdown	Provide an assessment of fracture orientation for the fault zone at the Gordon site. Discuss the effect of fracture orientation on groundwater flow. Discuss the anisotropy that may result from the interbedding of nearshore and offshore glaciolacustrine deposits at the MacLellan site. Discuss the effect of the inclusion of anisotropy on model calibration, and where necessary, model results.

			Hydrogeology Assessment, Section 4.4.4, Table 4-3	associated with open pit dewatering. For the Gordon site, the orientation of the fault zone or the fractures within the fault zone are not discussed; however, any preferential orientation may result in preferential groundwater flow. For the MacLellan site, the nearshore and offshore glaciolacustrine deposits are known to be interbedded. Interbedded units such as these can result in anisotropy in hydraulic conductivity when bulk values are applied.	
NRCan-22	NRCan	Section 6.1.5 Groundwater and Surface Water	EIS Volume 5, Appendix F, Gordon Lake Hydrogeology Assessment Section 5.1 Map 12, EIS Volume 4, Appendix H, Map 13	The EIS Guidelines state that an appropriate hydrogeological model should be included in the assessment. An appropriate hydrogeological will have the ability to replicate groundwater flow patterns inferred from the groundwater monitoring network. Volume 4, Appendix H, Map 13 shows the interpreted groundwater levels in the overburden based on measured groundwater elevations in the month of September. This map indicates that a groundwater divide is present to the south of the pits, with stronger gradients to the east and the west. The simulated water table elevation shown on Map 12 also indicates that a divide is present in the same region; however, the stronger gradients appear to be to the north and south. It is unclear whether this discrepancy is due the difference in contouring simulated water table elevation versus observed groundwater elevation in overburden. It is also possible that the monitoring well network did not capture all of the groundwater flow patterns near the divide.	Provide a comparison between simulated and observed horizontal gradients in the vicinity of the groundwater divide to the south of the open pits at the Gordon site for baseline conditions. Discuss differences where apparent.
NRCan-23	NRCan	Section 4.3 Study Strategy and Methodology	EIS Volume 5, Appendix F, Gordon Lake Hydrogeology Assessment, Section 5.2.1.1, and Appendix G, MacLellan Hydrogeology Assessment, Section 5.2.1.1	The EIS Guidelines state that all models will be documented such that analyses are transparent and reproducible. The FEFLOW FTM plugin was used to generate time variable pit wall hydraulic conductivity to represent the decrease in groundwater flow to the open pits during colder months. This reduction in hydraulic conductivity controls the seasonal variability in groundwater inflow to the open pit.	Provide the details of the parameterization of the FTM plugin for both sites.

NRCan-24	NRCan	Section 6.2.2 Changes to Groundwater and Surface Water	EIS Volume 5, Appendix F, Gordon Lake Hydrogeology Assessment, Section 5.2.1.1, Map 15 and Table 5-1, and Section 5.3.2.1, Map 18 and Table 5-5	The EIS guidelines state that the assessment of groundwater should include the assessment of changes to groundwater fluxes. Changes in the quantity of groundwater discharging to surface water, or the quantity of surface water recharging the groundwater system can influence the extent of groundwater drawdown associated with open pit dewatering, and can influence other linked valued components such as surface water and wetland environments, and fish and fish habitat. Drawdown contours shown on Maps 15 and 18 indicate that the unnamed lake to the north of the pits, and other smaller water courses and water bodies (i.e., FAR5-A1, FAR7-A1, Pump Lake, FAR3-SIM2, FAR3-A1) are contributing water to the groundwater flow system at a sufficient rate to limit drawdown. The change in flux at the unnamed lake does not appear to be included in Tables 5-1 or 5-2. The flux changes for these smaller water features should be included and discussed in the context of their ability of to sustain the simulated flux. As shown in Tables 5-1 and 5-3, lakes to the south of the open pit (Susan and Marnie Lakes) appear to lose less water to the groundwater flow system during the construction and operation phases in comparison to baseline conditions. Given that the recharge under the MRSA is limited to the recharge under baseline conditions, changes to boundaries do not appear to cause this shift.	Ensure that fluxes used to describe groundwater surface water interactions are in consistent units (i.e., m^3/day) For the small unnamed lake to the north of the open pits, provide changes in the groundwater flux to/from the lake for all simulated phases of the project (construction, operation, and closure). Discuss whether the catchment area for this lake would be sufficient to sustain the quantity of water lost to the groundwater flow system under pit dewatering conditions. Provide a rationale for the decrease in flux from lakes to the groundwater flow system, for the lakes to the south of the open pit during operations and construction phases.
NRCan-25	NRCan	Section 4.3 Study Strategy and Methodology	EIS Volume 5, Appendix F, Gordon Lake Hydrogeology Assessment, Section 5.3.1.1, and Appendix G, MacLellan Hydrogeology Assessment, Section 5.3.1.1	The EIS Guidelines state that all models will be documented such that analyses are transparent and reproducible. While details on the changes to boundary conditions made to represent the dewatering of the open pit are provided, these details do not include the depth of the pits during the various phases of development.	Provide the details of the simulated pit depth for each of the modelled phases of the project.

NRCan-26	NRCan	Section 6.2.2 Changes to Groundwater and Surface Water	EIS Volume 5, Appendix F, Gordon Lake Hydrogeology Assessment, Section 5.3.1.2	The EIS guidelines state that the assessment of groundwater should include the assessment of changes to groundwater fluxes. The use of groundwater interceptor wells within the faulted zone at the Gordon site has a strong influence on the groundwater flux to the open pit. The proper operation of this interceptor well system will ensure that flows to the open pits are controlled, and that water levels in Gordon and Farley Lake are maintained. The simulated groundwater interceptor wells were optimized to intercept a large quantity of groundwater that would otherwise discharge to the open pit. The average (although conservative) rates for these wells is twice that of the peak groundwater inflow into the open pit at the end of operations. This result indicates a significant reliance on the interceptor wells to limit groundwater inflow to the open pit. The interceptor wells are simulated to be screened throughout the upper bedrock (upper 50 m from the top of rock). As shown on Map 18, more than 50 m of water table drawdown is simulated on the western side of the open pit, and more than 100 m of water table drawdown were simulated on the eastern side of the open pit. The amount of drawdown at these wells can influence the ability of the wells to pump adequate volumes of water.	Provide a discussion of the following: 1. Whether all of the simulated interceptor wells remained operable during operations simulations. 2. The remaining depth of water above the simulated screen base of the interceptor wells. 3. Given that the pumping ability has been shown to be a strong function of well location (within or outside of the fractured zone (Volume 4, Appendix H, Section 4.2.1.4) provide any preliminary details for the design plan for well placement to ensure the simulated pumping rate is achieved.
NRCan-27	NRCan	Section 6.2.2 Changes to Groundwater and Surface Water	EIS Volume 5, Appendix F, Gordon Lake Hydrogeology Assessment, Section 5.3.2.3, and Appendix G, MacLellan Hydrogeology Assessment, Section 5.3.2.3	The EIS guidelines state that the assessment of groundwater should include the assessment of changes to groundwater fluxes. Groundwater fluxes from mine infrastructure such as the MRSAs can carry a chemical load that may affect groundwater or surface water quality. Section 5.3.2.3 states that the particle tracking simulation results for both sites represent fluxes with no operating contact water collection system. However; in section 5.3.1.3 for both sites it is stated that a SEEP/W model was used to calculate the amount of recharge that infiltrates to the groundwater flow system, and the amount that flows laterally to the seepage collection system. It is unclear how these two statements reconcile.	Provide the rate of infiltration calculated for the MRSAs from the water balance models. Provide the distribution of this water between the seepage collection system and groundwater recharge as calculated using the SEEP/W model. Provide details of the integration of the SEEP/W model results into the groundwater flow model including the applied recharge. Report on the simulated flux of water that enters the model from the MRSA recharge boundary (i.e. comment on whether all of the applied recharge enters the groundwater model, and whether groundwater mounding occurs). Provide the effective porosities used in the calculation of travels times from the various mine facilities to their down gradient receptors.

NRCan-28	NRCan	Section 6.2.2 Changes to Groundwater and Surface Water	EIS Volume 5, Appendix F, Gordon Lake Hydrogeology Assessment, Section 5.4.2.1, Table 5-8 and Map 21	The EIS guidelines state that the assessment of groundwater should include the assessment of changes to groundwater fluxes. Changes to groundwater fluxes during the closure period can be permanent, and result in permanent changes to groundwater receptors. Results in Table 5-8 indicate that during the closure phase Marie Lake experiences the greatest loss of water to the groundwater flow system relative to the other lakes more proximal to the open pit. As shown on Map 21 there is approximately 0.5 m of drawdown near Farley Lake at closure and no drawdown at Marie Lake. These drawdown results do not align with the flux change results reported in Table 5-8	Provide a rationale for the larger change in groundwater flux at Marie Lake relative to Farley and Gordon Lakes during the closure phase.
NRCan-29	NRCan	Section 6.1.5 Groundwater and Surface Water	Appendix G, MacLellan Hydrogeology Assessment, Section 4.3.2	The description of the baseline hydrogeological conditions should include a description of the physical properties including hydraulic conductivity. In Section 4.3.2 it is stated that shallow bedrock hydraulic conductivity testing data is not available for the NSZ fault zone. As a result this zone was assumed to have the same hydraulic conductivity as the host shallow bedrock. However, in Volume 1, Chapter 8, Section 8.2.2.3 it is noted that hydraulic conductivity testing indicated that there was no difference between the NSZ fault zone and the host shallow bedrock. The presence or absence of a zone of increased hydraulic conductivity associated with faulting can strongly influence groundwater inflow to the open pit and the associated groundwater level drawdown.	Provide clarification on the availability of hydraulic testing data within the NSZ fault zone. Discuss the potential impact of a higher hydraulic conductivity fault zone on assessment results.
NRCan-30	NRCan	Section 6.1.5 Groundwater and Surface Water	Appendix G, MacLellan Hydrogeology Assessment, Section 4.3.2, and Section 4.4.4 Table 4-3	The EIS guidelines state that hydrogeologic controls on groundwater flow (including recharge) should be discussed. Variability in groundwater recharge can influence groundwater flow directions and flux quantities. A single value for recharge was assigned in the MacLellan model. This uniform value is in contrast to the Gordon Model for which recharge is varied as a function of surficial geology. Although stated, the differences in the variability of the surficial geology is not apparent in the regional mapping provided in the various reports (i.e., Map 5). If these differences were noted	Provide maps showing the simulated surficial geology for each site at a LAA scale. For the MacLellan site discuss whether the 120 mm/year could be recharged throughout the model (as evidenced by the water balance results, and the locations where the groundwater table exceeds the ground surface elevation).

				through site drilling and test pitting, and illustrated through the geological model, figures should be included to support this assessment.	
NRCan-31	NRCan	Section 6.2.2 Changes to Groundwater and Surface Water	Appendix G, MacLellan Hydrogeology Assessment, Section 5.1.1	The EIS guidelines state that the assessment of groundwater should include the assessment of changes to groundwater fluxes. Groundwater fluxes from mine infrastructure such as the MRSAs can carry a chemical load that may affect groundwater or surface water quality Groundwater fluxes from the historical MRSA are stated to travel through deeper flow paths resulting in long travel times to receptors. Based on the conceptual model for the MacLellan site, it is suggested that the majority of the groundwater flow occurs through the upper 10 m of bedrock. It is unclear whether these long travel times are associated with flow through the shallow bedrock, or with the lower bedrock units.	When describing the particle tracking results, include a discussion of the hydrostratigraphic units through which the particles are transported.
NRCan-32	NRCan	Section 4.3 Study Strategy and Methodology	Appendix G, MacLellan Hydrogeology Assessment, Section 5.2.1.3	The EIS Guidelines state that all models will be documented such that analyses are transparent and reproducible. In the description of the modifications made to the baseline model to represent operations phase conditions, it is stated that the TMF materials are added to the top layer of the model. While the hydraulic conductivity of these materials is provided, the configuration of the materials, and their thickness relative to the model layer thickness are not discussed. These factors, along with hydraulic conductivity, influence the quantity of seepage and particle tracking results for the TMF.	Provide a schematic cross-section showing the configuration of the tailings, HDPE liner, and dam rock fill within the numerical model. Include the thickness of the numerical layer along with the design thickness of each material. Label the materials with the hydraulic conductivity applied in the model.
NRCan-33	NRCan	Section 6.2.2 Changes to Groundwater and Surface Water	Appendix G, MacLellan Hydrogeology Assessment, Section 5.2.2.1, Table 5-3	The EIS guidelines state that the assessment of groundwater should include the assessment of changes to groundwater fluxes. The change in fluxes between groundwater and surface water can affect other valued components such as surface water and wetland environments, and fish and fish habitat. In Table 5-3 the change in the quantity of groundwater discharging to the Lynn River during the construction phase is very similar in magnitude to the change simulated for the Keewatin River. Given	Where possible change numerical solver settings to improve model stability, such that changes in flux being assessed are greater in magnitude than the numerical artifacts of the model.

				the distance from the Lynn River to the project area, the changes at the Lynn River are attributed to numerical artifacts. When numerical variability is of the same order as the variability that results from model boundary changes, it becomes difficult to separate true changes from model artifact.	
NRCan-34	NRCan	Section 4.3 Study Strategy and Methodology	Appendix G, MacLellan Hydrogeology Assessment, Section 5.3.1.2 and 5.3.1.3	The EIS Guidelines state that all models will be documented such that analyses are transparent and reproducible. This documentation includes the modifications made to the baseline model to represent operations conditions. In Section 5.3.1.2 it is stated that the boundary on the tailings pond was changed to a recharge boundary to maintain the tailings pond at the tailings surface at the end of operations. However, the quantity of recharge applied was not documented. Section 5.3.1.3 describes the addition of seepage boundaries at 2 m below ground surface to represent the seepage collection system during operation. Although these ditches are shown on Map 3, the details in that map do not allow one to determine the locations of the active seepage nodes. As described, the water table is more than 2 m below ground surface on the upland site of the TMF. Seepage nodes in this area would not actively remove water from the model.	In describing the changes made to the TMF boundary at the end of operations, include the top elevation of the tailings, and the applied recharge boundary. Provide a map showing the locations of the boundaries applied to represent the seepage collection system. Note which nodes actively remove water from the model in both operations and closure phases.
NRCan-35	NRCan	Section 6.2.2 Changes to Groundwater and Surface Water	Appendix G, MacLellan Hydrogeology Assessment, Section 5.2.2.1 Map 15, and Section 5.4.2.1 Maps 24, 25, and 26.	Although Section 5.2.2.1 describes the drawdown associated with the starter pit as being up to 1 m at 200 m from the pit during the construction phase, drawdown contours associated with the starter pit do not appear on Map 15. The contours shown on Maps 24, 25, and 26 do not appear to match the associated text in section 5.4.2.1.	Update maps 15, 24, 25, and 26 to show model results that are consistent with the text description.

NRCan-36	NRCan	Section 6.2.2 Changes to Groundwater and Surface Water	Appendix G, MacLellan Hydrogeology Assessment, Section 5.3.2.1, Table 5-5	The EIS guidelines state that the assessment of groundwater should include the assessment of changes to groundwater fluxes. The change in fluxes between groundwater and surface water can affect other valued components such as surface water and wetland environments, and fish and fish habitat. A summary of the changes to groundwater discharge to surface water features during operations indicates that East Pond will be drained by open pit dewatering. However, the outlet of this pond (KEE3-B2-A1) appears to continue flowing and contributing recharge to the groundwater flow system. The flow from the outlet stream to the groundwater flow system appears to limit groundwater drawdown in its vicinity. If this watercourse was to run dry as a result of the draining of East Pond, groundwater drawdown would increase, and other surface water features would contribute more to the groundwater flow system.	Describe how the boundaries for the East Pond and KEE3-B2-A1 are modified during operation. With the drainage of East Pond, discuss the likelihood for its outlet to continue to flow.
Geochemistry					
NRCAN-37	NRCan	Part 2, Section 6.1.2 Geology and geochemistry	Volume 4 Appendix F Geochemistry Baseline Technical Data Report Section 3.0	As detailed in MEND (2009), the waste rock sampling program must be representative of the spatial, geological, and geochemical variability of the deposit. MEND (2009) recommends that samples collected from drill core be recorded in block models and shown on cross sections and plan view maps in order to best display how the sample spatially fits within the material it was intended to represent. Two plan views (Figures 4.1-1 and 4.1-5) and 6 cross sections (Figures 4.1-2 to 4.1-4 and 4.1-5 to 4.1-8) were presented in the Table of Contents for MacLellan and Gordon, respectively. However, these figures were not included in the report and are not considered adequate to demonstrate the spatial distribution of all ore and waste rock samples collected as part of this study. The mine rock sample interval length ranged from 1.0 to 1.5 m. MEND (2009) recommends that sample dimensions reflect the bench heights for open pits. Additionally, long sample intervals better capture the potential heterogeneity of the unit being sampled and avoid skewing results by the inclusion of sulphide or carbonate mineral clusters or veins. Short sample intervals can skew the compositional representativeness with respect to the overall lithology composition. Over the life of mine, 239.1 Mt waste rock will be produced from MacLellan and 51 Mt waste rock from Gordon. MEND (2009)	a. Provide cross sections or block model images that show the location of all mine rock and ore samples from both Gordon and MacLellan deposits. At a minimum, the images must clearly show the borehole traces, geology surfaces, ore zones, the anticipated location of the open pit, the location of the historic mine workings, and a legend to allow for interpretation of these images. All sample locations from both deposits must be presented in order to verify spatial representativeness of the samples. b. Provide a review of sample heterogeneity with respect to mineralogy and sample observations in the field, to justify the short sample interval utilized in this study. c. Provide tonnage estimates for each lithology from both the Gordon and MacLellan deposits and quantitative justification for the number of samples collected in consideration of the initial sampling frequency provided in MEND (2009). The waste rock tonnages must reflect the most up-to-date mine plan.

				provides a recommended minimum sampling frequency per lithology, which is a starting point from which the final sample number must be determined based on site-specific conditions and objectives, as well as the overall tonnage to be mined from each lithology. Tonnage estimates per lithology were not provided, nor an evaluation of the compositional representativeness of samples for each lithology to be mined to ensure that the main lithologies were sampled and analyzed.	
NRCAN-38	NRCan	Part 2, Section 6.1.2 Geology and geochemistry	Volume 4 Appendix F Geochemistry Baseline Technical Data Report Section 3.4.2 and 3.4.3	A comprehensive kinetic testing program was completed, including field bins and laboratory humidity cells for overburden, ore, mine rock, and tailings. Further, the composite samples were subjected to mineralogy and static tests. A complete set of static data was not included for the kinetic test samples. MEND (2009) provides detailed considerations to support the design of a kinetic test program. This includes sample representativeness with respect to the material type and lithology they represent, particularly mineralogy, ARD potential, metal(loid) content, and elevated metal leaching potential. A kinetic test sample selection rationale was not provided to justify the representativeness of the tested samples. This review should present the static test data for the kinetic test samples in relation to the overall static test database for the same material type. For waste rock this should be completed for each lithology. Tables or figures can be used to present the percentile rankings of the kinetic test sample against the appropriate static test database for each kinetic test sample. This evaluation must be completed for ABA, trace metal, and SFE results for parameters of interest, including but not limited to NP, total sulphur, NPR, Ag, Al, As, Cd, Cu, F, Mo, Ni, Pb, Se, and U.	Provide the static test data for all kinetic test samples and a rationale for the selection of kinetic test samples including a detailed quantitative review of the representativeness of each kinetic test sample with respect to the material type / lithology that they represent and parameters of interest with respect to ARD/ML.
NRCAN-39	NRCan	Part 2, Section 6.1.2 Geology and geochemistry	Volume 4 Appendix F Geochemistry Baseline Technical Data Report Section 3.0	NAG tests were stated to have been conducted but results were not tabulated, nor were NAG tests considered in the evaluation of ARD potential. Further, detailed methods were not provided with respect to the use of sequential NAG tests, or an evaluation of oxidation of sulphide minerals and thus the effectiveness of the test to capture the ARD potential for material with a high sulphur content.	Provide the tabulated NAG test results along ABA data, provide a thorough description of the NAG methods used and approach to data evaluation, and a detailed review of how the NAG test results compare with the ARD potential determined through ABA tests.

NRCAN-40	NRCan	Part 2, Section 6.1.2 Geology and geochemistry	Volume 4 Appendix F Geochemistry Baseline TDR and Geochemical Baseline Technical Data Validation Report	The development of an ARD block model based on the exploration geochemistry database is an excellent method to support mine rock management planning. It is noted that the multi-element analysis did not include TIC, which was statistically derived based on major elements associated with NP. The calculated NP and AP derived from total sulphur were used to determine the proportion of PAG and non-PAG waste rock at both sites. However, it is not clear if the geochemical data collected as part of the baseline study was included in the model and used to validate the projections of PAG and non-PAG waste based on the statistically derived NP. The ARD block model should also be used to evaluate the feasibility of using the proposed sulphur cut-off of 0.11 wt.% based on the distribution of PAG and non-PAG materials and mine sequencing. Further, the full list of analytes from the multi-elemental analysis of 20,782 samples was not provided. If metal leaching potential is correlated with total metal content, as determined for arsenic, then the block model can also be used to determine waste rock zones with high metal content that could present elevated risk for metal leaching.	a. Provide a detailed validation of the block model using the baseline geochemistry data as well as the feasibility of waste segregation using a sulphur cut-off of 0.11 wt.% both in terms of the physical segregation of materials at an operational level as well as mine sequencing. b. Provide a list of parameters included in the multi-elements scan and justification for why this was not included in the block model to evaluate zones of elevated metal content.
NRCAN-41	NRCan	Part 2, Section 6.1.2 Geology and geochemistry	Volume 4 Appendix F Geochemistry Baseline TDR Section X and Geochemical Baseline Technical Data Validation Report Section 3.3 and 3.4	At MacLellan site, due to lack of runoff or seepage at the time of sampling, groundwater wells in the northeast corner of the historic rock storage area are considered to represent contact water with the historical mine rock. These wells report elevated sulphate, mildly acidic pH, and elevated concentration of P, Cu, Zn, Cd, As, Fe, and Ni. At Gordon site, runoff and seepage from the north mine rock storage area reported elevated concentrations of NH3, As, and Se. The south mine rock storage runoff and seepage reported elevated NH3, NO2, Se, As, Fe, and Cr concentrations. Both pit lakes report chemical and thermal stratification, with elevated As, F, and Fe, associated with anoxic conditions below 10 m, and elevated P associated with both surface and deep samples. Monitoring indicates that the lakes are meromictic. Water quality associated with the historic mine workings is considered a proxy for future mine rock. Site performance is generally more indicative of reactivity than laboratory tests. However, no comparison of the geology and mineralogy of the	Provide a comparative evaluation of the geology, mineralogy, and ARD/ML potential of the historic waste and future waste. This must consider historic and current geology, mineralogy, and geochemical data and observations, the ARD block model, as well as include block model images or cross sections that clearly distinguish between the historically mined rock and the future mine rock to developed in the open pits.

				historic mine rock and future mine rock was provided to justify this. Significant changes in the geology and mineralogy of the mine rock to be disturbed by the proposed project can greatly affect the potential that material could generate ARD/ML.	
NRCAN-42	NRCan	Part 2, Section 6.1.2 Geology and geochemistry	Volume 4 Appendix F Geochemistry Baseline TDR and Geochemical Baseline Technical Data Validation Report	As stated in Section 4.0 of the Validation Report, monitoring results downstream of the Gordon waste rock storage site do not show any sign of ARD and thus management of historic waste through blending of PAG and non-PAG rock and cover with overburden and topsoil is considered to be effective to control ARD/ML after closure at both Gordon and MacLellan sites, despite the differences in geology between the sites. Contact water quality at the MacLellan site reports mild acidity and elevated sulphate and metals, indicative of ARD. Waste at both sites was placed between 1996 and 1999 (Gordon site) and 1986 and 1989 (MacLellan site) and thus exposed to weathering for up to 24 and 34 years, respectively. Kinetic tests on the argillite (FLS2C), considered to have the highest ARD potential of all waste rock lithologies at the Gordon site, and the MacLellan sample "ML WR S>1%" do not report acidic leachate in testing to date. Although both samples report elevated sulphur content, they also both contain significant NP (upper quartile) in comparison with other argillite and mine rock samples at Gordon and MacLellan, respectively. Per MEND (2009) guidance, neither sample is considered to be sufficiently conservative in their representation of potentially acid generating rock from the Gordon argillite unit or the MacLellan mine rock. Further, based on NP depletion rates for the Gordon argillite sample, the timing to onset of ARD is approximately 30 years, which is longer than the period of exposure to date (up to 24 years) of the existing waste rock pile. It is thus possible that the ARD potential of historical material at Gordon site has not been realized. Blending of PAG rock with non-PAG rock as a means to minimize the development of ARD/ML from the waste rock piles at both sites must be supported by a conservative evaluation of the risk	a. Provide additional justification for the use of existing mine waste contact water as a proxy for future contact water, particularly in light of the review of sample representativeness requested in NRCan-05. b. Provide a plan to conservatively evaluate the long-term ARD potential of the argillite unit, including timing to the depletion of buffering capacity and the onset of acidic leachate as well as metal leaching potential associated with acidic drainage. Consideration should be given to the evaluation of the kinetic behaviour of blended future mine waste, to demonstrate the potential that buffering capacity from other materials is successful at preventing the development of acidic drainage from the argillite and MacLellan waste rock. c. Provide an evaluation of options for mine waste management to minimize ARD/ML at both Gordon and MacLellan sites in consideration of the differing geology at both sites, planned mine sequencing, and practicality at the operations level.

				that localized zones of ARD/ML could be developed, should waste with high sulphur content and low NP be placed on the edge or top surface of the piles. The evaluation of the feasibility of blending and cover for the proposed waste rock piles must consider mine sequencing to ensure that sufficient blending of PAG waste with rock containing high buffering capacity is realistic and practical at the operations level. Further, consideration should be given to segregation and backfill of PAG waste in the open pit at Gordon site as a means of managing PAG waste rock.	
NRCAN-43	NRCan	Part 2, Section 6.1.2 Geology and geochemistry	Volume 4 Appendix F Geochemistry Baseline TDR and Geochemical Baseline Technical Data Validation Report	Contact water downstream of the Gordon waste rock pile is not acidic, however elevated concentrations of nitrogen species are suggestive of the dissolution of blasting residuals, and elevated metal concentrations indicate that neutral mine drainage is not mitigated through blending and cover. Neutral leaching potential has been identified in various rock types from both Gordon and MacLellan mine through kinetic tests. A more detailed evaluation of neutral mine drainage is required to support mine waste management planning. This should include the identification of waste rock types and zones of high metal leaching potential to evaluate the option to segregate waste not only for ARD potential but also for neutral ML potential.	Provide a thorough evaluation of the potential to develop neutral mine drainage, mine rock lithologies that are associated with higher potential, and zones within the two deposits that may contain waste with higher potential to develop NMD. This evaluation should consider the practicality of segregating waste with high NMD potential.
NRCAN-44	NRCan	Part 2, Section 6.1.2 Geology and geochemistry	Volume 4 Appendix F Geochemistry Baseline TDR and Geochemical Baseline Technical Data Validation Report	Overburden is considered to have a low risk of ARD/ML based on testing to date and confirmed by the monitoring of contact water from the historical overburden storage area at Gordon site. Appendix C provides a summary table of all samples collected to date from Gordon site, including overburden. A similar table is not provided for MacLellan site, and based on the description in Section 3.3.1, which states that 49 samples were collected from drill holes near the proposed open pits, it is not clear which open pits were considered and whether any overburden samples were collected from MacLellan site. Lastly, a map of sampling locations was not provided to confirm the location of the boreholes with respect to the historic and proposed pit outlines. Further, considering the use of the existing contact water from the overburden storage area at Gordon site to justify the low risk of all overburden materials for the project, including MacLellan site, a thorough comparison of the historic and future overburden to be disturbed is required. A comparison of the types of overburden	a. Confirm if overburden samples were collected at MacLellan site and provide a table summarizing the descriptions for these samples, similar to the one presented in Appendix C. If samples were not collected, please provide justification for this and why overburden from Gordon site is considered a reasonable proxy. b. Provide a maps showing the locations of all overburden samples relative to the historic mine workings, proposed mine development, and surficial geology at both the Gordon and MacLellan sites.

				anticipated to be disturbed at MacLellan site is required to support any justification that Gordon site overburden can be used as a proxy for MacLellan site, as well as future overburden to be disturbed at Gordon site.	
NRCAN-45	NRCan	Part 2, Section 6.1.2 Geology and geochemistry	Volume 4 Appendix F Geochemistry Baseline TDR and Geochemical Baseline Technical Data Validation Report	Tailings are expected to generated ARD and associated ML in the long-term. During operations, tailing contact water will be managed and in closure a cover will be placed on the tailings. In post-closure, metals in seepage could be attenuated by the overburden. Further, aging tests show that WAD cyanide degrades but is still present at elevated concentrations after a duration of testing. Process water was not analyzed as part of the tailings geochemical baseline study. The timing to onset of acidic conditions in the tailings is estimated to be as soon as eight years based on depletion calculations. Depletion calculations are theoretical in nature and account for reaction times under controlled laboratory test conditions and thus do not account for factors such as the armouring of buffering minerals with secondary oxidation products or the accelerated kinetics of oxidation reactions once initiated. Time equivalency of laboratory tests should also be considered based on the water to rock ratio in the tests and site rainfall. Management of PAG tailing during operations will consider the continual burial of tailings under a fresh layer and thus minimizing the exposure time of fresh tailings. A comprehensive options analysis should be completed to determine the best available approach for tailings management and mitigation of ARD/ML and cyanide.	Provide a detailed summary of the method used to determine the timing to onset of acidic conditions in the tailings samples, including a comparative evaluation of the timing based on samples considered most representative of future tailings to be managed in the facility and thus generating seepage. Include in this summary expectations for process water quality and how this will influence seepage quality with respect to ARD/ML and cyanide. Tailings management planning must include a review of the best available practices to minimize the generation of ARD/ML and seepage containing elevated cyanide. Please provide a comprehensive review of the management options being considered and how they address these issues.
NRCan-46	CanmetMINING	2.2 Alternative means of carrying out the project	Volume 1 section 2.9 and Appendix Ii volume 5.	The Minerals and Metals Policy of the Government of Canada (https://www.nrcan.gc.ca/mining-materials/mining/minerals-and-metals-policy/minerals-and-metals-policy-government-canada/8690#soc-d) with regards to Mine reclamation expect industry and the government to develop comprehensive plans for the reclamation of disturbed areas, including the provision of satisfactory financial assurances to cover the costs of reclamation and, where necessary, long-term maintenance. In the EIS section	Following the Government of Canada Guidelines for the assessment of alternatives for mine waste disposal, please proceed with an alternative assessment that would compare backfill of problematic waste rock in the open pit with the placement of an engineered cover on the Mine Rock Stockpile Area at closure for the Gordon Site.

				2.9, the assessment of alternatives for mine waste management did not consider backfill of waste rock in the open pit at the Gordon site. Many operations across Canada commit to backfill as progressive decommissioning during closure. The Gordon site will be decommissioned at year 6 while the MacLellan site will continue to operate for an additional 7 years, providing continuous capital influx to the company. App I1 and I2 of Volume 5 provide predictions of seepage water quality, which raises some concern to the reviewer. Water quality of seepage from the waste rock has expected and upper selenium levels during operations (3.5 to 5.5 µg/L), closure (7.7 to 11 µg/L) and post-closure (5.8 to 11 µg/L) which are above the 5 µg/L limit for selenium in the new MDMER (https://laws-lois.justice.gc.ca/PDF/SOR-2002-222.pdf). Water quality of seepage from the waste rock has expected and upper arsenic levels during operations (71 to 79 µg/L), closure 100 µg/L at closure and post closure, which is at the maximum monthly mean level of 100 µg/L for new mine sites listed in the MDMER. Chromium is also expected to be high in the post-closure (1.9 to 3.5 µg/L). Water quality of seepage from the waste rock has expected and upper uranium levels during operations (30 to 46 µg/L), closure (63 to 97 µg/L) and post-closure (51 to 94 µg/L). While there is currently no federal limits on Uranium, the Canadian Nuclear Safety Commission expect Uranium mines and mills operators to keep releases as low as reasonably achievable, social and economic factors considered. Using this principle, the Uranium operations have maintained uranium levels below 21 µg/L between 2012 and 2016 (p.22 of http://nuclearsafety.gc.ca/pubs_catalogue/uploads/Regulatory_Oversight_Report_for_Uranium_Mines_and_Mills_in_Canada_2016_eng.pdf). While collection ditches will capture this seepage during operation and levels in the collection ponds are lower likely because of dilution, at closure covering the pile may only work for 1-3 centuries as the cover will erode with time and long-term stability under climate change will require regular inspection. Hence, backfill appears like the ideal long-term solution to protect the environment and future generations.	

NRCan-47	CanmetMINING	6.4 Mitigation measures	EIS Volume 3, Table 20A-1 Potential environmental, effects, residual effects and significance.	At the Gordon Site, project residual effects are predicted to be greatest in West Farley Lake and never extend downstream to Ellystan Lake. The EIS does not mention that this corresponds to 7.5 Km long of potentially affected lakes (Farley, Swede and Ellystan) and rivers from fluoride and phosphorus. It should also be highlighted that the mine will operate for approximately 6 years, and the proponent does not conclude on significant impacts to the aquatic ecosystem. Phosphorus is a well known eutrophication agent that could range from 0.1 to 200 µg/L. Fluoride is less toxic as chronic effects to fish and benthic invertebrates have been measured at 5 mg/L and higher. During operations, metals are not expected to reach MDMER limits in the collection ponds so treatment will only be considered if the metals in the collection ponds meet the MDMER.	Provide an assessment of best available treatment technology and techniques economically achievable for phosphorus and fluoride and provide concentration triggers in the collection pond water that would require the implementation of treatment for P and F.
NRCan-48	CanmetMINING	6.1.5. Groundwater and Surface Water	NRCan-3	During operations, metals are not expected to reach MDMER limits in the collection ponds of both sites so treatment will only be implemented if metal concentrations in the collection ponds meet the MDMER limits. These MDMER limits are based on Best Available Technology and Techniques economically achievable at the time of the MMER reviews. These limits do not guarantee that Farley Lake, Swede Lake and Ellystan Lake will be protected at the Gordon site if these limits are reached nor that lakes downstream of the MacLellan Facility will be protected	Provide water and sediment quality modelling downstream of the Gordon and MacLellan sites and associated ecological risks in the event that MDMER limits in the collection ponds are reached. If additional risks in the receiving environment are identified, please discuss significance of the risks, identify concentrations in groundwater and surface water (i.e. site-specific water quality objectives) that would trigger re-assessment of alternative treatment measure.
NRCan-49	CanmetMINING	6.4 Mitigation measures	EIS Volume 3 Table 20A-1	For the MacLellan site, the magnitude of residual effects are characterized as low during construction, operation, and active closure because predicted changes in water quality either do not exceed modelled baseline + 20%, or do not exceed water quality guidelines (i.e., no POPCs were identified for the construction, operation and active closure). It should be acknowledged that Phosphorus is expected to be around 45 µg/L as far as in Minton Lake which would lead to eutrophication of the receiving environment. NRCan also noted that selenium in the collection ponds could reach up 4.5 µg/L just below the 5 µg/L MDMER limit but up to 6 and 8 µg/L during operation and closure at KeeBi in the receiving environment. While these are localised areas, it remains that the MDMER could be exceeded in KeeB1 for these two elements.	Provide an assessment of best available treatment technology and techniques economically achievable for phosphorus and provide concentration triggers in the collection pond water that would require the implementation of treatment for P and Se.

NRCan-50	CanmetMINING	2.2 Alternative means of carrying out the project	EIS Volume 3 Table 20A-1	For the Maclellan site, the magnitude of potential residual effects due to total aluminum, total arsenic, total and dissolved cadmium, total copper, and fluoride are characterized as moderate during post-closure. This is because predicted concentrations of these parameters exceed modelled baseline + 20% and the long-term guidelines for the protection of aquatic life but are not expected to result in adverse effects on aquatic biota (evaluated in the Fish and Fish Habitat assessment). However, selenium and nickel are not mentioned even if they pose risks to aquatic mammals and ducks.	Following the Government of Canada Guidelines for the assessment of alternatives for mine waste disposal, please proceed with an alternative assessment that would compare backfill of problematic waste rock and tailings in the open pit with the placement of an engineered cover on the Mine Rock Stockpile and tailings management areas at closure for the MacLellan site.