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387	NRC-006	29-Sep-16	Angeles Albornoz, Natural Resources Canada	This project falls within a region of high to moderate seismic hazard in the Howe Sound region located northwest of Vancouver, BC. The project duration is short (operations for 16 years). The proposed mitigation measures indicate: "Mitigative measures to prevent damage as a result of earthquake or tsunami events include: - Proposed Project facilities will be built to the BC Building Code 1 in 2,475 year earthquake design criteria; - Detailed, site-specific geotechnical investigations will be conducted to determine: o The need for ground improvement (e.g., soil densification); o Selection of suitable building locations to prevent excessive loadings or ground movement; - Mitigation measures will be designed by qualified and experienced professionals; and - Proposed Project facilities will be designed and constructed to achieve life safety and performance criteria of the National and BC Building Codes, or as otherwise required for the Proposed Project." are appropriate.	NRCan-IR-01: NRCan requests that the proponent include clarification by providing additional details on the following statement in section 15.0 Requirements for Federal Environmental Assessments: "The likelihood of seismic hazards (liquefaction induced loss of strength, settlements and lateral spreading) would likely only be associated with a large earthquake event, such as a BC Building Code 1 in 2,475 year event."	As part of the geotechnical investigation and aggregate assessment, a series of test holes were put down throughout the proposed project area, including 7 sampled Becker holes, with continuous recorded penetration blow counts extending to depths of up to 30 m or more. These test holes, as well as examination and characterization of subsoil properties based on stability analyses of the existing groundwater channel, confirm that the fan/delta subsurface conditions at the site generally comprise dense sand and gravel sediments, with some local, near surface less dense soils or fills. Based on a conservative assessment using the open ended Becker blow counts of 20 blows/0.3 m or more, the risk of significant and extensive liquefaction is considered to be low to very low and would likely only be associated with a large earthquake such as the 1 in 2,475 year event.
388	NRC-007	29-Sep-16	Angeles Albornoz, Natural Resources Canada	NRCan notes that the Building Code provides a shaking "level" at the 2% in 50-year probability.	NRCan-IR-02: Given the materials at the site, NRCan requests the proponent to confirm the following: - What is the shaking level (and period of shaking) that might be expected to induce liquefaction? - Has a seismic hazard de-aggregation been conducted to examine distance/magnitude (and hence period of shaking and amplitudes) that dominate the hazard here? NRCan agrees that the probability of a large earthquake during the 16-19 year-window is very low (but not zero). The de-aggregated seismic hazard results (2nd bullet above) would allow for examination of possible contributions from smaller, closer events.	In response to what shaking level and period of shaking would be expected to induce liquefaction: As described above, it is anticipated that the potential risk of significant liquefaction would likely only be associated with a 1 in 2,475 year event, with an anticipated shaking level equivalent or larger than Magnitude 7 and period of shaking of 20 to 30 seconds. In response to seismic hazard de-aggregation: a seismic hazard de-aggregation has not been conducted and is not considered necessary based on the dense and coarse-grained characteristics of the fan-delta deposit underlying the project site, such that risk of seismic hazard due to smaller earthquake events with short periods of shaking is considered to be very low or minimal.
389	NRC-008	29-Sep-16	Angeles Albornoz, Natural Resources Canada	Since liquefaction is a potential factor and one of the mitigation measures of the proponents is: - " Detailed, site-specific geotechnical investigations will be conducted to determine: o The need for ground improvement (e.g., soil densification); o Selection of suitable building locations to prevent excessive loadings or ground movement"	NRCan-IR-03: NRCan requests to review the detailed report when it becomes available.	With approval from the client and applicable regulatory authorities, Golder will be pleased to provide a copy of the detailed report for review by NRC, when available
390	NRC-009	29-Sep-16	Angeles Albornoz, Natural Resources Canada	The hydrogeological study clearly shows that the quality of surface water is directly related to groundwater quality. Particularly, for the minor creeks located downgradient from the pit lake, where water in the pit lake transits first through the aquifer before emerging in the creeks. On this premise, NRCan suggests to monitor the quality of surface water in addition to groundwater quality as already proposed by the proponent.	NRCan-01: NRCan suggests that the proponent should mention the measures that will be undertaken if the monitoring program shows degradation of surface water quality. NRCan also suggests that the proponent monitor the quality of the surface water features (pit lake, minor creeks, McNabb Creek). This was not initially proposed by the proponent.	The Water Management Plan, currently being prepared for inclusion in the Mines Act and Water Sustainability Act Permit applications, will provide a more detailed plan for surface water quality monitoring than the conceptual plan proposed in the EA. Regular surface water quality monitoring in minor creeks and McNab Creek during the mine life is proposed in the Water Management Plan, consistent with the EA. These waterbodies represent the downstream receiving aquatic environment. A direct surface connection between the pit lake and the receiving environment is not expected during operations; it will only be established at closure when the constructed offset habitat is connected to the pit lake. At that time, pit lake water will be monitored to confirm the prediction made in the assessment that pit lake water does not represent a deleterious substance and would be unlikely to cause pollution in the downstream receiving environment. If mine-related changes in surface water quality during the mine life consistently exceed provincial and federal water quality guidelines and concentrations can be distinguished from the baseline conditions, then biological monitoring will be triggered to determine if these changes have impacted aquatic resources in the downstream receiving environment. Relevant groundwater data will be reviewed as part of the adaptive management process. Further details will be provided in the Water Management Plan.
391	NRC-010	29-Sep-16	Angeles Albornoz, Natural Resources Canada	In terms of the terrain stability, in the local study area and the regional study area, the proponent outlines the potential hazards and has discussed monitoring and mitigation measures.	NRCan-02: NRCan has no concerns. However, it is essential that the proponent complete the proposed monitoring and implement the mitigation measures related to the potential landslide hazards as they are quite evident, especially in the regional study area, i.e., upstream from the local study area.	Landslide hazards identified in the RSA are not anticipated to impact the LSA during the Project lifespan. Appropriate monitoring and mitigation measures for landslide hazards will be provided in the Mines Act Permit Application.

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664	NRC-011	30-Nov-16	Veronica Mossop, Natural Resources Canada	CEA Agency's Question: Avulsion risk is greatest during an extreme precipitation event, and the risk is considered "high" for segment 3.3. (See Appendix 5.4 A, Section 6.0 and Figure 4), why does the containment berm not cover all of segment 3.3 (see Section 5.1, figure 5.1-4)? Does the containment berm need to cover this area since it is listed as a mitigation measure? Golder Associates (section. 5.1.2, 2013) mentions that an adequately engineered training berm would serve "to reduce the risk of avulsion [along reaches 3.3 and 3.4] by preventing the development of new side channels as a result of overland flow". They also mention that the setback between the berm and the present active channel should be no less than 75 m. EIS (section 5.1, figure 5.1-4) shows a "flood protection dyke" along the right side of the creek across the outside of the gradual bend at the lowest end of reach 2 and adjacent to most of reach 3.1. This dyke clearly is intended to keep an extreme flow within the creek valley and preventing the flow from entering the project area. The berm is located along the portion of the creek where the channel direction shifts approximately towards the southeast direction before turning approximately towards the south. It is NRCan's opinion, that the dyke is correctly positioned to serve this purpose. This flood protection dyke is not mentioned in the Golder Associates report nor shown on any of their figures. EIS (section 5.1, figure 5.1-4) also shows a roughly east-west-oriented containment berm across the southern portion of the pit area that hooks to the northwest near the creek. There is a gap between the containment berm and the end of the flood protection dyke	Unless there is a specific characteristic to the local topography that would inhibit an extreme flood flow from spilling through this gap into the pit area, it is not clear to NRCan as to why there is no dyke/berm spanning this gap. Unless there are local topographic characteristics that alleviate the need for one, NRCan suggests that the proponent considers that a dyke/berm should be put in place within the identified gap.	The McNab Creek Flood Control Dyke along the northern edge of the Site and the Pit Lake Containment Berm along the southern edge of the Site are different structures with different primary purposes. The primary purpose of the McNab Creek Flood Control Dyke is the management of floods from McNab Creek. The primary purpose of the Pit Lake Containment Berm is the containment of floods from within the Pit Lake. Both the McNab Creek Flood Control Dyke and the Pit Lake Containment Berm are being engineered to serve the function of a training berm as discussed in the avulsion risk assessment provided in Appendix 5.4-A of the EAC Application/EIS. Revisions to the McNab Creek Flood Control Dyke design criteria for permitting and review of the recommendations provided in Appendix 5.4-A have resulted in the extension of the Flood Control Dyke adjacent to McNab Creek reach 3.3 to connect to the Pit Lake Containment Berm. The Flood Control Dyke, the Pit Lake Containment Berm and the 1/100 flood inundation area are presented in the attached Figure 2 entitled 100 Year Flood Inundation Area. As shown, the proposed works have been designed as set-back structures and they are to be developed on existing ground which is generally higher than the Creek and the floodplain relative to the current hydrologic regime.

end.