Rook I Project

Environmental Impact Statement

Annex 1 Responses:
Federal Indigenous Review Team Information Request – Round 2

Environmental Impact Statement – Federal Indigenous Review Team Information Request Responses – Round 2

No.	Department	Project Effects Link	Reference to EIS, appendices, or supporting documentation (if applicable)	Context and Rationale	Information Requirement	NexGen Response	Section in EIS	Justification/Rationale	Follow up IR #	Follow up Information Request	NexGen Response	Section in EIS
4	ECCC	Fish and fish habitat Change to an environmental component due to hazardous contaminants	Section 1.2.6	The Proponent proposes storing tailings underground as a cemented backfill material. ECCC agrees that storing cemented tailings as backfill material is an environmental design feature. However, it is not clear whether there has been an assessment to determine if there are fractures, faults or other discontinuities underground that may become conduits for seepage or contaminants from the cemented tailings backfill underground to Patterson Lake. It is also not clear what distance separates the reaches of the underground mine and Patterson Lake. This information will help to determine its proximity to Patterson Lake, which will indicate whether contaminants have a possibility of reaching Patterson Lake.	Regarding stored tailings used as cemented backfill material: 1. Confirm whether there has been an assessment for the presence of fractures, faults and other discontinuities underground that could become conduits for seepage and/or contaminant flow to Patterson Lake. 2. Provide information on the distance between the reaches of the underground mine location and Patterson Lake. 3. Demonstrate that no contaminants will migrate or seep into Patterson Lake from the cemented backfill material.	NexGen notes that Draft EIS Section 1.2 (Rook I Project Overview) is intended to provide information at a summary level. NexGen confirms that information addressing the reviewer's IR is included within the Draft EIS submission. Responses to part 1, part 2, and part 3 of this IR are provided below. 1. NexGen generated a geological model that was used to define the hydrostratigraphic units. Within the crystalline basement rock, the model defined shear and fault zones that were mapped as sub-vertical features as they were encountered during borehole drilling. The primary hydraulic pathway applicable on the scale of the proposed mine development is through the fractures related to fault and shear zones (Draft EIS Annex III [Hydrogeology Baseline Report], Section 5.1.3.1). Groundwater modelling presented in Draft EIS TSD XIV (Groundwater Flow and Solute Transport Modelling Report) included the presence of these fault and shear zones and their ability to enhance flow to Patterson Lake. In addition, sensitivity analysis on the mass loading to Patterson Lake was conducted, wherein the hydraulic conductivity of the fault zone was assumed to be five times higher than the values from the calibrated groundwater model. Model predictions of mass loading to Patterson Lake are presented in Section 4 and Section 5 of Draft EIS TSD XIV. Note that fault zones are illustrated in the figures prepared in NexGen's response to IR 266 (Attachment IR 231/264/266/267-1). 2. Figure 10 of Draft EIS TSD VII (Mine Waste Alternatives Assessment Report) and Figure A-15 of Appendix A of Draft EIS TSD XIV both present a visual of the location of the underground mine relative to Patterson Lake. The underground tailings management facility (UGTMF), as shown in both of these figures, is approximately 350 m below Patterson Lake. Vertical raises are located approximately 315 m from Patterson Lake. 3. Figure A-17 of Appendix A of Draft EIS TSD XIV presents a conceptual breakdown of the advective flux from the various underground components to Patterson Lake. Seepage from the UGTMF, primary backfill, secondary backfill, and reflooded mine workings to Patterson Lake is predicted to occur, as presented in Figure A-17. Mass loadings to Patterson Lake are inputs to the surface water quality analysis and effects assessment for Patterson Lake as documented in Draft EIS Section 10 (Surface Water Quality and Sediment Quality), Draft EIS Section 11 (Fish and Fish Habitat), and Draft EIS Section 15 (Human Health), which concluded no significant adverse effects on valued components.	n/a	**Context:** Parts one and two of the original IR have been met. These parts related to requests for information about the presence of fractures, faults and other discontinuities as well as providing the distance between underground tailings storage and Patterson Lake. This information was provided by the Proponent in their response. Further details are requested for part three of the original IR, as well as parts one and two of IR 26, related to scientific information that is needed to assess the potential for contaminants to migrate from the Underground Tailings Management Facility (UGTMF) and the Reflooded Mine Workings (RMW) area, to Patterson Lake by the groundwater pathway, and details related to the extent and associated timing of potential contamination. The details provided and requested in this IR are in following with the original request to demonstrate that no contaminants will migrate or seep into Patterson Lake from the cemented backfill material. The information requested is intended to provide specificity to the request to support a more structured response. It is also noted that discussion of the RMW as a source of contamination to Patterson Lake by the groundwater pathway was not discussed in Section 10.5.1 of the EIS. It is unclear if the EIS considered the RMW as a contamination source within the term UGTMF (potentially due to the close proximity of the UGTMF and the RMW). The Proponent's response indicated that an advective flux of 0.55 m^3/d from the UGTMF and 2.7 m^3/d from the RMW to Patterson Lake is anticipated, as listed in Figure A-17 of Appendix A of Draft EIS TSD XIV. The advective flux values of 0.55 m^3/d and 2.7 m^3/d are not listed in the EIS or Appendix A of Draft EIS TSD XIV, outside of Figure A-17. White Figure A-17 contains a diffusive flux section, it has not been made clear how these values were considered or utilized. It was therefore difficult to assess the validity of the values in Figure A-17. The timing of when peak mass flux of contaminants from the UGTMF and RMW to Patterson Lake would occur was also not clear. A summary of the mass flux of individual contaminants from the UGTMF and RMW after closure could not be found. A clear understanding of how regional hydrogeology and the Project results in groundwater being transported from the UGTMF and RMW to Patterson Lake is requested to assess this potential pathway for surface water contamination. From Section 3.3.2	4-R1	1. Provide details on how the advective flux of 0.55 m^3/d from the UGTMF and 2.7 m^3/d from the RMW to Patterson Lake were determined (Figure A-17 of Appendix A of Draft EIS TSD XIV). Details related to how mass flux from the UGTMF to Patterson Lake will occur over time should be provided. The requested details should be included within the body of text in Appendix A, with a summary of key parameters and results provided in the body of the EIS. 2. Provide details on how the flooding of the mine during closure will impact regional hydrogeology, specifically related to the migration of contaminants from the UGTMF and RMW to Patterson Lake by the groundwater pathway. 3. Clarify if contamination sourced from the RMW by the groundwater pathway has been included within the term UGTMF in section 10.5.1 of the EIS. If the RMW was not considered as a source of contamination to Patterson Lake by the groundwater pathway in Section 10.5.1 of the EIS, it should be added. 4. Include a table summarizing the predicted mass flux of contaminants from the UGTMF and RMW to Patterson Lake over time. 5. Provide justification for the assumption in the groundwater flow model of an equivalent porous media approach for groundwater transport through the shear and fault zones. The model should give due consideration for fracture dominated transport, either by directly modelling as fracture flow or through a robust justification for how the parameters used in the existing equivalent porous media model are reflective of fracture-dominant transport. 6. Provide additional information on the assumption that dispersity is 10% of the flow pathway for vertical flows from the UGTMF to Patterson Lake. Provide a reference for the validity of this approach that is either peer reviewed or which demonstrates that it is an established method. The supporting documentation for the use of this method to estimate dispersivity should indicate that it is valid for situations that are comparable to the Project site, notably vertical groundwater flows that are likely to be fracture dominated. 7. Provide additional details on why the hydraulic conductivity value of the sandstone unit in the model is two orders of magnitude above the geometric mean. 8. Provide details on the source of the values selected for the hydraulic conductivity of the fault and shear zones. 9. If multiple calibrated model solutions were trialed, provide details, including why the parameters that were selected are considered the most appropriate model solution. If multiple calibrated model solutions were not trialed, provide information to support that the calibrated parameter values represent a unique calibration solution. 10. Where model parameters were obtained from site analogues or literature values, provide additional details that establish why the selected site analogues are valid for the Project site. 11. For fault and shear zone features that extend out of the local area, provide a clear explanation of the method used to determine the location, size, angle, and parameters that were used in the model to describe these zones. Provide the reasoning for the use of different hydraulic conductivity values for the	Please see Attachment IR 04-R1, 26-R1 for NexGen's response to this IR. As described in the attachment, NexGen concurs with the reviewer that additional clarity could be provided within the EIS and will provide additional details in the revised EIS in response to part 1, part 3, and part 4 of IR 4-R1. In summary, the additional information provided is consistent with the information presented in the Draft EIS, for which the assessment concluded that there would be no significant adverse effects to valued components as a result of the underground storage of tailings or reflooded mine workings.	Section 10.5.1; TSD XIV, Section 3.3, Section 4.5, Appendix A

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								(Groundwater Flow Pathways) of Appendix A of Draft EIS TSD XIV, the advective flux from the UGTMF and RMW to Patterson Lake is stated to occur following flooding of the mine during closure: "Upon completion of mining and placement of underground waste, the mine would be flooded, and groundwater pressures would re-establish to natural hydrostatic conditions, which are anticipated to be similar to those observed in the pre-development period. Upon saturation of the mine backfill and open workings, groundwater would migrate from these source areas, through the geological pathways, discharging to the receiving environment." The groundwater contaminant transport model is the primary tool being used to predict when and to what extent Patterson Lake may be contaminated by the groundwater pathway. It is therefore important that details of how key parameter values in the model were selected are provided and that the best available information is utilized. Parameter values in the groundwater model were selected by a variety of methods, including site analogues, literature values, and through model calibration. The source of hydraulic conductivity values for the fault and shear zones within the local areas was not clear. For vertical dispersivity from the UGTMF and RMW, a value equal to 10% of the flow pathway was used, referencing lecture notes. In addition to the parameters of relevance to contaminant transport in groundwater listed above, the fault zone and shear zone features that extend outside of the local area were included in the model through the following approach outlined in Section 2.3.3 (Groundwater flow Pathways) of Appendix A of Draft EIS TSD XIV: "To account for the presence of these [fault and shear zone locations outside of the local area] features, the bedrock in this area was assigned a horizontal hydraulic conductivity of $1.3x10^{-07}$ m/s with an orientation of 43° from north (i.e., approximating the trend of the fault and shear zones) and $1.0x10^{-08}$ m/s in the perpendicular (i.e., northwest-southeast) direction." The approach to numerical modelling of groundwater flow is also relevant to assessing predictions for the transport of contaminants to Patterson Lake from the UGTMF and RMW by the groundwater pathway. Notably, in		fault and shear zones within the local area vs outside the local area. 12. In the sensitivity analysis, provide a justification for the magnitude of variability considered for each parameter. The justification should include consideration of how the value for each parameter was selected (field data, model calibration, etc.) and the level of uncertainty associated with each parameter. The magnitude of variability used for sensitivity analysis for each parameter should be chosen with respect to the level of confidence in the accuracy of each parameter value.		

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								Section 2.2 (Numerical Model Approach) of Appendix A of Draft EIS TSD XIV, a general assumption and limitation applied to the numerical modelling approach is: “Groundwater flow in the model, regardless of the presence of bedrock fractures, is represented by an equivalent porous media approach.” **Rationale:** Following from the original IR to demonstrate that no contaminants will migrate or seep into Patterson Lake from the cemented backfill material, specific information is being requested related to groundwater as a contamination pathway to Patterson Lake. Expansion of the IR is intended to elucidate outstanding issues and improve specificity. Parameter values with an unclear source and the selection of model assumptions and parameters that are consequential simplifications of known site characteristics result in a high degree of uncertainty in the reliability of predictions from the groundwater model, predictions for contaminant transport from the UGTMF and RMW to Patterson Lake and subsequent impacts to fish and fish habitat cannot be adequately assessed. The groundwater flow and contaminant transport models are critical to predictions of how much and when contaminated groundwater from the UGTMF and RMW will reach Patterson Lake. To adequately assess the validity of the groundwater models, the reasoning behind underlying assumptions should be clearly explained. Specifically, the use of an equivalent porous media approach to model fractured media should be justified as the fracture dominated fault and shear zones are the likely path for water from the UGTMF and RMW to reach Patterson Lake. Using the most accurate values available for key parameters is important to assess the validity of predictions of the contamination pathway from the UGTMF and RMW to Patterson Lake. The parameters that quantify key groundwater characteristics should be based on the best available data, with the reasoning behind selection criteria clearly outlined. Where regional analogues or literature values are used, a justification of why the analogues are reasonable should be provided, based upon similarities between the Project location and the analogue location.				

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5	ECCC	Wildlife and Wildlife Habitat	Section 2 Section 3 Section 14 Section 16 Section 20 Section 23 Section 24 Table 20.3-1 Table 23A-5	The Proponent has committed to developing a Caribou Monitoring and Offsetting Plan due to residual effects to caribou. This plan should consider ECCC's Biodiversity Offsetting Approach that is described in the Operational Framework for Use of Conservation Allowances (ECCC, 2012)[1]. ECCC is available to assist the Proponent in the determination of appropriate offsets that would balance against Project effects. Note 1: https://www.canada.ca/en/environment-climate-change/services/sustainable-development/publications/operational-framework-use-conservation-allowances.html	Provide the Caribou Monitoring and Offsetting Plan for review and clearly explain efforts to minimize, avoid, mitigate and offset impacts to caribou. **Suggestions for mitigation and follow-up measures** In the Caribou Monitoring and Offsetting plan, provide details on how severity of disturbance and vulnerability of the caribou population were considered in coming up with offsetting amounts relative to area disturbed. Important factors including time lag (the amount of time from restoration work to when the habitat would be considered caribou habitat) would need to be considered.	NexGen notes the Environment and Climate Change Canada's (ECCC's) request for the Caribou Mitigation and Offsetting Plan (CMOP) is outside the scope of the Project Terms of Reference (Draft EIS Appendix 1A [Concordance Tables for the Terms of Reference and Generic Guidelines for Preparation of an Environmental Impact Statement], Table 1A-2). Information on NexGen's approach to minimizing, avoiding, and mitigating effects to woodland caribou is summarized in the Draft EIS. The CMOP cannot be provided within the EA process as this plan is still in the development stage and requires the involvement of multiple parties. NexGen is in the process of developing the CMOP through engagement with the Saskatchewan Ministry of Environment and primary Indigenous Groups to meet provincial requirements and align with Indigenous goals. NexGen confirms that factors such as population status, vulnerability (resilience), and time lags that are identified by the ECCC in its draft *Offsetting Policy for Biodiversity* (ECCC 2020) and associated operational guidance and decision support tools, should they be provided by the ECCC, will be considered in the offsetting methods and calculations. Draft EIS Section 14.5 (Residual Effects Analysis) provides information on NexGen's approach to minimizing, avoiding, and mitigating effects to woodland caribou, and the specific mitigations measures relating to potential effects to woodland caribou are identified in Table 14.4-1 of Draft EIS Section 14.4 (Project Interactions), including Pathway ID W-01 (Habitat loss), Pathway ID W-02 (Habitat alteration), and Pathway ID W-03 (Sensory disturbance). Information on the mitigation hierarchy level for these mitigation measures is included in Draft EIS Appendix 23A (Summary of Project Environmental Design Features and Mitigation Measures). No changes are proposed in the revised EIS to address this IR. **<u>References</u>** ECCC (Environment and Climate Change Canada). 2020. Draft Offsetting Policy for Biodiversity. [accessed June 2023]. Available at https://www.canada.ca/content/dam/eccc/documents/pdf/offsetting-policy-biodiversity/draft-biodiversity-offsetting-policy.pdf	n/a	**Context:** The Proponent states that the information on their approach to minimizing, avoiding, and mitigating effects to woodland caribou is summarized in the Draft EIS. However, the information provided in the draft EIS is insufficient to adequately assess impacts and plans related to woodland caribou. The mitigations listed in Table 14.4-1 are insufficient to determine if impacts to boreal woodland caribou will be fully addressed, and often the proposed mitigation is the commitment to develop a Caribou Mitigation and Offsetting Plan (CMOP). **Rationale:** The Proponent states that they are in the process of developing the CMOP and are engaging with Saskatchewan and Indigenous groups to meet provincial requirements. ECCC is collaborating with Saskatchewan to support alignment of the CMOP with the federal recovery strategy. ECCC recommends using the Operational Framework for Use of Conservation Allowances to inform offset multipliers. However, the determination of the appropriate offset ratio following the framework is case-specific and is based on an assessment of several factors such as impact type, severity, duration, site characteristics, vulnerability, uncertainties and risk characterization. For caribou, ECCC typically recommends a minimum offset multiplier of 4:1 (offset outcome : residual impact). This is a benchmark ratio applied to a project that is in the lower end of the risk spectrum; for example, for a project with a low severity impact adversely affecting a low vulnerability ecological component. In general, the minimum 4:1 multiplier accounts for time-lags to restoration, uncertainty in outcomes, a precautionary approach, and the adverse impact itself in its specific context. However, offset multipliers are variable and determined by project-specific circumstances and associated risks and uncertainties. Based on ECCC's characterization of risk for this Project a ratio of 4:1 to 20:1 would be consistent with the recovery objectives. Relevant factors in risk characterization include an assessment of population status, habitat replicability, habitat function, connectivity, and sensitivity, magnitude of impact, geographic scope, duration of effect, frequency, timing and irreversibility. When additional information is made available, a more specific range for offsetting can be provided.	5-R1	Provide the draft Caribou Mitigation and Offsetting Plan, including details on how residual effects to Caribou will be offset. If details on mitigation and offsetting cannot be provided at the time of response, present a discussion of the gap in information, related uncertainty with regards to potential effects and mitigation, and any additional mitigation measures and/or monitoring and follow up that will be implemented on a precautionary basis.	NexGen confirms that the Caribou Mitigation and Offsetting Plan (CMOP) remains under development at this time and further confirms that NexGen will both provide a draft of the CMOP to provincial and federal regulators in 2024 and continue to invite Environment and Climate Change Canada (ECCC) and the CNSC to attend Caribou Working Group meetings facilitated by NexGen with primary Indigenous Groups. NexGen notes that Draft EIS Section 14.5.1 (Woodland Caribou) presents a detailed assessment that allows for a fulsome understanding of the potential effects of the Project and the Project combined with reasonably foreseeable developments on woodland caribou. With respect to the reviewer's request for details on mitigation and discussion on gaps in information, related uncertainty with respect to potential effects and mitigations, and the inclusion of additional mitigation measures and/or monitoring and follow-up that would be implemented, NexGen confirms that this information is contained within the Draft EIS: ▪ Draft EIS Section 14.5 (Residual Effects Analysis) provides information on NexGen's approach to avoiding, minimizing, and mitigating effects to woodland caribou. Specific mitigation measures related to potential effects to woodland caribou are identified in Table 14.4-1 of Draft EIS Section 14.4 (Project Interactions and Mitigations), including Pathway ID W-01 (Habitat loss), Pathway ID W-02 (Habitat alteration), and Pathway ID W-03 (Sensory disturbance). Information on the mitigation hierarchy level for these mitigation measures is included in Draft EIS Appendix 23A (Summary of Project Environmental Design Features and Mitigation Measures). ▪ Draft EIS Section 14.6 (Prediction Confidence and Uncertainty) describes primary factors affecting confidence in the predictions made in the wildlife and wildlife habitat assessment and how this uncertainty was managed. ▪ Draft EIS Section 14.7 (Monitoring, Follow-up, and Adaptive Management) describes monitoring programs that would be used to evaluate effectiveness of the environmental protection measures and enhance mitigation measures, as necessary. The assessment concluded that, despite Project-related adverse effects to woodland caribou being anticipated, adverse effects already exceed the provincial management threshold under existing (i.e., baseline) conditions and the woodland caribou herd is not considered self-sustaining in the SK2 Administrative Unit (ECCC 2020). Under this context, and as woodland caribou is designated as a species at risk under the *Species at Risk Act*, NexGen has committed to creating and implementing a Caribou Mitigation and Offsetting Plan (CMOP) that would be developed through engagement with the Saskatchewan Ministry of Environment (ENV) and Indigenous Groups (Draft EIS Section 14.5.1.1.1 (Habitat Availability). NexGen notes that, as a condition of provincial EA approval, the CMOP must be submitted to the ENV for approval prior to NexGen initiating the Project Construction phase (ENV 2023). As additional information to what was provided in the Draft EIS, NexGen confirms that the CMOP continues to be developed with input from Indigenous Groups and based on meetings held with provincial regulators in 2022 and 2023, including a workshop held on 30 October 2023 with representatives of Indigenous Groups and the ENV,	n/a

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											CNSC, and ECCC. The CMOP is being developed to be consistent with the provincial Range Plan for Woodland Caribou in Saskatchewan: Boreal Plain Ecozone – SK2 West Caribou Administrative Unit (range plan) (ENV 2021) and the related federal Amended Recovery Strategy for the Woodland Caribou (Rangifer tarandus caribou), Boreal Population, in Canada (federal recovery strategy) (ECCC 2020a). NexGen notes that the Saskatchewan range plan was developed to support the landscape-level planning requirements of the federal recovery strategy. The range plan is consistent with the federal recovery strategy and applicable to the local conditions of the SK2 West Boreal Plain herd. Specifically, the federal recovery strategy says, "[t]o guide the protection of critical habitat and the recovery of boreal caribou, range plans or other similar documents and/or action plans are being prepared by provincial and territorial jurisdictions" (ECCC 2020a). As stated in the provincial range plan, "Saskatchewan is responsible for managing woodland caribou on provincial and private lands, and as signatory to the Accord for the Protection of Species at Risk in Canada, has a responsibility to prepare a provincial range plan for woodland caribou. Range plans provide a path forward for effective landscape management. They provide the federal government with clear information on the measures, tools and targets for woodland caribou habitat management being deployed, and that they effectively protect woodland caribou habitat" (ENV 2021). The ENV then reports to ECCC on the implementation of the plan every five years. Following the federal-provincial agreement for the conservation of the woodland caribou in Saskatchewan (ECCC 2019), NexGen has assumed that federal and provincial governments are coordinated and aligned on the recovery strategies, action plans, and range plans. The CMOP is also being designed to be consistent with the seven policy statements in the Draft Offsetting Policy for Biodiversity (ECCC 2020b). The CMOP will incorporate Indigenous engagement and components, follow the mitigation hierarchy, account for adverse effects, follow no net loss and net gain, identify limitations, present how the offset design meets the implementation concepts (i.e., equivalency, use of multipliers, additionality, location, timing and duration, monitoring and evaluation, and accountability and governance), and include complementary measures. The mitigation measures for avoidance, minimization, and reclamation in the CMOP will be the same as those presented in Draft EIS Section 14 (Wildlife and Wildlife Habitat). In addition, there are three components currently being proposed in the draft CMOP to offset residual effects. These components are consistent with the Saskatchewan range plan and federal recovery strategy to meet no net loss of functional habitat and include: ▪ restoration of linear features in Tier 2 habitat through the provincially led restoration program; ▪ research and restoration of linear features in Tier 1 habitat adjacent to the Project (building on caribou-focused research already being conducted by NexGen); and ▪ Indigenous-led stewardship. Implementation of the offsetting is expected to begin concurrent with Construction but would be dependent on provincial restoration timelines and Indigenous timelines. The proposed offsetting components are compatible with the federal recovery strategy in that they: ▪ follow provincial landscape-level planning objectives of the range plan;	

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											▪ restore habitat to work toward recovering the 65% undisturbed threshold for sustainable population in the SK2 West; ▪ work to reduce predation mortality by reducing predator use of linear features; and ▪ take a coordinated approach, with inclusion of Indigenous-led stewardship and monitoring. The CMOP is being developed to include calculations to determine offset requirements to meet no net loss objectives while incorporating multipliers to manage uncertainties. The calculations follow methodologies used on many federally accepted caribou offsetting projects throughout Canada. The offsetting plan is also considering and incorporating the Saskatchewan offset calculator requirements as per the assumptions provided by the ENV. NexGen is committed to adaptive management through the execution of the CMOP to ensure success. If ongoing monitoring indicates that any components of the CMOP are not achieving their objectives, revisions would be made to the mitigation and/or offsetting measures, as required. As the potential Project effects to woodland caribou have been appropriately assessed in the Draft EIS and the CMOP would require ENV approval prior to Construction to verify suitable mitigation measures would be implemented, NexGen confirms that an appropriate level of information has been provided for the purposes of EA review. **References** ECCC (Environment and Climate Change Canada). 2019. Woodland caribou (Boreal population) in Saskatchewan: draft conservation agreement. Available at https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry/administrative-agreements/agreement-conservation-woodland-caribou-boreal-saskatchewan.html. Accessed December 2023. ECCC. 2020a. Amended Recovery Strategy for the Woodland Caribou (Rangifer tarandus caribou), Boreal Population, in Canada. *Species at Risk Act* Recovery Strategy Series. Environment and Climate Change Canada, Ottawa. xiii + 143pp. ECCC. 2020b. Draft Offsetting Policy for Biodiversity. Available at https://www.canada.ca/en/environment-climate-change/services/biodiversity/offsetting-policy-biodiversity.html. ENV (Saskatchewan Ministry of Environment). 2021. Range Plan for Woodland Caribou in Saskatchewan: Boreal Plain Ecozone - SK2 West Caribou Administration Unit. October 2021. 109 pp. ENV. 2023. Notice of Ministerial Decision Pursuant to Section 15 *The Environmental Assessment Act* NexGen Energy Limited Rook I Project.	
6	CNSC	Current use of lands and resources for traditional purposes	Table 2.4-4	**Context:** Under the rationale for Athabasca Chipewyan First Nation (ACFN) being included as an Indigenous group identified for information sharing, the EIS states "Potential overlap with traditional territory but no access link or known residency/land use". It is not clear how this was determined.	Provide any additional information about any engagement NexGen has done with ACFN to understand their land use in the vicinity of the Project. Please provide additional information available related to ACFN's Lands and Resource use in	NexGen acknowledges the reviewer's comment and provides the following rationale for excluding the Athabasca Chipewyan First Nation (ACFN) within the information presented in Draft EIS Section 16.3.3 (Contemporary Indigenous Land and Resource Use). As discussed in Draft EIS Section 2.4.1 (Identification of Indigenous Groups for Engagement), a detailed evaluation was undertaken for the proposed Project to	Section 2; TSD I	For this IR, NexGen states that they disagree with the reviewer and will not be updating Section 16.3.3 of the EIS or the IER due to the level of information within the documents being appropriate. NexGen should continue to demonstrate that they have been reaching out to meet with ACFN to get their input and remain open to	6-R1		NexGen confirms that appropriate edits will be made in revised EIS Section 2 (Indigenous, Regulatory, and Public Engagement) and revised EIS TSD I (Indigenous Engagement Report) with respect to engagement conducted with the ACFN between Draft EIS submission and revised EIS submission. NexGen also confirms that, as of 31 March 2024, no additional relevant information regarding potential ACFN	Section 2; TSD I

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				ACFN provided comments on the Project Description for the Rook-1 Project and identified that they use the land in the vicinity of the project for hunting, fishing and trapping. It is not clear if NexGen has discussed this with ACFN to better understand their land use in the vicinity of the Project or how ACFN's comments on the Project Description were considered when making this determination. **Rationale:** Additional information regarding engagement with ACFN and the projects potential impacts on ACFNs Indigenous and/ or Treaty rights and interest is required.	Section 16.3.3 of the EIS and in the Indigenous Engagement Report (IER).	identify the scope of engagement to be completed with Indigenous Groups. This evaluation considered traditional territories; traditional and current land uses; proximity of the Project to Indigenous communities; and potential Project effects on health and safety, the environment, and any potential or established Aboriginal or treaty rights and related interests of Indigenous Groups (REGDOC-3.2.2 Version 1.1 [CNSC 2019]). Through this process, NexGen determined that the ACFN would either not be affected by, or would experience minor effects from, the Project and should be engaged at an information-sharing level (Draft EIS Section 2.4.2 [Identification of Indigenous Groups for Engagement]). NexGen has offered engagement opportunities to, and held meetings with, the ACFN since 2019, including advising the ACFN of the CNSC's public comment period for the Draft EIS and presenting the results of the EA to the ACFN on 13 April 2023. Engagement conducted with the ACFN during the review of the Draft EIS will be updated in the revised EIS. With respect to engagement conducted with the ACFN between Draft EIS submission and revised EIS submission, NexGen will make appropriate edits in revised EIS Section 2 (Indigenous, Regulatory, and Public Engagement) and revised EIS TSD I (Indigenous Engagement Report). NexGen notes that available information, including information provided by the ACFN through Project engagement activities, did not demonstrate that the ACFN have documented traditional land use activities within any of the Project local study areas (LSAs). Map 1 of *Níh boghodi: We are the stewards of our land* (ACFN 2012) shows that the proposed Project location is located outside the ACFN self-declared protection and stewardship zones; the Project location is only within the ACFN self-declared consultation area. This information is consistent with Map 1 of the *Athabasca Chipewyan First Nation Advice to the Government of Alberta Regarding the Lower Athabasca Regional Plan* (ACFN 2010), which shows the proposed Project is located outside of the ACFN Homeland. NexGen acknowledges the ACFN submitted comments on the Project Description that included general concerns related to potential effects on their rights to hunt, trap, and fish; the continuation of their culture; and cumulative effects. However, through engagement activities conducted to date with the ACFN, no specific traditional land uses have been identified within the Project LSA (Draft EIS Appendix 2A [Summary of Indigenous Group Engagement Activities], Table 2A-6; Draft EIS TSD I [Indigenous Engagement Report], Appendix B, Table B-6). Based on the currently known information presented above, NexGen respectfully disagrees with the reviewer's request to provide additional information available related to the ACFN's Lands and Resource use within either revised EIS Section 16.3.3 or the Indigenous Engagement Report (revised EIS TSD I) as the level of information within these documents in the Draft EIS is appropriate. Other than updating engagement records in revised EIS Section 2 and revised EIS TSD I, no changes are proposed in the revised EIS to address this IR. **<u>References</u>**		including any relevant information about ACFN's traditional uses and knowledge that may be relevant to the Rook 1 project if provided. ACFN will be completing their Land Use and Indigenous Knowledge Study in February 2024, there may be additional information available and show land use in the region by ACFN members. NexGen should remain flexible and integrate and summarize any key findings from this study within the EIS including Section 16.3.2 and other relevant sections as applicable. If the study does not reveal any new or additional relevant information on ACFN's land use as it pertains to the Rook 1 project, or it does not get submitted to NexGen and the CNSC within a timely manner (in advance of the EIS being finalized), then this IR would be accepted as long as NexGen continues to document their attempts to engage with ACFN to gather and consider their knowledge, land use and concerns within the EIS and a proposed path forward to continue working with ACFN on addressing any concerns they raise regarding the Rook 1 project, as appropriate.			land use in the area of the Project has been received. Therefore, no further edits are required in revised EIS Section 16.3.3 (Contemporary Indigenous Land and resource Use).	

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						ACFN (Athabasca Chipewyan First Nation). 2010. Athabasca Chipewyan First Nation Advice to the Government of Alberta Regarding the Lower Athabasca Regional Plan. November 2010. ACFN. 2012. Níh boghodi: We are the stewards of our land. April 2012. CNSC (Canadian Nuclear Safety Commission). 2019. REGDOC-3.2.2, Indigenous Engagement, Version 1.1. August 2019. ISBN: 978 0 660 04518 4. Available at http://www.nuclearsafety.gc.ca/pubs_catalogue/uploads/REGDOC-3-2-2-Aboriginal-Engagement-version-1.1-eng.pdf						
16	CNSC	Current use of lands and resources for traditional purposes	Section 2.6.1.3 and Appendix 2B	**Context:** The summary of issues tables does not appear to include all key issues identified by the Indigenous Nations and communities For example, some of Indigenous Nations and communities have shared concerns with respect to reduced access to cabins and cultural sites, lack of trust in the process and the road safety of highway #955 that were not captured in the issues and concerns and summary tables in Appendix 2B. The final EIS and IER supporting documentation should include further details on the validation of issues and concerns directly raised by Indigenous Nations and communities, and how NexGen is addressing them as per REGDOC-3.2.2 and CNSC's Generic EIS Guidelines. Particularly, those concerns related to impacts on any potential or established Indigenous and/or treaty rights. **Rationale**: Additional detail is required to understand the status of validation for each issue raised and the response provided.	Update the summary of issues and concerns tables to include all issues and concerns raised by each of the Indigenous Nations and communities to date, including concerns raised in the Traditional Knowledge studies, on the Project Description, and during engagement activities. Demonstrate that each Indigenous Nation and community has reviewed and validated their summary of issues and concerns table and/or a path forward to complete the validation throughout the EIS and the update in the IER. **Suggestions for mitigation and follow-up measures** It is recommended that NexGen creates a commitment tracking table, or adds a column to their issues table, that clearly articulates the specific mitigations that they have committed to for each Indigenous Nations and community to address the issues and concerns they have raised. Validation must be complete by the time the technical review of the EIS is complete, prior to submission of a final EIS. Should the proponent not be able to fully address issues, concerns or feedback raised by any Indigenous Nation or community, this must be clearly documented, and a rationale provided.	NexGen notes that Table 2.6-5 through Table 2.6-8 in Draft EIS Section 2.6.1.2.1 (Primary Indigenous Groups) are intended to present a concise summary of issues and concerns identified by primary Indigenous Groups. Each entry listed in the tables may represent more than one comment received by an Indigenous Group as similar issues and concerns were consolidated. More details regarding issues and concerns raised by Indigenous Groups are presented in Draft EIS Appendix 2B (Summary of Issues Identified by Indigenous Groups), and Appendix C of Draft EIS TSD I (Indigenous Engagement Report). NexGen is confident that Table 2B-1 through Table 2B-5 of Draft EIS Appendix 2A (Summary of Indigenous Group Engagement Activities), and Table C-1 through Table C-5 of Appendix C of Draft EIS TSD I present comprehensive information for the issues and concerns raised by Indigenous Groups noted within the tables (i.e., Clearwater River Dene Nation [CRDN], Métis Nation – Saskatchewan [MN-S], Birch Narrows Dene Nation [BNDN], Buffalo River Dene Nation [BRDN], and Ya'thi Néné Lands and Resources [YNLR]). With respect to the examples raised by the reviewer: ▪ concerns related to reduced access to cabins are contained within Issue IDs CRDN-017, MN-S-001, BNDN-001, BRDN-001, BRDN-005, and YNLR-004; ▪ concerns related to a lack of trust in the EA process are contained within Issue IDs CRDN-001, CRDN-003, and MN-S-011; and ▪ concerns related to road safety are contained within Issue IDs MN-S-009, MN-S-023, BNDN-012, BRDN-007, BRDN-010, BRDN-014, and YNLR-003. For the revised EIS, NexGen will review the engagement record from the Draft EIS, the Indigenous Knowledge and Traditional Land Use Studies, the Project Description, and new engagement records generated since submission of the Draft EIS and include any additional issues and concerns raised in revised EIS Section 2.6.1.2 (Summary of Identified Topics of Interest, Issues, and Concerns), revised EIS Appendix 2B, and Appendix C of revised EIS TSD I. In addition, NexGen will clearly articulate in the revised EIS the key accommodations, including mitigations, proposed to be applied to address issues and concerns raised by the Indigenous Groups.	Section 2.6.1.2; Appendix 2B; TSD I, Appendix C	Although NexGen provided information about the verification process for CRDN with an example chart, CNSC requires NexGen to complete this process with all identified Indigenous Nations and communities and provide updated charts and rational for each within the Final revised EIS in order to accept this IR. The example table of issues and concerns for CRDN is acceptable and will need to be completed for each of the identified Indigenous Nations. CNSC recommends including another line in the table which indicates the status of the concern and justification of the status including how NexGen and the Nation came to consensus on the concern and validated the response and status with the Indigenous Nation. If NexGen was not able to receive a response with regards to addressing and validating the concerns and proposed responses with particular Indigenous Nations, NexGen should continue to document the attempts made to reach out, engage and address the concerns raised by the Indigenous Nation and confirm NexGen's planned path forward to continue to work with the Indigenous Nation and address their concerns, as appropriate.	16-R1		NexGen confirms that revised EIS Section 2.6.1.3 (Validation of Identified Issues) and Section 6.3 of revised EIS TSD I (Indigenous Engagement Report) will be updated to describe the processes used to complete the issues and concerns validation process for Indigenous Groups who raised Project-related issues and concerns and that updates will be provided in a manner that clearly and succinctly describes the processes undertaken. NexGen further confirms that, at the time of writing, issues and concerns validation has been completed with each of the Clearwater River Dene Nation, Métis Nation – Saskatchewan Northern Region 2, Birch Narrows Dene Nation, and Buffalo River Dene Nation and that letters from each of these Indigenous Groups have been sent to the CNSC confirming the resolution of these items and completion of the validation process. Tables documenting the issues and concerns will be included in Appendix 2B of revised EIS Section 2 (Indigenous, Regulatory, and Public Engagement) and Appendix C of revised EIS TSD I. NexGen further confirms that revised EIS Section 2.7.2 (Continuing to Work to Understand Interests and Address Issues) will be updated to reflect how NexGen plans to address any outstanding or future issues and concerns, as applicable.	Section 2, 2.6.1.3, 2.7.2; Appendix 2B TSD I, Section 6.3; Appendix C

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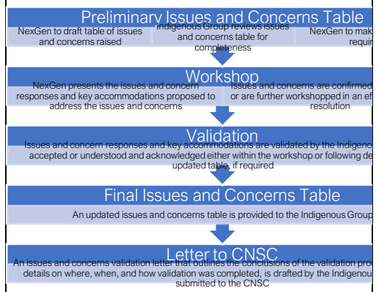
						NexGen also acknowledges the reviewer's comment regarding validation, which is consistent with the intent of actions described in Draft EIS Section 2.6.1.3 (Validation of Identified Issues) and Draft EIS Section 2.7.2 (Continuing to Work to Understand Interests and Address Issues). The process to validate Indigenous issues and concerns has been discussed with and agreed upon by four Indigenous Groups. At the time of writing, the issues and concerns validation process has been concluded with the CRDN. The general approach to validate Indigenous issues and concerns with the Indigenous Groups is as follows:  To support the response to this IR, NexGen has provided Attachment IR 16-1, which includes the letter from the CRDN to the CNSC validating that CRDN issues and concerns have been addressed, as well as the final CRDN issues and concerns table. NexGen notes that the issues and concerns validation process may be amended, where necessary, should Indigenous Groups and NexGen agree on modified steps that would better facilitate the validation process.						
26	ECCC	Fish and fish habitat Change to an environmental component due to hazardous contaminants	Section 4.5.6	The Proponent indicates that "One specific underground location, U-4 was carried forward for screening for technology; U-4 is located outside of known major geologic structure and potential areas of mineralization." Looking at figure 4.5.4, ECCC notes that the U-4 location is quite close to, and some portions of it overlap with, parts of Patterson Lake. It is unclear what the actual distance between the U-4 underground storage and Patterson Lake will be upon construction, and the probability that contaminants from the U-4 underground location will seep into Patterson Lake is not stated.	1. Provide the distance from the U-4 underground storage location to Patterson Lake. 2. Demonstrate that no contaminants will migrate or seep into Patterson Lake from the U-4 underground storage location.	Responses to part 1 and part 2 of this IR are provided below. 1. Figure 10 in Draft EIS TSD VII (Mine Waste Alternatives Assessment Report) and Figure A-15 in Appendix A of Draft EIS TSD XIV (Groundwater Flow and Solute Transport Modelling Report) both present a visual representation of the location of the underground mine relative to Patterson Lake. The underground tailings management facility (UGTMF), as shown in both of these figures, is approximately 350 m below Patterson Lake. 2. Figure A-17 in Appendix A of Draft EIS TSD XIV presents a conceptual breakdown of the advective flux from the various underground components to Patterson Lake. Seepage from the UGTMF, primary backfill, secondary backfill, and reflooded mine workings to Patterson Lake is predicted to occur, as presented in Figure A-17. Mass loadings to Patterson Lake are inputs to the surface water quality analysis and effects assessment for Patterson Lake as documented in Draft EIS Section 10 (Surface Water Quality and Sediment Quality), Draft EIS Section 11 (Fish and Fish Habitat), and Draft EIS Section 15 (Human Health), which concluded no significant adverse effects on valued components.	n/a	See IR-4	26-R1	See IR-4	Please see NexGen's response to IR 4-R1 for response to this IR.	n/a

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31	CNSC	Alternative Assessment	Table 4.5-8	**Context:** Table 4.5-8 contains categories, sub-categories, and set of criteria for four alternatives for tailings storage. For the construction risk and complexity Sub- category of Technical category, the criteria include geotechnical stability considering foundation conditions and waste placement. For the underground tailings storage using the UGTMF, there are concerns of geotechnical stability of the UGTMF caverns as the UGTMF caverns have large dimensions. **Rationale:** Any failures of UGTMF caverns during construction could pose significant risks to workers' safety and might also cause significant underground water inflow and should be considered in the alternative means assessment for underground tailings storage.	Include geotechnical stability of the UGTMF caverns in criteria for construction risk and complexity sub- category and provide supportive information on geotechnical conditions of the UGTMF.	NexGen appreciates the CNSC's comment regarding geotechnical stability of the underground tailings management facility (UGTMF) and confirms that, as presented in Table 4.5-8 of Draft EIS Section 4.5.6.2 (Tailings), geotechnical stability of the UGTMF caverns is included under the 'Technical' category and 'Construction risk and complexity' sub-category in the alternatives assessment. A summary of the UGTMF geotechnical conditions includes: ▪ The UGTMF would be located approximately 350 m into the footwall (i.e., north) of the Arrow deposit and a minimum 240 m below the unconformity in predominantly unaltered basement lithologies, including semi-pelitic gneiss and Intrusives. Approximately one-third of the southern chambers would be located within the Intrusives that exhibit relatively better rock mass quality than the semi-pelitic gneiss. ▪ For both of these lithologies, rock mass conditions within the UGTMF zone typically range from 'Good' to 'Very Good' using standard rock mass classification systems, with intact rock strengths generally greater than 100 megapascals (MPa) (i.e., classified as 'Strong' rock). Rock mass conditions associated with major structural features, such as shears or faults, are classified as 'Fair' to 'Good'. ▪ NexGen has assessed the stability of the UGTMF chambers/pillars using empirical, structural (i.e., kinematic or 'wedge analysis'), and three-dimensional numerical stress modelling methods. ▪ Stress modelling results indicate that the extent of probable rock mass yield is minimal at the designed UGTMF chamber and pillar dimensions and for the planned excavation sequence. NexGen confirms that, during initial development of the UGTMF, instrumentation would be used in the chamber back (i.e., roof) and pillars to monitor rock mass response to confirm design assumptions. NexGen has identified proactive mitigation options to apply if rock mass conditions are locally poorer than anticipated, rock structure impacts wall/pillar stability, and/or pillar stresses are higher than anticipated. Mitigations may include one or more of the following: ▪ additional cable bolt support; ▪ decreasing UGTMF chamber plan dimensions; and ▪ increasing pillar thickness. No changes are proposed in the revised EIS to address this IR.	n/a	The reviewer agrees with the response NexGen provided. However, in Table 4.5-8 of Draft EIS Section 4.5.6.2 (Tailings), geotechnical stability of the UGTMF caverns is not included under the 'Technical' category and 'Construction risk and complexity' sub-category.	31-R1	Add geotechnical stability of the UGTMF caverns to Table 4.5-8 under the 'Technical' category and 'Construction risk and complexity' sub-category.	NexGen confirms that "Geotechnical stability considering foundation conditions and waste placement" is included as a criterion under the "Technical" assessment category and "Construction risk and complexity" sub-category in Table 4.5-8 of Draft EIS Section 4.5.6.2 (Tailings). NexGen notes that this description is intended to be generic to the four options being assessed (i.e., underground with paste at location U-4; in-pit with slurry at location P-3; surface with paste at location S-1; and surface with paste at location S-3). In the context of the UGTMF alternative noted by the reviewer (i.e., underground with paste at location U-4), NexGen confirms that this description includes geotechnical stability of the UGTMF caverns. NexGen agrees that additional clarity could be included in the EIS, and will add the following table footnote to Table 4.5-8 in revised EIS Section 4.5.6.2: "Geotechnical stability includes geotechnical stability of the excavated caverns under the underground alternative, the excavated pit walls under the in-pit alternative, and the containment structure under each of the surface alternatives considered in the assessment."	Section 4.5.6.2
32	CNSC	Alternative Assessment	Section 4.5.9 Camp Location	**Context:** The Rook I project is to be developed as an on-site camp-based operation with the workforce typically working 12-hour shifts on a rotational basis. Three on-site locations were selected for a screening-level assessment for camp location by considering environmental, technical, economic, and social categories. After evaluation of the relative advantages and disadvantages of the range of feasible alternatives, the preferred alternative for camp	Provide further justification and assessment on camp location by considering workers' health and safety during all phases of the project taking into account accidents and malfunctions.	NexGen acknowledges the importance of protecting workers staying at the Project camp and confirms that worker health and safety would be protected at the chosen camp location. As described in Draft EIS Section 4.5.9 (Camp Location), the alternatives assessment for the camp location included preliminary screening of both off-site vs. on-site accommodations followed by the comparison of three alternative options to identify the preferred alternative that best met a combined set of criteria or sub-categories within environmental, technical, economic, and social assessment categories. Under the social assessment category, the alternatives assessment considered the potential	n/a	Although the preferred alternative for camp location is the west location after a screening level assessment for camp location with considering environmental, technical, economic, and social factors, the main shortcoming of the alternative assessment is that worker health and safety is not considered, in particular, under potential accidents and malfunctions. The preferred camp location may not be a preferred or safe location for workers if the factor of worker health and safety is taken into account for operation and/or under	32-R1	Provide further justification on the assessment of potential risk level of accidents and malfunctions on the camp workers or an amended camp location assessment as required by the Saskatchewan Ministry of Environment.	Please see Attachment IR 32-R1 for NexGen's response to this IR, which provides additional information that justifies the proposed location of the camp in consideration of accidents and malfunctions. No changes are proposed in the revised EIS to address this IR.	n/a

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				location for the Project was the west location. The west location is located west of, and adjacent to, mine buildings for the Project, and would be integrated into the general mine and mill terrace areas. The camp location alternative assessment appears to have not considered the workers safety, in particular, the impact of accidents on the workers safety. **Rationale:** In the assessment of accidents and malfunctions, bounding scenario 6-acid plant tail gas scrubber failure, the modeling results show that distance to (Acute Exposure Guideline Level) AEGL-3 is 261 m and to AEGL-2 is 2500 m under worst- case weather conditions, while distance to AEGL-3 is 122 m and to AEGL-2 is 849 m under typical weather conditions. AEGL-3 means that the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals could experience life-threatening health effects or death while AEGL-2 means that the airborne concentrations of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape. Given the close proximity of the camp location to the mine process plant, the likely accident from the mine process plant could pose significant risks to workers' health and safety.		camp location effects to worker safety and human health, particularly with respect to air and noise emissions. The selected camp location represents the preferred alternative for the environmental, technical, and economic assessment categories, and for 8 of the 10 assessment subcategories. While the chosen camp location was less preferred with respect to the social assessment category, any camp location would be required to meet provincial and federal design standards, regulatory guidance, and applicable building codes that require that worker health and safety are protected. As such, confirming worker health and safety is protected was not a differentiating factor between any of the alternatives. Potential effects to workers' health and safety from a potential accident and malfunction in consideration of the relative proximity of the camp to the process plant was not included but would not change the assessment results presented in Table 4.5-21 of Draft EIS Section 4.5.9. The selected camp location (i.e., west location) was already assessed as less preferred with respect to workers' health and safety and would remain a less preferred alternative in consideration of a potential accident at the proposed process plant. In consideration of the combined assessment rankings, NexGen is currently proposing to locate the camp at the west location. Worker health and safety in the camp was considered as part of the human health and risk assessments. As shown in Table 15.2-5 of Draft EIS Section 15.2.8.3 (Exposure Pathways and Conceptual Model), the potential effects on the camp worker were assessed for inhalation of air; incidental ingestion of soil or sediment; ingestion of water and traditional foods; and dermal contact with soil, sediment, and water for both radiological and non-radiological sources. The assessment showed that potential Project effects associated with non-carcinogens (Draft EIS Section 15.5.1.1 [Non-carcinogens]), carcinogens (Draft EIS Section 15.5.1.2 [Carcinogens]), and radionuclides and radon (Draft EIS Section 15.5.1.3 [Radionuclides and Radon]) would not result in a significant adverse effect on human health (Draft EIS Section 15.6 [Risk Characterization and Significance]). With respect to the results of the assessment of accidents and malfunctions, and the reviewer's reference to the use of Acute Exposure Guideline Levels (AEGLs), NexGen notes the assessment of accidents and malfunctions is predominantly conducted to understand and plan for emergency (i.e., non-routine) events and confirm that the resulting risk is tolerable. This approach includes considering if the Project design has appropriately incorporated design features and controls to minimize the probability of occurrence and minimize the consequence of an accident or malfunction, should an event occur. In addition to evaluating whether these design features and controls have mitigated overall risk to levels that are acceptable or as low as reasonably practicable (ALARP), the results of the accidents and malfunctions assessments are used to inform emergency planning. Section 11 of Draft EIS TSD VIII (Accidents and Malfunctions Report) assessed the overall risk to the public for the acid plant tail gas scrubber failure, which also represents the scenario with the greatest potential risk to workers staying at the camp. The probability of this type of accident or malfunction to		potential accidents and malfunctions in the process plant. In the response, with respect to the results of the assessment of accidents and malfunctions, NexGen stated that *"The probability of this type of accident or malfunction to occur is likely (i.e., less than or equal to 1 occurrence in 10 years and more than 1 occurrence in 100 years) and the consequence associated with this type of accident or malfunction is minor to moderate, for an overall risk rating of low to moderate (i.e., risk -reduction activities would reduce the risk associated with these scenarios to ALARP; risk may be characterized as tolerable)."* The reviewer does not agree with this statement. The west location is about 300~500 m west of the process plant, which is within the zone of (Acute Exposure Guideline Level) AEGL-2 based on the proponent's assessment of bounding scenario 6 – acid plant tail scrubber failure whether or not it is under worst-case weather conditions (i.e., the distance to the process plant from 261 m to 2500 m for AEGL-2, assumed peak wind speeds and worst-case conditions for dispersion of released materials) or under typical weather conditions (i.e., the distance to the process plant from 122 m to 849 m for AEGL-2, assumed average wind speeds and average conditions for dispersion of released materials). The level AEGL-2 means that the airborne concentrations of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape. This consequence can be classified as Major based on the definition of consequence in the EIS (Table 21.5-2). The probability of this accident is 0.1 per year as stated in the EIS (Table 21.6-3), which falls under likelihood of Likely to Very Likely. The risk of this accident to worker health and safety would then be Moderate to High based on Table 21.5-3 in the EIS.			

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						occur is likely (i.e., less than or equal to 1 occurrence in 10 years and more than 1 occurrence in 100 years) and the consequence associated with this type of accident or malfunction is minor to moderate, for an overall risk rating of low to moderate (i.e., risk -reduction activities would reduce the risk associated with these scenarios to ALARP; risk may be characterized as tolerable). The modelled exceedance would be short in duration. In addition, since the predominant winds at the Project site are northwest and south-southeast (Figure 7A-1 of Draft EIS Appendix 7A [Air Dispersion Modelling Report]), the likelihood of the acid plant tail gas scrubber failing combined with the likelihood that the wind is blowing in the direction of the camp reduces the overall risk of effects to workers at the camp. While the evaluation did not consider the effect indoors, the risk would be lower indoors as a result of the heating, ventilation, and air cooling system in the camp. NexGen confirms that the accident malfunction probability, consequence, and overall risk rating would be similar between workers staying at the camp and the public. With consideration of conditional probabilities of indoor versus outdoor exposure (i.e., shelter-in-place provisions during short-term releases) and wind direction, the probability of exposure is expected to be reduced to unlikely and the overall risk rating would be reduced to low. With the risk at the ALARP level, the residual risk would be managed through emergency response provisions that would protect the safety of camp occupants during a short-term release of sulphur dioxide (SO_2). Overall, worker health and safety would be protected at the proposed camp location. As the Project design proceeds, NexGen will continue to investigate opportunities to further promote health and safety for workers at the camp. NexGen acknowledges that the Saskatchewan Ministry of Environment (ENV) has expressed concerns regarding the proposed camp location for the Project. Should a change in camp location be required as the result of an approval condition issued by the ENV, NexGen notes that, assuming the amended camp location would occur within the Project maximum disturbance area, the potential effects of the associated footprint alteration would fall within the conservative assumptions utilized for the EA and would not require further assessment. No changes are proposed in the revised EIS to address this IR.						
36	ECCC	Fish and fish habitat Change to an environmental component due to hazardous contaminants	Section 4.5.16 Section 11.4.2	**Context:** Section 4.5.16 provides an alternatives assessment of sewage treatment technologies and provides the rationale for the selected treatment technology. However, there is no assessment of alternatives or discussion of any treated sewage discharge options. Within Section 11.4.2 the treated sewage discharge location is discussed, but there is no alternatives assessment for potential options such as a combined treated effluent and sewage discharge location and how	1. Provide an alternatives assessment for treated sewage discharge options, which includes options that investigate a combined treated sewage and effluent discharge. 2. Provide an assessment of how combining treated sewage and effluent may affect the chosen treatment technology and water quality in the receiving environment. 3. Update the surface water quality modelling, effluent and sewage dispersion modelling, environmental	NexGen notes the Environment and Climate Change Canada's (ECCC's) recommendation that a sewage treatment alternatives analysis might reduce effects to surface water quality and fish and fish habitat; however, the currently proposed system with two discharge points represents a conservative assessment of Project environmental effects because this assumption considers two separate discharge disturbances. NexGen maintains that the precautionary approach used in the Draft EIS appropriately captures potential effects associated with sewage treatment and discharge. 1. and 2. Despite the approach undertaken to assess potential effects in the EA, NexGen acknowledges	n/a	**Context:** The Proponent has acknowledged that a combined sewage and mine effluent final discharge point could reduce environmental impacts to surface water quality and aquatic receptors and has committed to evaluating options for a combined discharge system for effluent and sewage, though additional information is needed for all parts of the IR. ECCC acknowledges that the Province has requested the Proponent evaluate alternative locations for the mine campsite, and that this design change could influence the design	36-R1	Provide the following items for review and comment if a combined sewage and effluent discharge is selected: ▪ Finalized combined discharge design, ▪ Near-field modelling, ▪ Updated environmental risk assessment predictions	NexGen confirms that a combined effluent and sewage discharge is not currently being proposed for the Project; therefore, the requested information is not required for the EA. Should a combined effluent and sewage discharge be considered at a future date, NexGen confirms that an assessment of the potential environmental effects would be conducted according to the process laid out in REGDOC-2.9.2 (CNSC 2021) as part of licensing. **<u>References</u>** CNSC (Canadian Nuclear Safety Commission). 2021. REGDOC-2.9.2, Environmental Protection, Controlling Releases to the Environment. DRAFT. March 2021. Available at https://www.nuclearsafety.gc.ca/eng/pdfs/regulatory-	n/a

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				that may affect the chosen sewage/effluent treatment technologies. **Rationale:** An evaluation of treated sewage discharge that goes beyond location siting and considers potential options, such as combined treated effluent and sewage discharge location, should be completed. This assessment should provide information on how this may affect the chosen effluent and sewage treatment technologies and how this may reduce impacts to surface water quality and fish and fish habitat.	risk assessment and aquatic health assessment as needed to reflect any changes that may arise if a combined discharge is selected.	that potential environmental and economic benefits may be realized if the treated effluent and treated sewage discharges could be combined into a single release point. As a part of advancement of Project design, NexGen will evaluate options for combining treated effluent streams from the sewage treatment plant (STP) and effluent treatment plant (ETP), including the option of routing treated STP effluent through the process plant. This evaluation would be used to support any changes to the configuration for the ETP and STP reflected in the Draft EIS, if proposed, which would be included in the applicable licensing documentation. 3. NexGen notes that, using the conservative approach described above, the treated sewage effluent did not adversely affect the surface water quality assessment (Draft EIS Section 10.5.3.1 [Lifespan of the Project]) nor the fish and fish habitat assessment (Draft EIS Section 11.5.4.2 [Significance Determination]). A revised combined discharge design is expected to be within the bounds of the EA and would not require reassessment. However, if the design is revised, the environmental risk assessment would be updated as part of licensing documentation and in consideration of the requirements of REGDOC 2.9.2 (CNSC 2021), as applicable. No changes are proposed in the revised EIS to address this IR. **References** CNSC (Canadian Nuclear Safety Commission). 2021. Environmental Protection: Controlling Releases to the Environment. DRAFT. March 2021. Available at https://www.nuclearsafety.gc.ca/eng/pdfs/regulatory-documents/regdoc2-9-2/REGDOC-2_9_2_Controlling_Releases_to_the_Environment.pdf		decisions for a combined mine effluent and sewage discharge. It is however noted in the Proponent's IR response that: "…the currently proposed system with two discharge points represents a conservative assessment of Project environmental effects because this assumption considers two separate discharge disturbances." And: "…using the conservative approach described above, the treated sewage effluent did not adversely affect the surface water quality assessment (Draft EIS Section 10.5.3.1 [Lifespan of the Project]) nor the fish and fish habitat assessment (Draft EIS Section 11.5.4.2 [Significance Determination]). A revised combined discharge design is expected to be within the bounds of the EA and would not require reassessment." The current assessment examines the discharges in separate locations and plumes. ECCC acknowledges the Proponent's conclusion that two discharge points represent a greater disturbance and therefore evaluating two discharge points could be considered conservative compared to a single discharge point. However, the bounds of the current evaluation of effects does not consider the additive impacts from elevated concentrations of contaminants such as total suspended solids, chlorides and un-ionized ammonia from the sewage discharge to the mine effluent discharge within the near-field aquatic environment. Therefore, the effects in the receiving environment from the total concentrations of contaminants based on a single combined discharge should still be assessed. **Rationale:** If a combined sewage and effluent discharge is selected, updated information is required to consider potential effects on fish and fish habitat. To adequately capture potential effects to the aquatic environment in the EIS, a review of the finalized combined discharge design, near-field modelling, and updated predictions in the environmental risk assessment are required to confirm modelling predictions for effluent discharged into the receiving environment.			documents/regdoc2-9-2/REGDOC-2_9_2_Controlling_Releases_to_the_Environment.pdf.	
40	ECCC	Fish and fish habitat Change to an environmental component	Section 5.3.3.5	**Context and Rationale:** The Proponent states, "Based on results from ongoing kinetic (i.e., longer-term tests over many weeks) testing on representative waste rock samples, material with greater than	Provide details on how the cutoff criteria were established for sulphur and if they were based on test results or some other information. If tests were used, provide details on	NexGen confirms the rationale described below is with respect to using only total sulphur content less than 0.1% for acid rock drainage (ARD) (potentially acid generating vs. non-potentially acid generating [NPAG]) classification.	n/a	**Context:** In response to the IR, the Proponent provided detailed justification for how the cutoff criteria for sulphur was established. The Proponent also indicated from the bulk mineralogy that	40-R1	Provide additional information to support the statement that "… the rate of sulphide oxidation is lower than the rate of silicate weathering". The information provided should be linked to the classification of PAG and non-PAG rocks.	Please see Attachment IR 40-R1 for NexGen's response to this IR, which includes additional information requested by the reviewer and supports the statement that the rate of sulphide oxidation is slower than the rate of silicate weathering.	n/a

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		due to hazardous contaminants		0.1% sulphur content has been defined as PAG, and material with less than 0.1% sulphur content has been defined as NPAG. Further, a delay to onset of acidic conditions is expected in PAG material with low sulphide content (i.e., below approximately 1% sulphide). Geochemical depletion calculations indicate that acidic conditions are not expected to develop for decades in PAG material with low sulphide content; the low-sulphide PAG material is expected to have near neutral pH during Operations, with acidic conditions forming after Closure." ECCC notes that acidity can occur if there is not enough neutralization potential. As indicated earlier by the Proponent, there is little neutralization potential available (pdf page 651). Therefore, the classification of rocks with less than 0.1 % sulphur content as NPAG appears to be based only on kinetic testing, without any other verification testing. Based on MEND, 2009[2], both kinetic and static tests are the industry norm. Note 2: MEND. 2009. Prediction Manual for Drainage Chemistry from Sulphidic Geologic Material. Mend Report. 1.20.1. 2009.	what tests were conducted and the test results.	Various static geochemical tests, including total metals, acid base accounting, mineralogy, and soluble fractions, have been conducted on waste rock samples, including samples that have less than 1% total sulphur. These results were considered in conjunction with the kinetic test results to support the derivation of the classification criteria. The bulk mineralogy of waste rock samples is consistent with that of the Proterozoic crystalline basement rock, consisting of quartz (39 weight percent [wt%] to 71 wt%), biotite (9.9 wt% to 33 wt%), muscovite (8.8 wt% to 24 wt%), chlorite (up to 12 wt%), anorthosite (up to 8.7 wt%), albite (up to 14 wt%), and clay species (4.5 wt% to 11 wt%). More specifically, only trace carbonate species (i.e., calcite up to 0.028 wt% and siderite up to 0.007 wt%) were identified. The acid potential (AP) of the less than 0.1% total sulphur materials is primarily associated with trace quantities of pyrite. The mineralogical analysis indicates that the bulk of the neutralization potential (NP) of the less than 0.1% total sulphur waste rock is associated with acid-consuming silicate minerals. Because silicate minerals dominate the mineralogy, bulk NP is effectively infinite compared to AP. Therefore, the rate of silicate weathering relative to sulphide oxidation determines the ARD classification of the waste rock materials. Kinetic test results of two waste rock samples containing less than 0.1% total sulphur indicate pH trends suggesting that the rate of sulphide oxidation is lower than the rate of silicate weathering, supporting the use of sulphide content as a management criteria for NPAG material. Based on the details provided above, NexGen is confident the classification of waste rock with less than 0.1% sulphur content as NPAG is appropriate.		although there is very little carbonate mineral in the rock to provide neutralization potential, that the silicate minerals in the rock will provide the neutralization potential (NP) needed to neutralize any sulphide oxidation. These led to the classification of potentially acid generating (PAG) and non-PAG rocks. However, the Proponent stated that "… the rate of sulphide oxidation is lower than the rate of silicate weathering" and it is not clear how the rate of sulphide oxidation could be slower than that the rate of silicate weathering when the opposite is typically true. **Rationale:** Clarity on the rate of sulphide oxidation in comparison to the rate of silicate weathering is needed to assess the NP of silicate minerals and the subsequent impact on the classification of PAG and non-PAG rocks. Any error in the classification of the PAG rock may result in increased ARD/ML and therefore impact the receiving environment including waters frequented by fish.				
44	ECCC	Fish and fish habitat Change to an environmental component due to hazardous contaminants	Table 5.4-4	The Proponent states "The west bermed runoff collection area would be located on the west side of the Project site. This collection area would receive runoff from the local contributing area as well as overflow from contact water pond #2, if required. This bermed area would prevent suspended solids entrained in runoff water from entering Patterson Lake by natural filtration through an unlined berm". The Proponent is reminded that as required by the *Metal and Diamond Mining Effluent Regulations* (MDMER) all effluent and seepage from the mine site that contains deleterious substances needs to be discharged through a final discharge point (FDP). From the description of the west bermed runoff collection area, it is not clear whether runoff that filters through the unlined berm will be discharged through the FDP or go directly to Patterson Lake without being discharged through the FDP.	Confirm that all effluent, as defined in the MDMER, will be discharged through a FDP.	NexGen notes the reviewer's comments that discharges must be through defined final discharge points as required by the Metal and Diamond Mining Effluent Regulations. NexGen would like to clarify the final discharge details. Contact water from the non-potentially acid generating (NPAG) waste rock storage area (WRSA) would report to site runoff pond #2 (referred to as contact water pond #2 in Figure 5.4-12 of Draft EIS Section 5.4.5 [Site Water Management]), which is sized to the 1:100 year 24-hour precipitation event. Water reporting to site runoff pond #2 is considered the final discharge point (i.e., final point of control) and would be tested to confirm that effluent release criteria are met before water was released to the west bermed runoff collection area, where this water would diffuse passively to Patterson Lake. Water not meeting effluent release criteria would be pumped to the settling pond for treatment in the effluent treatment plant (Draft EIS Section 5.4.5.2 [Surface Water Management]). The treated effluent release criteria would be proposed to the Saskatchewan Ministry of Environment and the CNSC. The outlet of site runoff pond #2 will be proposed as the final point of control.	n/a	**Context:** The Proponent indicated that contact water from the non-potentially acid generating (NPAG) waste rock storage facility would report to the site run off pond 2, which they consider the final discharge point (FDP). In the EIS, the Proponent stated that "The west bermed runoff collection area would be located on the west side of the Project site. This collection area would receive runoff from the local contributing area as well as overflow from contact water pond #2, if required. This bermed area would prevent suspended solids entrained in runoff water from entering Patterson Lake by natural filtration through an unlined berm", but did not mention any control points where the quality of effluent will be monitored. Part one of the Metal and Diamond Mining Effluent Regulations (MDMER) defined effluent to mean: (a) hydrometallurgical facility effluent, milling facility effluent, mine water effluent, tailings impoundment area effluent, treatment pond	44-R1	Demonstrate how all effluent, including any seepage or surface runoff containing deleterious substances that flows over, through or out of the site, will be discharged through an FDP.	NexGen confirms that contact water released to the receiving environment would not contain deleterious substances above Project thresholds. As noted in NexGen's initial response to the original IR, contact water pond #2 (i.e., site runoff pond #2) is considered the final point of control where water would be tested to confirm that effluent release criteria other than total suspended solids (TSS), including requirements under the Metal and Diamond Mining Effluent Regulations, are met prior water being released to the west bermed runoff collection area, where this water would diffuse passively (i.e., to ground; there would be no overland path for water containing TSS to travel to Patterson Lake). In other words, contact water pond #2 represents a final discharge point (i.e., control point) where water would be monitored prior to release to the environment. Should water quality in contact water pond #2 not meet Project thresholds, water would be pumped to the settling pond for treatment in the effluent treatment plant and re-tested to confirm compliance prior to discharge to Patterson Lake (Draft EIS Section 5.4.5.2 [Surface Water Management]). NexGen further notes that the monitoring ponds that receive water from the effluent treatment plant also represent a final discharge point where water would be monitored prior to release to the environment.	Section 5.4.5.2; TSD XVIII

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						Surface water quality modelling completed for the Draft EIS included loadings from the NPAG WRSA contact water input into Patterson Lake. The modelling indicated that this water release would not result in Project thresholds being exceeded in Patterson Lake during Construction, Operations, and Decommissioning and Reclamation (i.e., Closure) (Draft EIS Section 10.5.1 [Application Case]). Monitoring would be in place at site water infrastructure (e.g., monitoring at site runoff pond #2) to confirm that waters are suitable for release, in groundwater to monitor the flow pathway, and within Patterson Lake as the ultimate receptor. This monitoring would be developed and specified in detail as part of the Environmental Protection Program and supporting documentation (e.g., Effluent Monitoring Plan and Environmental Monitoring Plan), which would be submitted as part of the applications for provincial permitting and federal licensing, commensurate with the stage of Project development. **<u>References</u>** Metal and Diamond Mining Effluent Regulations. SOR/2002-222 under the *Fisheries Act*. Last amended June 18, 2020. Available at https://laws-lois.justice.gc.ca/eng/Regulations/SOR-2002-222/index.html		effluent or treatment facility effluent other than effluent from a sewage treatment facility; or (b) any seepage or surface runoff containing any deleterious substance that flows over, through or out of the site of a mine. It also provides a definition for the FDP, "Final discharge point in respect of an effluent, means an identifiable discharge point of a mine beyond which the operator of the mine no longer exercises control over the quality of the effluent." The MDMER requires that any seepage or surface runoff containing deleterious substances that flows over, through or out of the site of a mine is required to go through the final discharge point. **Rationale:** Without any effluent monitoring in place to measure the quality of water leaving the unlined bermed area or without further information regarding whether runoff that filters through the unlined berm will be discharged through the FDP or will bypass the FDP and discharge directly to Patterson Lake, it is unknown if there will be effluent containing deleterious substances discharging from a location that is not the FDP. Confirmation that all effluent will be discharged through an FDP will allow ECCC to assess potential adverse effects to water frequented by fish.				These two final discharge points would represent monitoring locations/points of control for all Project site contact water. NexGen acknowledges that the statement "[t]he west bermed runoff collection area would be located on the west side of the Project site. This collection area would receive runoff from the local contributing area as well as overflow from contact water pond #2, if required" (Draft EIS Section 5.4.5.2, Table 5.4-4) could be interpreted as there being a possibility that water not meeting Project threshold criteria could be discharged into the west bermed runoff collection area. For this reason, Table 5.4-4 in revised EIS Section 5.4.5.2 (Surface Water Management) will be updated to state "[t]he west bermed runoff collection area would be located on the west side of the Project site. This collection area would receive runoff from the local contributing area as well as discharges from contact water pond #2 (i.e., a final point of control), provided Project discharge criteria are met". In addition, NexGen will also update Figure 5 of Section 3.4 of revised EIS TSD XVIII (Site-Wide Water Balance and Water Quality Modelling Report) to show the Project site water process flow more clearly.	
45	ECCC	Fish and fish habitat Change to an environmental component due to hazardous contaminants	Section 5.4.4.3 Section 5.5.3.1 Table 11.4-1	The Proponent states that "The top of the finished PAG and NPAG WRSAs would be tied into the hill to the south of the mill terrace, and the overall height would not exceed the highest nearby topography. At closure, an engineered cover system (e.g., growth medium) would overlay the final PAG WRSA and NPAG WRSA landforms." It is unclear how the PAG and NPAG WRSAs would be impacted by wind or water erosion due to their height or elevation. In Section 5.4.4.3 it is stated that "At Closure, an engineered cover system (e.g., growth medium) would overlay the final PAG WRSA and NPAG WRSA landforms." Table 11.4-1 indicates that an "engineered cover of compacted clean material and growth medium layer" will be installed over the PAG WRSA. A growth medium cover will be installed over the NPAG WRSA.	1. Provide information on how the PAG and NPAG WRSAs will be impacted by wind and water erosion as a function of their height or elevation. 2. Provide clarification on what other types of cover systems have been considered for the PAG rock cover, including whether NPAG may be used as cover. 3. Provide details on what the thickness of the cover system will be to ensure that the PAG rock will be contained in the frozen layer below the active layer. 4. Provide details on how the seepage from the PAG and NPAG WRSA will be managed post-closure if the ditches and runoff collection system are decommissioned.	NexGen acknowledges the Environmental and Climate Change Canada's (ECCC's) request for details on the waste rock storage area (WRSA) cover systems and provides the following details in response: 1. It is expected that there would not be significant wind and water erosion of the WRSAs. The potentially acid generating (PAG) WRSA would be constructed at the closure slope landform angle (i.e., nominally 4H:1V, subject to further stages of engineering) and the non-potentially acid generating (NPAG) WRSA would be resloped to the closure landform angle (i.e., nominally 4H:1V, subject to further stages of engineering) prior to or during the Decommissioning and Reclamation (i.e., Closure) Phase. Closure slope angles are expected to reduce water erosion compared to a steeper design. The waste rock material in both WRSAs would be composed of crystalline basement rock after being blasted, mucked, and transported. Material placed in the WRSAs would be composed mostly of coarse rock material that would not be prone to wind and water erosion. Progressive and final revegetation would also reduce erosion. 2. Non-potentially acid generating or borrow material may be used for a compacted layer overlaying the final PAG WRSA surface at Closure. However, throughout Operations, NexGen would progressively reclaim lower slopes of the PAG	n/a	**Context:** Parts one and two are accepted. The Proponent's response indicated that wind and water erosion is not expected given the slope and construction of the waste rock storage area (WRSA). Additionally, the waste rock material is composed of crystalline rock that was blasted large boulders that is not prone to wind erosion. It was also indicated that the final vegetation cover will also help to reduce any potential wind or water erosion. The Proponent indicated that non-PAG rock or borrow materials may be used for compacted layer overlying the PAG rock. Also, a vegetative cover that is suitable for plant growth will be applied over the compacted non-PAG and borrow material. Parts three and four were not fully responded to; although the Proponent indicated that the ARD mitigation associated with the cover system does not rely on the frozen core, they do not provide the thickness of the cover system that will ensure that the active layer is within the non-PAG cover material.	45-R1	1. Provide the thickness of the active layer and demonstrate that the active layer will be contained within the thickness of the cover during the warm months. 2. Provide details on how the seepage from the PAG and NPAG WRSA will be managed post-closure if the ditches and runoff collection system are decommissioned.	1. NexGen notes that based on context provided by the reviewer, the term 'active layer' may be referring to the layer that would be subject to seasonal freeze/thaw cycles, the layer that would be chemically active as a result of diffusive gas transport reaching reactive materials (i.e., potentially acid generating [PAG] waste rock), or both. The following response for part 1 assumes that both definitions may apply. With respect to an active layer representing the area of the PAG waste rock storage area (WRSA) that would be subject to seasonal freeze/thaw cycles, as indicated in NexGen's initial response to the original IR, there are no parts of the PAG WRSA that are expected to remain frozen year-round. In other words, containment of a frozen layer within the cover thickness is not expected. With respect to an active layer representing the layer that would be chemically active as a result of diffusive gas transport reaching reactive materials, the PAG WRSA would be specifically designed to limit potential chemical activity. As part of the PAG WRSA design, engineered source control would be implemented where a 0.5 m lift of fine-grained material is placed between 5 m lifts of waste rock. The fine-grained layer would act to control flow of water and oxygen, which would reduce the advective air flux through the placed material (Draft EIS Section 5.5.2.4 [Mine Rock Management]), thereby placing a control on chemistry through the reduction of diffusive gas transport (Draft EIS TSD VII [Mine Waste Alternatives Assessment], Section 6.3.1). As a result, the	n/a

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				It is unclear whether "compacted clean material" may include NPAG waste rock. If NPAG waste rock or other materials are used as cover for the PAG rock, information should be provided on the thickness of the cover so as to ensure that the PAG material is contained within the frozen layer, below the active layer, thereby minimizing ARD. It is also not indicated whether the ditches and the seepage and runoff collection system will be functional or present post-closure.		WRSA. Throughout this phase, NexGen would assess PAG WRSA system performance and refine closure designs based on these results. For the purposes of the EIS, NexGen assumed a cover system, with the primary purpose of supporting vegetation growth, that had the properties of borrow material found extensively at the Project site; the soil properties for borrows would be as described in Section 5.2 of Draft EIS Annex VI (Terrain and Soils Baseline Report). Borrow material has texture more suitable for plant growth than NPAG waste rock. 3. The cover system and associated mitigation against acid rock drainage (ARD) does not rely on a frozen layer. If the core or layers within the WRSAs do freeze, water in WRSA runoff would be equal to, or lower in, constituent concentrations than has been assessed. 4. Seepage from the WRSAs post-closure is expected to be primarily basal seepage to the shallow groundwater. It is assumed in modelling for the EA that the liner underlying the PAG WRSA would not function post-closure. This assumption was carried forward in the post-closure groundwater and solute transport modelling (Draft EIS TSD XIV [Groundwater Flow Solute Transport Modelling Report]), and subsequently into the environmental risk assessment (Draft EIS TSD XXI [Environmental Risk Assessment]). Information regarding post-closure WRSA seepage is provided in Draft EIS TSD XIV.		Additionally, the Proponent referred to post-closure groundwater and solute transport modelling (Draft EIS TSD XIV Groundwater Flow Solute Transport Modelling Report). However, the requested information, such as thickness of the cover and how the seepage from the PAG and non-PAG waste rock storage area (WRSA) would be managed post closure, was not contained in the referenced report. **Rationale:** It is unclear if the active layer will be contained within the non-PAG material during the warm or thaw months, whether or not the frozen core is relied on for containment. The thickness of the active layer is unknown, therefore ECCC cannot verify the Proponent's conclusions that the cover and vegetated cover layers are thick enough to contain the active layer during the warm months. Additionally, the Proponent has not clarified if the ditches and the runoff collection system will be decommissioned or provided details on how the seepage from the PAG and NPAG WRSA will be managed post-closure if they are decommissioned. This information is needed to assess the adequacy of the collection systems and any impact potential seepage may have on the environment.			active layer thickness for the PAG WRSA would be approximately 3 m of the average 16 m PAG WRSA height (Draft EIS TSD XVII [Waste Rock and Underground Wall Rock Source Term Predictions Report], Section 3.2.2). As noted in NexGen's initial response to the original IR, the cover system placed on top of these engineered layers is expected to consist of borrow-type materials that would have the primary purpose of supporting vegetation growth rather than contributing to the reduction of PAG WRSA chemical activity. In other words, the cover layer would not be intended to contain the active layer as this purpose would be performed through the engineered source control (i.e., layered construction of the PAG WRSA). In summary, the thickness of the cover layer would not have a bearing on the chemical activity of the PAG WRSA as it is assumed that a frozen layer would not exist and the primary mechanism to minimize PAG WRSA chemical activity would be the engineered source control. 2. NexGen confirms that all water management infrastructure would be removed during the Active Closure Stage. After this time, in line with EA predictions, seepage from the PAG and non-potentially acid generating WRSAs would diffuse to the local ground environment. Further management of this seepage is not expected to be required unless monitoring during Operations and the Active Closure Stage indicates effects to the environment would be worse than predicted. Should potential effects be worse than predicted, water management infrastructure would remain operable until operational control monitoring results determine that the collection and treatment of contact water is no longer required to meet established decommissioning criteria and protect the environment. Final decommissioning criteria would be reflected in the Detailed Decommissioning and Reclamation Plan.	
46	ECCC	Fish and fish habitat Change to an environmental component due to hazardous contaminants	Section 5.4.5.2 TSD XVIII, Section 3.4	**Context:** There is not enough information provided within the EIS and site water infrastructure designs to determine if the design will sufficiently contain mine site contact and non-contact water runoff to be protective of the environment. It is stated that contact water ponds and collection areas can contain specified Probable Maximum Precipitation (PMP) events for select ponds/areas, however the actual volume and dimensions of these ponds/areas are not provided. There are no estimates on the total volume of water that may be drained from the overall site infrastructure (i.e. the mine terrace, the camp area etc.) during a 24-hr PMP event and if contact water ponds can contain that drainage. On pg. 1567 a list of potential Project activities that would have the potential to affect surface water quality and sediment quality during the Project lifespan is provided, however runoff from the site airstrip and roads is not included in this list. Runoff from both of these Project activities can have	1. Provide the dimensions and maximum volume capacity of each pond and collection area for all site water management infrastructure. 2. Provide a map marking the locations of proposed surface drainage structures including collection ditches, culverts, diversion ditches, perimeter berms and swales. 3. Provide estimated volumes of water to be drained from overall site infrastructure (such as the mine terrace, airstrip, camp area etc.), during a 24-hr PMP event and an analysis of the capacity of the water infrastructure to contain and treat this water. 4. Provide information on how runoff water from the site airstrip will be managed and how monitoring for contaminants within this runoff (ex. hydrocarbons, etc.) will be conducted.	NexGen acknowledges the reviewer's requests and notes that many of the requested details are outside the scope of the Project Terms of Reference (Draft EIS Appendix 1A [Concordance Tables for the Terms of Reference and Generic Guidelines for Preparation of an Environmental Impact Statement], Table 1A-2). Specifically, as noted in Section 3 of the Project Terms of Reference regarding the Project Description, "[t]he scope of the description will be conceptual and will incorporate reasonable assumptions, as appropriate. Detailed design information will be provided as part of permitting and licensing stage." The current site water infrastructure design is considered appropriate for the EIS and for the assessment of potential effects of runoff from the area of the Project on surface water quality and sediment quality. As a global response to this IR, the detailed design information requested will be refined and provided in the applicable federal licensing documentation, commensurate with the stage of Project development. However, NexGen has provided the following information to provide additional context for the reviewer. Responses to part 1 through part 7 of this IR are provided below. 1. The maximum storage capacity of individual Project ponds and collection areas incorporated in the site-	n/a	**Context:** The Proponent has addressed parts one, two, three, and five. However, further information is requested in responses to parts four, six and seven. ECCC notes that non-contact water/non-mineralized contact water runoff from site infrastructure and seepage from the west bermed runoff collection area meets the requirements of the definition of mine effluent under the Metal and Diamond Mining Effluent Regulations (MDMER) as it has the potential to contain deleterious substances. Runoff water from site infrastructure such as the airstrip and roads may be categorized as non-contact water because it does not come into contact with contaminants of potential concern (COPCs) directly from mining operations infrastructure. However, runoff water still has the potential to contain deleterious substances from all site infrastructure including the airstrip, roads, and camp area, and from mine-related activities such as operation of vehicles, including heavy machinery and aircraft, spills,	46-R1	1. Provide an updated site water management plan that includes management of the site infrastructure runoff water (i.e. non-contact water/non-mineralized contact water) from the airstrip and the west bermed runoff collection area. 2. Demonstrate how all Project effluent as defined under the MDMER (i.e. runoff and seepage), will be discharged through an FDP. 3. Demonstrate how the west bermed runoff collection area will prevent seepage of potentially deleterious substances containing non-contact water.	NexGen has provided the information below to address part 1 through part 3 of IR 46-R1. NexGen acknowledges that one figure within the Draft EIS contained a graphical error and that certain information within the Draft EIS could have been more clearly presented. These items will be addressed in the revised EIS as further described below. 1. NexGen confirms that runoff from site infrastructure not associated with mineralized waste or the mill terrace or mine terrace, which includes the Project airstrip and the site road that leads to the explosives magazine storage area, would be managed as non-mineralized contact water. To support the response to part 1 of this IR, a general representation of the local geography and drainage is shown in Figure 1 of Attachment IR 46-R1. <u>Project Airstrip</u> The Project airstrip would be positioned along a general high point in which the topography falls to the east, west, and south. The airstrip would consist of a runway and adjacent apron pad. As described in part 4 of the initial response to the original IR, the non-mineralized contact water from the apron pad would be collected and contained, while non-contact runoff from the remainder of the airstrip would naturally run off into the receiving environment. Potential runoff from the airstrip was represented in the Site-Wide Water Balance Model by two	TSD XVIII

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				impacts on surface water quality and sediment quality and should be considered as potential effect pathways. The site layout and locations of surface drainage structures including collection ditches, culverts and diversion ditches are not provided on a map. Figure 5 pg. 24 of TSD XVIII was reviewed, however the locations of infrastructure in this flow diagram do not necessarily correspond to geographic locations. Drainage of the site airstrip is not described as part of the infrastructure in the EIS. For lined ponds and collection areas, there is no description of how leak detection monitoring will be completed. For the potentially acid generating (PAG) runoff collection area, it is stated that "The contained water will be tested before release to the environment based on regulatory requirements; water that does not meet the release specifications would report to the ETP for treatment". There are no details provided on how often this water would be tested or how it would be released to the environment (i.e. straight to the Effluent Treatment Plant (ETP) discharge). For contact water pond two, no water volume capacity is provided, and there is no information on frequency of monitoring to determine if water will require treatment or be released to the west bermed runoff collection area. There is also no information regarding water quality monitoring of the west bermed runoff collection area and its capacity. Additionally, the west bermed runoff collection area is described as being unlined to allow natural filtration of collected non-contact water to the environment. However the Metal and Diamond Mining Effluent Regulations (MDMER) pursuant to the Fisheries Act requires all mine effluent and seepage from the mine site that contains deleterious substances be discharged through a final discharge point. **Rationale**: In order to be able to understand site water management and flood risk potential, more information needs to be provided regarding the site water infrastructure designs. More information on the volume of water expected to be captured within the site water management infrastructure during PMP events, and the probability that site infrastructure can contain that water	5. Describe how leak detection monitoring from lined ponds and collection areas will be conducted. 6. Provide additional information on the frequency of water quality monitoring and which contaminants will be tested for in the PAG runoff collection area, contact water pond two and the west bermed runoff collection area. 7. Provide further information on how water will be released into the receiving environment from the PAG runoff collection area and west bermed runoff collection area with consideration of MDMER requirements.	wide water balance and water quality model are presented in Table C-6 of Appendix C in Draft EIS TSD XVIII (Site-Wide Water Balance and Water Quality Modelling Report). This table has been updated to provide more detailed information in response to part 1 and part 3 of this IR and is provided as Table 1 in Attachment IR 46-2; the reference values used in Table 1 are unchanged from those in the EIS and are provided in Table C-2 of Appendix C in Draft EIS TSD XVIII. 2. NexGen notes that detailed information on locations for surface drainage structures (e.g., collection ditches, culverts, diversion ditches, perimeter berms, swales) will be submitted to the CNSC as part of the federal licensing process for the Project. To assist the reviewer within the specific context of the IR, a figure developed in support of the Rook I Project Feasibility Study (NexGen 2021) is included as Figure 1 of Attachment IR 46/73-1 and provides the locations of proposed surface drainage structures, including ditches, culverts, and swales. 3. An analysis of the capacity of the water infrastructure to contain and treat runoff during design storms was completed under Scenario 6 (i.e., the sensitivity of the site water management infrastructure to extreme summer rainfall events) as described in Section 5.1.2.2 Draft EIS of TSD XVIII. In this scenario, a summer probable maximum precipitation (PMP) event was simulated during each 15 July of the 43-year simulation to assess the capacity of the water management infrastructure under a variety of antecedent conditions. The model results for this scenario confirm that the site water management infrastructure design is appropriate for this stage of the Project, and that operational refinement for flood storage dewatering would be warranted during later stages of Project planning. NexGen confirms that detailed design information will be provided to the CNSC as part of federal licence application activities, as applicable. 4. NexGen confirms that information on runoff water management and monitoring, including the management and monitoring of runoff water from the Project airstrip, will be included in the Environmental Protection Program and supporting documentation developed for the Project in support of federal licensing. A summary of the proposed monitoring and management for water on and around the airstrip is provided below. Runoff from the airstrip would drain to adjacent ditches where the water would report to ground. Ditches associated with the Project airstrip and airstrip apron are shown on Figure 1 in Attachment IR 46-2. With respect to the airstrip area, NexGen notes that: ▪ Consistent with the site water management approach described in Draft EIS Section 5.4.5 (Site Water Management), water that has not been physically, chemically, or radiologically altered by Project activities (i.e., non-contact water) would be diverted to the extent practicable		fire management practices, and snow removal practices. In their response the Proponent has confirmed that contact water pond #2 is proposed to be the Final Discharge Point (FDP) for monitoring and that the downstream west bermed runoff collection area would discharge into the ground. However, from the figures provided in the Proponent's IR response, it is noted that in addition to potential runoff from the airstrip, the runoff to the west bermed runoff collection area would include runoff from the site access road and runoff from the site road that leads to the Explosives Magazine Storage Area. Site infrastructure runoff water has the potential to contain deleterious substances from Project-related activities, therefore deleterious substances from mine related activities could be introduced to the water within the west bermed runoff collection area after the proposed FDP at the outflow of contact water pond #2. **Rationale:** An updated site water management plan that includes management of the site infrastructure runoff water from the airstrip and the west bermed runoff collection area is necessary to evaluate how deleterious substances could impact the receiving environment. The proposed location of the FDP at the outflow of contact water pond #2 prior to the west bermed runoff collection area may not allow for characterization of all potential deleterious substances. This may lead to the accidental release of contaminants to the receiving aquatic environment, negatively impacting water quality, fish, and fish habitat. The Proponent should demonstrate how the west bermed runoff collection area will prevent seepage of potentially deleterious substances containing non- contact water to confirm the protection of the receiving environment, and confirm that all Project effluent as defined under the MDMER is discharged through an FDP to allow for effluent characterization.			runoff-generating elements: R50 (contained airport runoff [i.e., non-mineralized contact water collected from the apron pad]) and R51 (non-contained airport runoff [i.e., non-contact water from the maneuvering area]) (Draft EIS TSD XVIII [Site-Wide Water Balance and Water Quality Modelling Report], Figure 5). Element R50 would be a lined collection area, and runoff would be directed to an airport fueling pad sump. Water collected in the airport fueling pad sump would be periodically pumped out and trucked to the settling pond for reuse in the mill or for treatment prior to release. Runoff from Element R51 would release to the adjacent landscape, where best management practices for erosion and sediment control would be applied to minimize effects to the local environment. A visual representation of the site water management process for the Project airstrip is shown in Figure 2 of Attachment IR 46-R1. NexGen notes that as some additional context has been provided in Figure 2 that was not presented within the Draft EIS, the appropriate inset within Figure 5 of revised EIS TSD XVIII (Site-Wide Water Balance and Water Quality Modelling Report) will be updated to include this context. <u>Explosives Storage Area</u> With respect to the explosives storage area and associated access road, no deleterious substance sources in runoff would exist; therefore, runoff would be non-mineralized contact water, which would be appropriate for collection in the west bermed runoff collection area. The potential of water quality deleterious substances from the explosives storage area would be limited to those associated with potential spills, which would be mitigated by area-specific management practices for stockpiled materials that will be developed in accordance with applicable regulatory requirements, including the *Explosives Act* and The Mines Regulations, 2018. The potential for spills of explosive materials have been considered in the Project design. As noted in the response to IR 185, the storage of explosives is heavily regulated to minimize risks. Explosives would be managed as per the *Explosives Act*, as well as CAN/BNQ 2910-500/2015 Explosives – Magazines for Industrial Explosives. Potential spills would be contained and managed according to the Rook I Environmental Protection Program to avoid the release of any nitrogen compounds to the environment. The explosives magazine would be designed and constructed with a lined sump capable of storing a 1:100 year, 24-hour precipitation event, and water that has contacted spilled material would be collected and trucked to the settling pond for subsequent treatment and testing prior to discharge through a final discharge point (FDP). In summary, runoff from the explosives magazine or associated access road is not expected to contain deleterious substances, and thus does not require control and management through a FDP. NexGen notes that Figure 5 of Draft EIS TSD XVIII incorrectly shows that Element R52 would contain mineralized contact water rather than non-mineralized contact water; this will be corrected in Figure 5 of revised EIS TSD XVIII. <u>West Bermed Runoff Collection Area</u>	

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				would help ECCC to understand how contact and non-contact water will be conveyed throughout the site. Further information on proposed monitoring locations would assist in the assessment of adverse effects to the receiving environment. Runoff from roads and the site airstrip will contain contaminants from vehicles, heavy machinery, aircrafts and de-icing practices. Additional information on the runoff collection systems for the site airstrip and roads would aid in understanding if the collection of runoff from this site infrastructure is properly managed.		and discharged directly to the receiving environment. ▪ Non-mineralized contact water (i.e., water that has been physically or chemically altered by Project activities and not in contact with mineralized and/or radiologically contaminated surfaces) that is not expected to require treatment and meets release criteria would be managed, monitored, and ultimately directed to the west bermed runoff collection area. Aircraft fuel would be stored within double-walled tanks in accordance with The Hazardous Substances and Waste Dangerous Goods Regulations. These tanks would be located within a dedicated area that would be constructed with a sump designed to capture and contain runoff from de-icing and fuelling activities. A collection area within the apron may be constructed as a gravel pad lined with high-density polyethylene (HDPE) or as a concrete pad. Captured water would be trucked to contact water pond #1 for treatment in the effluent treatment plant (ETP). A groundwater monitoring well would be installed between the airstrip fuel storage pad and Patterson Lake to detect potential leakage of aviation fuel and other potential contaminants along the migration pathway. The specific groundwater monitoring well location has not yet been selected but will be included in the Environmental Monitoring Plan submitted to the CNSC prior to the Project airstrip becoming operational. 5. As part 5 of this IR relates to detailed design, NexGen confirms that detailed design information will be provided to the CNSC as part of federal licence application activities, as applicable. Preliminary information is provided below. The monitoring ponds would be double lined with 80 mm thick HDPE lining for primary and secondary containment. Additionally, the containment system would have perforated leak-detection piping for both the primary and secondary liners, including interconnecting buried HDPE piping connected to leak-detection monitoring wells. Details of the leak detection liner system are shown on Figure 2 of Attachment IR 46-2. The ore storage stockpile area would have a high-perimeter berm and a dual HDPE liner system to prevent non-contact water from entering the ore storage stockpile area. The stockpile would be self-contained and capable of accommodating PMP events. Other liner design features would include perforated leak detection piping routed to leak detection monitoring ponds. Monitoring of the leak detection systems would be conducted through routine inspections and groundwater monitoring. Routine inspections will be described in the Environmental Protection Program and supporting documentation developed and submitted in support of federal licensing. Inspections would be completed to verify containment structures, including berms, retaining walls, sumps, sloped floors, and graded or lined surfaces are maintained in functioning condition to provide the required storage capacities, in					NexGen notes that management of runoff from the west bermed runoff collection area is discussed in part 2 and part 3 of the response to this IR and the response to IR 44-R1. 2. NexGen confirms that all site mineralized contact water would be discharged through one of two FDPs: the monitoring ponds and contact water pond #2. Water treated in the effluent treatment plant (ETP) would report to the monitoring ponds. Once this water was confirmed to meet Project licenced release limits (i.e., thresholds), it would then be discharged directly to Patterson Lake via the effluent pipeline and diffuser. Water in contact water pond #2 that meets Project thresholds, other than total suspended solids (TSS), would be discharged to the west bermed runoff collection area. As the west bermed runoff collection area would not have a direct surface water flow pathway to Patterson Lake (i.e., flow would be through shallow groundwater), TSS would be settled out prior to water reporting to Patterson Lake. If water quality in contact water pond #2 did not meet Project thresholds (other than TSS), it would be conveyed to the settling pond for treatment in the ETP. Therefore, no deleterious substances above Project threshold levels would be conveyed to Patterson Lake. 3. As noted in the part 2 response to this IR, NexGen confirms that water in contact water pond #2 that meets Project water quality thresholds, other than TSS, would be discharged to the west bermed runoff collection area. As the west bermed runoff collection area would not have a direct surface water flow pathway to Patterson Lake (i.e., flow would be through shallow groundwater), TSS would be settled out prior to water reporting to Patterson Lake. If water quality in contact water pond #2 did not meet Project thresholds (other than TSS), it would be conveyed to the settling pond for treatment in the ETP. NexGen also confirms that no water sources that could potentially require treatment would report directly to the west bermed runoff collection area. Therefore, no deleterious substances above Project thresholds would be conveyed to the receiving environment from the west bermed runoff collection area. **References** *Explosives Act*. RSC 1985, c E-17. Current to 28 July 2020. Available at https://laws-lois.justice.gc.ca/eng/acts/e-17/. The Mines Regulations, 2018. RRS c S-15.1 Reg 8 under *The Saskatchewan Employment Act*. Effective April 6, 2019. Available at https://www.canlii.org/en/sk/laws/regu/rrs-c-s-15.1-reg-8/latest/rrs-c-s-15.1-reg-8.html. SCC. 2015. CAN/BNQ 2910-510/2015: Explosives – Quantity Distances.	

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						accordance with REGDOC 2.9.1, *Environmental Protection: Environmental Principles, Assessments and Protection Measures* CNSC 2020) and The Hazardous Substances and Waste Dangerous Goods Regulations. Groundwater monitoring would include a network of 10 to 15 stations (i.e., wells) situated between Project infrastructure and Patterson Lake to detect the migration of potential contaminants along the flow path. Groundwater quality monitoring is planned to be conducted biannually and would include measurements of pH, temperature, specific conductivity, turbidity, ORP, NH_3 as N, P, alkalinity, HCO_3, CO_3, colour, OH, sum of ions, hardness, TSS, TOC, DOC, Ca, Cl, F, Mg, K, Na, SO_4, TDS, $NO_3 + NO_2$, NO_3 as N, TKN, dissolved metals (i.e., Al, As, Cd, Cr, Co, Cu, Fe, Pb, Mn, Hg, Mo, Ni, Se, Sr, U, V, Zn), Pb-210, Po-210, Ra-226, and Th-230. 6. Current monitoring plans that are relevant to the potentially acid generating (PAG) runoff collection area, contact water pond #2, and the west bermed runoff collection area are summarized below. Effluent, emissions, and environmental monitoring is a current topic of engagement with the CNSC and Saskatchewan Ministry of Environment: as such, the monitoring may be further refined beyond what is summarized below. Detailed plans will be provided to provincial and federal regulators through future permitting and licensing processes. Current monitoring plans are as follows: ▪ Monitoring runoff quality at the PAG runoff collection area is not proposed for compliance purposes because this water would not be discharged directly to the environment; instead this water would be contained within lined ponds and conveyances and treated prior to discharge, if required. However, purpose-driven monitoring would be conducted during Operations to validate and refine material source terms, reduce uncertainty in future predictions, and adapt the level of mitigation in response to operational information collected. Frequency and parameters monitored would be informed by the regulatory-approved Environmental Risk Assessment required to be conducted during the transition from Construction to Operations. ▪ Contact water pond #2 is the final point of control before non-mineralized waters are discharged to the west bermed collection area. As such, this location would be designated under Metal and Diamond Mining Effluent Regulations (MDMER) as a Final Discharge Point. Water in this pond would be sampled prior to each batch discharge to verify compliance with licensed release limits. Water quality parameters would include pH, temperature, DO, specific conductivity, turbidity, ORP, alkalinity, HCO_3, CO_3, pH, specific conductivity, sum of ions, hardness, TSS, turbidity, TOC, DOC, Ca, Cl, F, Mg, K, Na, SO_4, TDS, NH_3 as N, NH_3 as N (unionized), NO_3 as N, NO_2 as N, $NO_3 + NO_2$ as N, TP, TN, TKN, Al, Sb, As, Ba, Be, B, Cd, Cr, Co, Cu, Fe, Pb, Mn, Hg, Mo, Ni, Se, Ag, Sn, Sr, Th, Ti, U, V, Zn, Pb-210, Po-210, Ra-226, Th-230, U-234, U-238, TPH, BTEX, and F1-F4 hydrocarbon compounds. If water in contact water pond #2 did not meet licensed release limits, this water would be directed to the ETP for treatment, and would be re-sampled as part of the combined ETP treated						

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						effluent in the monitoring ponds to confirm compliance prior to discharge. ▪ Water in contact water pond #2 that is compliant with licensed release limits would be discharged to the west bermed collection area. As this water would have already been verified for compliance with licensed release limits, this water would not be re-sampled in the west bermed collection area. ▪ Relevant to the PAG runoff collection area, contact water pond #2, and the west bermed runoff collection area, groundwater would be monitored between the surface infrastructure and Patterson Lake. Groundwater monitoring would include a network of 10 to 15 stations (i.e., wells) situated between Project infrastructure and Patterson Lake to detect the migration of potential contaminants along the flow path. Groundwater quality monitoring is planned to be conducted biannually and would include measurement of pH, temperature, specific conductivity, turbidity, ORP, NH_3 as N, P, alkalinity, HCO_3, CO_3, colour, OH, sum of ions, hardness, TSS, TOC, DOC, Ca, Cl, F, Mg, K, Na, SO_4, TDS, $NO_3 + NO_2$, NO_3 as N, TKN, dissolved metals (i.e., Al, As, Cd, Cr, Co, Cu, Fe, Pb, Mn, Hg, Mo, Ni, Se, Sr, U, V, Zn), Pb-210, Po-210, Ra-226, and Th-230. Monitoring details, including information on the frequency of water quality monitoring, will be included in the Environmental Protection Program and supporting documentation submitted to the CNSC for approval with each stage of licensing. NexGen confirms that no contact water would be discharged to the environment from any of the facilities listed unless licensed release limits were met. 7. The PAG runoff collection area would receive runoff from the PAG WRSA and the collected water would be pumped to the settling pond for treatment, if necessary. After treatment in the ETP, this water would be pumped to the monitoring ponds. A final discharge point would be designated for the single point of release from the monitoring ponds that hold treated effluent, where water can be monitored and analyzed to confirm all discharge criteria are met, including MDMER requirements. For the west bermed runoff collection area, a final discharge point would be contact water pond #2. Contact water pond #2 represents a final point of control, and a location where water would be monitored and analyzed to confirm all discharge criteria, including MDMER limits excluding total suspended solids (TSS), are met. As the water in the west bermed runoff collection area would be discharged to ground from contact water pond #2, TSS would be removed from the water before reaching fish habitat. If these remaining limits are not met within contact water pond #2, water from this pond would be pumped to the ETP rather than being discharged to the west bermed runoff collection area. No changes are proposed in the revised EIS to address this IR. **References**						

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						CNSC (Canadian Nuclear Safety Commission). 2020. Environmental Protection: Environmental Principles, Assessments and Protection Measures. REGDOC-2.9.1, version 1.2. September 2020. Available at https://www.nuclearsafety.gc.ca/pubs_catalogue/uploads/REGDOC-2-9-1-Environmental-Principles-Assessments-and-Protection-Measures-Phase-II.pdf Metal and Diamond Mining Effluent Regulations. SOR/2002-222 under the *Fisheries Act*. Last amended June 18, 2020. Available at https://laws-lois.justice.gc.ca/eng/Regulations/SOR-2002-222/index.html NexGen. 2021. Rook I Project Feasibility Study. Feasibility Study Report. Rev 0. Document No. 0000-BA00-RPT-0001. Prepared by Stantec for NexGen Energy Ltd. 28 April 2021. The Hazardous Substances and Waste Dangerous Goods Regulations. RRS c E-10.2 Reg 3 under *The Environmental Management and Protection Act, 2010*. Effective April 1, 1989. Available at https://www.canlii.org/en/sk/laws/regu/rrs-c-e-10.2-reg-3/latest/rrs-c-e-10.2-reg-3.html						
47	ECCC	Fish and fish habitat	Section 5.4.5.2 Section 22.6.3	**Context:** The Proponent states in Section 5.4.5.2 that the 24-hour 100-year event will result in 89.4 mm accumulation of precipitation. However, in Section 22.6.3 Major Precipitation Events the value quoted is 75.8 mm, which represents a 15% difference. In Section 5.4.5.2 the Probable Maximum Precipitation (PMP) is quoted as 489.2 mm in 24 hours. In Section 22.6.3 Major Precipitation Events, the PMP value quoted is 490 mm in 24 hours. It is unclear if the PMP values correspond to the 24-hour 2000-year return period. **Rationale**: Based on the discrepancies noted in the values presented for the accumulation of precipitation and for the PMP, it is unclear which datasets were used to generate these values, which values were used in the hydrology and climate change assessments or in which elements of Project design. While the discrepancies may be small, over the long term this could result in much larger differences for predicted effects.	1. Provide details on the dataset used to generate the accumulation of precipitation values (89.4 mm and 75.8 mm), which generated value is used in each of the assessments (hydrology and climate change), and which elements of Project design were informed by these assessments and why. 2. Confirm if the PMP quoted in the draft EIS (489.2mm and 490 mm in 24-hours) correspond to the 24-hour 2000-year return period and clearly show the datasets from which this value was generated.	Responses to part 1 and part 2 of this IR are provided below. 1. The 24-hour probable maximum precipitation (PMP) event value of 489.2 mm presented in Draft EIS Section 5.4.5.2 (Surface Water Management) represents the short duration rainfall compiled for the purposes of hydrological modelling, which is described in detail in Section 5.1.1 of Draft EIS Annex IV.1 (Regional Meteorological and Hydrological Characterization Report). The 24-hour, 100-year event precipitation value of 89.4 mm presented in Section 5.1.1 of Draft EIS Annex IV.1 was derived based on values published by Environment and Climate Change Canada (ECCC 2019) for nearby climate monitoring stations most representative of the Project site. The 24-hour 100-year precipitation event of 75.8 mm presented in Draft EIS Section 22.6.3 (Major Precipitation Events) was compiled from a different data source (Draft EIS Appendix 22A [Climate Change Assessment]) for the purposes of evaluating potential effects of the environment on the proposed Project and evaluating the effects of climate change. For Draft EIS Appendix 22A, detailed, site-specific future climate projections were developed for the Project through analysis of available projections from a multi-model ensemble. The multi-model ensemble consists of available regional-scale projections from several climate models representing different future climate scenarios (e.g., level of greenhouse gas emissions). Further detail on how the standard and climate change values were incorporated throughout the Draft EIS and considered in Project design is provided Draft EIS Appendix 6A (Climate Change Roadmap).	n/a	**Part 1: Not Accepted** NexGen response indicated that the 24-hour 1:100-year rainfall to be used for design purposes is 89.4mm which appears to be obtained from ECCC IDF data **[A1]** at Cree Lake (Climate Station ID: 4061861). Nevertheless, no attempts were made by NexGen to utilize most up to date extreme rainfall data for estimation of 24-hour 1:100-year rainfall. The estimate at Creek Lake is based on data from 1970-1993 (24 years) thus no recent rainfall data is considered. CNSC staff request NexGen to provide updated 24-hour 1:100-year rainfall data with confidence intervals or provide justification on the validity of the current value despite the estimate is based on old data. **Part 2: Not Accepted** The response from NexGen indicated that the source of PMP estimate is from Hopkinson (1999) study and the value is 498.2mm (~490mm) and to be used design purpose. The 2000-year return period values for rainfall and precipitation are presented in Section 22A4.6 which is pointed out to be unrelated to PMP. CNSC staff accepts that critical structures (self-contained contact water ponds) are to be designed using a PMP however the PMP value of 489.3mm is obtained from 1999 study **[A.2]**, based on historical rainfall data pre-1998, which appears to require an updated PMP value.	47-R1	CNSC staff request NexGen to provide updated 24-hour 1:100-year rainfall data with confidence intervals or provide justification on the validity of the current value despite the estimate is based on old data. CNSC staff requests NexGen to use a PMP value that is estimated using updated historical rainfall data that includes the most up to date meteorological data or provide justification on the validity of the current PMP estimate.	The following information has been organized to speak to part 1 followed by part 2 of the IR. **<u>Part 1</u>** NexGen notes that the approach utilized within the Draft EIS to determine the 24-hour, 1:100-year rainfall data relied on intensity-duration-frequency (IDF) curves published by ECCC (2019). The published data were interpreted to provide a value that was most representative of the geographic location of the Project. The reviewer is correct that the record available for Cree Lake is shorter and consists of older data than other nearby stations. However, NexGen maintains the current value of 89.4 mm for the 24-hour, 1:100-year precipitation event is valid. For short-duration rainfall storm events, data were reviewed from IDF curves published by ECCC (2019) for Buffalo Narrows, Cluff Lake, and Cree Lake in Saskatchewan and for Fort McMurray Airport in Alberta (Draft EIS Annex IV.1 [Regional Meteorological and Hydrological Characterization Report]). Cree Lake was carried forward as the most representative of the anticipated area of the Project based on similar latitude, elevation, European Centre for Medium-Range Weather Forecasting Reanalysis-Interim annual total precipitation data, and similar isolines for a probable maximum precipitation (PMP) event (Hopkinson 1999). Cree Lake has a detailed IDF data record of 24 years. The Fort McMurray, AB and Buffalo Narrows, SK stations have IDF data published based on 43 years of data over the period 1966 to 2017. The IDF values are approximately 5% to 10% higher for Fort McMurrray, AB (95.4 mm per 24 hrs) and Buffalo Narrows, SK (92.9 mm per 24 hours) than at the Project site and Cree Lake based on expected regional geographical variation of extreme rainfall. The expected regional geographic variation in extreme rainfall was based on isolines for extreme rainfall presented by Hopkinson (1999). The relative ratios adopted by Hopkinson (1999) are expected to be less sensitive to change than the magnitude of rainstorms. Using Buffalo	n/a

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						2. The PMP for the Draft EIS is 489.2 mm in 24 hours, which is rounded to 490 mm in Draft EIS Section 22.6.3. The PMP adopted for the Draft EIS is based on values developed by Hopkinson (1999) using a rational method informed by maximum persistent dew-point temperature rather than a statistical approach. The PMP is an upper bound precipitation event and cannot be assigned a valid return period (e.g., 2,000-year return period). The PMP assessment completed by Hopkinson (1994) was prepared to provide guidance for the safe design of tailings ponds associated with the uranium mining industry in northern Saskatchewan. The data set used by Hopkinson (1994) included hourly dew-point temperatures at 78 stations across western Canada with a focus on the prairie provinces for which sufficient data were available. Statistical approaches to estimating point PMPs in the prairies are usually avoided because of the influence of limited meteorological records on results. In northern Saskatchewan, statistical methods of PMP estimation have been shown (Hopkinson 1994) to yield values much lower than the rational method using persistent dew-point temperature used for the Draft EIS. No changes are proposed in the revised EIS to address this IR. **References** ECCC (Environment and Climate Change Canada). 2019. Environment Canada – Engineering Climate Datasets: Short Duration Rainfall Intensity-Duration-Frequency Data. Accessed November 2019. Available at https://climate.weather.gc.ca/prods_servs/engineering_e.html Hopkinson RF. 1994. Point Probable Maximum Precipitation in Northern Saskatchewan. Environment Canada – Canadian Climate Program. Report No. CSS – R94 – 01. Hopkinson RF. 1999. Point Probable Maximum Precipitation for the Prairie Provinces. Environment Canada Prairie and Northern Region. Report No. AHSD – R99 – 01. 54 p.		Based on the response provided by NexGen it is difficult for CNSC staff to confirm whether the current PMP (489.3m) is conservative or not. Therefore, CNSC staff requests NexGen to use a PMP value that is estimated using updated historical rainfall data that includes the most up to date meteorological data or provide justification on the validity of the current PMP estimate. **Reference:** **[A.1]** ECCC (Environment and Climate Change Canada). 2019. Environment Canada – Engineering Climate Datasets: Short Duration Rainfall Intensity- Duration-Frequency Data. Accessed November 2019. Available at https://climate.weather.gc.ca/prods_servs/engineering_e.html **[A.2]** Hopkinson RF. 1999. Point Probable Maximum Precipitation for the Prairie Provinces. Environment Canada Prairie and Northern Region. Report No. AHSD – R99 – 01. 54 p.			Narrows, SK and Fort McMurray, AB as reference points scaled according to the expected regional variation in the area of the Project, the 43 years of data would yield a 24-hour, 1:100-year rainfall of 85 mm and 91 mm, respectively, or an average of 88 mm, which is slightly less than the value used for Cree Lake (i.e., 89.4 mm). This comparison suggests that reliance on current IDF data from nearby stations with more recent records would have yielded a similar value to that used in the Draft EIS; thus, NexGen confirms that the 24-hour, 1:100-year precipitation event value utilized in the Draft EIS remains valid, and no change is required for the revised EIS. **Part 2** NexGen notes that the probable maximum precipitation (PMP) value (i.e., 489.2 mm) adopted for the Draft EIS was based on a meteorological method derived from persistent dew point temperatures rather than historical rainfall events. As this method does not rely on statistical analysis of historical rainfall events, inclusion of more recent rainfall data will not impact the PMP estimate. This method has been commonly used for determining PMP estimates for uranium mines and mills in Saskatchewan. Therefore, NexGen maintains that the PMP value utilized in the Draft EIS remains valid, and no change is required for the revised EIS. NexGen notes that the design bases and management strategies for site water management infrastructure designed to accommodate a 24-hour PMP event have been included in the licence application for the Project and would be subject to review and revision (as required) throughout the Project lifespan. If the size of the 24-hour PMP were to change as a result of climate change during the Project lifespan, mechanisms within the CNSC licensing process would require revisions to the site water management design bases and associated infrastructure (as required) to ensure adequate containment of mineralized contact water during extreme precipitation events and to maintain protection of the environment. **References** ECCC. 2019. Environment Canada – Engineering Climate Datasets: Short Duration Rainfall Intensity-Duration-Frequency Data. Accessed November 2019. Available at https://climate.weather.gc.ca/prods_servs/engineering_e.html. Hopkinson RF. 1999. Point Probable Maximum Precipitation for the Prairie Provinces. Environment Canada Prairie and Northern Region. Report No. AHSD – R99 – 01. 54 p.	
49	ECCC	Fish and fish habitat Change to an environmental component due to radiological contaminants	Section 5.4.5.4	**Context:** There is currently not enough information provided about the Effluent Treatment Plant (ETP) design to determine if the design is sufficient for treating mine effluent. ECCC notes the following information gaps provided within this section: no schematic for the treatment process within the ETP facility; no information on the two-stage treatment process; and no flow rates, capacity details, effluent characterization information, proposed effluent discharge targets;	1. Provide a schematic demonstrating flow through the ETP including flow rates, capacity of system tanks and clarifiers, locations and average and maximum treatment capacity of the ETP. 2. Provide a more in-depth overview of the treatment processes within the proposed ETP and how the ETP is designed to remove the chemical and radiological constituents from	NexGen notes the reviewer's request for detailed information on the effluent treatment plant (ETP) is outside the scope of the Project Terms of Reference (Draft EIS Appendix 1A [Concordance Tables for the Terms of Reference and Generic Guidelines for Preparation of an Environmental Impact Statement], Table 1A-2) and the CNSC Generic Guidelines for the preparation of an EIS (CNSC 2021a). Sufficient information on the ETP is presented in the Draft EIS to enable the assessment of potential adverse effects to water quality and aquatic biota. The information presented below has been provided to assist in the reviewer's understanding of the Project, though no changes are proposed for the revised EIS.	n/a	**Context:** The Proponent has addressed parts one, two, four and six of the IR. However, further information is requested to resolve parts three and five. Additional information is needed to address effluent characterization concentrations and proposed environmental release targets for total suspended solids (TSS), un- ionized ammonia, and thallium, and to address the predicted exceedance of the MDMER Schedule 4 Maximum	49-R1	1. Provide updated modelling and tables within Appendix G in Draft EIS TSD XVIII to include effluent characterization concentrations and proposed environmental release targets for the following parameters: TSS, un-ionized ammonia, and thallium 2. Address the predicted exceedance of the MDMER Schedule 4 Maximum Authorized Monthly Mean Concentration for radium-226. 3. Identify when it is predicted that effluent discharge flow rates from the mine site would meet the requirements for reporting under the MDMER and when effluent characterization concentrations or proposed environmental release targets for thallium will be provided.	NexGen has provided the information below to address part 1 through part 4 of IR 49-R1. 1. NexGen confirms that information provided within the Draft EIS and responses to round 1 and round 2 FIRT IRs will allow for ECCC and the CNSC to confirm how total suspended solids (TSS), un-ionized ammonia, and thallium will be managed to protect water quality in the receiving environment and to meet Metal and Diamond Mining Effluent Regulations (MDMER) requirements. The following details represent a summary of the available information for these three parameters. **Total Suspended Solids**	TSD XVIII, Appendix H

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				no Final Discharge Point (FDP) location information. The Proponent plans to install a pipeline to discharge effluent, but it is unclear where the final discharge point (FDP) will be located. Note that the *Metal and Diamond Mining Effluent Regulations* (MDMER) define the FDP as "in respect of an effluent, means an identifiable discharge point of a mine beyond which the operator of the mine no longer exercises control over the quality of the effluent." **Rationale:** Further information about the proposed ETP will assist ECCC in determining if the design will be sufficient to treat mine effluent and that the capacity of the ETP will be sufficient for the site. Effluent characterization information and proposed discharge targets will enable ECCC to assess adverse effects to water quality and aquatic biota.	effluent, including the expected efficiency of treatment. 3. Provide the expected effluent characterization and final effluent discharge targets, as well as effluent discharge flow rates and estimated volume per batch release to the environment. 4. Describe how waste generated from the effluent treatment process (ex. Solids and sludge) that is not discharged as treated effluent be managed? 5. Include the effluent monitoring plan details in Section 5.4.5.4 including contaminants that will be monitored for. 6. Provide the specific location of the FDP.	1. and 2. To assist the reviewer within the specific context of the IR, Attachment IR 49-1 has been developed and provides a description of the ETP, which contains the requested information regarding the ETP specifications. 8. Modelled ETP discharge concentrations are presented in Table G-2 of Appendix G in Draft EIS TSD XVIII (Site-Wide Water Balance and Water Quality Modelling Report) for each year of Construction, Operations, and Decommissioning and Reclamation (i.e., Closure). Preliminary environmental release targets are provided in Appendix H of Draft EIS TSD XVIII. As noted in Table 9 of Draft EIS TSD XVIII, the EA assumed that the 5,000 cubic metre (m^3) monitoring ponds would be released at a maximum rate of 5,000 m^3 over a 6-hour period, which equates to 0.23 cubic metre per second (m^3/s). NexGen notes that effluent quality predictions, environmental release targets, licensed release limits, and related information will be further updated and submitted to the CNSC as part of the Application for a Licence to Operate. 9. During the Construction Phase, before the mill is operational, effluent precipitates from the clarifier underflow would be pumped to geotubes for dewatering, which are long tube made of porous weather-resistant geotextile. At the end of the Construction Phase, the geotubes would be cut open, and the solids would either be deposited in the potentially acid generating (PAG) waste rock storage area (WRSA) or transferred to the paste plant for ultimate disposal underground in cemented paste tailings (CPT) or cemented paste backfill. During the Operations Phase, effluent precipitates would be blended with neutralized leach residue, gypsum, and a binder to create CPT. The CPT would be disposed of in the UGTMF as described in Draft EIS Section 5.4.3.1 (Paste Plant). 10. Effluent monitoring is summarized in Draft EIS Appendix 23B (Environmental Assessment Monitoring and Follow-Up Programs Proposed for the Project) and would be refined and updated as part of the Environmental Protection Program and supporting documentation submitted to the CNSC as part of federal licensing, commensurate with the stage of Project development (e.g., Construction, Operations). During Operations, effluent monitoring would be conducted in the monitoring ponds to confirm compliance with licensed release limits (including Metal and Diamond Mining Effluent Regulations [MDMER] limits) prior to each batch release of treated effluent. A composite sample would be drawn from the monitoring pond water and would analyzed for pH, DO, specific conductivity, turbidity, ORP, Cl, SO_4, NH_3 as N, NH_3 as N (unionized), NO_3, TP, Al, As, Cd, Cr, Co, Cu, Fe, Pb, Mn, Hg, Mo, Ni, Se, Sr, U, V, Zn, TSS, Pb-210, Po-210, Ra-226, Th-230, U-234, and U-238. In addition, monthly samples would be collected and analyzed for a larger suite of parameters that includes alkalinity, HCO_3, CO_3, pH, DO, specific conductivity, sum of ions, hardness, TSS, turbidity,		Authorized Monthly Mean Concentration for radium-226. Under the Metal and Diamond Mining Effluent Regulations (MDMER) there are Schedule 4 substances with Maximum Authorized Monthly Mean Concentrations permitted for discharge. Table G-2 of Appendix G in Draft EIS TSD XVIII does not provide effluent characterization concentrations or proposed environmental release targets for the following Schedule 4 substances: un-ionized ammonia and TSS. Additionally, the proposed environmental release target for radium-226 is 0.88 Bq/L which exceeds the Schedule 4 Maximum Authorized Monthly Mean Concentration of 0.37 Bq/L under the MDMER and could result in adverse effects to water quality and aquatic biota. Based on Appendix F Table F-1 Draft EIS TSD XVIII, during the construction phase the predicted effluent discharge rate is 899 m^3/day. At an effluent flow rate of 50 m^3/day, the mine becomes subject to the MDMER. Under the MDMER there are Schedule 5 Section 4(1) substances that have requirements for effluent characterization. Table G-2 does not provide effluent characterization concentrations or proposed environmental release targets for thallium under Schedule 5 which poses uncertainty regarding its effects on the receiving aquatic environment, including effects to fish and fish habitat. **Rationale:** Discharges from the proposed Project will alter water quality in the nearfield receiving environment and could negatively affect aquatic biota. The lack of effluent characterization concentrations and proposed environmental release targets for un-ionized ammonia and TSS cause uncertainty about the effects of the Project's effluent on the receiving environment, and the release target for radium-226 may result in adverse effects to water quality and aquatic biota. Additionally, the Proponent has not provided data to validate their statements that there will not be a significant source term of thallium in Project effluent. Currently not enough information is available regarding missing Schedule 4 and 5 parameters necessary for effluent characterization. This information is required to determine if effluent at the end-of-pipe from all final discharge points is predicted to be acutely lethal to aquatic biota including fish and fish habitat and to verify acute		4. Update the Draft EIS Section 5.4.5.4 to include information on predicted effluent characterization concentrations and environmental release targets for MDMER Schedule 4 and 5 parameters.	Changes to TSS were evaluated in Pathway ID SWQ-10 of Draft EIS Section 10.4.2 (Secondary Pathways). The evaluation concluded that Project controls would minimize potential TSS loadings. Total suspended solids would be treated in the effluent treatment plant (ETP), as necessary, to meet Maximum Authorized Concentrations of Prescribed Deleterious Substances listed in columns 2, 3, and 4 of MDMER Schedule 4. These Maximum Authorized Concentrations will also be incorporated into the effluent release targets (ERTs) that will be provided to the CNSC as part of the REGDOC-2.9.2 process to determine the Best Available Technology and Techniques Economically Available (BATTEA) for effluent treatment as part of licensing for each phase of the Project. The evaluation of effects of discharge of TSS from the ETP and sewage treatment plant (STP) to the receiving environment was completed using a near-field modelling approach focused on the assumed regulated mixing zone (RMZ) boundary, located at 100 m from each of the ETP diffuser and STP outfall (Draft EIS Section 10.2.8.1.2 [Near-Field Water Quality Model]). Specifically, TSS concentrations at the edge of the RMZs were predicted using the equation in Section 10A7.4 of Appendix 10A (Surface Water Quality Modelling Report) and incorporated conservative assumptions (e.g., no settlement to the lakebed following discharge). The modelled results indicated that for the period of operational discharge from the ETP, increases in TSS concentrations at the edge of the regulated mixing zones would be less than 2 mg/L, which would further attenuate through the receiving environment beyond the RMZ (Draft EIS Appendix 10A, Section 10A7.4). As NexGen has confirmed that MDMER Schedule 4 Maximum Authorized Concentrations of Prescribed Deleterious Substances will be met at end-of-pipe for TSS and has provided modelling results that confirm a lack of effects to Patterson Lake with regards to TSS, additional modelling and updates to the EIS are not required. **<u>Un-ionized Ammonia</u>** NexGen confirms that un-ionized ammonia was considered in the surface water quality assessment for the Application Case and Reasonably Foreseeable Development Case as a component of total ammonia (Draft EIS Appendix 10A [Surface Water Quality Modelling Report], Attachment 10A-1a and Attachment 10A-2). In the background surface water quality characterization and near-field and regional surface water quality modelling, total ammonia incorporates the sum of the un-ionized ammonia (NH_3) and ionized ammonia (NH_4^+) species that exist in equilibrium in water. Within the assessment, the un-ionized fraction of the total ammonia was estimated at various instances based on ambient water temperature and pH. Therefore, un-ionized ammonia was considered in the assessment, but total ammonia was reported. NexGen will provide additional clarity regarding ammonia and un-ionized ammonia in the surface water quality assessment in revised EIS Section 10.2.8.2.1 (Surface Water Quality Constituents of Potential Concern) and include both ammonia and un-ionized ammonia in the assessment figures and tables in revised EIS Appendix 10A (Surface Water Quality Modelling Report), where applicable. This update will show that un-ionized ammonia	

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						ORP, TOC, DOC, Ca, Cl, F, Mg, K, Na, SO_4, TDS, NH_3 as N, NH_3 as N (unionized), NO_3 as N, NO_2 as N, NO_3 + NO_2 as N, TP, TN, TKN, Al, Sb, As, Ba, Be, B, Cd, Cr, Co, Cu, Fe, Pb, Mn, Hg, Mo, Ni, Se, Ag, Sn, Sr, Th, Ti, U, V, Zn, Pb-210, Po-210, Ra-226, Th-230, U-234, U-238, and acute lethality tests for rainbow trout (*Oncorhynchus mykiss*) and water flea (*Daphnia magna*). 11. The location of the final discharge point for the ETP would be at the monitoring ponds as shown in Figure 5.1-3 of Draft EIS Section 5.1.1 (Project Overview). The specific discharge location will be finalized during detailed design and provided to Environment and Climate Change Canada as part of the MDMER registration. Additional details regarding the ETP and discharge characteristics will be provided in the applicable stages of federal licencing and provincial permitting (e.g., Operations). NexGen will provide any updates regarding the requested ETP design details (i.e., part 1 through part 4 of this IR) as part of licensing and in accordance with the requirements of REGDOC 2.9.2, *Environmental Protection, Controlling Releases to the Environment* (CNSC 2021b), recognizing this regulatory guidance remains in draft form at this time. Similarly, additional information on the requested effluent monitoring details (i.e., part 5 of this IR) will be provided in the Environmental Protection Program and supporting documentation that will be submitted to the CNSC in support of the applicable stages of federal licensing, commensurate with the stage of Project development. As this IR is out of the scope of the EA, no changes are proposed in the revised EIS. **<u>References</u>** CNSC (Canadian Nuclear Safety Commission). 2021a. Generic Guidelines for the Preparation of an Environmental Impact Statement – Pursuant to the *Canadian Environmental Assessment Act, 2012*. Available at http://cnsc.gc.ca/eng/resources/environmental-protection/ceaa-2012-generic-eis-guidelines.cfm CNSC. 2021b. REGDOC-2.9.2, Environmental Protection, Controlling Releases to the Environment. DRAFT. March 2021. Available at https://www.nuclearsafety.gc.ca/eng/pdfs/regulatory-documents/regdoc2-9-2/REGDOC-2_9_2_Controlling_Releases_to_the_Environment.pdf Metal and Diamond Mining Effluent Regulations. SOR/2002-222 under the *Fisheries Act*. Last amended June 18, 2020. Available at https://laws-lois.justice.gc.ca/eng/Regulations/SOR-2002-222/index.html		and chronic water quality thresholds. In accordance with the MDMERs, the Proponent will be required to demonstrate that their effluent quality meets the limits in the MDMER.			concentrations will remain below MDMER Schedule 4 Maximum Authorized Concentrations at the end-of-pipe and within Patterson Lake during all phases of the Project. Similar to TSS, the MDMER limits for un-ionized ammonia will be considered in the REGDOC-2.9.2 process for determining the BATTEA for un-ionized ammonia that will be provided to the CNSC for approval as part of each phase of Project licensing. As NexGen has confirmed that the MDMER Schedule 4 Maximum Authorized Concentrations of Prescribed Deleterious Substances will be met for un-ionized ammonia and will make updates to the revised EIS to present modelling results that confirm a lack of effects to Patterson Lake with regards to un-ionized ammonia, additional modelling and updates to the EIS are not required. **<u>Thallium</u>** Per Attachment IR 49-R1, 79-R1, and 82-R1, baseline and source input data gathered for the Draft EIS and more recent data measured from field work conducted from 2021 to 2023 validate the exclusion of thallium as a constituent of potential concern (COPC) for the EA. Reported values for the baseline and source term datasets are generally well below detection limits. While detection limits vary within these datasets, the majority of data points are below the Canadian Council of Ministers of the Environment (CCME) guideline, and in most cases, are orders of magnitude below the CCME guideline. Therefore, there is negligible potential for adverse effects to surface water quality as a result of inputs of thallium to the receiving environment from the Project. Hence, thallium was screened out as a COPC for the Project. Thallium is not expected to be present in quantities that pose a potential environmental risk; therefore, there is no conceptual pathway for thallium to the receiving environment or need to develop ERTs for thallium. In accordance with REGDOC-2.9.2, which would be applied to Project effluents during licensing to guide the development of BATTEA and licensed release limits, thallium would not be defined as a substance that requires control because the data indicate no potential for environmental risk. Therefore, updated modelling of thallium is not required for the revised EIS. 2. NexGen confirms that updates to the Project ERTs for radium-226 will conform to the MDMER Schedule 4 Maximum Authorized Monthly Mean Concentration for radium-226 of 0.37 Bq/L. Table 7 of Appendix H of revised EIS TSD XVIII (Site-wide Water Balance Modelling Report) will be updated to include the MDMER Schedule 4 Maximum Authorized Monthly Mean Concentration of 0.37 Bq/L. 3. Effluent discharge rates for the Project would meet the reporting requirements under MDMER (i.e., when discharged effluent is released to the receiving environment at more than 50 m^3/day) during the first or second year of Construction, depending on the specific start date, and reporting requirements would remain throughout Operations. As shown in Figure 9 of Section 5.1.1 of Draft EIS TSD XVIII, the range of proposed daily discharge rates from the ETP to Patterson Lake North Arm – West Basin during Construction and Operations is 400 m^3/day to 1,400 m^3/day and 5,500 m^3/day to 7,500 m^3/day, respectively. As per REGDOC-2.9.2 requirements, effluent characterization will be updated for each phase of licensing to confirm that the Project	

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											applies BATTEA to meet ERTs. The updated effluent characterization, including quantities and qualities, will be provided to the CNSC for approval for each phase of licensing. Additionally, as per MDMER Section 8(1)(a), within 60 days of exceeding the 50 m^3/day discharge threshold and becoming subject to MDMER, NexGen will submit in writing to the Minister of Environment the information required in MDMER Section 2. With respect to the effluent characterization concentrations or proposed environmental release targets for thallium, these are not required for the reasons outlined in Attachment IR 49-R1, 79-R1, and 82-R1. 4. NexGen notes that Draft EIS Section 5.4.5.4 (Effluent Treatment) is intended to provide a description of Project components and is not the appropriate location for information regarding predicted effluent characterization concentrations and environmental release targets (ERTs). This information has been appropriately included in Appendix G and Appendix H, respectively, of Draft EIS TSD XVIII. NexGen confirms that as part of the surface water quality assessment, not all MDMER Schedule 4 and 5 parameters screened in as COPCs for the Project; therefore, not all of these parameters were characterized for effluent concentrations or had ERTs proposed as part of the surface water quality assessment. However, compliance with the MDMER and implementation of REGDOC-2.9.2 represent key considerations in the development of the Project Effluent and Emissions Plan and Environmental Monitoring Plan that will be applied to Project effluents once approved by the CNSC as part of licensing for each phase of the Project. Parameters listed under Schedule 4 (Table 1) and Schedule 5 (Part 1.4[1]) of the MDMER would be monitored in Project effluent as per the requirements set out in Schedule 4 and Schedule 5 of MDMER, regardless of whether those parameters were identified as COPCs in the EIS. **<u>References</u>** CNSC (Canadian Nuclear Safety Commission). 2021. Environmental Protection: Controlling Releases to the Environment. DRAFT. March 2021. Available at https://www.nuclearsafety.gc.ca/eng/pdfs/regulatory-documents/regdoc2-9-2/REGDOC-2_9_2_Controlling_Releases_to_the_Environment.pdf. Metal and Diamond Mining Effluent Regulations. SOR/2002-222 under the *Fisheries Act*. Last amended June 18, 2020. Available at https://laws-lois.justice.gc.ca/eng/Regulations/SOR-2002-222/index.html.	
64	HC	Human health with with respect to hazardous contaminants	Section 7.2.5, page 7-41	**Context:** Concentrations of NO_2, TSP and PM_{10} are predicted to be greater than the short- term (1-hour) SAAQS within a few hundred metres of the maximum disturbance area for the Project, where traditional land users may be present. The human health risks associated with these exceedances are not discussed in the HHERA.	Discuss the impacts of these short-term air quality exceedances (NO_2, TSP and PM_{10}) on human health.	The short-term air quality exceedances for nitrogen dioxide, total suspended particulates (TSP), and particulate matter less than 10 microns in diameter (PM_{10}) are discussed in Draft EIS TSD XXI (Environmental Risk Assessment). Specifically, Section 4.3.3.3 of Draft EIS TSD XXI discusses air quality constituents that exceed screening values. As stated in Section 4.3.3.3.1 of Draft EIS TSD XXI, "[a]dverse health effects that are attributed to short-term exposures to ambient nitrogen dioxide include	n/a	IR-64 was partially addressed, however, the rationale for not applying the CAAQS in the assessment lacks sufficient justification from a health perspective and further assessment is recommended. 1) The response to HC's IR-64 states that, "The CAAQS are applicable to measured ambient air concentrations over a three-year period and are not	64-R1	HC recommends that the Impact Statement: 1. Compare ambient air concentrations to CAAQS to determine the nature and severity of the project's impacts and need for further mitigation measures; 2. Use modelled results for at least one calendar year when data is unavailable, to indicate frequency of CAAQS exceedances, and provide a discussion as to whether human health impacts are anticipated; and, 3. Implement a monitoring plan for constituents where there are predicted exceedances.	Responses to part 1 through part 3 of IR 64-R1 are provided below. 1. NexGen confirms that a comparison of Project predicted ambient air quality to the Canadian Ambient Air Quality Standards (CAAQS) was made in Table 7.2-12 of Draft EIS Section 7.2.5.1.1.2 (Air Dispersion Modelling Predictions). As noted in Draft EIS Section 7.2.2.8.2 (Comparison to Canadian Ambient Air Quality Standards), achievement determination of the CAAQS is determined by provinces and territories using ambient	n/a

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				The proponent states: *"As discussed in Section 7.2.2.8.2, Comparison to Canadian Ambient Air Quality Standards, the comparison to CAAQS is provided for information only and does not represent a compliance metric or environmental risk."* **Rationale:** NO_2 and PM_{10} are non-threshold pollutants (meaning that any increment in concentrations presents an increased risk for health effects). Health Canada recommends the use of the CAAQS for project-associated air quality assessments, as they are the appropriate comparison targets for measured, modeled or estimated ambient air concentrations. The CAAQS are some of the most stringent air quality criteria, especially for long-term project emissions after 2025. It is recommended that the proponent take into consideration that NO_2 and $PM_{2.5}$ are non-threshold pollutants. The Canadian Air Quality Management System (AQMS) explicitly recognizes that health effects occur below the CAAQS values, and proposes additional management levels in recognition of the health and environmental benefits that can be realized by taking actions to decrease or maintain background levels of air pollution.		asthma exacerbations and possibly increased risk of cardiopulmonary effects, and to a lesser extent cardiovascular and respiratory mortality (Health Canada 2016b). Individuals with certain pre-existing diseases such as asthma appear to be sensitive to exposure to ambient nitrogen dioxide. If individuals are present during periods when ambient nitrogen dioxide concentrations exceed the screening value, it is possible that they could experience minor irritation of the respiratory system. These effects would be reversible and would subside after exposure." As stated in Section 4.3.3.3.2 of Draft EIS TSD XXI, "[e]levated TSP concentrations are generally not considered to pose significant health risks because these particles are too large to be inhaled deep into the lungs; therefore, TSP was not considered further in the ERA [Environmental Risk Assessment]." With respect to PM_{10} and particulate matter less than 2.5 microns in diameter ($PM_{2.5}$), Section 4.3.3.3.2 of Draft EIS TSD XXI states "[e]xposure to elevated concentrations of both PM_{10} and $PM_{2.5}$ are associated with various respiratory and cardiovascular effects in humans. The finer particles that can be inhaled deeply into the lungs are associated with greater risk because they are more chemically active and have more complex characteristics than larger particles (Health Canada 2016c). If individuals are present during short-term periods of elevated PM_{10} and/or $PM_{2.5}$, they may experience respiratory symptoms such as coughing or difficulty breathing, or asthma symptoms and chronic bronchitis. For most individuals, effects would be reversible and subside after exposure." With respect to the Canadian Ambient Air Quality Standards (CAAQSs), as discussed in Draft EIS Section 7.2.2.8.2 (Comparison to Canadian Ambient Air Quality Standards), the CAAQCs are applicable to measured ambient air concentrations over a three-year period and are not specifically applicable to modelled results from a single facility. As the information requested by the reviewer is already contained within the Draft EIS, no changes are proposed in the revised EIS to address this IR. **References** Health Canada. 2016b. Human Health Risk Assessment for Ambient Nitrogen Dioxide. Healthy Environments and Consumer Safety Branch. Health Canada. 2016c. Human Health Risk Assessment for Coarse Particulate Matter. Healthy Environments and Consumer Safety Branch.		specifically applicable to modelled results from a single facility." The CAAQS are generally calculated for specific multi-year averages and for a particular statistical form so that extreme and unpredictable events do not drive risk management. However, if the data is not available for comparison to a full CAAQS timeframe, HC recommends using modelled results for at least one calendar year to allow for a basic comparison with the CAAQS statistical form. The CAAQS are national air quality standards, but they are not restricted to applications within the context of the Air Quality Management System (AQMS). An evaluation using CAAQS may be considered in determining the nature and severity of the project's impact on air quality levels, and mitigation measures that may be required to maintain good air quality levels or to prevent an exceedance of the CAAQS. Please see *Table 2: Review of the NexGen Responses to Annex 2 – FIRT Advice to the Proponent (HC-1)* for further discussion on the use of CAAQS. 2) The response also indicates that Section 4.3.3.3 of Draft EIS TSD XXI discusses air quality constituents that exceed screening values, including short-term exceedances for nitrogen dioxide, total suspended particulates (TSP), particulate matter ($PM_{2.5}$, PM_{10}), and uranium. Given the potential for these guideline exceedances, it is important to use a robust monitoring system capable of generating sufficient data to determine if any new mitigation measures are required. Health Canada (HC) also notes that, while more conservative than the former National Ambient Air Quality Objectives (NAAQO), the Saskatchewan Ambient Air Quality Standards (SAAQS) and Alberta Ambient Air Quality Objective (AAQO)'s screening values do not reflect the most recent science, which indicates that there is no apparent threshold for NO_2, meaning that health effects may occur at any level of exposure.			concentrations measured in the air zones for a three-year period rather than by comparison of modelled predictions at or beyond a facility boundary (CCME 2012, CCME 2020a,b). NexGen also notes that the CAAQS were not developed as facility-level regulatory standards (CCME 2019). Therefore, the comparisons of modelled values to the CAAQS in Table 7.2-12 of Draft EIS Section 7.2.5.1.1.2 are for information only and are not indicative of compliance or the severity of Project effects. The mitigation measures for the Project are expected to minimize effects to air quality such that no significant adverse effects are expected to the human health (Draft EIS Section 15.6 [Risk Characterization and Significance Determination]) or wildlife (Draft EIS Section 14.5 [Residual Effects Analysis]) valued components; therefore, no changes to revised EIS Section 7.2.4 (Project Interactions and Mitigations) are necessary. 2. NexGen confirms that the number of hours with model-predicted 1-hour NO_2 concentrations exceeding the CAAQS value were computed for each model year (i.e., 2012 through 2016) at each human health receptor. Please see Attachment IR 69-R1 for context regarding potential human health effects from NO_2 emissions. As described in IR 69-R1, the results of the human health risk assessment remain as presented in the Draft EIS (i.e., no significant effects to human health). 3. NexGen confirms that a monitoring program would be implemented to measure ambient air concentrations. As noted in Draft EIS Section 7.2.8 (Monitoring, Follow-Up, and Adaptive Management), monitoring and follow-up programs would be used to: a. Verify the predictions through monitoring of air quality during Construction, Operations, and Closure. The current monitoring program that measures meteorological parameters, NO_2, sulphur dioxide, TSP, and $PM_{2.5}$ would be continued through all phases of the Project, with modification through the licensing and provincial permitting processes, as required. b. Evaluate the effectiveness of mitigation measures and modify or enhance as necessary through monitoring and developing updated mitigation measures, if needed. c. Identify unanticipated negative effects, including possible accidents and malfunctions. NexGen confirms that the Integrated Management System developed for the Project would describe the processes required to monitor and characterize emissions from Project facilities and activities, including those described above. **References** CCME (Canadian Council of Ministers of the Environment). 2012. Guidance Document on Achievement Determination Canadian Ambient Air Quality Standards for Fine Particulate Matter and Ozone. PN 1483. Available at https://ccme.ca/en/res/pn1483_gdad_eng-secured.pdf. CCME. 2019. Guidance Document on Air Zone Management. PN 1593. Available at https://ccme.ca/en/res/guidancedocumentonairzonemanagement_secured.pdf. CCME. 2020a. Guidance Document on Achievement Determination for Canadian Ambient Air Quality Standards for Nitrogen Dioxide. PN 1608. Available at	

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											https://ccme.ca/en/res/gdadforcaaqsfornitrogendioxide_en1.0.pdf. CCME. 2020b. Guidance Document on Achievement Determination for Canadian Ambient Air Quality Standards for Sulphur Dioxide. PN 1610. Available at https://ccme.ca/en/res/gdadforcaaqsforsulphurdioxide_en1.0.pdf.	
67	ECCC	Air Quality, Noise, and Climate Change	Section 7.4.5	**Context:** In Section 7.4.5 the Proponent states that the land use change emissions include the annual loss of carbon sinks. It is anticipated that there will be 897.8 ha of new disturbance added to the Project area. **Rationale:** While ECCC recognizes that this Project falls under CEAA 2012, the principles of the SACC and Draft Technical Guide should be followed by the Proponent in order to support Canada's ability to meet its environmental obligations and commitments in respect of climate change. There is a distinction between direct GHG emissions from land use change and the effects on carbon sinks. The GHG emissions from land use change should be evaluated, however the effects on carbon sinks should be considered separately. An effect to a carbon sink implies the interruption of the land's natural process that results in the net absorption of carbon from the atmosphere. The Proponent should refer to the Strategic Assessment of Climate Change (SACC) section 5.1.2 and the associated Draft Technical Guide section 4 for guidance on how to perform an assessment of the impact on carbon sinks. This assessment should be qualitative and quantitative.	Provide separate assessments for GHG emissions due to land use change and for GHG emissions due to the effects on carbon sinks. **Suggestions for mitigation and follow-up measures** The Proponent should consider mitigation measures for the disturbance of carbon sinks. The Proponent can refer to the Draft Technical Guide section 3.5.3 for additional guidance.	As noted by both NexGen and the reviewer, the request to provide separate assessments for greenhouse gas (GHG) emissions due to land use change and for GHG emissions due to the effects on carbon sinks is outside the scope of both the *Canadian Environmental Assessment Act, 2012* and the CNSC Generic Guidelines for the preparation of an EIS (CNSC 2021). Greenhouse gas (GHG) emissions associated with the land use changes and the resulting loss of carbon sinks are provided in Table 7.4-8 in Draft EIS Section 7.4.5.1.1 (Project Greenhouse Gas Emissions). The total emissions from land use change presented include separate calculations for the GHG emissions associated with the land use change (i.e., the one-time loss of the carbon sink from the land clearing), as well as the annual emissions associated with the loss of carbon sinks. These emissions were calculated using the approach provided in the Intergovernmental Panel on Climate Change (IPCC 2006) guidelines (Draft EIS Appendix 7C [Greenhouse Gas Emissions Estimation Methodology Report], Section 7C5.4) and are aligned with a Tier 1 approach provided in the draft technical guidance supporting the Strategic Assessment of Climate Change (SACC; ECCC 2021). During development of the Draft EIS, the approach for the carbon sink calculations was presented by NexGen as part of proactive engagement between NexGen, the CNSC, and the Saskatchewan Ministry of the Environment on 14 June 2021. No comments were received at the time related to the approach proposed by NexGen for carbon sinks. Outside of the EA process, NexGen's commitments to environmental, social, and corporate governance and sustainability will be used to guide decision-making on reducing GHG emissions. These commitments can be found on NexGen's Sustainability webpage (https://www.nexgenenergy.ca/sustainability/default.aspx) as well as in Draft EIS Section 1 (Introduction). A mitigation for the disturbance of carbon sinks includes removal of merchantable trees and most of the woody debris with soils that are salvaged, where required (i.e., where not planned for use in future reclamation activities), in order to maintain the carbon stocks and avoid release of carbon through decomposition. This mitigation measure is listed in Table 7.4-7 in Draft EIS Section 7.4.4 (Project Interactions and Mitigation). Other mitigation measures to limit disturbance of carbon sinks include the following measures (Draft EIS Appendix 23A [Summary of Project Environmental Design Features and Mitigation Measures]): ▪ designing an efficient infrastructure footprint (i.e., buildings clustered together); ▪ optimizing the use of cleared areas for Project activity; ▪ using existing road infrastructure, including the existing access road and bridge crossing;	n/a	**Context:** The Proponent noted that GHG emissions associated with land use changes and the resulting loss of carbon sinks are provided in Table 7.4-8 in Draft EIS Section 7.4.5.1.1. These values are provided in tonnes of carbon dioxide equivalent (t CO2e), which is reasonable for land use change emissions. However, impacts on carbon sinks should be provided in tonnes of carbon (t C). **Rationale:** There is a distinction between direct GHG emissions from land-use changes and the impacts on carbon sinks. An effect to a carbon sink implies the interruption of the land's natural processes that results in the net absorption of carbon from the atmosphere and should be considered separately from the land-use change evaluation. It is unclear which values presented in the table correspond to carbon sinks, therefore Table 7.4-8 should be updated to clarify the values for carbon sinks and allow for a more accurate assessment of the impact on carbon sinks. ECCC recognizes that this Project falls under CEAA 2012. However, the *Strategic Assessment of Climate Change (SACC) and the Draft Technical Guide Related to the SACC: Guidance on quantification of net GHG emissions, impact on carbon sinks, mitigation measures, net-zero plan and upstream GHG assessment* (Draft Technical Guide) contains the most up-to-date guidance for developing a qualitative and quantitative assessment on impact on carbon sinks. Therefore, ECCC recommends that the principles of the SACC and Draft Technical Guide be followed in order to support an understanding of how the Project impacts Canada's ability to meet its environmental obligations and commitments in respect of climate change.	67-R1	Update Table 7.4-8 in Draft EIS Section 7.4.5.1.1 to display impacts on carbon sinks in tonnes of carbon (t C) using the Strategic Assessment of Climate Change (SACC) section 5.1.2 and the Draft Technical Guide section 4 for the most up to date guidance.	NexGen notes that, as confirmed by the reviewer, the reviewer's request to update the EIS to present Project effects on carbon sinks in terms of tonnes of carbon is outside the scope of the requirements of an EA of a designated project under the *Canadian Environmental Assessment Act, 2012* (CEAA 2012). Also, the Project is not subject to the Strategic Assessment of Climate Change (SACC) guidance (ECCC 2020, 2021). In addition, as noted in Draft EIS Section 4.3.1 (Alternatives to the Project – Energy Type), providing carbon intensity values (i.e., CO_2 produced per unit of electrical energy generated) in CO_2 equivalent (CO_{2e}) units aligns with the measurements used in climate change stabilization scenarios developed by the International Energy Agency in 2017 (i.e., the power sector's carbon intensity must be reduced to 10 to 25 g CO_{2e}/kWh by 2050 and to less than 2 g CO_{2e}/kWh by 2060). For these reasons, the approach to the emissions calculations will not be updated in the revised EIS. However, to support the reviewer's request, NexGen has provided Attachment IR 67-R1, which provides the Project land use change emission values in tonnes of carbon per year. As important context to the reviewer's rationale that this information is required in order to support an understanding of how the Project impacts Canada's ability to meet its environmental obligations and commitments in respect of climate change, NexGen notes that, as described in Draft EIS Section 4.2 (Purpose of the Project), the Project represents a substantial and consistent potential source of uranium for meeting the expected growing global demand for electricity. The Project could contribute to the Government of Canada's ability to meet its environmental obligations and commitments with respect to climate change by displacing high-greenhouse gas (GHG) intensity, fossil fuel (i.e., coal and natural gas) electrical generation in favour of low-GHG emitting, renewable energy options. To achieve decarbonization at the lowest possible cost in Canadian provinces, a diverse set of low carbon technologies, including nuclear, will need to be implemented (Canadian Nuclear Association 2017). In Canada, various climate scenarios for low GHG economy modelling analyses indicate the importance of nuclear energy installation before mid-century to meet the Paris Agreement targets (Draft EIS Section 4.3 [Alternatives to the Project]). As currently proposed, the Project benefits on climate change mitigation significantly outweigh Project effects. For this reason alone, the Project would already align with net-zero initiatives and support Canada's ability to meet its environmental obligations and commitments in respect of climate change. **<u>References</u>** *Canadian Environmental Assessment Act, 2012*. SC 2012, c 19, s 52. Repealed, 2019, c 28, s 9. Available at https://laws-lois.justice.gc.ca/eng/acts/C-15.21/20170622/P1TT3xt3.html. Canadian Nuclear Association. 2017. Vision 2050: Canada's Nuclear Advantage. Available at	n/a

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						▪ storing tailings underground; ▪ maximizing water diversion away from site facilities through design and the establishment of berms and grading; and ▪ reclaim and revegetate areas where non-permanent Project facilities have been decommissioned. As the reviewer's request is outside the scope of both the *Canadian Environmental Assessment Act, 2012* and the CNSC Generic Guidelines for the preparation of an EIS (CNSC 2021), no changes are proposed in the revised EIS to address this IR. **<u>References</u>** *Canadian Environmental Assessment Act, 2012*. SC 2012, c 19, s 52. Repealed, 2019, c 28, s 9. Available at https://laws-lois.justice.gc.ca/eng/acts/C-15.21/20170622/P1TT3xt3.html CNSC (Canadian Nuclear Safety Commission). 2021. Generic Guidelines for the Preparation of an Environmental Impact Statement – Pursuant to the *Canadian Environmental Assessment Act, 2012*. Available at http://cnsc.gc.ca/eng/resources/environmental-protection/ceaa-2012-generic-eis-guidelines.cfm ECCC (Environment and Climate Change Canada). 2021. Draft Technical Guide Related to the Strategic Assessment of Climate Change. August 2021. Available at https://www.canada.ca/en/environment-climate-change/corporate/transparency/consultations/draft-technical-guide-strategic-assessment-climate-change.html IPCC (Intergovernmental Panel on Climate Change). 2006. IPCC Guidelines for National Greenhouse Gas Inventories, Prepared by the National Greenhouse Gas Inventories Programme, Eggleston HS, Buendia L, Miwa K, Ngara T, Tanabe K (eds). Published: IGES, Japan. Available at https://www.ipcc-nggip.iges.or.jp/public/2006gl/					www.readkong.com/page/vision-2050-canada-s-nuclear-advantage-using-nuclear-9950301. ECCC (Environment and Climate Change Canada). 2020. Strategic Assessment of Climate Change. October 2020. Available at https://www.strategicassessmentclimatechange.ca/. ECCC. 2021. Draft Technical Guide Related to the Strategic Assessment of Climate Change. August 2021. Available at https://www.canada.ca/en/environment-climate-change/corporate/transparency/consultations/draft-technical-guide-strategic-assessment-climate-change.html.	
69	HC	Human health with with respect to hazardous contaminants	Section 7A3.2.13.3 Table 7A-114, Page 116	**Context:** Several tables, such as Table 7A-114 (Page 116), show the predicted concentrations of some metals for the operations phase; however, the toxicological reference values (TRVs) used to determine the risk quotient in the HHRA section do not appear in these tables. **Rationale:** To assess health risk, HHRAs compare predicted chemical exposures TRVs defined by regulatory agencies such as Health Canada or US Environmental Protection Agency. TRVs represent the amount of a substance below which adverse effects are not expected to be observed in a population. These are not regulatory limits, but are thresholds meant to be used as a decision aid.	1.Where toxicological reference values are available or could be derived, identify these chemicals as COPCs and carry them into the modelling predictions. 2.Revise the table to include TRVs which are applicable to the general public, including sensitive receptors or provide rationale as to how the selected TRVs provide an adequate level of health protection for the general public including sensitive receptors.	Responses to part 1 and part 2 of this IR are provided below. 1. The evaluation of air modelling predictions against air quality criteria is presented and discussed in Draft EIS TSD XXI (Environmental Risk Assessment). As discussed in Section 4.3.3 of Draft EIS TSD XXI, the maximum predicted air concentrations at a conservative human and ecological exposure location (i.e., camp location) were compared against air quality criteria to determine constituents of potential concern (COPCs) for further assessment in the environmental risk assessment (ERA). Table 4-6 in Draft EIS TSD XXI identifies the screening values used in the assessment to determine if an air constituent required further quantitative assessment. Section 4.3.4 of Draft EIS TSD XXI concluded that no air COPCs were required for further evaluation in the ERA; however, radionuclides were assessed as part of the total radiological dose. Therefore, the air assessment in the ERA did not progress past a screening phase, and toxicity reference values (TRVs) and	n/a	The response did not address NO_2, particulate matter, and uranium (Chemical Risk), which exceeded the screening criteria. The response to HC's IR-69 indicates that "The TRVs were not presented for air constituents since no air COPCs progressed past the s0creening phase of the ERA"; however, Table 4-9 of the Draft EIS TSD XXI (ERA) indicates that nitrogen dioxide, particulate matter (total suspended particulate (TSP), PM_{10}, $PM_{2.5}$, and TSP deposition), and uranium exceeded their respective air screening criteria. Subsequently, NO_2 and Chemical Risks from Uranium were screened out of further assessment through qualitative evaluations, some of which contain limited, out of date and/or inaccurate information (e.g., referencing values from the NAAQO instead of the current CAAQS). HC's	69-R1	Health Canada recommends that the Impact Statement characterize (i.e., quantify) potential health risks for NO_2, particulate matter, and uranium (Chemical Risk) to support the qualitative assessment in Section 4.3.3.3 of the ERA, considering the following: 1. For NO_2, use the most stringent, Canadian standards (e.g., 1-hour and Annual CAAQS). 2. Consider inhalation risk to off-duty workers who reside at the Project site (i.e., in camp). 3. Consider inhalation risks for receptors at other identified receptor sites where modeled concentration exceed the CAAQS or other health-based standards (e.g., Beet Lake, 19EXP01, and 19EXP02).	NexGen maintains that, as discussed in Section 4.3.3.3 of Draft EIS TSD XXI (Environmental Risk Assessment) further quantitative assessments for nitrogen dioxide (NO_2), particulate matter (PM), and uranium are not required as the screening assessments showed that only minor, short-term, reversible effects to human health could potentially occur. Due to the importance of maintaining human health, NexGen confirms that a monitoring program would be implemented to measure ambient air concentrations. As noted in Draft EIS Section 7.2.8 (Monitoring, Follow-Up, and Adaptive Management), monitoring and follow-up programs would be used to: ▪ Verify the predictions through monitoring of air quality during Construction, Operations, and Closure. The current monitoring program that measures meteorological parameters, NO_2, sulphur dioxide, total suspended particulate, and PM with a diameter of 2.5 microns of less ($PM_{2.5}$) would be continued through all phases of the Project, with modification through the licensing and provincial permitting processes, as required. ▪ Evaluate the effectiveness of mitigation measures and modify or enhance as necessary through monitoring and developing updated mitigation measures, if needed.	TSD XXI, Section 4.3.3

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						subsequent hazard quotients were not calculated for the air pathway. 2. The intent of Draft EIS Section 7.2 (Air Quality) is to present the air modelling results; the interpretation of these results is provided in Draft EIS TSD XXI. Therefore, Table 7A-114 in Draft EIS Appendix 7A (Air Dispersion Modelling Report) presents the predicted metals concentrations during the Operations Phase but does not present the air quality criteria used in the screening assessment in the ERA. These criteria are presented in Table 4-6 in Draft EIS TSD XXI and are health and environment based. The TRVs were not presented for air constituents since no air COPCs progressed passed the screening phase of the ERA; therefore, hazard quotients were not calculated for the air pathway. No changes are proposed in the revised EIS to address this IR.		concerns with this approach are discussed further in *Table 2: Review of NexGen Responses to Annex 2 - FIRT Advice to the Proponent* (HC-1). Uncertainty with the rationale used for screening these substances out for further assessment has the potential to underestimate potential health risks from the project. Providing an up-to-date quantitative risk assessment for the anticipated NO_2, particulate matter, and uranium (Chemical Risk) emissions generated by the project and project activities, which considers site specific receptors, exposure, and appropriate reference values, would characterize potential health risks, reduce uncertainty, and strengthen the assessment. Please see the *Advice to the Proponent (Table 2)* for further discussion on the use of CAAQS, particularly in the context of NO_2 which HC considers a non- threshold contaminant, meaning that health effects may occur at any level of exposure.			▪ Identify unanticipated negative effects, including possible accidents and malfunctions. With respect to NO_2, in addition to the discussion provided in Section 4.3.3.3.1 of Draft EIS TSD XXI, further information in response to the part 1 through part 3 of this IR is included in Attachment IR 69-R1. In summary, while comparison of modelled predictions at or beyond a facility boundary to Canadian Ambient Air Quality Standards (CAAQS) is not appropriate (CCME 2012, CCME 2020a,b), a screening exercise was conducted for information purposes only that shows there would be infrequent exceedances of the 1-hour NO_2 threshold. While there could be potential effects to sensitive human receptors, these effects would be short-term and subside shortly after exposure. Additionally, air quality model predictions are inherently overestimated as several conservative assumptions were made to ensure that effects were not underestimated. In consideration of these factors, significant adverse effects are not predicted to human health and further quantitative assessment of NO_2 is not warranted. NexGen will provide additional context regarding the comparison of predicted Project NO_2 emissions to the CAAQS to Section 4.3.3 of revised EIS TSD XXI (Environmental Risk Assessment) for information purposes; however, no other changes are required. With respect to PM, NexGen notes that Section 4.3.3.3.2 of Draft EIS TSD XXI provides context to support the conclusion that further quantitative assessment is not required. The assessment showed that the 24- hour criteria for PM with a diameter of 10 microns or less (PM_{10}) and $PM_{2.5}$ are exceeded during Construction and Operations at the fence line and camp location; however, frequency of exceedances are low (2.7% and 0.5%, respectively) and the annual criteria are not exceeded. It is acknowledged that some individuals may experience respiratory symptoms, but symptoms would be reversible and subside shortly after exposure (Draft EIS TSD XXI, Section 4.3.3.3.2). Additionally, air quality model predictions are inherently overestimated as several conservative assumptions were made to ensure that effects were not underestimated. In consideration of these factors, significant adverse effects are not predicted to human health and further quantitative assessment of PM is not warranted. With respect to uranium, Section 4.3.3.3.3 of Draft EIS TSD XXI provides context to support the conclusion that further quantitative assessment of uranium was not required. From a radiological perspective, uranium was quantitatively assessed in the multi-pathways assessment in Section 5.2.4 of Draft EIS TSD XXI. From a non-radiological perspective, uranium in PM_{10} marginally exceeded the 24-hour criterion but did not exceed the annual criterion at the fence line or Project camp location during Operations. The 24-hour uranium criterion is converted from the annual Ontario criterion to allow for comparison; the health effects are based on chronic effects to kidneys. Since the predicted maximum concentrations did not exceed the annual screening value, from a non-radiological risk perspective, unacceptable levels of risk for human and ecological health are not expected from the occasional exceedances of the 24-hour value.	
70	CNSC	Geology	Section 8.3.1	**Context:** Section 8.3.1 provides a brief description of Bedrock Geology with a statement that “Additional details on the bedrock geology can be	Provide NexGen 2021a Geology Baseline Report.	NexGen will include the Geology Baseline Report as a new document in the revised EIS (i.e., Annex XI). NexGen maintains that geology should not be considered as a valued component (VC) in the EA. As	Annex XI (new)	CNSC staff request that NexGen include a justification for the exclusion of geology as a valued component within the EIS. As planned, the project will result in the creation of a disposal	70-R1		As noted in the initial response to the original IR, NexGen maintains that geology should not be considered as a valued component (VC) in the EA as, among the other reasons stated, geology does not have an assessment endpoint (Draft EIS Section 6.3.2 [Assessment Endpoints	n/a

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				found in the Geology Baseline Report (NexGen 2021a)." However, the Geology Baseline Report was not provided. **Rationale:** Information about the geological environment is not sufficiently documented in the EIS especially for a new mine proposal that also proposes to develop an underground TMF. REGDOC 2.9.1 appendices describe the expected geological information to be assessed - B.4.1 baseline geological information; and C.4.1 on the description of any changes to the geology as a result of the project. In addition, the EIS does not assess the geology as a valued component for the Project with no justification for its exclusion.	Assess the geology as a valued component or justify its exclusion as a valued component.	described in Draft EIS Section 6.3.1 (Valued Components), VCs are aspects of the biophysical, cultural, and socio-economic environments considered to have scientific, social, cultural, economic, historical, archaeological, or aesthetic importance. The selection of appropriate VCs focuses the EA on those aspects of the biophysical, cultural, and socio-economic environments that are of greatest importance to both society and species conservation. Key factors considered when selecting the list of VCs for the proposed Project included: ▪ potential for interaction with the Project and degree of interaction, including presence, abundance, and amount of spatial overlap of a VC with the Project; ▪ sensitivity of a VC to potential Project effects and level of damage or harm that could be realized should an adverse effect occur; ▪ species conservation status or concern (e.g., rarity, sensitivity, uniqueness); ▪ Indigenous and Local Knowledge; and ▪ ecological and socio-economic/cultural value to communities, government agencies, and the public. Selected VCs were primarily aspects or elements of biological and human environments; VCs did not represent physical aspects or disciplines of the biophysical environment (e.g., air quality, groundwater, surface water) except for climate change (i.e., greenhouse gases), which was selected as a VC based on the importance of climate change to federal and provincial governments and Indigenous communities. It is important to note that VCs are associated with assessment endpoints or significance criteria, while physical elements of the environment do not have assessment endpoints (Draft EIS Section 6.3.2 [Assessment Endpoints and Measurement Indicators]; Draft EIS Section 6.3.3 [Intermediate Components]). This note is important because the significance of changes to physical elements, such as geology, can only be evaluated in context of how those changes affect VCs such as fish, vegetation, wildlife, and people, which are the ultimate receptors of concern. For these reasons, geology was not selected as a VC; however, geology is a key aspect of the hydrogeological assessment. The geological model for the Project contributed to defining hydrostratigraphic units (i.e., geological formations characterized by hydraulic properties). The characteristics defining the hydraulics of each hydrostratigraphic unit included hydraulic conductivity (i.e., ability of water to move through rock), porosity of rock types (i.e., ratio of voids to rock volume), degree of weathering through chemical and mechanical degradation of the rock, natural fracture and foliation (i.e., folding) planes, and shear zones (Draft EIS Section 8.2.6.2 [Hydrostratigraphy]). The hydrogeological assessment provided important supporting information to the assessments of aquatic and terrestrial ecosystems (e.g., surface water quality and sediment quality, fish and fish habitat, vegetation, wildlife and wildlife habitat) and the human environment (e.g., Indigenous land and resource use, human health). Besides the inclusion of the Geology Baseline Report, no changes are proposed in the revised EIS to address this IR.		facility (the underground tailings management facility – and the waste rock); geology has been included as a VC in the environmental assessments for other disposal projects as an important aspect of the physical environment (and expected to form a key part of the disposal system description in the documentation of the safety case for disposal); thus staff's request for further explanation.			and Measurement Indicators]; Draft EIS Section 6.3.3 [Intermediate Components]). This aspect is important because the significance of changes to physical elements, such as geology, can only be evaluated in context of how those changes affect VCs such as fish, vegetation, wildlife, and people, which are the ultimate receptors of concern. Although NexGen maintains that it would not be appropriate to include geology as a VC in the EA, NexGen agrees with the reviewer regarding the importance of ensuring that changes in the geological environment as a result or Project activities are properly considered in the context of effects on VCs and confirms that these effects have been appropriately assessed in the Draft EIS. As noted by the reviewer, a key Project activity would include the disposal of cemented paste tailings in an underground tailings management facility (UGTMF). While there are several benefits associated with the storage of tailings in a UGTMF (e.g., smaller surface footprint, reduced potential effects to groundwater, lower surface water management requirements) (Draft EIS Section 4.5.6.2 [Tailings]), adverse effects could still occur through the hydrogeological environment, which could ultimately affect VCs. In addition, waste rock storage on surface in waste rock storage areas (WRSAs) could affect the hydrogeological and surface water environments. NexGen confirms that potential Project effects from the UGTMF and WRSAs on the hydrogeological environment were assessed in Draft EIS Section 8 (Hydrogeology), with outcomes of the assessment further considered in the aquatic and terrestrial ecosystem, human health, Indigenous land and resource use, and other land and resource use assessments (Draft EIS Section 8.1 [Introduction], Figure 8.1 3). Specifically, Pathway HG-04 (Seepage from the UGTMF and backfilled production stopes after Closure), Pathway HG-02 (Seepage from the WRSAs during Construction, Operations and Closure), and Pathway HG-03 (Seepage from the WRSAs after Closure) (Draft EIS Section 8.4.3 [Primary Pathways]) were assessed in Draft EIS Section 8.5.1.2 (Groundwater Quality), which included specific consideration of solute mass loading rates to Patterson Lake. Results from this assessment were then considered in the surface water quality and sediment quality assessment (Draft EIS Section 10), with outputs then being further considered in determining the effects to fish and fish habitat (Draft EIS Section 11), vegetation (Draft EIS Section 13), wildlife and wildlife habitat (Draft EIS Section 14), human health (Draft EIS Section 15), Indigenous land and resource use (Draft EIS Section 16), and other land and resource use (Draft EIS Section 17) VCs. Potential Project effects from the UGTMF and WRSAs on the surface water environment were assessed in Draft EIS Section 10, with outcomes of the assessment further considered in the fish and fish habitat, terrestrial ecosystem, human health, Indigenous land and resource use, and other land and resource use assessments (Draft EIS Section 10.1 [Introduction], Figure 10.1 3). Specifically, Pathway SWQ-05 (Seepage from the WRSAs during Construction and Operations) and Pathway SWQ-06 (Runoff and seepage from the WRSAs and UGTMF following Closure) (Draft EIS Section 10.4.3 [Primary Pathways]) were assessed in Draft EIS Section 10.5.1 (Application Case), which included specific consideration of a far-future scenario where effects were predicted for a period of time long after Project surface water management infrastructure such as water treatment would be removed. Outputs from the surface water quality	

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						References NexGen (NexGen Energy Ltd.). 2021. Geology Baseline Report for the Rook I Project. Prepared by NexGen Energy Ltd. June 2021.					assessment, including the far-future scenario, were then further considered in determining the effects to fish and fish habitat (Draft EIS Section 11), vegetation (Draft EIS Section 13), wildlife and wildlife habitat (Draft EIS Section 14), human health (Draft EIS Section 15), Indigenous land and resource use (Draft EIS Section 16), and other land and resource use (Draft EIS Section 17) VCs. In addition to potential adverse chemical effects associated with the UGTMF and WRSAs, the Project has the potential to result in changes to surficial geology and the aboveground and underground geologic environments; both of these topics are discussed in the Draft EIS. Existing surficial and underground geologic conditions are presented in Draft EIS Section 5.3.3.2 (Geotechnical Conditions). Overall, eight subsurface geologic units and three basement geologic units exist in the area of the Project (Draft EIS Section 5.3.3.2, Table 5.3-2 and Table 5.3-3, respectively). In general, geotechnical conditions in the area of the Project are characterized by up to 75 m of dense to very dense sedimentary layers underlain by very competent basement rock extending to below the Arrow deposit. The understanding of surficial and underground geology has allowed NexGen to appropriately design the surface and underground developments and infrastructure. Effects to surficial geology were assessed in Draft EIS Section 12 (Terrain and Soils), with outcomes of the assessment further considered in the aquatic and terrestrial ecosystem, human health, Indigenous land and resource use, and other land and resource use assessments (Draft EIS Section 12.1 [Introduction], Figure 12.1 3). Specifically, Pathway TS-01 (Alteration of soil and terrain conditions) (Draft EIS Section 12.4.3 [Primary Pathways]) was assessed in Draft EIS Section 12.5.1.1 (Quantity and Distribution of Terrain Units), which included specific consideration of the potential permanent changes to terrain. Outputs from the terrain and soils assessment were then further considered in determining the effects to fish and fish habitat (Draft EIS Section 11), vegetation (Draft EIS Section 13), wildlife and wildlife habitat (Draft EIS Section 14), human health (Draft EIS Section 15), Indigenous land and resource use (Draft EIS Section 16), and other land and resource use (Draft EIS Section 17) VCs. Considerations related to the long-term geotechnical conditions of the WRSAs and the underground mine workings (including the UGTMF) were expressed in Draft EIS Section 5 (Project Description) and have formed key aspects of Project design. A goal of Project reclamation is to establish a landscape that is stable under a natural disturbance regime typical for the Project location (Draft EIS Section 5.3.2 [Design Objectives and Guiding Principles]). Both the PAG WRSA and NPAG WRSA would be constructed with side slopes of 4H:1V (Draft EIS Section 5.5.2.4 [Mine Rock Management]), which would facilitate long-term geotechnical stability. Regarding the stability of crown pillars, or the vertical distance between the unconformity and the uppermost production and UGTMF stopes, empirical stability assessments using the scaled span method (Carter, 2008; Carter, 2014) were conducted. The uppermost underground production stope crown pillars are rated as either Class F (0.5% to 1.5% chance of failure; public access allowed) or Class G (<0.5% chance of failure; free public access). Probability of failure of the crown pillars above the production stopes would be further	

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											reduced as the stopes would be backfilled with cemented paste backfill (CPB), which would consist of neutralized leached residue, water, and binder mixed in various ratios to meet appropriate geotechnical strength requirements (Draft EIS Section 5.4.3.1 [Paste Plant]). The UGTMF stopes would be rated as Class G as a result of the existing geotechnical conditions of the surrounding basement rock; these stopes would be backfilled with the CPB and cemented paste tailings, which, as with CPB, would contain a binder to promote structural strength (Draft EIS Section 5.5.2.3 [Tailings Management]). Overall, potential subsidence is not expected due to the combination of low failure probabilities and the backfilling of both underground production and UGTMF stopes, which would facilitate long -term geotechnical stability. As noted by the reviewer, a mine waste safety case is being completed for the Project in accordance with federal licensing requirements. The mine waste safety case will focus on the UGTMF and WRSA disposal systems. The purpose of the mine waste safety case will be to verify that proposed disposal of mine waste from the Project is safe and meets applicable regulatory requirements. Key considerations within the mine waste safety case that are linked to geology will include consideration of constituent of potential concern (COPC) mobility from and long term structural integrity of the UGTMF and WRSAs. As described in the text above, these aspects have been considered in Project design and/or the Draft EIS (i.e., Section 5, Section 8, Section 10, and Section 12), with results of these assessments being forwarded for determination of effects to multiple VCs. In summary, while geology is not considered as a VC within the Draft EIS, the aspects of geology that could potentially result in effects to VCs (i.e., chemical loadings to the environment from the UGTMF and WRSAs, permanent changes to surficial geology, and other aspects of the geologic environment) have been thoroughly assessed. For this reason, no further assessment of geology is necessary and no changes to the revised EIS are required. **<u>References</u>** Carter TG, Cottrell BJ, Carvalho JL, Steed CM. 2008. Logistic regression improvements to the scaled span method for dimensioning surface crown pillars over civil or mining openings. Proceedings from the 42nd US Rock Mechanics Symposium, San Francisco. Carter T. 2014. An update on the scaled span concept for dimensioning surface crown pillars for new or abandoned mine workings. Environmental Science.	
71	ECCC	Fish and fish habitat	Section 9.2.3 Section 9.2.6 Section 9.3.2 Appendix 9A	**Context**: In Section 9.2.3 Spatial Boundaries of the EIS it is stated “There are five larger lakes in the Local Study Area (LSA) including Broach, Patterson, Forrest, Beet and Naomi lakes, as well as several smaller waterbodies including Lake G, Lake H, and wetlands.” It is clearly stated that there are wetlands present within the LSA, and at least two wetlands can be seen within the Project footprint in Section 9.1 Figure 9.1-4 pg. 1337 of the EIS. The location of these wetlands within the Project	Provide baseline information regarding wetland characterization within the LSA, including: locations, wetland type, size, water surface elevation, depth, water flow pathways, and the presence of wildlife receptors including presence of fish/fish habitat within the main body of the EIS. Provide further information on mitigation measures and monitoring that would be applied for the protection of wetlands. If this information is available in annexes or technical supporting documents, summarize it	Baseline information regarding wetland ecosystem characterization is provided in Draft EIS Section 13.3.2 (Wetland Ecosystems). Table 13.3-3 in Draft EIS Section 13.3.2.1 (Ecosystem Availability) lists the wetland size and type (defined as wetland Ecological Land Classification [ELC] units) within the local study area (LSA) and regional study area (RSA). Figure 13.3-3 and Figure 13.3-4 in Draft EIS Section 13.3.2.2 (Ecosystem Distribution) show wetland ecosystems and rare plant species in the RSA and LSA, respectively. Additional baseline information is also provided in Section 6.3 of Draft EIS Annex VII.1 (Vegetation Baseline Report 1 [Mapping]).	n/a	**Context:** The Proponent has provided the requested wetland baseline characterization information. However, the Proponent has not incorporated the information into the Draft EIS Section 9 on hydrology, identifying potential hydrological effects to wetlands as a Project pathway, including mitigation measures and monitoring. In Section 9.2.2.2 Measurement Indicators, wetlands are briefly mentioned as being captured under the umbrella term “waterbodies” for the	71-R1	Incorporate specific information regarding the analysis of potential hydrological related effects to wetlands within the LSA and RSA into Section 9 of the Draft EIS. Assess potential impacts of Project-related activities to measurement indicators (i.e. waterbody surface elevation, watercourse flow rates, stream channel parameters, and fluvial sediment transport) for wetlands including updated sediment transport modelling as required to the hydrological assessment of wetlands.	NexGen confirms that the assessment requested by the reviewer is provided in the Draft EIS. NexGen notes that the focus of Draft EIS Section 9 (Hydrology) is to provide a description of Project effects and cumulative effects, including consideration of reasonably foreseeable developments, on the hydrology intermediate component. Information regarding changes to valued components (VCs) due to changes to the hydrological environment has been appropriately considered in the relevant discipline assessments. For the wetland ecosystem VC, the assessment is provided in Draft EIS Section 13 (Vegetation).	n/a

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				footprint, as well as the other wetlands existing within the LSA can be confirmed from Annex V11.2: Vegetation Baseline Report 2 (Inventory, Rare Plants and Wetlands), including the wetland classifications. However, beyond the above statement from Section 9.2.3, there is no consideration of wetlands or potential effects to wetland hydrology throughout the remainder of the hydrological assessment and hydrological modelling. Potential effects to flow rates, water levels or sediment transport to wetlands within the LSA are not considered. **Rationale:** There is currently not enough information provided for ECCC to provide advice on the potential risks of the proposed Project to wetland hydrology within the LSA. This pathway of effects is important to assess in terms of potential effects to wetland habitat availability due to changes in flow rates, water levels and sediment transport, and potential effects to terrestrial and aquatic receptors. It is necessary to evaluate if draw down from mine dewatering or changes in surface water runoff flows and routing will affect water levels and habitat availability within wetlands.	within the main body of the EIS with references to respective documents for review.	For riparian wetlands, water surface elevation (WSE) is anticipated to be strongly influenced by the WSE of adjacent waterbodies since the overburden at surface is highly permeable. Consequently, for riparian wetlands adjacent to waterbodies such as Patterson Lake or Lake G, the WSE in the wetland is expected to be primarily controlled by the WSE of the adjacent waterbody. For the purposes of the EA, it is assumed that these wetlands represent fish habitat; however, the Project is not anticipated to result in disturbance to riparian wetlands. While also not currently expected to be disturbed under the existing Project design, there is one isolated wetland perched on a hillslope in ELC unit BP19(BU) – Black spruce treed bog (Burned). This wetland is located adjacent to the existing exploration access road, approximately 30 m in elevation above Patterson Lake, and is the only wetland located in the LSA that is not a riparian wetland. This perched wetland is not expected to be an area of groundwater discharge under current conditions or during the Project lifespan. This perched wetland is also not expected to serve as fish habitat as it is not connected hydrologically to any fish-bearing waterbodies or watercourses and is only expected to hold ponded water for a short period of time each year during spring freshet. Wildlife that may use wetlands in the LSA and RSA are listed in Table 14.2-1 of Draft EIS Section 14.2.2 (Valued Components, Measurements Indicators, and Assessment Endpoints) and include, but are not limited to, muskrat, rusty black bird, mallard, yellow rail, and Canadian toad. Muskrat, rusty blackbird, mallard, and Canadian toad were detected during baseline surveys. Information on mitigation measures that would be applied for the protection of wetlands is included in Draft EIS Section 10.4 (Project Interactions and Mitigations), Draft EIS Section 11.4 (Project Interactions and Mitigations), Draft EIS Section 13.4 (Project Interactions and Mitigations), Draft EIS Section 14.4 (Project Interactions and Mitigations), and Draft EIS Appendix 23A (Summary of Project Environmental Design Features and Mitigation Measures). Monitoring of three LSA wetlands is discussed in Draft EIS Section 13.7 (Monitoring, Follow-Up, and Adaptive Management) and Draft EIS Appendix 23B (Environmental Assessment Monitoring and Follow-Up Programs Proposed for the Project) and this monitoring would be included in the Environmental Monitoring Plan developed as part of federal licensing to confirm the predictions of negligible effects to wetlands. As the requested baseline and mitigation measure information is presented within the Draft EIS, no changes are proposed in the revised EIS to address this IR.		hydrological assessment of waterbody surface elevation. Information on wetlands is not provided for any of the other measurement indicators. In Section 9.2.3 Spatial Boundaries the Regional Study Area (RSA) and Local Study Area (LSA) are defined, however, wetlands are not discussed in this section. The Proponent confirms there are several riparian wetlands adjacent to the lakes in the LSA assumed to be fish habitat, and one isolated non-riparian wetland that is not hydrologically connected to fish-bearing waters These wetlands are located within the LSA and additional information should be provided to allow for an assessment of potential impacts of Project- related activities to aquatic receptors including fish and fish habitat, species at risk, and migratory birds. In Section 9.2.6.1 Baseline Hydrology Monitoring and Studies, no specific baseline information is provided for wetlands. However, in Section 9.2.6.2 Hydrological Modelling of Water Surface Elevation and Flow Rates, some input data and parameterization of hydrological processes for wetlands were incorporated. In the following Section 9.2.6.4 Fluvial Sediment Transport, there is no mention of incorporating wetland data into the sediment transport modelling. In Section 9.3.2 Hydrographic Setting, the lakes in the RSA and LSA are described, but there is no mention of any wetlands connected to these lakes, and none are identified. Throughout the remainder of Section 9 there is no explicit mention of wetland hydrology in the modelling results, evaluation tables of potential adverse effects pathways for hydrology, residual effects analysis or mitigation measures and monitoring. The Proponent states in their response that waterbody surface elevation in wetlands will be strongly influenced by adjacent waterbodies and that the isolated wetland is not likely to be influenced by project activities. However, no information has been provided about the other measurement indicators: watercourse flow rates, stream channel parameters, and fluvial sediment transport. Watercourse flow rates and stream channel parameters may not be as applicable to wetlands; however, wetlands are often depositional areas for sediment and the fluvial sediment transport measurement indicator has not been adequately assessed for impacts to wetlands. For example, the fluvial sediment transport analysis throughout Section 9 focuses on erosion from the Clearwater River below Patterson Lake Upper Reach to the northern end of			The assessment of potential Project effects on wetland ecosystems due to changes to the hydrological environment is discussed in Draft EIS Section 13.4.2 (Secondary Pathways); specifically, in Pathway ID V-08 (Surface water flow changes). Pathway ID V-08 considered changes in: ▪ surface water levels, flows, and drainage areas that can affect soils and the availability, distribution, and condition of wetland ecosystems; and ▪ surface water levels and flows that can alter waterbodies and watercourses and affect the availability, distribution, and condition of wetland ecosystems. Overall, a net discharge of water to Patterson Lake from Project activities is expected to create small changes such as increasing water surface elevation by 5 cm, increasing flows in the Clearwater River downstream of Patterson Lake by less than 5%, and changing stream channel parameters (i.e., wetted area) by less than 1%. Erosional losses in the Clearwater River Upper Reach and subsequent sediment deposition in the lower reach may increase by a non-detectable margin. Therefore, sediment deposition would not result in changes to the physical environment of the Clearwater River below Patterson Lake or the adjacent riparian wetland. Surface water in the receiving environment downstream of the Project would be protected and managed through the Environmental Monitoring Plan, which would include monitoring surface water levels and flows. As a result, the Project could result in minor alterations to the availability, distribution, and condition of wetland ecosystems. However, the changes are predicted to have a negligible residual effect on the wetland ecosystem VC (Draft EIS Section 13.4.2). As noted in NexGen's initial response to the original IR 71, there is one isolated non-riparian wetland perched on a hillslope in ELC unit BP19(BU) – Black spruce treed bog (Burned). This wetland is located adjacent to the existing exploration access road, approximately 30 m in elevation above Patterson Lake, and is the only wetland located in the LSA that is not a riparian wetland. This perched wetland is neither expected to be disturbed by the Project nor to be an area of surface water or groundwater discharge under current conditions or during the Project lifespan. Therefore, Project effects to this wetland are not anticipated. As an analysis of potential hydrological related effects to wetlands is appropriately presented in Draft EIS Section 13, no additional context is required in Draft EIS Section 9.	

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								Forrest Lake. According to Section 13.3.2.2 Wetland Ecosystem Distribution Figure 13.3-3, this area is predominantly riparian wetland. While the predicted changes in sediment transport and deposition are low, there are no references to the wetland habitat in this area throughout the results for hydrology in Section 9 of the EIS. **Rationale:** To assess potential impacts of Project-related activities to measurement indicators (i.e. waterbody surface elevation, watercourse flow rates, stream channel parameters, and fluvial sediment transport) for wetlands and determine potential impacts to aquatic receptors, additional information is needed. Additional details provided should include specific information on wetland hydrology in the modelling results, evaluation tables of potential adverse effects pathways for hydrology, residual effects analysis, mitigation measures and monitoring.				
74	ECCC	Fish and fish habitat	Section 9.5	**Context:** In Table 9.5-2 pg. 1401 H-06 for culverts, the Proponent states that the design cross drainage maximum flow was considered for a 24-hour 100-year event. No rationale was provide for the selection of the maximum instantons flow used for culvert design. **Rationale:** Culverts function primarily as hydraulic conduits but serve the dual purposes of functioning as hydraulic structures as well as acting as load bearing structures. As a result, the amount of precipitation becomes secondary to the intensity of precipitation. Considering the lifetime of the Project, a 100-year return period is not considered conservative. A risk analysis for a shorter event duration and longer return period should be considered for precipitation intensities.	Provide rationale for the selection of the 24-hour 100-year maximum flow used for culvert design considering both the lifetime (i.e., 43 years) of the Project and the likelihood of an extreme precipitation event occurring.	Design flow ratings and capacity for the on-site culverts would meet the Saskatchewan Environment and Resource Management *Construction Guidelines for Pollution Control Facilities at Uranium Mining and Milling Operations* (SERM 2000) requirements for conveyance structures (i.e., ditches and swales), and are planned as follows: ▪ Design capacity: o 1:100-year, 24-hour storm event; or o where overflow would be a reportable spill, culverts would be sized for the 24-hour probable maximum precipitation (PMP) event. ▪ Factor: 1.2 increase multiplier applied in design flow to allow for reduced culvert area from silting. ▪ Culvert material: corrugated steel or high-density polyethylene (HDPE) pipe. ▪ Minimum culvert diameter: 400 mm. ▪ Minimum culvert longitudinal slope: 0.50%. ▪ Erosion protection: rip-rap cobbles, armouring, or equivalent. The design of existing culverts on the access road to a 1:100-year 24-hour storm event meets the design standard for primary access roads in Saskatchewan (MHI 2014). This design standard would be maintained during the Project lifespan. NexGen notes that there is a 35% probability that the 43-year life of the Project will include an event of 100-year return period (TAC 2004). Further rationale for the selection for the design event used for culvert design will be provided to the CNSC and Saskatchewan Ministry of Environment in the Environmental Protection Program and supporting documentation (e.g., water management processes) required as part of permitting and licensing processes for the Project. **<u>References</u>**	n/a	**Context:** In Table 9.5-2 pg. 1401 H-06 for culverts, the Proponent states that the design cross drainage maximum flow was considered for a 24-hour 100-year event. The Proponent's response indicates that this meets a provincial guideline that cannot be located (SERM, 2000). The Proponent also erroneously states that the 100-year 24-hour storm event meets the design standard for a "primary access road" in Saskatchewan Ministry of Highways and Infrastructure (MHI) (2014). MHI (2014) does not use the term "primary access road" but does recommend the use of an instantaneous peak flow for culverts and a 100-year return period in cases where an area would be isolated by a hydraulic failure (PDF page 80 in MHI, 2014). The Proponent also indicates there is a 35% probability that the culverts will encounter a discharge event above their design in the 43 years planned for the Project. A storm above design can lead to failure of the culvert in various ways: road washout, overtopping, erosion, and sediment deposition downstream. The Proponent clarifies that culverts where overflow would be a reportable spill will use the higher 24-hour probable maximum precipitation (PMP). The Proponent does not comment on the choice of a 24-hour storm event, despite the likelihood that the time of concentration of the relatively small upstream areas would be much shorter than 24 hours. The rainfall intensity for shorter duration storms of the same	74-R1	1. Provide a rationale for the selected 24-hour storm duration. 2. Given that a storm event above design will affect all the culverts on site, discuss the potential impacts of a storm above design. Describe how the probability of a storm above design (35% over the life of the project) is incorporated into the description of significance of potential impacts. If there are potential impacts, describe any potential mitigations. 3. Describe how culverts at risk of "reportable spill" will be identified. 4. If the storm duration is reduced in line with the likely time of concentration for the site, provide clarity on if the design values will be adjusted for both the regular culverts (100-year return period) and the "reportable spill" culverts (PMP).	NexGen has provided the information below to address part 1 through part 4 of IR 74-R1. 1. NexGen confirms there are two design capacities listed in the Draft EIS for surface drainage facilities: the maximum flow resulting from the 1:100-year, 24-hour storm event (i.e., 89.4 mm) and the maximum flow resulting from the 24-hour probable maximum precipitation (PMP) storm event (i.e., 489.2 mm). The 1:100-year, 24-hour rainfall event and 24-hour PMP both represent the total precipitation falling over a 24-hour period. The storm classifications established for the design of surface drainage facilities are based on precipitation intensity, duration, and frequency (i.e., return period or annual exceedance probability). The 24-hour duration of design storms was applied because 24 hours allows for representation of both total extreme event volume and peak runoff conditions. Based on other mesoscale convective complex storms observed in the region, the bulk of the 24-hour storm event would be concentrated in an 8-to-12-hour period. Also, SERM (2000) specifically references the 24-hour duration PMP for structures such as ponds that could contain contaminated water. Although SERM (2000) does not provide a duration for the 100-year storm event to be considered for ditches and swales, a consistent approach timeframe of 24 hours was adopted for design criteria development. NexGen maintains that the rainfall intensity during the 24-hour period is appropriate because, when distributed over time for application during Project design, it includes constituent time increments with elevated rainfall intensity. When translating the design storm to a design flood, the design storm is temporally distributed using a storm distribution hyetograph (i.e., a graphical representation of the distribution of rainfall intensity over time) and mass curve (i.e., a graphical representation of the accumulated rainfall over time) to establish the rainfall intensity at the constituent time increments within the 24-hour period. The reviewer is correct that rainfall	n/a

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						MHI (Saskatchewan Ministry of Highways and Infrastructure). 2014. Hydraulic Manual. Accessed February 2021. Available at http://www.highways.gov.sk.ca/business SERM (Saskatchewan Environment and Resource Management). 2000. Construction Guidelines for Pollution Control Facilities at Uranium Mining and Milling Operations. In draft. October 2000. TAC (Transportation Association of Canada). 2004. Guide to Bridge Hydraulics 2nd Edition. Pp 181.		return period is higher; the design discharge for a shorter duration storm would be higher as well. **Rationale:** Culverts function primarily as hydraulic conduits but serve the dual purposes of functioning as hydraulic structures as well as acting as load bearing structures. As a result, the amount of precipitation becomes secondary to the intensity of precipitation. Considering the lifetime of the Project and the negative consequences of a culvert failure, a 100-year return period is not considered conservative. A risk analysis should be performed considering different rainfall intensity-duration-frequencies (IDF), including higher intensity, shorter duration rainfall events. **References:** SERM (Saskatchewan Environment and Resource Management). 2000. Construction Guidelines for Pollution Control Facilities at Uranium Mining and Milling Operations. In draft. October 2000. [link unavailable] MHI (Saskatchewan Ministry of Highways and Infrastructure). 2014. Hydraulic Manual. Accessed December 2023. Available at Publications Centre (saskatchewan.ca)			intensities may exceed the return period rainfall rate provided by the published Intensity Duration and Frequency (IDF) curve (i.e., 3.7 mm / hour). The reviewer is also correct that the time of concentration is in many cases less than 24 hours and that a shorter storm duration would be accompanied by higher rainfall intensities that could result in increased flood peaks. NexGen confirms that both of these issues will be addressed during the translation of design storm to design flood during subsequent phases of Project detailed design. Design flow ratings and capacities for the on-site culverts would meet applicable guidelines and codes of practice such as the Environment Canada Environmental Code of Practice for Metal Mines (EC 2009) recommendations for designing surface drainage facilities for extreme weather events and the Saskatchewan Environment and Resource Management Construction Guidelines for Pollution Control Facilities at Uranium Mining and Milling Operations (SERM 2000) guidelines for conveyance structures (i.e., ditches and swales). The EC (2009) recommendation for surface drainage facilities is to handle peak conditions at least equivalent to the once in 100-year flood event. The SERM (2000) guideline includes reference to the 1:100-year storm event as a general Water Management Design Criteria for ditches and swales and other structures; where overflow could have deleterious effects on the downstream environment in the event of overtopping or rupture, other facilities (i.e., ditches, swales, and culverts) should be sized for the 24-hour PMP event (SERM 2000). NexGen notes that the reviewer was unable to access SERM (2000). For this reason, SERM (2000) has been provided as Attachment IR 74-R1. 2. NexGen notes that the potential for a storm above design is not probable for culverts designed for the maximum flow resulting from a 24-hour PMP event; therefore, potential environmental effects associated in this regard are not anticipated. As detailed in part 3 of this IR response, these culverts would include those that could contain potentially deleterious substances or where a breach of design could lead to run-on to critical facilities or external loss of containment. A storm event above the 24-hour, 1:100-year design storm could exceed the design capacity for ditches and culverts designed to the 1:100-year, 24-hour storm event. However, as discussed in part 3 to this IR response, this would only apply to culverts located along ditches that convey water from catchments that intercept non-mineralized water and could not potentially affect surface water management infrastructure that contains potentially deleterious substances. Therefore, adverse effects to the environment are not anticipated. Mitigation measures would include inspection and maintenance of road embankments, ditches, and cross-drainage structures and the implementation for a Project-specific Environmental Protection Program and a Project-specific Environmental Monitoring Plan. NexGen would also explore potential additional mitigation measures during future phases of Project design, if necessary. 3. NexGen confirms that a 24-hour PMP criterion was adopted for culvert design capacity where an overflow could result in a release of deleterious substances such	

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											as mineralized contact water to the downstream environment. As part of ongoing engineering design, culverts where overflow could have deleterious effects and where a 24-hour PMP would be adopted have been identified as follows: a. Culverts located along ditches conveying water from catchments that intercept mineralized contact water. b. Culverts situated near the margins of the site conveying non-mineralized contact water where failure could lead to external loss of containment (i.e., result in off-site environmental effects). c. Culverts located along ditches or swales conveying non-contact water that run adjacent to critical facilities and where failure could affect the integrity of containment (e.g., at the toe of a containment dyke) or where failure would result in run-on to a critical facility. NexGen notes that a 1:100-year, 24-hour storm event criterion was adopted for culverts located along ditches that convey water from catchments that intercept non-mineralized water and would not potentially affect surface water management infrastructure that contains potentially deleterious substances. 4. NexGen notes that for the reasons stated in part 1 of this IR response, the storm duration will not be reduced. The design capacities listed in the Draft EIS are either the 24-hour PMP or the 1:100-year, 24-hour storm event. In each case, the 24-hour 100-year design storm and 24-hour PMP references the total precipitation falling over the 24-hour period. The adoption of a 24-hour period is important to allow for representation of both total extreme event volume and peak runoff conditions. No changes are proposed to the revised EIS with respect to this IR. **<u>References</u>** EC (Environment Canada). 2009. Environmental Code of Practice for Metal Mines. 1/MM/17. ISBN 978-1-100-11901-4. 108 pp. MHI (Saskatchewan Ministry of Highways and Infrastructure). 2014. Hydraulic Manual. Accessed December 2023. Available at https://publications.saskatchewan.ca/#/home. SERM (Saskatchewan Environment and Resource Management). 2000. Construction Guidelines for Pollution Control Facilities at Uranium Mining and Milling Operations. In draft. October 2000.	
75	ECCC	Fish and fish habitat	Section 9.6 Section 9.7 Annex IV.2, Section 5.3.1	**Context:** Rating curves represent an approximation of the stream discharge at a location based on the water levels. This allows the estimation of streamflow from continuous water levels that are relatively easy to measure. Inconsistencies with best practices (WSC, 2016) used in developing the rating curves, as well as some general inconsistencies, led ECCC to question their accuracy (Section 5.3.1 of Annex IV.2 Hydrometric Monitoring Characterization Report). Specifically:	1.Explain why the rating curve formulae for stations CR-WC-MS-02 and CR-WC-MS-06 do not match the plotted lines, specify where this data was used further, and if applicable, discuss effects of correcting the formulae. 2. Provide justification for the use of different methods for determining rating curves at different sites, detailing how they are comparable. 3. Clarify if the comment in the text regarding measurements below the open water rating curve in May and	Responses to each of the numbered parts of this IR are provided below. However, the following information is noted as being relevant to all of these IR parts: ▪ Additional monitoring in the years since 2020 has improved approaches to and understanding of rating curve development at the watercourse hydrometric stations. Through this process, rating curves have been improved and the observed hydrographs updated. ▪ The adjustments to the observed hydrographs are not of a magnitude that would impact model calibration, hydrological model simulation results for baseline conditions, or the hydrological effects assessment. Nor would the adjustments propagate to subsequent models or assessments.	Annex IV.2, Section 5.3.1.3	**Context:** Parts two, three and five of the IR are accepted. The responses to part one, four, and six of the original IR have not been fully answered. The Proponent has continued hydrometric monitoring and plans winter discharge measurements that will help characterize the inter- and intra- seasonal changes to the rating curves. However, the response to part one does not acknowledge that the open water rating curves for hydrometric stations CR-WC-MS-02 and CR-WC- MS-06, plotted in Figures	75-R1	1. Explain why the rating curve formulae for stations CR-WC-MS-02 and CR-WC-MS- 06 do not match the plotted line for the open water rating curve. If corrections are required, detail any other report sections that are affected and ensure that all sections impacted by the error are updated. 2. Provide an explanation for rating curve shifts that are not associated with data. Provide details on the monitoring strategy that will be utilized to deal with the unpredictable backwater effects that have led to frequent rating curve shifts. New data that supports the original rating curves should be presented in figures. If general rules on rating curve shifts have been developed, provide all relevant details. 3. Provide details on where and how data derived from rating curves (i.e. the continuous discharge values	Please see Attachment IR 75-R1 for NexGen's response to this IR.	Annex IV.2, Section 5.3.1.6

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				1. The open water rating curves for hydrometric stations CR-WC-MS-02 and CR-WC- MS-06, plotted in Figures 15 and 27 respectively, do not correspond to the equations printed in the same figures. 2. Different methodologies were used to develop rating curves for different stations without justification. An open water rating curve developed through a HEC-RAS model (as described in Appendix 9B Hydraulic and Sediment Transport Modelling Summary Report) was used for station CR-WC-MS-03. 3. Eight of the ten rating curves developed are preliminary since a subset of two to five data points with the lowest water elevations for discharges were used when WSC (2016) recommends at least six data points for curves with a single segment; 4. Rating curve stage shifts due to aquatic plant growth in the streambed might be expected to follow an increasing pattern through the summer, and to be similar at the same period of different years. Neither of these signals is present in the stage shifts for the hydrometric stations, rather the shifts jump without following a pattern; 5. Rating curve stage shift above the base curve are expected due to backwater, however shifts below the base curve would need to be well documented as these might be caused by scour in the control section. Figure 18 shows three measurements (15-May-19, 18-May-19 and Jun-19) below the base curve at station CR-WC-MS-03 with no explanation offered. The text states that no levelling or discharge error or physical cause was identified for May 2020 and June 2020 readings below the base curve, but they are not plotted below the curve. 6. Rating curve equations are power relationships between the effective depth and discharge with a multiplier and an exponent. The exponent depends on geometry of the control section and is typically between 1.3 and 3 (WSC, 2016), with similar values for control sections with similar shapes. The open water rating curve for CR-WC-MC-04 has an exponent of 4.5, well above the typical range and no explanation has been provided for this unusual value. **Rationale:** The rating curves are used within the hydrologic model to create stream discharge time series. In turn, the model is used to determine	June 2020 at station CR-WC-MS-03 refer to those plotted as May and June 2019 in Figure 18 and provide supporting arguments for keeping the station location since there are indications of channel instability. 4. Provide rationale for the inconsistencies with best practices identified in points 3, 4 and 6 in the context and rationale column. Discuss any effects to the confidence in the rating curve. 5. Discuss how backwater effects are integrated into model predictions including lake levels, discharge estimates and wetted stream areas. 6. Discuss how uncertainty from the rating curves propagates in the hydrologic and subsequent models, and influences the confidence in the conclusions on effects. **Suggestions for mitigation and follow-up measures** The hydrometric monitoring program could be made more robust by including: • hydrometric stations to measure lake levels, particularly in Patterson Lake; • a regular schedule of field visits to monitor rating curve applicability and backwater; and under-ice flow measurements where possible, since discharge from the Project occurs year round and currently under ice flows are only estimated. **Discussion Required:** Yes Measurements of water level and discharge will rarely allow a perfectly fitted rating curve, particularly in low gradient streams. However, the noted inconsistencies with best practices (WSC, 2016) contribute to larger than expected uncertainty in the rating curves. The rating curves are at the base of a very complicated model and the impact to overall results is very difficult to ascertain.	▪ Backwater is a persistent challenge and unavoidable at several stations due to the low gradient between lakes in the Upper Clearwater River, where the Project is located. Additional baseline monitoring from 2020 to 2022 has improved the shifts used to address backwater at these stations. Responses to part 1 through part 6 of this IR are provided below. ***1. Explain why the rating curve formulae for stations CR-WC-MS-02 and CR-WC-MS-06 do not match the plotted lines:*** The rating curve at CR-WC-MS-02 is backwatered under most conditions and is influenced by the water level of Patterson Lake downstream. The reach of the Clearwater River between Jed Lake and Patterson Lake is short and of low gradient with little relief. The rating curve at CR-WC-MS-06 is seasonally backwatered by vegetation growth and water levels in the Clearwater River below the Mirror River Confluence. Rating curve formulae are for the base rating curve. The plotted lines represent rating shifts used to account for backwatered conditions. ***Specify where this data was used further:*** The rating curves presented are for converting continuous measurements of water surface elevation at the hydrometric station to discharge. The rating curves presented in Section 5.3 of Draft EIS Annex IV.2 (Hydrometric Monitoring Characterization Report) were not used in the hydrological model. The hydrological model does not calculate flows from watercourse water level using a rating curve for riverine sections. Rating curves were only used in the model at lake outflows as discussed in Section 9A3.7 of Draft EIS Appendix 9A (Hydrological Modelling Summary Report). Therefore, the rating curve equations for CR-WC-MS-02 and CR-WC-MS-06 were not used in the modelling for the Draft EIS. The observed discharge hydrograph that is presented in Figure 16 of Draft EIS Annex IV.2 for CR-WC-MS-02 was used for the purposes of model calibration at CR-WC-MS-02. The observed discharge hydrograph that is presented in Figure 28 of Draft EIS Annex IV.2 for CR-WC-MS-06 was used for the purposes of model calibration at CR-WC-MS-06. ***Discuss effects of updating the formulae:*** Updating the formulae with more recent measured data for CR-WC-MS-02 and CR-WC-MS-06 is not expected to have any effect on the results presented in the Draft EIS. Improvements to approach were made in 2021 and 2022 for the rating curves at both CR-WC-MS-02 and CR-WC-MS-06. Changes to the rating curve in 2021 and 2022 and adjustments to resultant hydrographs are not of a magnitude that would impact model calibration, hydrological model simulation results for baseline conditions, or hydrological effects assessment, nor propagate to other subsequent models. Therefore, updates are not required to the revised EIS.		15 and 27 respectively, do not correspond to the equations printed in the same figures. For example, using Figure 27, the open water rating curve line for CR-WC-MS-06 passes very near a water surface elevation of 97.4 m and a discharge of 8 m^3/s; however, using a water surface elevation of 97.4 m and a datum of 95.82 with the equation shown in the figure gives a discharge of 12.7 m^3/s (over 50% higher). The response to part one also includes two statements that appear to be in contradiction: “the rating curves […] were not used in the hydrological model” and “the observed discharge hydrograph […] was used for the purpose of model calibration […]”. However, both of those hydrometric stations are listed as calibration nodes in Table 9A-10 of Appendix 9A Hydrological Modeling Summary Report. The continuous discharge points shown in figure 9A-14 of the Hydrological Modelling Summary Report assume to be calculated from water surface elevations and a rating curve. In Appendix B Rating Shift Reports Annex IV.2: Hydrometric Monitoring Characterization Report, there are multiple rating shifts that are not associated with any discharge measurements and are not otherwise justified. For example, Table B-6 Rating Shift Report for CR-WC-MS-06, which happens to be a critical inflow to Patterson Lake, shows that in 2019 there were three rating shifts between July and August despite the only measurements that year being in May and October. These three rating shifts are not accompanied by written justifications such as a site visit or temperature needed for plant growth or senescence. **Rationale:** The rating curve formulae for stations CR-WC-MS-02 and CR-WC-MS-06 do not match the plotted line for the open water rating curve. An error could be propagated to other sections of the EIS. Correction of this error and confirmation that other rating curves have not been affected is required. The data in Annex IV.2 did not present a strong case for the chosen rating curves or the associated shifts. The Proponent’s IR response indicated that they have acquired additional field data that supports the rating curves and shift patterns. However, the data is not presented and therefore cannot be verified. Verification of the rating		for CR-WC-MS-01 to 06) are used in the hydrological model in the draft EIS Appendix 9A. Describe how the seasons with the most variable rating curve shifts (i.e. summer and fall) could be affected by this uncertainty.		

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				baseline conditions and Project effects on water levels and flow. Using more data points to fit the open water rating curve (see point 3), would likely result in lower estimates of baseline flows. If the baseline flows were lower, the proportional increase in flows due to the Project discharging mine water to the surface would be greater, changing the results in tables 9.6-5 to 9.6-7, 9.6-14 to 9.6-16 and 9.6-23 to 9.6-25 of the EIS and potentially the residual effects classification in Section 9.7. The stream width is an important factor when considering the river's navigability and wetted area contributes to describing fish habitat. Changes to both these stream channel parameters are discussed in Sections 9.4.3, 9.6.1.3, 9.6.2.3 and 9.6.3.3 for various scenarios in the EIS. There is no mention of variability of channel parameters due to backwater, so it is not clear if the percent change in wetted area of Tables 9.6-8, 9.6-17 and 9.6-26 account for these effects. The inconsistencies with best practices (WSC, 2016) contribute to larger than expected uncertainty in the rating curves, in subsequent studies that use that information, and ultimately the description of baseline conditions. The effect of this uncertainty on the Project residual effects is unclear. **Reference**: WSC - Water Survey of Canada, 2016, Hydrometric Manual – Data Computations, Stage-Discharge Model Development and Maintenance		***2. Provide justification for the use of different methods for determining rating curves at different sites, detailing how they are comparable.*** Different methods for determining rating curves were used at different sites where the ultimate use of the rating curve in further hydrological analysis differed: ▪ At station CR-WC-MS-03, additional information was available in the form of a 1-D HEC-RAS model. Additional data were collected and the model was developed to evaluate potential changes to river hydraulics and sediment transport and because this location was immediately downstream of the Project activities. ▪ Rating curves were developed for watercourse hydrometric stations as described in Section 4.5 of Draft EIS Annex IV.2 for the purpose of developing observed discharge hydrographs. ▪ Rating curves were developed during regional hydrology model development to calculate lake outflow as a function of lake storage. ***3. Clarify if the comment in the text regarding measurements below the open water rating curve in May and June 2020 at station CR-WC-MS-03 refer to those plotted as May and June 2019 in Figure 18 and provide supporting arguments for keeping the station location since there are indications of channel instability.*** NexGen notes that this text in Draft Section 5.3.1.3 of Draft EIS Annex IV.2 should have referred to 2019 rather than 2020. The revised EIS will be updated to correct this text by changing "May 2020 and June 2020" to "May 2019 and June 2019" in Section 5.3.1.3 of revised EIS Annex IV.2 (Hydrometric Monitoring Characterization Report). Given the high importance of Patterson Lake to the Project hydrological effects assessment, it is important to have a watercourse hydrometric station between Patterson Lake and Forrest Lake. Hydrometric station CR-WC-MS-03 is in a straight reach downstream of the Patterson Lake outlet and upstream of the Clearwater River Bridge. Downstream of the bridge, the reach of the Clearwater River between Patterson Lake and Forrest Lake is sinuous, with few straight reaches with laminar flow developed. The existing location is anticipated to the be the most stable location in the reach. ***4. Provide rationale for the inconsistencies with best practices identified in parts 3, 4 and 6 in the context and rationale column. Discuss any effects to the confidence in the rating curve.*** ***In response to part 3 and the need for more data points:*** NexGen agrees and has continued to collect data annually. The number of hydrometric points available at the time of the Draft EIS was subject to the baseline period and external events. Hydrometric monitoring began in August 2018 and continued in 2019 and 2020 following a seasonal schedule. Monitoring in 2020 was completed during exceptional lockdown conditions due to the COVID-19 pandemic. Further baseline hydrometric monitoring has since extended the number of points available; however, these additional data are		curves chosen and shift patterns is needed to develop a stream discharge time series, which is used to establish baseline conditions and subsequently assess Project effects on water levels and flow. Due to the combined backwater effect of downstream lake levels and weed growth in the channel, there is a need for frequent spot measurements to justify rating curve shifts. It may not be possible to establish a regular pattern at the site due to an insufficient availability of historical data. A commitment by the Proponent to measure discharge year-round would increase confidence in reported discharge values. The inconsistencies with best practices (WSC, 2016) contribute to larger than expected uncertainty in the rating curves. Since rating curves are used to estimate stream flow (discharge) from measured water levels, inaccuracies and uncertainties in the rating curves can lead to under or overestimates of water quantity. This uncertainty is carried into subsequent studies that use the information and ultimately cause uncertainty in the description of baseline conditions and residual effects. As such, accurate rating curves are critical for monitoring water quantity in streams related to water intakes and discharges to the environment. Intakes and discharges have the potential to impact water quality and fish habitat through changes in streamflow and effects on flow velocities, water depths, water temperature, suspended sediment concentrations, erosion, sedimentation, and other related factors. The hydrological model outputs are also used to evaluate the Project's resilience to extreme high and low flow events. Due to the uncertainty in the rating curves, the hydrological model outputs may under or overestimate extreme high and low flow events. As such, the Project's resilience to extreme events may be overstated, leading to accidental contaminant releases into the receiving aquatic environment which can negatively impact water quality, fish, and fish habitat.			

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						not anticipated to result in material changes to the hydrological model simulation results for baseline conditions or hydrological effects assessment, nor propagate to other subsequent models that were presented in the Draft EIS. Therefore, updates are not required to the revised EIS. ***In response to part 4 and seasonal shifts to account for vegetation growth:*** At station CR-WC-MS-04, the rating curve is influenced by the water level in Naomi Lake as well as vegetation effects. General conditions in 2018 and early 2019 were dry with associated low flows and water levels. General conditions in 2020 were wet with associated high flows and water levels. The influence of vegetation during these two years specifically is obscured by the variation in magnitudes of flow over this period. Monitoring since 2020 has improved characterization of the seasonal influence of aquatic plant growth, which does follow an increasing pattern through the summer before senescence in September. However, the additional data are not anticipated to result in material changes in the hydrological model simulation results for baseline conditions or the effects assessment, nor propagate to other subsequent models that were presented in the Draft EIS. Therefore, NexGen is confident in the current rating curve and updates are not required to the revised EIS. ***In response to part 6 and the exponent of the base rating curve being higher than the standard values:*** The reviewer is correct; the calibrated value of the exponent exceeds the general range of the exponent b represented in Table 1 of the *Water Survey of Canada hydrometric manual* (WSC 2016). This exceedance remains the case in subsequent years with additional data. The channel is wide, shallow, and impacted primarily by the difference in water surface elevation in the upstream and downstream lakes. In general, rating shifts have been further developed, and advancement of the hydrometric program has increased confidence in the existing results. Therefore, updates are not required to the revised EIS. ***5. Discuss how backwater effects are integrated into model predictions including lake levels, discharge estimates and wetted stream areas.*** Backwater effects were integrated into model predictions for lake outflow and associated lake level due to winter ice effects. Regional flow observations suggested that backwater from ice effects may cause flows to be overestimated by up to 20%. Ice effects were accounted for by applying a linear reduction in discharge with accumulated cold content based on ambient air temperatures following a degree-day threshold. Wetted stream areas were calculated directly from annual average discharge estimates. Backwater was not considered because stream channel parameters were evaluated on an annual average basis.						

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						6. Discuss how uncertainty from the rating curves propagates in the hydrologic and subsequent models and influences the confidence in the conclusions on effects. The uncertainty from the rating curves is not anticipated to have a meaningful effect on the hydrological model, subsequent models, or influence the confidence in the conclusion on effects. Improvements to the approach were made in 2021 and 2022 for all rating curves. Changes to the rating curves in 2021 and 2022 have not changed the resultant hydrograph enough to imply changes to model calibration. The resulting changes to the observed hydrographs are not of a magnitude that would impact model calibration, hydrological model simulation results for baseline conditions, or hydrological effects assessment, nor propagate to other subsequent models. Therefore, updates are not required to the revised EIS. With respect to the reviewer's suggested mitigation and follow-up measures, please see the below points: ▪ Hydrometric stations exist to measure lake levels at nine waterbodies (i.e., lakes), including Patterson Lake. The reviewer is directed to Section 3.0 of Draft EIS Annex IV.2. ▪ Additional baseline hydrometric monitoring has been completed in 2021 and 2022 since submission of the Draft EIS and is ongoing in 2023. ▪ As part of the ongoing baseline program, visits are conducted on a regular schedule including under ice-covered conditions in March. Additional regularly scheduled visits in winter months (i.e., December, January, February, and March) in the future will improve rating shifts required to characterize seasonally changing ice conditions. Revised EIS Annex IV.2 will be updated to correct the dates referenced in part 3 of this IR. As noted above, the adjustments to the observed hydrographs resulting from ongoing monitoring are not of a magnitude that would impact model calibration, hydrological model simulation results for baseline conditions, or the hydrological effects assessment. Nor would the adjustments propagate to subsequent models or assessments. Therefore, no other changes are proposed in the revised EIS to address this IR. **<u>References</u>** WSC (Water Survey of Canada). 2016. Hydrometric Manual – Data Computations, Stage-Discharge Model Development and Maintenance						
76	ECCC	Fish and fish habitat	Appendix 9A3.6.4 Current Climate Total precipitation data – model input	**Context:** Clarification on some of the climate input data and methods used in the hydrological assessment would help in understanding the Proponent's predictions for the Project, particularly into the far future. The hydrology assessment describes existing conditions and predicts Project effects on the hydrological regime. A hydrological model, which uses various inputs (e.g., historical climate data, hydrometric data, ,	1. Confirm if the ERA1, the ERA5 database or a combination of the databases was used for climate data. If both databases were used provide details on how the databases were compiled and where the complied dataset was used throughout the draft EIS. 2. Describe the procedure by which longer timeframes were obtained from ECMWF Re-analysis data.	NexGen notes that the data used in the hydrological assessment were the best available at the time of model preparation, planning, and execution. Site-specific, long-term historical meteorological data were not available near the proposed Project location. Further, in the regional hydrology model, storage and attenuation in soil and lakes throughout the hydrological system mean that the model response to individual daily events is attenuated. The hydrological system and response are more heavily influenced by precipitation totals at a monthly or seasonal scale.	n/a	**Part 1: Accepted** **Part 2: Accepted** **Part 3: Not Accepted** The comparison of total precipitation and mean temperature for the period from 1979 to 2019 was completed for nearby stations (Cree Lake, Cluff Lake, Key Lake and Fort McMurry). Total precipitation correlation analysis showed good correlation (R2>7)	76-R1		NexGen has provided the information below to address part 3 and part 7 of IR 76-R1. **<u>Part 3</u>** Regarding the daily time step of the hydrological model as it relates to climate input data, the Regional Hydrology Model was developed to support continuous simulations on a daily time step. Precipitation showed good correlation on a monthly scale. Agreement with locally measured temperature and other influential meteorological input variables other than precipitation was strong at a daily timescale. A daily timestep was required to effectively	n/a

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				precipitation etc.) was used to characterize the existing conditions and make predictions on future effects in order to inform the assessment of Project effects. Appendix 9A describes the methods used to conduct the hydrology assessment including hydrological modelling. . The following areas is describe where additional information will assist ECCC in assessing the model: -Medium-Range Weather Forecasts (ECMWF) Reanalysis database provides synthetic hourly climate data. The European Reanalysis Interim (ERA1) database consists of data spanning from January 1979 to July 2018 on a 50km spacing grid. The European Reanalysis 5 (ERA5) database consists of data spanning 1950 to present on a 30 km spacing grid. It is unclear which datasets were used, if a combination of the datasets were used or how the datasets were compiled. There was no detail provided on how longer timeframes (e.g., 24-hour) were inferred from the hourly data. -The synthetic data was verified by comparison with a locally collected data set spanning only 2 years but no rationale for the use of this methods was provided. Verification of the synthetic data using available observed data sets in combination with a weighted average algorithm for the Project location will yield more accurate data. -An assembly of climate time series data was also used in the hydrological model. It is not clear if the probability distribution of the sequential times series is the same, if the probability distribution was verified or how the time series distribution errors were considered. Understanding how probability distribution for the times series was verified helps to understand how the bias, which is directly related to time series and probability distribution was addressed. By forcing the modelled future data to maintain the past synthetic data, time series PD statistical errors of the past time series are propagated into the future generated data set model. Without an understanding of the limitations of the past data (which in itself was modeled), it is not possible to understand the limitations in the future modeled data. The same applies for value-biased corrections. -In several areas of the draft EIS both climate points (average over 30	Provide this information for 12 and 24-hour periods. 3. Provide rationale as to why a data set spanning two years was used for verification of the synthetic data rather than using available observed datasets in combination with a weighted average algorithm for the Project location. 4. Confirm that the sequential time series have the same probability distribution. Confirm if the time series sequences were verified for best fit probability distribution or if they were assumed to have the same probability distribution. 5. Clarify if the potential size of time series probability distribution errors was estimated due to statistical assumptions. 6. Describe where time series analysis versus climate data points were used in the hydrology and climate change assessments. **Discussion Required:** Yes. The hydrology assessment is based on a complicate hydrological model that has a number of inputs sources. Further discussion would help ECCC to assess the potential effects of the Project.	Responses to part 1 through part 6 of this IR are provided below. ***1. Confirm if the ERA1, the ERA5 database or a combination of the databases was used for climate data. If both databases were used provide details on how the databases were compiled and where the complied dataset was used throughout the draft EIS.*** The climate record was developed based on a combination of global reanalysis data, including the European Reanalysis Interim (ERAI) and European Reanalysis 5 (ERA5) datasets (i.e., global climate reanalysis datasets produced by the European Centre for Medium-Range Weather Forecasts) and local observations. The use of reanalysis products permitted the extension of the climate record beyond the measurement period for site data (i.e., 3 to 6 years, depending on parameter) to account for a broader range of natural variability over a 41-year period. Total precipitation, rainfall, and snowfall were based on ERAI data for the Project location from 1 January 1979 to 31 July 2018 and observations from the Rook I Meteorological Station for 1 August 2018 to 31 October 2020. Ambient air temperature, dew point temperature, wind speed, and net all-wave radiation were derived from the ERAI database from 1 January 1979 to 31 August 2019 (i.e., when ERAI was replaced by ERA5 data) and then from the ERA5 database from 1 September 2019 to 31 October 2020. Measured data collected on site were given priority if time series records from multiple sources overlapped. However, in some cases, further verification from stream flow records were used to screen and support selection of alternate data sources during periods of overlap. This compiled database was used in Draft EIS TSD XVIII (Site-Wide Water Balance and Water Quality Modelling Report) and the Draft EIS Appendix 9A (Hydrological Modelling Summary Report), with the results then being used for assessing potential effects in Draft EIS Section 10 (Surface Water Quality and Sediment Quality), Draft EIS Section 11 (Fish and Fish Habitat), Draft EIS Section 15 (Human Health), and Draft EIS TSD XXI (Environmental Risk Assessment). ***2. Describe the procedure by which longer timeframes were obtained from ECMWF Re-analysis data. Provide this information for 12 and 24-hour periods.*** Accumulated precipitation data over 12-hour intervals from 1 January 1979 to 31 August 2019 were downloaded from the Medium-Range Weather Forecasts data using the Python program. Data extraction and processing were completed using the MATLAB program. A similar approach was completed for smaller intervals. The procedure of aggregating data for longer time frames (i.e., 24-hour period data) from more frequent time frames was parameter dependent and completed using MATLAB. ***3. Provide rationale as to why a data set spanning two years was used for verification of the synthetic data rather than using available***		between ERA-I and Observed at monthly scale (poor correlation for daily or annual). The daily, monthly and annual temperatures showed strong correlation (R2>9). Nevertheless, the hydrologic model was run at daily time step with daily ERA-I data as input (Section 9A3.2) although the ERA-I data does not accurately represent observed data as this time scale. CNSC staff requests NexGen to provide justification why model was run at daily timestep instead of monthly and how this will not impact the hydrologic model outputs. In addition, it is not clear why ERA-I is preferred over MERRA-2 which was indicated to be better in quality than ERA-I (Section 22A4.1.2) used to characterize baseline climate (1981-2019) in Section 22A4.1 (Appendix 22A Climate Change Assessment). **Part 4: Accepted** **Part 5: Accepted** **Part 6: Accepted** **Part 7: Not Accepted** CNSC staff accepts that critical structures (self-contained contact water ponds) are to be designed using a PMP however the PMP value of 489.3mm is obtained from 1999 study **[A.1]**, based on historical rainfall data pre-1998, which appears to require an updated PMP value. Based on the response provided by NexGen it is difficult for CNSC staff to confirm whether the current PMP (489.3m) is conservative or not. Therefore, CNSC requests NexGen to use a PMP value that is estimated using updated historical rainfall data that includes the most up to date meteorological data or provide sufficient justification on the validity of the current PMP estimate. Reference: [**A.1**] Hopkinson RF. 1999. Point Probable Maximum Precipitation for the Prairie Provinces. Environment Canada Prairie and Northern Region. Report No. AHSD – R99 – 01. 54 p.			represent key physical processes included in the hydrological model such as atmospheric losses, snowmelt, canopy storage, surface / subsurface storage and routing, and lake storage routing. Given the characteristics of hydrological processes dominant in the region (e.g., highly permeable soils, subsurface storage routing lag) and considering the high degree of lake storage routing lag, potential variation on a daily time scale is expected to be minor. The attenuated watershed response to precipitation inputs implies that multi-day, monthly, and seasonal alignment are more important drivers of regional hydrology in continuous model simulations than specific daily values in isolation. Consequently, daily fluctuations in precipitation do not affect the model's ability to predict potential Project effects to waterbody surface elevation, watercourse flow rate, stream channel parameters, and fluvial sediment transport. Therefore, the use of daily rather than monthly flow inputs is not expected to influence results of hydrological modelling or the conclusions of the hydrology assessment. Regarding the use of European Reanalysis 5 (ERA5) data published by the European Centre for Mid-Range Weather Forecasting (ECMWF) over the Modern-Era Retrospective analysis for Research and Applications, Version 2 (MERRA-2) data, NexGen notes that ERA5 is the latest climate reanalysis produced by ECMWF, providing hourly data on many atmospheric, land-surface, and sea-state parameters together with estimates of uncertainty. ERA5 has better temporal coverage over selected climate stations and higher spatial resolution than MERRA-2. In addition, previous experience from WSP working on Canadian sites has shown better rainfall estimates with ERA5 relative to MERRA-2. **<u>Part 7</u>** As presented in the response to IR 47-R1, NexGen notes that the probable maximum precipitation (PMP) value (i.e., 489.2 mm) adopted for the Draft EIS was based on a meteorological method derived from persistent dew point temperatures rather than historical rainfall events. As this method does not rely on statistical analysis of historical rainfall events, inclusion of more recent rainfall data will not impact the PMP estimate. Therefore, NexGen maintains that the approach used to determine the PMP is appropriate and conservative, and no change is required for the revised EIS. NexGen notes that the design bases and management strategies for site water management infrastructure designed to accommodate a 24-hour PMP event have been included in the licence application for the Project and would be subject to review and revision (as required) throughout the Project lifespan. If the size of the 24-hour PMP were to change as a result of climate change during the Project lifespan, mechanisms within the CNSC licensing process would require revisions to the site water management design bases and associated infrastructure (as required) to ensure adequate containment of mineralized contact water during extreme precipitation events and to maintain protection of the environment.	

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				years) and time series analysis were referenced. It is unclear where climate points and where time series analysis were used in the assessments. **Rationale:** The draft EIS does not provide enough detail surrounding the current climate data used in the hydrology assessment for ECCC to assess the predicted effects of the Project particularly into the far future.		***observed datasets in combination with a weighted average algorithm for the Project location.*** Long-term historical meteorological data are not available near the proposed Project location. Meteorological monitoring at the Project began in 2015, and the Rook I Meteorological Station was expanded in 2018 to include additional parameters. A long-term meteorological record for the Project was developed for the years 1979 to 2017 using a combination of data from meteorological stations near the Project as well as global reanalysis products including ERAI data sourced from a numerical weather prediction system. Historical meteorological data were compiled from Environment and Climate Change Canada (ECCC) stations within 225 km of the Project, including Fort McMurray, Cree Lake, Key Lake, and Cluff Lake. A weighted average algorithm was not anticipated to account for the main geographic factors influencing climate in the region. Draft EIS Annex IV.1 (Regional Meteorological and Hydrological Characterization Report) provides comparisons of ERAI global reanalysis data to nearby stations. The ERA5 data was published following the initial data compilation for the Project. At the time of initial data compilation, only ERAI data were available. The comparison was not reproduced for ERA5. Differences between ERAI and ERA5 data are not anticipated to result in material changes to the Draft EIS. Therefore, updates are not required in the revised EIS. ***4. Confirm that the sequential time series have the same probability distribution. Confirm if the time series sequences were verified for best fit probability distribution or if they were assumed to have the same probability distribution.*** Where local station data were available, these data were used. The time series sequences were evaluated at the regional station locations based on summary statistics at time scales greater than daily. The sequential time series used for record extension based on global reanalysis data at the geographic location of the site were assumed to have a similar probability distribution. ***5. Clarify if the potential size of time series probability distribution errors was estimated due to statistical assumptions.*** The potential size of time series probability distribution errors due to statistical assumptions was not estimated and was not required for this task. Given the characteristics of hydrological processes dominant in the region (e.g., highly permeable soils, subsurface storage routing lag, lake storage routing lag), potential variation in the probability distribution is expected to be minor and therefore is not expected to influence results of hydrological modelling or effects assessment. ***6. Describe where time series analysis versus climate data points were used in the hydrology and climate change assessments.*** The assessment cases are based on time series analysis rather than climate data points. A combination of time series analysis and event-based data (i.e., climate data points) were used in the site-wide water balance modelling (Draft EIS						

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						XVIII). The time simulation modes used for climate in the site-wide water balance model are explained in Section 3.2.2.2 of Draft EIS TSD XVIII, and described briefly for each scenario in Table 8 of Draft EIS TSD XVIII. All site-wide water balance modelling scenarios that provided data for effects assessment were based on time series analysis. ***7. The length of time used for the Time Series Analysis of the observation data resulted in a shorter Time Series used by the Proponent at all locations. This shorter verification period could lead to inaccurate estimations of probable maximum precipitation (PMP), therefore a longer analysis length should be used. If a longer analysis length isn't available the Proponent should use verified site observations using data from nearby weather stations capable of producing results with a longer time series, provide the methodology used to derive the results, and update the PMP definition to match that of the World Met Org (2009) to reflect the change in the time series.*** NexGen notes that the question stated in part 7 of this IR response was not submitted to NexGen as part of the original IR, though has been created to address comments received from ECCC via email on 12 July 2023. These comments were received following additional discussion conducted with the CNSC and ECCC (as requested in the original IR). The probable maximum precipitation (PMP) adopted for the Draft EIS is based on published values conventionally used for uranium mines in northern Saskatchewan but adjusted for the location of the proposed Project. The PMP was adopted based on the PMP rationale from Hopkinson (1994). The PMP does not strictly follow the PMP estimation method using the World Meteorological Organization (WMO 2009) approach based on time series. There is precedent for use of the PMP from Hopkinson (1994), adjusted for location, at all of the operating uranium mines in northern Saskatchewan. Experience suggests that the PMP rationale and value adopted for the Draft EIS is conservative relative to the values that would be derived using the WMO (2009) method. Additional detail is available in NexGen's response to IR 47. No changes are proposed in the revised EIS to address this IR. **<u>References</u>** Hopkinson RF. 1994. Point Probable Maximum Precipitation in Northern Saskatchewan. Environment Canada – Canadian Climate Program. Report No. CSS – R94 – 01. WMO (World Meteorological Organization). 2009. Manual on Estimation of Probable Maximum Precipitation (PMP). WMO-no. 1045, 291 pp.						
78	ECCC	Fish and fish habitat	Section 10.2.6	**Context:** Baseline surface water and sediment quality throughout the	1. Provide baseline information on wetland surface water and sediment quality characterization for wetlands	Responses to part 1 and part 2 of this IR are provided below.	Appendix 23B	**Context:** The Proponent has addressed both items from the original IR in their	78-R1	1. Update the water quality modelling and environmental risk assessment using baseline data from wetlands adjacent to the Project for water	NexGen acknowledges that information previously provided in response to this IR could have been more clearly stated. Specifically, NexGen confirms that although	n/a

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		Change to an environmental component due to hazardous contaminants	Section 10.4.2 Section 10 Appendix 10A	Local Study Area (LSA) and Regional Study Area (RSA) are discussed within this section and sampling locations are presented in Figure 10.2-4 pg. 1601 of the EIS. However, no baseline information is provided about wetlands within the LSA and Project footprint. The location of wetlands within the Project footprint, as well as the other wetlands existing within the LSA can be confirmed from Annex V11.2: Vegetation Baseline Report 2 (Inventory, Rare Plants and Wetlands), including the wetland classifications. There is no consideration of wetlands or potential effects to wetland surface water or sediment quality throughout the surface water and sediment quality assessments and surface water quality modelling report in Appendix 10A. **Rationale:** There is currently not enough information provided for ECCC to provide advice on the potential risks of the proposed Project to wetland surface water and sediment quality within the LSA. This pathway of effects is important to assess in terms of potential impacts to wetland habitat availability and effects to terrestrial and aquatic receptors. Potential effects from Constituents of Potential Concern (COPCs) and radionuclides to surface water and sediment, or potential effects to ecological receptors within wetlands have not evaluated.	within the Project footprint, including physiochemical parameters and particle size for sediment. 2. Provide an assessment of potential effects to surface water and sediment quality for wetlands within the LSA and potential effects to ecological receptors during all phases of the proposed Project.	1. Water quality and sediment quality baseline information applicable to wetlands within the local area of the Project was not collected for the water quality and sediment quality assessment in the Draft EIS. Within the proposed Project footprint, there are no wetlands that would be physically disturbed; some small wetland areas exist within the southwest portion of the maximum disturbance area; however, NexGen designed the proposed site access road footprint to avoid this wetland area. Therefore, no additional baseline wetland information other than what has been provided in Draft EIS Section 13.3.2 (Wetland Ecosystems) is currently available. 2. The potential for effects on wetland ecosystems in the local study area (LSA) and regional study area (RSA) during all phases of the proposed Project was evaluated in the terrestrial component of the Draft EIS; specifically, Draft EIS Section 13 (Vegetation). Wetlands evaluated in the Draft EIS included those in close proximity to the Project, the largest of which is to the east of the Project and extends from Patterson Lake North Arm – East Basin, through Lake G, across the north end of Forrest Lake, and to the outlet area of Naomi Lake (Figure 13.3-3 of Draft EIS Section 13.3.2.2 [Ecosystem Distribution]). There are additional small wetland areas along the south shore of Patterson Lake North Arm – West Basin that are within the maximum disturbance area. Draft EIS Section 13 assessed the potential for the Project to affect wetland ecosystems in the LSA and RSA through the following pathways: Pathway ID V-01 (Direct loss), Pathway ID V-04 (Fugitive dust and constituent emissions), Pathway ID V-05 (Particulates and acid emissions), Pathway ID V-08 (Surface water flow changes), Pathway ID V-09 (Surface water quality from runoff), Pathway ID V-10 (Treated effluent discharge), and Pathway ID V-13 (Groundwater and soil quality changes from seepage). Direct loss of wetland ecosystems in the RSA was determined as a primary pathway; however, effects on wetland ecosystems from changes in surface water flow and/or changes in the quality of surface flows or groundwater, and changes from Project discharges to Patterson Lake, were determined to be no pathways or secondary pathways. The primary effects assessment of the Project on the direct loss of wetland ecosystems through disturbance, alteration, and fragmentation is presented in detail in Draft EIS Section 13.5.2 (Wetland Ecosystems). The analysis of no pathway and secondary pathways for wetland ecosystems is provided in Draft EIS Section 13.4 (Project Interactions and Mitigations). The secondary pathways that describe and analyze the potential effects on wetlands from changes to water levels, runoff quality, air emissions, and discharge of treated effluent, including seepage, from the Project are Pathway ID V-04, Pathway ID V-05, Pathway ID V-08, Pathway ID V-09, and Pathway ID V-10, which are presented in Draft EIS Section 13.4.2 (Secondary Pathways). Changes in surface flows and water quality in wetlands from Project discharges to Patterson Lake were projected to result in		response; the Proponent has confirmed that no water quality or sediment quality baseline data within wetlands was collected or utilized in the water quality or sediment quality assessments. Additionally, the Proponent has confirmed that potential effects to wetlands within the Local Study Area (LSA) and Regional Study Area (RSA) were only evaluated as pathways for vegetation valued components within the terrestrial component of the draft EIS Section 13. While the potential exposure pathways evaluated may remain the same (i.e. effects from deposition of effluent), the potential effects to fish and fish habitat as a valued component, including to surface water and sediment quality as intermediate components which will affect fish and fish habitat, may differ and must be confirmed. **Rationale:** The Proponent has provided little information regarding baseline surface water and sediment quality for wetlands and has not assessed potential effects to surface water and sediment quality within wetlands. However, the Proponent has agreed to collect water level, water quality and sediment quality sampling data from wetlands adjacent to the project footprint and representative wetlands within the LSA. This data can be utilized to refine predictions of potential effects to wetland surface water and sediment quality, resulting in more accurate predictions of the likelihood of adverse direct effects to aquatic receptors and indirect effects within the pathway of consumption of aquatic receptors in wetlands through to higher trophic level species.		levels, water quality and sediment quality. With consideration of this new data, confirm predictions of negligible effects to the aquatic environment and aquatic receptors. If additional corrections are required, detail any other report sections that are affected and ensure that all sections impacted by the error are updated. 2. Incorporate information regarding the analysis of potential surface and sediment quality within wetlands and potential effects to fish and fish habitat within the LSA and RSA within Section 10 of the EIS.	wetland water quality and sediment quality baseline data were not collected for consideration in the EIS, NexGen has a high degree of confidence that the EA presents conservative results of Project effects to the environment, including potential effects to wetlands, fish and fish habitat, and ecological and human health. The commitment included in the response to IR 78 to conduct water level, water quality, and sediment quality sampling and monitoring of wetlands within and adjacent to the Project footprint and representative wetlands within the LSA, as appropriate, is to help form detailed recommendations for follow up monitoring during the life of the Project, if necessary. No further assessment in the EA is proposed or required. To provide further context on how potential effects have been assessed, the following information has been generated to address both part 1 and part 2 of IR 78-R1. NexGen confirms that riparian wetlands adjacent to Patterson are not anticipated to be disturbed by the Project, and baseline water quality and sediment quality data collected in Patterson Lake are expected to be representative of baseline water quality and sediment quality in the riparian wetlands. However, while not required for the EA, NexGen is planning to collect water quality and sediment quality samples from riparian wetlands, as appropriate, prior to Project Construction NexGen further notes that the focus of Draft EIS Section 10 (Surface Water Quality and Sediment Quality) is to provide a description of Project effects and cumulative effects, including consideration of reasonably foreseeable developments, on the surface water quality and sediment quality intermediate components. Information regarding changes to valued components (VCs) due to changes to the surface water quality and sediment quality environments has been appropriately considered in the relevant discipline assessments. For the wetland ecosystem VC, the assessment is provided in Draft EIS Section 13 (Vegetation), and for the fish and fish habitat VCs, the assessment is provided in Draft EIS Section 11 (Fish and Fish Habitat). NexGen confirms that changes to wetlands as a result of changes to water quality and sediment quality was considered in Draft EIS Section 13.4.2 (Secondary Pathways), including Pathway ID V-04 (Fugitive dust and constituent emissions), Pathway ID V-05 (Particulates and acid emissions), Pathway ID (Surface water quality from runoff), Pathway ID V-10 (Treated effluent discharge), and Pathway ID V-11 (Surface water quality from WRSAs [waste rock storage areas] and UGTMF [underground tailings management facility] after Closure). No modelled water quality constituents or parameters exceeded their respective threshold values during Operations for the nearfield and regional assessments. In the far future, cobalt exceedances were predicted for Patterson Lake North Arm – West Basin and Patterson Lake South Arm, and copper exceedances were predicted for Patterson Lake North Arm – West Basin. As changes to water quality were predicted, an ecological risk assessment was completed to determine the health risks to aquatic plant receptors. The risk assessment considered effects for the far-future and upper-bound scenarios. Results indicated that predicted changes in surface water quality for the upper bound scenario would not cause adverse effects on the health of aquatic plants (i.e., macrophytes, such as sedges and bulrush, and phytoplankton). In the far future, only copper has the potential to exceed the Project hazard quotient threshold of 1, which is limited spatially to the near field in Patterson Lake and limited in magnitude to just	

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						measurable minor changes to the condition of wetland ecosystems relative to existing conditions and be limited to the maximum disturbance area. For these pathways, and all other potential secondary effects pathways, the implementation of environmental design features and mitigation measures resulted in a determination of negligible residual effects on wetland ecosystems. Overall, effects to the wetlands ecosystems valued component were predicted to be not significant. To confirm the prediction of negligible effects on wetlands, NexGen will conduct water level, water quality, and sediment quality sampling and monitoring of wetlands within and adjacent to the Project footprint and representative wetlands within the LSA. From the results of these surveys, a detailed recommendation for follow-up monitoring during the life of the Project would be developed, if necessary. This commitment will be added to Table 23B-1 of revised Appendix 23B (Environmental Assessment Monitoring and Follow-Up Programs Proposed for the Project).					above the benchmark for the upper bound sensitivity scenario. However, these exceedances are not predicted to occur for aquatic plants. Therefore, changes to wetland vegetation as a result of changes to water quality or sediment quality are predicted to be negligible. With respect to fish and fish habitat, changes to water quality and sediment quality during the Project lifespan were considered in Draft EIS Section 11.4.2 (Secondary Pathways), Pathway ID F-13 (Project activities affecting water and sediment quality and aquatic health). As noted above, modelled water quality constituents or parameters were predicted to remain below Project specific water quality threshold values in both the Application Case and the reasonable upper bound scenario. The ecological risk assessment concluded that effects during the Project lifespan are not expected to result in adverse effects on the health of fish and lower trophic organisms. Effects to fish and fish habitat in the far future were considered in Draft EIS Section 11.5 (Residual Effects Analysis). The ecological risk assessment concluded that effects to fish and fish habitat VCs and lower trophic organisms as a result of changes to water quality in the far future would be minor for most water quality constituents and parameters. However, the hazard quotient for copper would exceed 1 in Patterson Lake North Arm – West Basin. To assess effects further, an aquatic health assessment was also conducted. The aquatic health assessment concluded that effects on the health of fish due to direct exposure to copper in the water column are not expected for predator fish (e.g., lake trout, walleye, northern pike) and are unlikely for forage fish (e.g., lake whitefish). These changes in habitat quality are considered unlikely to measurably affect the survival and reproduction of fish VCs. Therefore, effects to fish and fish habitat VCs were predicted to be not significant. NexGen confirms that as part of monitoring and follow up, an Environmental Monitoring Plan would be implemented to mitigate Project effects and apply adaptive management, where necessary. The Environmental Monitoring Plan would be developed in accordance with the Metal and Diamond Mining Effluent Regulations (MDMER) for metal and diamond mining environmental effects monitoring (EEM), the federal *Fisheries Act*, the CNSC operating licence, and the ENV operating approval requirements. The key components of the aquatic ecology environmental monitoring program are expected to include water and sediment quality, benthic invertebrates, and fish. With respect to the specific issue of copper loading from the potentially acid generating waste rock storage area to Patterson Lake in the far future, NexGen is developing an adaptive management plan to reduce uncertainty and manage risks related to this pathway (Draft EIS Section 11.7 [Monitoring, Follow-Up, and Adaptive Management). As the technical assessments requested by the reviewer in this IR are presented in the Draft EIS, no changes are required in the revised EIS. **<u>References</u>** Fisheries Act. R.S.C., 1985, c. F 14. Last amended 28 August 2019. Available at https://laws-lois.justice.gc.ca/eng/acts/f-14/. Metal and Diamond Mining Effluent Regulations. SOR/2002-222 under the *Fisheries Act*. Last amended June 18, 2020. Available at https://laws-lois.justice.gc.ca/eng/Regulations/SOR-2002-222/index.html.	

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79	ECCC	Fish and fish habitat Change to an environment al component due to radiological contaminants	Section 10.2.8.2.1	**Context:** This section discusses the elimination of chemical constituents from further analysis in water quality modelling for the Project. ECCC acknowledges the rationale provided by the Proponent for eliminating thallium and Dissolved Organic Carbon (DOC) as Constituents of Potential Concern (COPCs) for further assessment in the pathways analysis. Total ammonia is included for assessment, but un-ionized ammonia is not. Despite the provided rationale, due to requirements under the *Metal and Diamond Mining Effluent Regulations* (MDMER) for effluent testing and receiving environment monitoring, it is recommended that thallium, DOC, and un- ionized ammonia be carried forward for a complete assessment of all required monitoring parameters under the MDMER. **Rationale**: ECCC recommends that thallium, DOC and un-ionized ammonia be screened in as COPCs for further assessment in the pathways analysis and water quality modelling due to requirements under the MDMER Schedule 4 and Schedule 5 Sections 4(1), 7(1) and 12(1)(ii) for environmental effects monitoring. ECCC recommends that these parameters, as well as hydrocarbons, be included in the larger set of constituents that surface water quality monitoring would be conducted for.	Assess un-ionized ammonia, thallium and DOC in the pathways analysis and surface water quality modelling for the surface water quality assessment**.** **Suggestions for mitigation and follow-up measures** Un-ionized ammonia, thallium, DOC and hydrocarbons should be included in follow-up surface water quality monitoring.	NexGen acknowledges that a number of water quality constituents that are typically measured in general or regulated monitoring programs were not carried forward into the surface water quality assessment (Draft EIS Section 10 [Surface Water Quality and Sediment Quality]). NexGen confirms that not carrying these constituents forward does not mean they were not considered or overlooked; the exclusion specifically identifies these constituents are not anticipated to change in the receiving environment as a result of the Project and are predicted to remain below guidelines during the life of the Project and/or into the far-future scenario. Nevertheless, in addressing each of the listed constituents in this IR (i.e., un-ionized ammonia, thallium, dissolved organic carbon [DOC], and hydrocarbons), NexGen confirms: ▪ Un-ionized ammonia was considered in the surface water quality assessment for the Application Case and Reasonably Foreseeable Development Case as a component of total ammonia (Draft EIS Appendix 10A [Surface Water Quality Modelling Report], Attachment 10A-1a and Attachment 10A-2). In the background surface water quality characterization, and near-field and regional surface water quality modelling, total ammonia incorporates the sum of the un-ionized ammonia (NH_3) and ionized ammonia (NH_4^+) species in the measurable concentration, which exist in equilibrium in water. Within the assessment, the un-ionized fraction of the total ammonia was estimated at various instances based on ambient water temperature and pH and vice versa. Therefore, un-ionized ammonia was considered in the assessment, but total ammonia was reported. NexGen will provide additional clarity regarding ammonia and unionized ammonia in the surface water quality assessment in revised EIS Section 10.2.8.2.1 (Surface Water Quality Constituents of Potential Concern) and include both fractions in the assessment figures and tables in revised EIS Appendix 10A (Surface Water Quality Modelling Report), where appropriate. ▪ Thallium was evaluated as a constituent of potential concern (COPC) but was not carried forward in the surface water quality assessment (Draft EIS Section 10.2.8.2.1) because: o thallium was not identified as a deleterious substance under Metal and Diamond Mining Effluent Regulations (MDMER); o where source term data were available, thallium concentrations were generally non-detectable and below current applicable guidelines; and o where source term data for thallium were not available, it was assumed based on the available source data that any contributions from other sources would similarly be negligible. NexGen maintains that an update to the surface water quality assessment for the inclusion of thallium in the modelling is not required. ▪ Dissolved organic carbon was not carried forward in the assessment because baseline concentrations were low and the Project is not expected to be a notable source of DOC (i.e., organic carbon is not expected to be an additive in the effluent treatment	Section 10.2.8.2.1; Appendix 10A	**Context:** The Proponent has provided additional context regarding excluded parameters from surface water quality modelling and assessment with the exception of thallium. In their IR response the Proponent states that thallium is not expected in significant concentrations in effluent, however, this claim was not confirmed with predicted effluent concentration data and is not currently presented in effluent characterization tables. Because thallium was eliminated from further assessment based on the view that there will be no significant concentrations in effluent, there was no consideration of baseline concentrations of thallium in the receiving surface water and sediment quality. In Section 10.3.1 Water Quality and 10.3.2 Sediment Quality for existing conditions in the receiving environment there is no baseline data on thallium. In Appendix 10A Surface Water Quality Modelling Report Attachment 10A-1 Background Water Quality Characterization there is no baseline water quality data provided for thallium for any of the sampling locations within the Local and Regional Study Area. Regardless of whether thallium could potentially be screened out of later stages of the assessment, baseline concentrations of thallium in the receiving environment are required to validate that there are no baseline exceedances of water quality guidelines (i.e. Elevated background concentrations) of thallium in the existing receiving environment and to establish a baseline for comparison against future monitoring. Effluent characterization data and surface water quality modelling for thallium should be provided for review to confirm that concentrations in effluent will not result in negative effects to the receiving environment and aquatic receptors. **Rationale:** Baseline data on thallium concentrations in water quality in the receiving environment are needed to verify that there are no elevated background concentrations of thallium and are needed for comparison against future monitoring and to inform surface water quality modelling. To confirm predictions that thallium will not result in negative effects to fish and fish habitat, predicted effluent concentrations and surface water quality modelling of thallium concentrations are needed.	79-R1	1. Provide baseline receiving environment surface water quality data for thallium and the predicted effluent concentrations of thallium. 2. Update the surface water quality assessment and modelling as needed to incorporate data on thallium to confirm predictions of no adverse effects to the aquatic receiving environment. If additional corrections are required, detail any other report sections that are affected and ensure that all sections impacted by the omission of thallium data are updated.	The following response has been drafted to address both part 1 and part 2 of the IR. 1. NexGen confirms that baseline surface water quality data for thallium is included in Appendix A of Draft EIS V.1 (Aquatic Environment Baseline Report). In response to the request from the reviewer, information is further summarized in Attachment IR 49-R1, 79-R1, and 82-R1, which includes a discussion regarding the potential sources of thallium in effluent. 2. As described in Attachment IR 49-R1, 79-R1, and 82-R1, NexGen confirms that thallium does not represent a constituent of potential concern for the Project. Based on the measured concentrations of thallium in the baseline aquatic environment and in potential effluent sources, NexGen has confirmed that there is no potential for adverse effects to aquatic receiving environment and receptors with regards to thallium. Therefore, updates to the surface water quality assessment and modelling or any other report sections in the EIS are not required.	n/a

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						plant process). Further, DOC is also not a surface water quality constituent that is typically modelled in assessments. NexGen maintains that an update to the surface water quality assessment for the inclusion of DOC is not required. ▪ Hydrocarbons were not included as a COPC given the lack of any background data or likely notable Project source contributions to the receiving environment. NexGen maintains that an update to the surface water quality assessment is not required for hydrocarbons. Despite thallium, DOC, and hydrocarbons not being carried forward as COPCs in the surface water quality assessment (Draft EIS Section 10) and Draft EIS TSD XXI (Environmental Risk Assessment), NexGen confirms that ammonia (both total and un-ionized forms), thallium, DOC, and hydrocarbons would be included in verification and follow-up surface water quality monitoring programs for the Project. Monitoring commitments, such as meeting MDMER requirements, are presented in Draft EIS Section 10.7.2 (Surface Water Receiving Environment Monitoring). As noted above, NexGen will provide additional clarity regarding ammonia and un-ionized ammonia in revised EIS Section 10.2.8.2.1 and in revised EIS Appendix 10A, where appropriate. **<u>References</u>** Metal and Diamond Mining Effluent Regulations. SOR/2002-222 under the *Fisheries Act*. Last amended June 18, 2020. Available at https://laws-lois.justice.gc.ca/eng/Regulations/SOR-2002-222/index.html						
81	ECCC	Fish and fish habitat Change to an environmental component due to hazardous contaminants	Section 10.2.8.2.2 Section 10.3.2	**Context**: The Proponent has provided a list of total metals and radionuclides that were carried forward for the quantitative sediment quality assessment and modelling in the Environmental Risk Assessment (ERA). The Proponent states that these were determined based on the corresponding water quality constituents having the potential to exceed baseline values and availability of guidelines. Due to requirements for environmental effects monitoring under the *Metal and Diamond Mining Effluent Regulations* (MDMER) total Organic Carbon (TOC) must be screened for further assessment and modelling. Additionally, based on baseline condition data provided in Section 10.3.2 for sediment quality, barium, iron, manganese and vanadium should be screened in for further assessment as these metals had the highest concentrations in sediment within Patterson Lake and Naomi Lake. **Rationale:** Due to requirements under the MDMER Schedule 5 Sections	1. Include TOC in further assessments in the ERA and sediment quality modelling for the sediment quality assessment. 2. Include barium, iron, manganese and vanadium in further sediment quality assessment and modelling.	NexGen acknowledges the request, and at this time, NexGen maintains that the constituents of potential concern (COPC) screening in the Draft EIS was reasonable and appropriate, and that there is no reason to add total organic carbon (TOC), barium, iron, manganese, or vanadium to a future sediment quality assessment. The screening applied in Draft EIS Section 10.2.8.2 (Constituents of Potential Concern) and in Section 4.2.3 of Draft EIS TSD XXI (Environmental Risk Assessment) indicated negligible risk of the Project to incrementally change the concentration of these sediment constituents in the receiving environment through all phases of the Project to levels that would exceed reference values or guidelines and thus pose a risk to the environment. Specifically, NexGen notes: 1. Total organic carbon was not included in the sediment quality assessment because the Project discharges to Patterson Lake are not expected to be a substantial source of TOC due to the milling and ore processing and water treatment processes on site (i.e., discharges will predominantly be composed of inorganic constituents, and there are minimal organic additives in mine processes/treatment). Therefore, TOC was not identified as having the potential to adversely change sediment quality or surface water quality in the receiving environment, and thus TOC did not screen in as a COPC. Similarly, TOC did not screen in as a COPC for the environmental risk assessment (ERA) (Draft EIS TSD XXI).	n/a	**Context:** The Proponent has responded to both parts of the original IR and has provided rationale for the exclusion of Total Organic Carbon (TOC), barium, manganese and vanadium from further assessment in sediment quality modelling and the Environmental Risk Assessment. However, based on requirements of CSA N288.6-22, iron should be evaluated further due to exceedances of water quality guidelines in baseline surface water quality data and the potential negative effects this may have on the receiving environment. In Section 10.3.1.2, iron was identified as having baseline water quality threshold exceedances in eight waterbodies and watercourses throughout the Local and Regional Study Areas including Patterson Lake. As per CSA N288.6-22 Section 7.2.5.4.2: “If COPCs exceed the screening level for one medium, they should be carried forward into the EcoRA [ecological risk assessment] for all media that are likely to contribute to exposure. For	81-R1	Iron should be included in the exposure assessment portion of the ERA and the sediment quality modelling for the sediment quality assessment.	NexGen concurs with the reviewer that if a constituent of potential concern (COPC) exceeds screening criterion in one medium, it should be assessed for all media that are likely to contribute to exposure points (CSA N288.6-22, Section 7.2.5.4.2 [CSA Group 2022]). NexGen confirms that, for constituents that were identified as COPCs in the Draft EIS (i.e., exposure situations that exceeded a screening criterion), this guidance was followed for the environmental risk assessment (ERA). All COPCs identified in surface water (Draft EIS Section XXI [Environmental Risk Assessment], Section 4.2.3.2) were also assessed in sediment (Draft EIS Section XXI, Section 4.2.3.3), and vice versa, as well as in additional food chain pathways. With respect to iron, it is important to note that an updated Federal Environmental Quality Guideline (FEQG) has been drafted that follows the CCME species sensitivity distribution protocol (ECCC 2019). The updated guideline is dependent on dissolved organic carbon (DOC) and pH. For a pH of 7.0 and using the lower end of the site-specific DOC range from 2.4 mg/L to 13 mg/L (Draft EIS Appendix 10A [Surface Water Quality Modelling Report], Section 10A3.2), the calculated FEQG is 1,588 µg/L for a DOC of 2.4 mg/L. The equation utilized is as follows: FEQG (µg/L) = exp(0.671[ln(DOC)] + 0.171[pH] + 5.586). Under the most recent draft FEQG for iron, there would be no baseline exceedances of iron in the waterbodies in the LSA and RSA, and there would be no need to identify iron as a COPC. NexGen acknowledges that the CCME guideline for iron is 0.3 mg/L; however, this guideline was	n/a

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				12(1)(ii) for environmental effects monitoring of benthic invertebrate communities, TOC must be screened in for further assessment and modelling. Due to elevated concentrations of barium, iron, manganese and vanadium in sediment concentrations within Patterson Lake and Naomi Lake, it is recommended that these metals be included for further sediment quality assessment and modelling.		2. Based on the aquatic baseline report (Draft EIS Annex V.1 [Aquatic Environment Baseline Report]), the only constituents that exceeded sediment quality guidelines in the background characterization monitoring were arsenic, cadmium, lead-210, polonium-210, and vanadium, the last of which is limited to Naomi Lake and the Clearwater River (Draft EIS Annex V.1, Appendix C, Table 27). With the exception of vanadium, the constituents that exceeded sediment quality guidelines in baseline were considered further in the screening assessment in Section 4.2.3.3 of Draft EIS TSD XXI. Of these constituents, arsenic, molybdenum, lead-210, and polonium-210 screened in as COPCs for quantitative assessment in the ERA (Draft EIS TSD XXI, Section 6). Vanadium was excluded from the screening assessment in the Draft EIS TSD XXI because the only exceedances of the sediment quality guideline occurred in a downstream waterbody that would not have a direct discharge from the Project (i.e., Naomi Lake and downstream) and because Project inputs via the water pathway did not indicate the potential for background levels to change in the receiving environment. At this time, NexGen maintains that the COPC screening was reasonable and that there is no need to add barium, iron, and manganese to future assessments because the screening applied in Draft EIS Section 10.2.8.2 and in Section 4.2.3 of Draft EIS TSD XXI indicated negligible risk of the Project to incrementally change the sediment quality in the receiving environment to levels that exceed reference values or guidelines. However, if future sediment monitoring, including monitoring associated with the environmental effects monitoring of benthic invertebrate communities per Schedule 5 of Metal and Diamond Mining Effluent Regulations (MDMER), indicates different conditions or the effluent treatment system includes substantial amounts of an organic additive, the COPC list will be re-evaluated. As per the MDMER, sediment quality constituents, which include TOC as well as barium, iron, manganese, and vanadium, will be reported in the First Interpretive Report not later than 36 months after the day on which the mine becomes subject to Section 7 of the MDMER. Monitoring commitments, such as meeting MDMER requirements, are presented in Draft EIS Section 10.7.2 (Surface Water Receiving Environment Monitoring). NexGen notes that, as part of NexGen's broader, proactive approach to Project engagement and planning (i.e., EA monitoring and follow-up activities), NexGen is conducting a baseline environmental effects monitoring program in 2023. Completing an environmental effects monitoring program during the baseline period enables a before-after-control-impact (BACI) design to be used for the Project moving forward. This proactive approach would help to distinguish potential treated effluent effects from natural differences between reference and exposure areas that may have existed before the initiation of treated effluent discharge. Components and methods to complete fish population and benthic invertebrate community surveys for the baseline environmental effects monitoring program, along with the collection of necessary supporting information (i.e., water quality		example, for a given COPC, if a water screening benchmark is exceeded, the same COPC should be carried forward for sediment if its concentration was above the detection limit." **Rationale:** Iron concentrations exceed water quality thresholds in baseline surface water quality throughout the LSA. Due to the exclusion of iron from the sediment quality assessment and ERA, a determination of Project-related impacts to sediment quality and aquatic biota cannot be made.			developed in 1987, and the draft FEQG guideline follows the most recent CCME species sensitivity distribution protocol. Additionally, the FEQG website (GoC 2024) states under the question "[h]ow do FEQGs differ from Canadian Environmental Quality Guidelines" that "[c]urrently, under the Chemicals Management Plan, there is an additional need to develop FEQGs to support federal environmental quality monitoring, risk assessment and risk management activities on substances for which CCME guidelines do not yet exist or are not reasonably expected to be updated in the near future". Therefore, NexGen maintains that the Draft FEQG guideline should be used in preference over the CCME guideline. From a human health perspective, Health Canada has not set a maximum acceptable concentration for iron (the current value represents an aesthetic objective). Iron is an essential element with no evidence for toxic effects unless large quantities of iron are ingested. To show that predicted iron concentrations in sediment in Patterson Lake North Arm – West Basin are below sediment quality guidelines, the following estimation has been performed: $C_{sediment,iron} = C_{water,iron} * K_d$ where: $C_{water,iron}$ = 8.84E-02 mg/L (Patterson Lake North Arm – West Basin, Max Upper Bound [Draft EIS TSD XXI, Table 4-2) K_d = 5000 L/kg (CSA N288.1-20 [CSA Group 2020]) $C_{sediment,iron}$ = 4.42E+02 mg/kg dw There are no federal or provincial guidelines for iron in sediment; therefore, the lowest effect level (LEL) for iron of 2.00E+04 mg/kg from Ontario was utilized (MOEE 1993). The predicted sediment concentration in Patterson Lake North Arm – West Basin is well below the sediment LEL; therefore, no impacts from iron on the aquatic environment are expected. NexGen confirms that the results of the assessment would remain unchanged based on the information in this IR response; therefore, no changes are required in the revised EIS. **<u>References</u>** CSA Group (Canadian Standards Association Group). 2020. CSA N288.1-20: Guidelines for Calculating Derived Release Limits for Radioactive Material in Airborne or Liquid Effluents for Normal Operation of Nuclear Facilities. CSA Group. 2022. CSA N288.6-22: Environmental Risk Assessments at Nuclear Facilities and Uranium Mines and Mills. ECCC (Environment and Climate Change Canada). 2019. Federal environmental quality guidelines – Iron. May. Available at https://www.canada.ca/en/environment-climate-change/services/evaluating-existing-substances/federal-environmental-quality-guidelines-iron.html. GoC (Government of Canada). 2024. Federal Environmental Quality Guidelines (FEQGs). Accessed March 2024. Available at https://www.canada.ca/en/health-canada/services/chemical-substances/fact-sheets/federal-environmental-quality-guidelines.html#a3.	

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						and sediment characterization), will follow the metal mining environmental effects monitoring guidance document (Environment Canada 2012). Planning for and initiating this baseline environmental effects monitoring program has also provided an opportunity to engage primary Indigenous Groups on study design; based on Indigenous Group's feedback, non-lethal fish surveys were selected to minimize fish mortality while following the metal mining environmental effects monitoring guidance document (Environment Canada 2012). No changes are proposed in the revised EIS to address this IR. **<u>References</u>** Environment Canada. 2012. Metal Mining Technical Guidance for Environmental Effects Monitoring. Government of Canada, Environment Canada National EEM Office, Science Policy and Environmental Quality Branch, Ottawa, Ontario. Available at https://www.canada.ca/en/environment-climate-change/services/managing-pollution/environmental-effects-monitoring/metal-mining-technical-guidance/metal-mining-technical-guidance-environmental-effects-monitoring.html Metal and Diamond Mining Effluent Regulations. SOR/2002-222 under the *Fisheries Act*. Last amended June 18, 2020. Available at https://laws-lois.justice.gc.ca/eng/Regulations/SOR-2002-222/index.html					MOEE (Ministry of Environment and Energy). 1993. Guidelines for the Protection and Management of Aquatic Sediment Quality in Ontario. Ontario Ministry of Environment and Energy.	
82	ECCC	Fish and fish habitat Change to an environmental component due to hazardous contaminants	Section 10.2.8.3.1 Section 10.3.1.2 Appendix 10A-2	**Context**: Table 10.2-5 pg. 1620-1622 demonstrates Constituents of Potential Concern (COPCs), their respective water quality guidelines from applicable sources, and proposed Project thresholds that have been selected based upon the most stringent guidelines. General parameters such as temperature, pH, conductivity, etc. that would require Project thresholds and monitoring under the *Metal and Diamond Mining Effluent Regulations* (MDMER) have not been provided in this table. Phosphorous and its respective guidelines and Project threshold is missing from this table. All COPCs that require calculations based on other parameters such as hardness, pH, or temperature to derive guidelines (i.e. ammonia, cobalt, zinc, etc.) should be calculated and added to the table, with a note specifying the parameter values used in the calculation. For nitrate (as N) the Canadian Council of Ministers of the Environment (CCME) chronic guideline provided in the table is 3.0 mg/L however, the correct value is 13 mg/L. For molybdenum, the most stringent water quality guideline is the CCME guideline of 0.073 mg/L, not the provincial guideline of 31 mg/L. For	1. Update Table 10.2-5 to include all general parameters required for environmental effects monitoring: pH, temperature, hardness, alkalinity, and conductivity. 2. Update Table 10.2-5 to include phosphorous and its respective guidelines and Project threshold. 3. Verify that all COPCs that require calculations based upon other parameters such as hardness, pH, temperature, etc. are calculated and input as values into the table with notes specifying the parameter values used in the calculations. 4. Update Project nitrate and vanadium guidelines and thresholds to the correct values, update molybdenum assessments and consider applying the most stringent molybdenum water quality guidelines as the Project threshold. 5. Provide additional information to justify the use of selected water quality guidelines on any water quality guideline exceedances for molybdenum for all Project phases including post-closure. 6. Update Table 10.3-3 to include the baseline data for general water	Responses to part 1 through part 7 of this IR are provided below. 1. NexGen notes that Table 10.2-5 of Draft EIS Section 10.2.8.3.1 (Water Quality Thresholds) is limited to presenting the selected chronic (i.e., long-term) Project thresholds for the constituents of potential concern (COPCs) that apply specifically to the protection of aquatic life. Thus, constituents such as pH, temperature, hardness, alkalinity, and conductivity have not been included in the table because they were not identified as COPCs. Assumptions regarding potential exposure and toxicity modifying factors such as pH, temperature, and hardness, and their influence on guidelines and the selected Project threshold are presented as footnotes to Table 10.2-5 and linked to the relevant constituent to which they apply. These additional constituents have been included in baseline monitoring datasets and tables and would be included in monitoring programs during the life of the Project, including reporting under the Metal and Diamond Mining Effluent Regulations (MDMER). In response to the meeting with the CNSC and Environment and Climate Change Canada (ECCC) on 9 June 2023 to discuss FIRT IRs, NexGen will revise Table 10.2-5 of revised EIS Section 10.2.8.3.1 to broaden the discussion of assumptions regarding pH, temperature, hardness, alkalinity, and specific conductivity, as necessary. 2. Phosphorus is a COPC in the surface water quality assessment but is not listed in Table 10.2-5 of Draft EIS Section 10.2.8.3.1 because it is a COPC that is associated with aquatic productivity limits and not guidelines for the protection of aquatic life. Table	Section 10.2.8.3.1, 10.3.1.2, 10.3.1.3	**Context:** Parts one, two, four and five of the original IR have been addressed by the Proponent. However, additional information is required to address parts three, six and seven. Baseline data has not been provided for thallium in Tables 10.3-3 to Table 10.3-6 or in Attachment 10A-1 of Draft EIS Appendix 10A. The Proponent has stated that thallium was not selected for further assessment because there is no significant source term, however, effluent characterization predictions and data on baseline concentrations of thallium in the receiving environment are required to validate predictions of no risk. Thallium is a required parameter for effluent and water quality monitoring under Schedule 5 of the MDMER. In the Draft EIS Table 10.2-5, the equation for calculating the Project threshold for Cobalt has been provided, rather than a calculated value based on baseline concentrations of hardness in the receiving environment. **Rationale:** Currently there is no available baseline receiving environment surface water quality data or effluent characterization	82-R1	1. Provide the calculations used to determine the calculated value for cobalt in Table 10.2-5. 2. Provide the revised Table 10.2-5 for review. **3.** Provide baseline receiving environment surface water quality data and predicted effluent characterization concentrations of thallium. **4.** Update the surface water quality assessment and modelling as needed to incorporate data on thallium and confirm predictions of no negative effects to the aquatic receiving environment and receptors.	NexGen has provided the information below to address part 1 through part 4 of IR 82-R1. 1. NexGen confirms that the Project cobalt threshold was calculated according to the equation below from the Federal Environmental Quality Guideline (Environment Canada 2017): FWQG = exp{(0.414[ln(hardness)] – 1.887} where: FWQG = Federal Water Quality Guideline (µg/L) hardness = ambient hardness (mg/L $CaCO_3$) As per Environment Canada (2017), this equation is used to calculate the cobalt guideline for waters with ambient hardness within the range of 52 mg/L to 396 mg/L $CaCO_3$. The equation is not to be extrapolated to calculate the guideline for waters with hardness outside of this range (i.e., this hardness range provides a lower bound and an upper bound for calculating the guideline). The ambient hardnesses for the watercourses and waterbodies local to the Project area (i.e., from Patterson Lake to Naomi Lake) vary from 12 mg/L to 18 mg/L $CaCO_3$. Therefore, as per Environment Canada (2017), to determine the Project threshold for cobalt, the lower bound hardness of 52 mg/L $CaCO_3$ must be used. As a result, the Project cobalt threshold is calculated as follows: FWQG = exp{(0.414[ln(52)] – 1.887} = 0.78 µg/L	Section 10; Section 11; Section 13; Section 14; Section 16; Section 17; TSD XXI

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				vanadium it appears the federal water quality guideline was suggested, however the correct value is 120 ug/L or 0.120 mg/L, not 0.00012 mg/L. In Appendix 10A-2 pg. 1946 modelled surface water concentrations of molybdenum for the application and upper bound modelling scenarios at all downstream lakes are displayed. There is a significant increase in surface water concentrations in the far future, and it is difficult to discern if there are any exceedances of the 0.073 mg/L CCME chronic guideline. There has been no discussion of these increases within the results of the EIS. Table 10.3-3 pg. 1634-1636 displays the existing baseline water quality conditions for all the areas within the LSA and RSA. General parameters (ex. temperature, pH, conductivity, etc.) and nutrients (ex. total and un-ionized ammonia, nitrate, phosphorus etc.) that would require Project thresholds and monitoring under the Metal and Diamond Mining Effluent Regulations (MDMER) have not been provided in this table. **Rationale**: The recommended changes for Table 10.2-5 are based upon providing all the information needed for reviewers to assess the characterization of effects Proposed changes incorporate the usage of correct, up-to-date and the most stringent chronic water quality guidelines. It is difficult to discern if there is an exceedance of the water quality threshold for molybdenum, which should be discussed more in-depth in the results of the EIS. The recommended changes for Table 10.3-3 are based on providing baseline conditions in order for comparisons to determine if there are Project related effects that could cause changes to these parameters over the course of the Project's lifespan.	quality parameters and nutrients that would require monitoring under the MDMER. 7. Update assessments as necessary according to changes in thresholds applied as described in ECCC- SW-13.	10.2-5 lists the COPCs that are associated with chronic (i.e., long-term) Protection of Aquatic Life Project thresholds. The phosphorus Project threshold is shown in Table 10.2-8 of Draft EIS Section 10.2.8.3.3 (Productivity Status Thresholds). The limit used for setting the Project threshold is based on total phosphorus concentrations and associated trophic conditions at the upper bound of the mesotrophic status per the provincial guidelines (MOEE 1994), which is consistent with the trophic categories based on total phosphorus in Canadian lakes and rivers (Environment Canada 2004; CCME 2004). The Project threshold for phosphorus is discussed and presented separately from the protection of aquatic life COPC Project thresholds in Draft EIS Section 10.2.8.3.3 (Productivity Status Thresholds). No changes are proposed in the revised EIS to address part 2 of this IR. 3. NexGen confirms that for COPCs that have exposure and toxicity modifying factors (ETMFs) such as pH, temperature, and hardness in the derivation of their respective Project thresholds, the ETMFs were applied accordingly. NexGen confirms that the various assumptions used in setting respective Project thresholds are provided in the footnotes of Table 10.2-5 of Draft EIS Section 10.2.8.3.1. No changes are proposed in the revised EIS to address part 3 of this IR. 4. With respect to the nitrate, vanadium, and molybdenum guideline changes requested by ECCC, NexGen responds as follows: ▪ For the nitrate (NO_3) Project threshold, NexGen recommends maintaining the nitrate Project threshold as 3 milligrams nitrogen per litre (mg N/L). This threshold is sourced from the British Columbia Ministry of Environment (BC MOE) water quality guidelines (BC MOE 2009), which includes freshwater species sensitivity in its derivation (i.e., the BC MOE recommended freshwater guideline for nitrate was derived by multiplying the 10-day lowest observed effect concentration of 133 mg NO_3/L [Schuytema and Nebeker 1999] by a safety factor of 0.1 and converting to nitrate as nitrogen [N]). This guideline is considered conservative as NexGen notes that nitrate guidelines have been more recently derived that consider the influence of chloride as a modifying factor that can reduce the potential for nitrate toxicity in freshwater ecosystems (e.g., Soucek and Dickenson 2016). NexGen also acknowledges that this threshold is only slightly above the Canadian Council of Ministers of the Environment (CCME) guideline (CCME 2012), so does not consider the selection of the BC MOE guideline as elevating potential for risk to aquatic life in the assessment. ▪ With respect to vanadium, NexGen acknowledges an error in the vanadium guideline stated in Draft EIS Section 10.2.8.3.1 and will adjust the Project threshold for vanadium (i.e., 0.12 mg/L) in Table 10.2-5 of revised EIS Section 10.2.8.3.1 accordingly.		data available for thallium to confirm predictions of no risk to the receiving environment and aquatic receptors. Additionally, due to predicted changes in concentrations of hardness in the receiving environment over the course of the Project life cycle it is necessary that the Proponent confirm the Project threshold for cobalt.			NexGen notes that the calculated Project cobalt threshold in the Draft EIS did not use the lower bound of 52 mg/L $CaCO_3$ but rather used the ambient hardness of Patterson Lake, which generally ranges from 15 mg/L to 17 mg/L $CaCO_3$; this resulted in a Project cobalt threshold of 0.46 µg/L rather than the 0.78 µg/L threshold calculated above. As a result, the assessment results associated with cobalt were overly conservative. In particular, as presented in Draft EIS Section 10.5.1.2.3 (Trace Metals), the predicted far-future cobalt concentration threshold exceedances in Forrest Lake – North Basin (i.e., 0.77 µg/L), Beet Lake (i.e., 0.62 µg/L), and Naomi Lake (i.e., 0.52 µg/L) would no longer exist. However, far-future cobalt concentrations in Patterson Lake North Arm – West Basin and Patterson Lake South Arm would remain above the Project cobalt threshold. As noted in Draft EIS Section 10.7.2 (Surface Water Receiving Environment Monitoring) and Draft EIS Section 23.5.3 (Adaptive Management), NexGen is developing an Adaptive Management Plan for cobalt and copper and will provide the Plan to the CNSC, when available, for review outside the EA process. To address inaccuracies within the Draft EIS related to the 0.46 µg/L Project cobalt threshold, NexGen will make revisions reflective of the updated Project cobalt threshold (i.e., 0.78 µg/L) in revised EIS Section 10 (Surface Water Quality and Sediment Quality), revised EIS Section 11 (Fish and Fish Habitat), revised EIS Section 13 (Vegetation), revised EIS Section 14 (Wildlife and Wildlife Habitat), revised EIS Section 16 (Cultural and Heritage Resources and Indigenous Land and Resource Use), revised EIS Section 17 (Other Land and Resource Use), and revised EIS TSD XXI (Environmental Risk Assessment). 2. NexGen confirms that Table 10.2-5 of revised EIS Section 10.2.8.3.1 (Water Quality Thresholds) will be updated to include the cobalt threshold and molybdenum provincial objective and threshold as well as broaden the discussion of assumptions regarding pH, temperature, hardness, alkalinity, and specific conductivity, as necessary. 3. Measured thallium data for the baseline receiving environment and potential sources of thallium in effluent are provided in Attachment IR 49-R1, 79-R1, and 82-R1. 4. As described in Attachment IR 49-R1, 79-R1, and 82-R1, thallium is confirmed not to be a constituent of potential concern. Based on the measured concentrations of thallium in the baseline aquatic environment and in potential effluent sources, NexGen has confirmed that there is no potential for adverse effects to aquatic receiving environment, including receptors, with regards to thallium. **<u>References</u>** Environment Canada. 2017. *Canadian Environmental Protection Act, 1999*. Federal Environmental Quality Guidelines Cobalt. May 2017. 9pp. Available at https://www.ec.gc.ca/ese-ees/92F47C5D-24F5-4601-AEC0-390514B3ED75/FEQG%20Cobalt%20Final%20EN.pdf.	

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						▪ In the Draft EIS, NexGen used the provincial molybdenum guideline (i.e., 31 mg/L; WSA 2017) preferentially over the more conservative federal guideline (i.e., 0.073 mg/L; CCME 2023) because the CCME guideline remains interim and because the provincial guideline has been derived from recent data, following the CCME (2007) protocol. However, based on feedback from Environment and Climate Change Canada (ECCC) on 9 June 2023, NexGen will change the Project threshold from the province-specific guideline for molybdenum (i.e., 31 mg/L; WSA 2017) to the recently updated BC MOE guideline of 7.6 mg/L (BC MOE 2021) in the revised EIS. The regulatory rationale for this change from the Saskatchewan Water Security Agency (WSA) guideline to the BC MOE guideline is because the BC MOE guideline is more conservative than the WSA guideline and is derived from recent data following the CCME (2007) protocol. The revised EIS will be updated to reflect the changes with regard to thresholds for vanadium and molybdenum outlined in part 4 of this IR. NexGen confirms that the corrected Project thresholds for vanadium and molybdenum would not change the findings of the surface water quality assessment for these constituents. 5. NexGen's preference for the BC MOE guideline for molybdenum is based on uncertainty in the CCME guideline, primarily due to the inability of follow-up studies to reproduce the findings of the source on which the CCME guideline was based. Specifically, the CCME guideline was based on multiplying the lowest chronic toxicity value, the 28-day 50% lethal effect concentration (LC_{50}) of 0.73 mg/L for rainbow trout (*Oncorhynchus mykiss*), by a safety factor of 0.1. The original study by Birge (1978) has not been reproducible, either using the original methods or using standard methods (Davies et al. 2005). 6. With respect to the list of constituents presented in Table 10.3-3 to Table 10.3-6 of Draft EIS Section 10.3.1.2 (Water Quality [Risk to Aquatic Life and Terrestrial Life] and Drinking Water Quality Constituent Concentrations) and Table 10.3-7 to Table 10.3-9 of Draft EIS Section 10.3.1.3 (Productivity Status Constituent Concentration), the tables only include background information for the COPCs selected for the surface water quality assessment. Therefore, the background data for constituents that did not screen in as COPCs for the Project are not included in these tables. A more complete surface water quality background baseline dataset, including those constituents listed as MDMER monitoring constituents, is provided in Attachment 10A-1 of Draft EIS Appendix 10A (Surface Water Quality Modelling Report). However, in response to the meeting with the CNSC and ECCC to discuss FIRT IRs on 9 June 2023, NexGen will revise Table 10.3-3 to Table 10.3-9 of revised EIS Section 10.3.1.2 and Section 10.3.1.3, as necessary, to clarify assumptions for constituents flagged as exceeding Project thresholds where the value or concentration of other measured constituents (e.g., pH, temperature, hardness) contributed to the exceedances under background conditions. These						

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						added assumptions will assist the CNSC and ECCC in verifying the identification of the Project thresholds. 7. With respect to the corrected Project thresholds (i.e., vanadium and molybdenum), the surface water quality assessment findings for these constituents would not change. Therefore, no changes are proposed in the revised EIS to address part 7 of this IR. **References** BC MOE (British Columbia Ministry of Environment). 2009. Water Quality Guidelines for Nitrogen (Nitrate, Nitrite, and Ammonia). Addendum to Technical Appendix. Water Stewardship Division, Ministry of Environment Province of British Columbia. BC MOE. 2021. B.C. Ministry of Environment and Climate Change Strategy 2021. Molybdenum Water Quality Guidelines for the Protection of Freshwater Aquatic Life, Livestock, Wildlife and Irrigation. Water Quality Guideline Series, WQG-07. Prov. B.C., Victoria B.C. Birge WJ. 1978. Aquatic Toxicology of Trace Elements of Coal and Fly Ash. Special Collections, USDA National Agricultural Library. Accessed February 2023, https://www.nal.usda.gov/exhibits/speccoll/items/show/5224 CCME (Canadian Council for the Ministers of the Environment). 2004. Canadian Water Quality Guidelines for the Protection of Aquatic Life: Phosphorus: Canadian Guidance Framework for the Management of Freshwater Systems. In: Canadian Environmental Quality Guidelines, 2004. Winnipeg, MB, Canada. CCME. 2007. A protocol for the derivation of water quality guidelines for the protection of aquatic life. CCME. 2012. Canadian Water Quality Guidelines for the Protection of Aquatic Life: Nitrate Ion. Canadian Environmental Quality Guidelines. Available at https://ccme.ca/en/res/nitrate-ion-en-canadian-water-quality-guidelines-for-the-protection-of-aquatic-life.pdf CCME. 2023. Water Quality Guidelines Summary Table. Available at https://ccme.ca/en/summary-table Davies TD, Pickard J, Hall JK. 2005. Acute molybdenum toxicity to rainbow trout and other fish. Journal of Environmental Engineering & Science 4: 481-485. Environment Canada. 2004. Canadian Guidance Framework for the Management of Phosphorus in Freshwater Systems: Science-based Solutions Report No. 1-8. National Guidelines and Standards Office, Water Policy ad Coordination Directorate, Environment Canada. Pp. 114. Metal and Diamond Mining Effluent Regulations. SOR/2002-222 under the *Fisheries Act*. Last amended June 18, 2020. Available at https://laws-						

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						lois.justice.gc.ca/eng/Regulations/SOR-2002-222/index.html MOEE (Ontario Ministry of Environment and Energy). 1994. Water management: policies, guidelines, provincial water quality objectives. Accessed September 2021. Available at https://www.ontario.ca/page/water-management-policies-guidelines-provincial-water-quality-objectives Schuytema GS, Nebeker AV. 1999. Comparative toxicity of ammonium and nitrate compounds to Pacific treefrog and African clawed frog tadpoles. Environmental Toxicology and Chemistry 18:2251-2257. Soucek DJ, Dickinson A. 2016. Influence of chloride on the chronic toxicity of sodium nitrate to *Ceriodaphnia dubia* and *Hyalella azteca*. Ecotoxicology. 2016 Sep;25(7):1406-16. Doi: 10.1007/s10646-016-1691-1. Epub 2016 Jul 7. PMID: 27386878. WSA (Saskatchewan Water Security Agency). 2017. Saskatchewan Water Quality Objective for the Protection of Aquatic Life – Molybdenum. Fact Sheet. Report No. WSA 514.						
83	CNSC	Radiological Threshold Selection for water quality	Section 10.2.8.3.1	**Context:** The EIS states that thresholds for radionuclides in surface water for risk to aquatic life were calculated from a biota dose benchmark, following the USDOE document: A Graded Approach for Evaluating Radiation Doses to Aquatic and Terrestrial Biota. **Rationale:** Typically, dose is cumulatively assessed from all sources of radiation by applying a recommended dose benchmark (100 µGy/hr for terrestrial biota and 400 µGy/hr for aquatic biota). It is unclear from the text if the selected concentrations for the radiological COPCs is reflective of the concentration of each individual radionuclide required to reach the threshold, or if the cumulative dose from all the radiological COPCs was considered in the calculation when deriving the concentration threshold in water.	1.Provide clarification of which dose benchmarks were considered when deriving the radiological concentration threshold in surface water. 2.Provide clarification on whether the thresholds derived only considered dose from the individual radionuclide or were they derived considering cumulative dose from all radiological COPCs? 3.Provide an example calculation on how these thresholds were derived to understand the process undertaken	Responses to part 1, part 2, and part 3 of this IR are provided below. 1. NexGen clarifies that the dose benchmarks for lead-210, polonium-210, and thorium-230 used for the surface water assessment and the ecological risk assessment are the Biota Concentration Guides (BCGs) from the United States Department of Energy (US DOE 2019), as discussed in Draft EIS Section 10.2.8.3.1 (Water Quality Thresholds). The radium-226 benchmark for surface water is from the Saskatchewan Ministry of Environment (Government of Saskatchewan 2017). These BCGs were derived based on a screening dose benchmark of 400 micrograys per hour (µGy/h) for aquatic organisms from US DOE (2019). 2. NexGen clarifies that the BCGs from the US DOE RESRAD-BIOTA tool (ISCORS 2004) are based on individual radionuclides meeting the dose benchmark. The BCGs were used as overall guidelines and were not used to screen and remove any radionuclides from the assessment. If the BCGs were to be used as a screening approach to remove radionuclides, then as recommended by US DOE, a sum of fractions approach would be used to ensure that all radionuclides cumulatively did not result in a dose above the dose benchmark. 3. Appendix G, Biota Concentration Guides (BCGs) in Water, Sediment, and Soil, in US DOE (2019) provides a detailed description of how radionuclides are selected and associated BCGs are derived, and the calculations required to derive the BCGs for each medium. No changes are proposed in the revised EIS to address this IR. **<u>References</u>**	n/a	Based on NexGen's response, CNSC staff understand that the thresholds selected for radiological COPC's in section 10.2.8.3.1 represent the concentration in water that would result in meeting the dose threshold for that individual COPC. CNSC staff would like to emphasize NexGen will need to assess cumulative dose to biota through ongoing environmental risk assessment to ensure the ratios of radiological COPC's released to the environment do not cumulatively exceed the appropriate dose threshold.	83-R1	CNSC staff request NexGen provide the values and sources of the fresh mass aquatic animal to water concentration factor, dose conversion factor, and dose coefficients used to calculate their Biota Concentration Guides (BCGs).	NexGen confirms that all radionuclides in the U-238 decay chain were assessed for cumulative total dose in Section 6.2.5.1.2 and Section 6.2.5.2.2 of Draft EIS TSD XXI (Environmental Risk Assessment), and concurs with the reviewer that this approach will continue to be implemented in future environmental risk assessments (ERAs). NexGen further confirms that the Biota Concentration Guides (BCGs) were not used in any calculations in the ERA or Draft EIS Section 10 (Surface Water Quality and Sediment Quality). The BCGs were used for information purposes only in Draft EIS Section 10 and were not used to screen out radionuclides from further assessment. The following information is provided in response to the reviewer's request. The limiting BCGs used for Pb-210, Po-210, and Th-230 were for aquatic animals. The requested data for fresh mass aquatic animal to water bioaccumulation factor (Biv; [ANL, 2016; US DOE 2019], which is defined as the equilibrium ratio of the contaminant concentration in the fresh weight of biota relative to the contaminant concentration in an environmental medium resulting from the uptake of the contaminant from one or more routes of exposure), and dose coefficients (DCF; external and internal) for aquatic animals are provided in Table 1 of Attachment IR 83-1. NexGen notes that the benchmark for Ra-226 of 0.11 Bq/L was taken from the Saskatchewan Ministry of Environment; therefore, no data for Ra-226 is provided. To illustrate that these BCGs are protective of the environment for the Project, the concentrations at the edge of the regulated mixing zone from Table 10.5-4 of Draft EIS Section 10.5.1.1.4 (Radionuclides) were compared against the screening benchmarks, and a sum of fractions approach was used to determine if these concentrations would be acceptable. As the sum of fractions is less than 1 (Table 2 of Attachment IR 83-1), no adverse effects would be anticipated. The complete ecological dose calculations	n/a

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						Government of Saskatchewan. 2017. Radium-226 in Surface Water – Fact Sheet. Saskatchewan Environmental Quality Guidelines. EPB #602. Saskatchewan Ministry of Environment. ISCORS (Interagency Steering Committee on Radiation Standards). 2004. RESRAD-BIOTA: A tool for implementing a Graded Approach to Biota Dose Evaluation. ISCORS Technical Report 2004-02 (U.S. Department of Energy report DOE/EH-0676), Washington, D.C. US DOE (United States Department of Energy). 2019. A Graded Approach for Evaluating Radiation Doses to Aquatic and Terrestrial Biota. DOE-STD-1153-2019.					are presented in Section 6.2.5.1.2, Section 6.2.5.2.2, and Appendix C of Draft EIS XXI. No changes are required to the revised EIS to address this IR. **References** ANL (Argonne National Laboratory). 2016. RESRAD-BIOTA Version 1.8. Available at https://resrad.evs.anl.gov/codes/resrad-biota. US DOE (United States Department of Energy). 2019. A Graded Approach for Evaluating Radiation Doses to Aquatic and Terrestrial Biota. DOE-STD-1153-2019.	
84	ECCC	Fish and fish habitat Change to an environmental component due to hazardous contaminants	Section 10.2.8.3.4	**Context**: The residual effects analysis measures the effects of the Project on surface water and sediment quality against existing conditions and thresholds. Thresholds were set to identify if projected surface water and sediment quality over the lifespan of the project and the far-future projection had the potential to adversely affect aquatic life and waterbody productivity health. In Table 10.2-9 pg. 1626 it is unclear why several parameters for sediment quality do not have a Project threshold identified despite there being potential sediment quality guidelines available (ex. cadmium, lead, nickel, selenium, vanadium and zinc). It is also unclear why Project thresholds that have been identified for some parameters (ex. arsenic, copper, and molybdenum) are not based upon the most stringent guidelines available with no rationale provided. **Rationale**: The recommended changes for Table 10.2-9 are based upon incorporating the use of the most stringent chronic sediment quality guidelines for the protection of the receiving environment. Use of the most stringent guidelines will allow for the most protective assessment to analyze risks to the receiving environment.	Update Table 10.2-9 to incorporate the selection of the most stringent sediment quality guidelines for all parameters with available sediment quality guidelines. If this cannot be done, provide rationale as to why.	As indicated in Section 4.2.3.3 of Draft EIS TSD XXI (Environmental Risk Assessment) and in Draft EIS Section 10.2.8.3.4 (Sediment Quality Thresholds), Burnett-Seidel and Liber (2013) Reference (REF) values were selected as the preferred source of the Project thresholds for constituents of potential concern (COPCs) in the sediment quality assessment. This selection was because the reported values in Burnett-Seidel and Liber (2013) are specifically applicable to uranium mining operations in Saskatchewan waterbodies. The REF values from Burnett-Seidel and Liber (2013) were preferentially used even if these values were higher than Canadian Council of Ministers of the Environment sediment quality guidelines (i.e., arsenic), which are generic guidelines that are applicable to all waterbodies in Canada. An exception in the sediment quality assessment in the Draft EIS was copper, where the selected Project threshold was sourced from the lowest effect level (LEL) value in the reference values for uranium mining and milling in Canada (Thompson et al. 2005). The Thompson et al. (2005) values are applicable to uranium ore-bearing regions of northern Saskatchewan and Ontario. However, the use of the LEL value for copper was an oversight, as there is a REF value for copper in Burnett-Seidel and Liber (2013); therefore, the Project threshold for copper for the sediment quality assessment will be updated to the Burnett-Seidel and Liber (2013) REF value in the revised EIS. Despite this change, the maximum predicted sediment copper concentrations in Patterson Lake North Arm – West Basin (Draft EIS TSD XXI) in the Application Case and the far-future projection are below the REF copper value. Table 10.2-9 in revised EIS Section 10.2.8.3.4 and Table 4-3 in Section 4.2.3.3 of revised EIS TSD XXI will be updated to correct the Project copper threshold for sediment quality. No other changes to the tables will be made as the purpose of the tables is to identify the sediment COPC Project thresholds for the sediment quality assessment. The selection of COPCs for Project thresholds for sediment quality was driven by the environmental risk assessment (ERA) screening, based on: ▪ if the maximum predicted sediment concentration of a sediment quality constituent in Patterson Lake North Arm – West Basin during the Application Case, including the maximum upper bound scenario and the far-future projection, was greater	Section 10.2.8.3.4; TSD XXI, Section 4.2.3.3	**Context:** The Proponent has provided rationale for the selection of Burnett-Seidel and Liber (2013) Reference (REF) values as the preferred sources for Project thresholds and the proposed updates to the copper threshold selection. However, there remain inconsistencies in the listed Selected Project Thresholds in Table 10.2-9 Draft EIS Section 10.2.8.3.4 and in Table 4-3 Section 4.2.3.3 of TSD XXI Environmental Risk Assessment that the Proponent has not addressed. In Table 10.2-9 Draft EIS Section 10.2.8.3.4 selected Project threshold have not been listed for cadmium, lead, nickel, selenium, vanadium and zinc, despite thresholds being available for these parameters. With the exception of vanadium, these parameters were all screened in as Contaminants of Potential Concern (COPCs) for the sediment quality assessment. Vanadium was identified as having baseline exceedances of sediment quality guidelines in Naomi Lake. Selected Project thresholds should be clearly identified and listed in this table for each of these COPCs, as they are currently not identified. Furthermore, when Table 10.2-9 Draft EIS Section 10.2.8.3.4 is compared to Table 4-3 Section 4.2.3.3 of TSD XXI Environmental Risk Assessment there remains inconsistencies in the selection of the thresholds. Table 4-3 is part of the sediment quality screening comparing predicted sediment concentrations in Patterson Lake to selected Project thresholds and determines which COPCs proceed to the next tier of assessment. Table 4-3 should use the same screening values as the selected Project thresholds outlined in Table 10.2-9, and both tables should use the most stringent guidelines available, or the preferred Burnett-Seidel and Liber (2013) REF values as justified by the Proponent. However, the Burnett-Seidel and Liber	84-R1	Update the following tables and provide them for review: ▪ Update Table 10.2-9 Draft EIS Section 10.2.8.3.4 to list the missing Selected Project Thresholds for cadmium, lead, nickel, selenium, vanadium and zinc. ▪ Update Table 4-3 Section 4.2.3.3 of TSD XXI Environmental Risk Assessment to utilize the Burnett-Seidel and Liber (2013) REF value of 16.3 ug/kg dw for lead as listed in Table 10.2-9 Draft EIS Section 10.2.8.3.4. ▪ Update Table 4-3 Section 4.2.3.3 of TSD XXI Environmental Risk Assessment to include vanadium and update the sediment quality assessment as needed. If additional corrections are required, detail any other report sections that are affected and ensure that all sections impacted by the error are updated.	NexGen confirms that the following response is specific to IR 84-R1 and does not speak to specific commitments made in NexGen's initial response to the original IR 84. NexGen further confirms that the revised EIS will contain changes committed to in the responses of both IR 84 and IR 84-R1. To clarify the context provided in NexGen's initial response to the original IR, Table 10.2-9 of Draft EIS Section 10.2.8.3.4 (Sediment Quality Thresholds) presents the Project sediment thresholds for constituents of potential concern that were forwarded for quantitative assessment in the environmental risk assessment (ERA). Constituents of potential concern that did not pass the ERA screening process did not have a sediment threshold value assigned; therefore, these values are not presented in Table 10.2-9 of Draft EIS Section 10.2.8.3.4. With this context, and to address the reviewer's request, Table 10.2-9 of revised EIS Section 10.2.8.3.4 will be updated to include Project thresholds for cadmium, lead, nickel, selenium, vanadium, and zinc. NexGen will add the Burnett-Seidel and Liber (2013) REF and NE2 values of 16.3 mg/kg dw and 19.7 mg/kg dw, respectively, for lead into Table 4-3 of Section 4.2.3.3 of revised EIS TSD XXI (Environmental Risk Assessment). NexGen will also add all table information for vanadium, including the Burnett- Seidel and Liber (2013) and Thompson et al. (2015) values for vanadium, in Table 4-3 in Section 4.2.3.3 of revised EIS TSD XXI. NexGen notes that there are no changes to the sediment screening conclusions as a result of these updates; therefore, no further changes within revised EIS TSD XXI are required in this regard. **References** Burnett-Seidel C, Liber K. 2013. Derivation of no-effect and reference-level sediment quality values for application at Saskatchewan uranium operations. Environmental Monitoring and Assessment. 185(11): 9481-9494. Thompson, P.A., Kurias, J., Mihok. S. 2005. Derivation and use of sediment quality guidelines for ecological risk assessment of metals and radionuclides released to the environment from uranium mining and milling activities in Canada. Environ. Monit. Assess. 110, 71-85.	Section 10.2.8.3.4; TSD XXI, Section 4.2.3.3

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						than a sediment quality guideline (i.e., arsenic, molybdenum, lead-210, and polonium-210); ▪ if the constituent was identified as a COPC in the surface water quality assessment (i.e., cobalt and copper); ▪ if the constituent required an evaluation for toxicity and radiotoxicity (i.e., uranium); or ▪ if the constituent was a Project-focused radionuclide (i.e., uranium-234, uranium-238, thorium-230, and radium-226). Where predicted sediment concentrations did not screen in on the basis of these four conditions, NexGen believes there is a negligible risk of that constituent increasing in the sediment to present a risk to aquatic biota or other users and it was not evaluated further. However, NexGen notes that all of the listed sediment quality constituents in Table 10.2-9 in Draft EIS Section 10.2.8.3.4 not screened in as COPCs, as well as those that did screen in for sediment quality, were carried forward to the ERA for screening as part of the ERA. The footnotes in Table 10.2-9 in revised EIS Section 10.2.8.3.4 will be updated to provide this clarification. Revised EIS Section 10.2.8.3.4 and Table 4-3 in Section 4.2.3.3 of revised EIS TSD XXI will be updated to reflect the changes outlined in this response. **<u>References</u>** Burnett-Seidel C, Liber K. 2013. Derivation of no-effect and reference-level sediment quality values for application at Saskatchewan uranium operations. Environmental Monitoring and Assessment. 185(11): 9481-9494. Thompson PA, Kurias J, Mihok S. 2005. Derivation and use of sediment quality guidelines for ecological risk assessment of metals and radionuclides released to the environment from uranium mining and milling activities in Canada. Environmental Monitoring and Assessment. 110:71-85.		(2013) values for lead are missing from Table 4-3, which as the most stringent value, should be used for the sediment quality assessment in the ERA. Additionally, vanadium is missing from Table 4-3 and should be included as part of the screening assessment for this tier of the ERA due to baseline exceedances of sediment quality guidelines. **Rationale**: Table 10.2-9 of the Draft EIS Section 10.2.8.3.and Table 4-3 Section 4.2.3.3 of TSD XXI Environmental Risk Assessment should be consistent with the COPCs being evaluated and the selected thresholds for those COPCs. The Proponent should remain consistent in the selection and application of thresholds based on their rationale for using Burnett-Seidel and Liber (2013) REF values and/or the selection of the most stringent guidelines and provide both updated tables for review to verify the changes.				
89	ECCC	Fish and fish habitat Change to an environmental component due to hazardous contaminants	Section 10.5.1.1.1	**Context**: Table 10.5-1 pg. 1657 depicts the chloride and sulphate concentrations in surface water at the edge of the proposed mixing zone for the Application Case. The water quality threshold for Aquatic and Terrestrial Life for sulphate is predicted to change from 128 mg/L at the beginning of operations to 429 mg/L near the end of operations due to changes in hardness levels in Patterson Lake surface water. It is unclear why hardness levels are expected to change over the lifespan of the Project and if this is a Project-related effect. **Rationale**: If Constituents of Potential Concern (COPC) water quality thresholds are dependent on other water quality parameters, such as hardness, and are predicted to change over the	1. Clarify if changes to hardness in surface water quality of Patterson Lake is an expected effect of the proposed Project. 2. Confirm if changes to hardness levels will affect any other COPC thresholds such as cobalt over the course of the Project. 3. Confirm if there are any other general water quality parameters that are expected to change over the course of the Project lifespan that may change COPC thresholds? 4. Include, in the potential COPC exceedances, an evaluation against thresholds that are calculated using baseline condition data during assessments of risk if threshold changes are caused by Project effects.	Responses to part 1 through part 4 of this IR are provided below. 1. NexGen clarifies that the changes to hardness in Patterson Lake are an expected effect of the proposed Project (i.e., from treated effluent discharge during Operations). As presented to the CNSC during early engagement meetings (e.g., 24 August 2021), the increase in hardness in the receiving environment (i.e., Patterson Lake and farther downstream in the local study area [LSA]) is an expected change because the primary ions that contribute to hardness (i.e., calcium and magnesium) are elevated in the treated effluent discharge as counter ions to chloride and sulphate. The projected changes to the major ions over the life of the Project and in the far-future projection are presented in Attachment 10A-2 of Draft EIS Appendix 10A (Surface Water Quality Modelling Report). The plots for hardness, chloride, and sulphate in this attachment show a corresponding temporal increase in Patterson Lake North Arm – West Basin due to the Project discharges during Operations, which attenuate downstream through	n/a	**Context:** While the Proponent provided information on all parts of the original IR, the information needs to be incorporated into the EIS. Where COPCs and their derived guidelines will be affected by sulphate should be outlined. In their response the Proponent states: "NexGen clarifies that the changes to hardness in Patterson Lake are an expected effect of the proposed Project (i.e., from treated effluent discharge during Operations)." However, this effect is not explicitly outlined within the project pathways within Section 10.4 Project Interactions and Mitigations or within Section 10.5 Residual Effects Analysis. Section 10.5.1.1 Application Case does not describe the increasing hardness due to effluent deposition as a Project	89-R1	1. Incorporate information into the Draft EIS regarding the effects from projected increases in hardness in the receiving environment into the following sections: Section 10.4.3 Primary Effects Pathway for effects for discharge of treated effluent, Section 10.5 Residual Effects Analysis, Section 10.6 Predictions of Confidence and Uncertainty, and Section 10.7 Monitoring, Follow-up and Adaptive Management. 2. Identify any COPCs with hardness-derived thresholds that would exceed their respective guidelines during operations if those guidelines were derived with respect to baseline hardness concentration of the receiving environment.	Responses to part 1 and part 2 of this IR are provided below. 1. NexGen maintains that Project thresholds for constituents of potential concern (COPCs) that possess a hardness-dependent toxicity modifying factor should be calculated using ambient hardness in the receiving environment to appropriately assess COPC changes in the receiving environment resulting from the discharge of treated effluent and to reflect the relevant ambient conditions to which biological receptors would be exposed. The assessment of the potential risk of adverse effects to aquatic life in the Draft EIS used water quality guidelines for the protection of aquatic life from the Canadian Council of Ministers of the Environment (CCME 2023), Environment and Climate Change Canada (Environment Canada 2017, Government of Canada 2021), and British Columbia Ministry of the Environment and Climate Change Strategy (BCMECCS 2019) that incorporated toxicity modifying factors, including hardness, in their derivation. The application of toxicity modifying factors such as hardness in the receiving environment is an appropriate and technically defensible site-specific application of the setting of	Section 10.2.8.3.1; Section 10.5.1.2

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				course of the Project lifespan, an explanation of why these changes occur must be provided with clarification whether it is a Project-related effect.		the rest of Patterson Lake and the downstream lakes in the LSA. These elevated major ion concentrations also diminish in parallel when treated effluent discharge ceases at the end of Operations. 2. As discussed with the CNSC during early engagement (i.e., prior to submission of the Draft EIS), the change in hardness during the life of the Project and the far-future projection was accounted for in all other constituents of potential concern (COPCs) that have hardness-dependent guidelines (e.g., sulphate, cadmium, cobalt, copper, lead, nickel) because hardness is an exposure- and toxicity-modifying factor (ETMF) for these constituents. Based on projected change to hardness in Patterson Lake and the downstream lakes, and the magnitude of change to hardness, specifically in Operations during treated effluent discharge, changes to the Project thresholds for these hardness-dependent COPCs only applied to sulphate and cobalt. These changes are illustrated in the modelled projections presented for sulphate, cadmium, cobalt, copper, lead, and nickel in Attachment 10A-2 of Draft EIS Appendix 10A. 3. The Project thresholds that have ETMFs other than hardness include: ▪ ammonia, where the ETMFs are pH and temperature; and ▪ aluminum, where the ETMFs are pH, dissolved organic carbon (DOC), and calcium. For ammonia, threshold modifications were based on measured monthly water temperature and pH as the Project is not expected to measurably change the water temperature and pH in Patterson Lake or any downstream waterbody. For total aluminum, the threshold was set as the uppermost threshold concentration (i.e., 100 µg/L) due to the background DOC concentration being greater than 2 mg/L (i.e., DOC was not modelled as the Project is not expected to be a material source of DOC [see NexGen's response to IR 79]) and the projected calcium concentrations are greater than 4 mg/L over the duration of the Project and into the far future. The resulting total aluminum threshold was the same as the upper-bound Canadian Council of Ministers of the Environment guideline (i.e., 100 µg/L; CCME 2023). 4. NexGen does not agree that the assessment suggested by ECCC constitutes a science-based evaluation because it does not account for the water quality conditions that would be experienced by biota. As hardness is an ETMF for some metals and ions, which means that the potential for one of these metals or ions to exert a toxicity influence on aquatic life decreases with increasing concentrations of the ETMF, it is reasonable and appropriate to consider hardness in the derivation of thresholds to evaluate the potential for adverse risk to aquatic biota. This approach is further supported by the water quality modelling results that show concurrent increases to each of the metals and ions during Project discharge (i.e., they are each sourced from the Project in the treated effluent discharge to the receiving environment). It is also worth noting that in the far-future projection where the cobalt increases in Patterson Lake are		effect. It also does not explain how the increased hardness was factored in when considering water quality thresholds for other contaminants of potential concern (COPCs) that have guidelines that vary based on the hardness of receiving waters. Section 10.5.1.1 Application Case does not describe the increasing hardness in the receiving aquatic environment due to effluent deposition as a Project effect. Additionally, this section does not describe how the increasing hardness concentrations influence the calculation of water quality thresholds for Contaminants of Potential Concern (COPCs) that have hardness-derived guidelines. **Rationale:** The Proponent indicated that Project discharges to the receiving environment will increase hardness concentrations causing the water quality thresholds for other COPCs to increase, allowing for higher discharge levels of these COPCs. To understand how the thresholds for relevant COPCs will be impacted by increasing hardness concentrations in receiving waters and the potential for related impacts to aquatic receptors such as fish and fish habitat, a dedicated discussion should be provided within the draft EIS. This discussion should outline how hardness derived guidelines for COPCs are influenced throughout the Project lifecycle and how this impacts the concentrations of COPCs within the nearfield receiving environment and aquatic receptors. This information should capture the full scope of potential effects and anticipated changes to the receiving environment and aquatic receptors from the deposition of effluent throughout the lifecycle of the Project.			Project thresholds. Further, CCME (2003) acknowledges the use of exposure and toxicity modifying factors such as hardness in the derivation of Project thresholds to account for site-specific water quality conditions that will maintain the protection of aquatic life in the receiving environment. NexGen agrees with the reviewer that the revised EIS would benefit from additional context regarding increasing hardness from Project effluent and how increases in hardness influences the calculation of water quality thresholds for certain COPCs. To provide these details, the following context will be added in revised EIS Section 10.2.8.3.1 (Water Quality Thresholds): "As noted in Table 10.2-5, sulphate, cadmium, copper, lead, manganese, and nickel have guidelines and Project thresholds that incorporate hardness as a toxicity modifying factor. For these COPCs, aquatic health studies have shown that their toxicity potential is influenced by hardness; specifically, increasing hardness has been identified as the key modifying factor in the water that can reduce the potential for metal uptake and toxicity (Adams and Garman 2023). In addition to COPCs, effluent can contain base cations (e.g., calcium, magnesium) that contribute to a water's hardness. Increases in hardness reduces the toxicity potential for hardness-dependent COPCs to aquatic organisms, so long as the increasing COPC concentrations remain below their hardness-dependent Project threshold. Therefore, applying ambient hardness concentration in the calculation of the Project threshold for these COPCs in the receiving environment provides a standardization in the surface water quality and aquatic health assessment. This standardization accounts for the changes in hardness concentration in the receiving environment during the period of discharge of treated effluent from the Project." In addition, the first paragraph in revised EIS Section 10.5.1.2 (Regional Surface Water Quality Model) will be modified to read as follows: "Regional surface water quality model results from the Application Case indicated that despite COPC concentrations increasing in the receiving environment due to the Project, concentrations remained below their respective thresholds throughout the lifespan of the Project. In addition, water hardness in the receiving environment is expected to increase during the lifespan of the Project, with a return to baseline conditions following Closure. The increase in COPC concentrations and water hardness in the receiving environment is primarily the result of the active ETP and STP discharges to Patterson Lake during Operations." 2. NexGen confirms that sulphate is the only COPC where the modelled concentrations in the receiving environment would potentially be higher than the Project threshold should the Project threshold be derived using baseline hardness concentrations. These higher concentrations would be limited to occur during Project Operations when there would be treated effluent discharged to Patterson Lake. NexGen further notes that, as discussed in part 1 of the response to this IR, the concentrations presented above would not result in adverse effects to the environment as changes in hardness would mitigate these effects.	

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						sourced from the groundwater pathway, there is no corresponding hardness increase. Thus, the cobalt projections are evaluated under low hardness conditions, which identifies conditions where the cobalt projections are higher than the Project threshold. No changes are proposed in the revised EIS to address this IR. **References** CCME (Canadian Council of Ministers of the Environment). 2023. Water Quality Guidelines for the Protection of Aquatic Life: Aluminium. Available at http://st-ts.ccme.ca.vsd46.korax.net/en/?lang=en&factsheet=4					**References** Adams WJ and ER Garman. 2023. Recommended updates to the USEPA Framework for Metals Risk Assessment: Aquatic ecosystems. Integrated Environmental Assessment Management. Available at https://setac.onlinelibrary.wiley.com/doi/full/10.1002/ieam.4827. BC MECCS (British Columbia Ministry of the Environment and Climate Change Strategy). 2019. British Columbia Approved Water Quality Guidelines: Aquatic Life, Wildlife & Agriculture. Summary Report. Ministry of the Environment and Climate Change Strategy: Water Protection & Sustainability Branch. Available at https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/waterquality/water-quality-guidelines/approved-wqgs/wqg_summary_aquaticlife_wildlife_agri.pdf. CCME (Canadian Council of Ministers of the Environment). 2003. Guidance on the Site-Specific Application of Water Quality Guidelines in Canada: Procedures for Deriving Numerical Water Quality Objectives. https://ccme.ca/en/res/guidance-on-the-site-specific-application-of-water-quality-guidelines-in-canada-en.pdf CCME (Canadian Council of Ministers of the Environment). 2023. Water Quality Guidelines for the Protection of Aquatic Life: Aluminium. Available at http://st-ts.ccme.ca.vsd46.korax.net/en/?lang=en&factsheet=4. Environment Canada. 2017. *Canadian Environmental Protection Act, 1999*. Federal Environmental Quality Guidelines Cobalt. May 2017. 9pp. Available at https://www.ec.gc.ca/ese-ees/92F47C5D-24F5-4601-AEC0-390514B3ED75/FEQG%20Cobalt%20Final%20EN.pdf. Government of Canada. 2021. Federal Environmental Quality Guidelines Summary Table. Available at https://www.canada.ca/en/environment-climate-change/services/evaluating-existing-substances/federal-environmental-quality-guidelines-summary-table.html.	
96	ECCC	Fish and fish habitat Change to an environmental component due to hazardous contaminants	Section Appendix 10A7.4.1	**Context**: It is incorrectly stated that only chloride concentrations exceed water quality thresholds at the edge of the mixing zone from the Effluent Treatment Plant (ETP). Table 10A-34 pg. 1777 demonstrates that both sulphate and chloride exceed water quality thresholds at the edge of the mixing zone. Additionally, this table should be updated to include all parameters of interest from the *Metal and Diamond Mining Effluent Regulations* (MDMER) and their respective water quality thresholds. **Rationale**: ECCC advice is to include the general water quality parameters that influence water quality thresholds in this table and parameters in Schedule 4 of the MDMER, so that any changes over	1. Include all general water quality parameters (ex. pH, temperature, hardness, total suspended solids, etc.) and un-ionized ammonia in Table 10A-34. 2. Include all water quality thresholds for each parameter in Table 10A-34. 3. Update the conclusions on water quality threshold exceedances at the edge of the mixing zone in this section to address sulphate exceedances and any other changes to general water quality parameters over the Project lifespan.	Responses to part 1, part 2, and part 3 of this IR are provided below. 1. and 2. The mixing zone modelling results shown in Table 10A-34 in Section 10A7.4.1 of Draft EIS Appendix 10A (Surface Water Quality Modelling Report) are limited to the constituents that screened in as constituents of potential concern (COPCs) in the assessment. Therefore, general constituents such as pH, temperature, hardness, and total suspended solids are not included in this table as these constituents were not identified as COPCs. However, in response to the meeting with the CNSC and Environment and Climate Change Canada (ECCC) on 9 June 2023, NexGen will update Table 10A-34 in Section 10A7.4.1 of revised EIS Appendix 10A to clarify assumptions for constituents flagged as exceeding Project thresholds where the value or concentration of other measured constituents (e.g., pH, temperature, hardness) contributed to the exceedances. These added assumptions will assist the CNSC and ECCC in verifying the identification	Appendix 10A, Section 10A7.4.1	**Context:** The Proponent has agreed to update Table 10A-34 to include general water quality parameters (ex. pH, temperature, hardness, total suspended solids, etc.) and un-ionized ammonia to address parts one and two of the original IR but has not provided the updated table for review. Additionally, in their response to part three of the original IR, the Proponent confirmed that sulphate concentrations in the nearfield receiving environment are not considered a threshold exceedance because the sulphate water quality threshold will increase from 128 mg/L to 429 mg/L over the course of the Project lifecycle due to increases in hardness concentrations from effluent deposition. However, the Proponent has not fully addressed and updated conclusions regarding	96-R1	1. Provide updated Table 10A-34 for review of proposed changes. 2. Within Appendix 10A Surface Water Quality Modelling Report include a discussion on how changes to receiving aquatic environment hardness concentrations are a Project-related effect. Discuss the implications of this effect to hardness-derived water quality guidelines and calculated concentrations of COPCs for nearfield water quality modelling results.	The following response is provided to address both part 1 and part 2 of the IR. 1. NexGen confirms that, as noted in the initial response to the original IR, NexGen will update Table 10A-34 in Section 10A7.4.1 of revised EIS Appendix 10A (Surface Water Quality Modelling Report) to both clarify assumptions for constituents flagged as exceeding Project thresholds where the value or concentration of other measured constituents (e.g., pH, temperature, hardness) contributed to the exceedances and correct the bolded sulphate concentrations. To also support the reviewer's request in the original IR, NexGen will add the following text in Section 10A7.4.1 in revised EIS Appendix 10A (Surface Water Quality Modelling Report): "Table 10A-34 is limited to presenting the selected COPCs that apply specifically to protection of aquatic life, drinking water quality, and primary productivity. Constituents that are ETMFs to specific COPCs, such as pH, temperature, and hardness, have not been included because they were not identified as COPCs. However, the determination of a threshold exceedance for COPCs	Section 10A.6.4.1.2; Section 10A7.4.1

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				the lifespan of the Project can be reviewed.		of the Project thresholds. NexGen also notes this broader range of constituents would be included in monitoring programs during the life of the Project. 3. With respect to the constituent exceedances identified by ECCC in the near-field mixing model results tables, the identification of sulphate in Table 10A-34 in Section 10A7.4.1 of Draft EIS Appendix 10A for the 'End' period of Operations for the ETP [effluent treatment plant] Reasonable Upper Bound Sensitivity Scenario and the STP [sewage treatment plant] Application Case exceeding its Project threshold at the edge of the mixing zone was an error. During this time, the Project threshold for sulphate would be 429 mg/L in the mixing zone because of the associated higher hardness; the maximum predicted sulphate concentrations at this time for both the ETP Reasonable Upper Bound Sensitivity Scenario and the STP Application Case are below the Project threshold. For this reason, the only predicted exceedance at the edge of the mixing zone is chloride. NexGen notes that the highlighted exceedance of chloride at the edge of the mixing zone is limited to the upper bound modelling scenario, which represents a conservative modelling case. Further, the maximum predicted chloride concentration (i.e., 134 mg/L) is just above the Project threshold (i.e., 120 mg/L), so any aquatic risk associated with exposure to that concentration is considered negligible. This conclusion is additionally supported by recent work by Elphick et al. (2011), which showed hardness is an effective exposure and toxicity modifying factor for chloride, meaning that any possible risk of exposure to the maximum predicted concentration would be mitigated by the corresponding elevated hardness at the edge of the mixing zone at this time. With respect to part 3 of this IR, NexGen will update Table 10A-34 in Section 10A7.4.1 of the revised EIS Appendix 10A to correct the bolded sulphate concentrations. NexGen confirms no other changes to conclusions for general water quality constituents over the Project lifespan are required to address part 3 of this IR. **References** Elphick JRF, Bergh KD, Bailey HC. 2011. Chronic toxicity of chloride to freshwater species: effects of hardness and implications for water quality guidelines. Environmental Toxicology and Chemistry. 30, 239-246.		changes to other water quality parameters over the Project lifespan. **Rationale:** An updated Table 10A-34 should be reviewed to validate the additional information and confirm all the requested information was included. Additionally, as described in IR-89 (CIAR doc #79) changes in hardness of the receiving aquatic environment causes an increase to the water quality thresholds of certain COPCs, which should be discussed as a Project effect within the Draft EIS and relevant appendices.			based on their projection takes into account the associated projection of any ETMF as applicable to a COPC. Where the potential for toxicity by specific COPCs is modified based on additional constituents defined as ETMFs (e.g., pH, temperature), assumptions regarding their influence on the selected Project threshold for those COPCs are provided as footnotes to Table 10A-34." 2. NexGen agrees with the reviewer that the revised EIS would benefit from additional context regarding increasing hardness from Project effluent and how increases in hardness influences the calculation of water quality thresholds for certain COPCs. To provide these details, the following context will be added in Section 10A4.1 of revised EIS Appendix 10A (Surface Water Quality Modelling Report): "As noted in Table 10A-2, sulphate, cadmium, copper, lead, manganese, and nickel have guidelines and Project thresholds that incorporate hardness as a toxicity modifying factor. For these COPCs, aquatic health studies have shown that their toxicity potential is influenced by hardness; specifically, increasing hardness has been identified as the key modifying factor in the water that can reduce the potential for metal uptake and toxicity (Adams and Garman 2023). In addition to COPCs, effluent can contain base cations (e.g., calcium, magnesium) that contribute to a water's hardness. Increases in hardness reduces the toxicity potential for hardness-dependent COPCs to aquatic organisms, so long as the increasing COPC concentrations remain below their hardness-dependent Project threshold. Therefore, applying ambient hardness concentration in the calculation of the Project threshold for these COPCs in the receiving environment provides a standardization in the surface water quality and aquatic health assessment. This standardization accounts for the changes in hardness concentration in the receiving environment during the period of discharge of treated effluent from the Project." In addition, the third paragraph in Section 10A.6.4.1.2 of revised EIS Appendix 10A will be modified to read as follows: "Predicted concentrations of selected constituents are summarized for the Project lifespan and far future in Table 10A-11 and Table 10A-12, respectively, and are illustrated in Attachment 10A-2. An increase from existing conditions for all modelled constituents as well as hardness is predicted in the three basins during Operations (i.e., 2029 to 2052). In general, COPC concentrations and hardness gradually increase throughout the Project lifespan in the three basins with the highest concentrations of COPCs observed in the North Arm – West Basin, which receives the Project discharges, followed by the South Arm and the North Arm – East Basin. Peak COPC concentrations during the Project lifespan are noted in the final years of Operations (i.e., 2051 in the North Arm – East Basin and North Arm – West Basin, and in 2052 in the South Arm), after which they steadily decline as the COPC mass loads are dispersed downstream after Operations discharges cease. Hardness is also expected to return to baseline conditions following Closure. The modelled projections do not show a discernible seasonal effect in the basins, likely due to their large volumes." **References**	

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											Adams WJ and ER Garman. 2023. Recommended updates to the USEPA Framework for Metals Risk Assessment: Aquatic ecosystems. Integrated Environmental Assessment Management. Available at https://setac.onlinelibrary.wiley.com/doi/full/10.1002/ieam.4827.	
105	ECCC	Wildlife and Wildlife Habitat	Table 11.4-1 Table 23A-4	The draft EIS states that water crossing structures will be designed to limit the area disturbed and in a manner that protects the banks from erosion (Table 11.4-1 path ID F-10), particularly when moving equipment across the river using cranes. There was no discussion of the potential effects of these activities to SAR, migratory birds or wetland function.	Describe the methods that will be used to minimize erosion of stream banks and how success of these measures will be evaluated. Explain any risks to migratory birds, SAR and wetland function as a result of these crossings.	NexGen confirms that information regarding methods used to minimize erosion of stream banks is included in the Draft EIS Section 23A (Summary of Project Environmental Design Features and Mitigation Measures). As presented in Table 23A-4 of Draft EIS Appendix 23A, NexGen commits to implementing sediment and erosion control best practices and standard mitigations (e.g., temporary sediment ponds, silt curtains, sediment traps) during all Project phases. Further details on specific erosion control methods and monitoring will be provided during the licensing and permitting processes for the Project, as applicable and commensurate with the stage of Project development. Risks to migratory birds and species at risk (SAR) from Project activities were assessed through the secondary pathway, Pathway ID W-05 (Injury and mortality from clearing), in Draft EIS Section 14.4.2 (Secondary Pathways). The assessment predicted that any adverse interactions between the proposed Project and wildlife, including SAR, are expected to be infrequent and result in negligible residual effects on valued components (VCs). Residual effects to wetlands and associated wetland condition and function from Project construction and infrastructure, such as water crossing structures, were assessed in Draft EIS Section 13.5.2 (Wetland Ecosystems). The assessment predicted that there would be no significant adverse effects to the wetland ecosystem VC. No changes are proposed in the revised EIS to address this IR.	n/a	**Context:** The Proponent provided additional clarification as to how negative effects to migratory birds and species at risk were assessed using pathway W-05, “Injury and mortality from clearing”, but did not provide similar information on negative effects to migratory birds and species at risk from moving equipment across the river adjacent to the bridge. **Rationale:** A comprehensive assessment of the pathways of effects to migratory birds and terrestrial species at risk, such as clearing land and equipment movement, is needed to understand potential impacts and mitigation measures. A pathway of effects must be relevant to the receptor, in this case migratory birds and species at risk, to understand how the impacts occur. The pathway used to assess impacts from clearing land does not fully address impacts to migratory birds and species at risk from moving equipment across the river adjacent to a bridge. This information is important since land adjacent to the bridge and/or the bridge itself may provide habitat for species at risk bats and species at risk migratory birds. Information remains outstanding regarding the pathway resulting from moving equipment across the river adjacent to the bridge.	105-R1	Include consideration of how migratory birds (e.g., shoreline or overwater nesting species) and terrestrial species at risk (e.g., little brown bat, barn swallow, yellow rail) may be impacted by moving equipment across the river adjacent to the bridge in the Environmental Protection Plan. Provide details in the EIS, if the EPP cannot be provided for review. If any of the details requested above cannot be provided at the time of response, present a discussion of the gap in information, related uncertainty with regards to potential effects and mitigation, and any additional mitigation measures and/or monitoring and follow up that will be implemented on a precautionary basis.	Through further advancement of Project design, NexGen confirms that use of a crane will not be required to move Project equipment across the river adjacent to the access road bridge crossing at the Clearwater River. As a result, no additional effects or effects pathways from the Project on migratory birds and terrestrial species at risk would exist relative to those currently described in the Draft EIS. Therefore, the assessment undertaken for the Draft EIS is conservative and no changes to the revised EIS are required.	n/a
106	ECCC	Fish and fish habitat Change to an environmental component due to hazardous contaminants	Section 11.4.2	**Context**: The movement of heavy equipment and infrastructure across the Clearwater River below Patterson Lake at the existing bridge crossing is discussed in this section. The Proponent proposed two options, (1) the use of a crane to maneuver equipment across the river, and (2) upgrading the existing bridge to provide additional capacity. The Proponent’s preferred approach is the use of a crane but the bridge will be upgraded in the event that it is deemed necessary. The Proponent concludes that upgrading the bridge will have negligible changes to fish habitat availability and thus is not further assessed. More information on the current bridge crossing would assist in the assessment of the amount of risk to the receiving environment from both options. **Rationale**:	1. Provide further information on the existing conditions and bridge crossing including dimensions, capacity, footprint and information about the Clearwater River at that specific location (i.e., flows, depth, width, etc.). 2. Provide more information on the number and types of equipment that would need to be lifted over the river and the footprint for both options. 3. Provide further information on which best management practices will be applied for spills management and monitoring.	NexGen acknowledges the reviewer’s request for information on the Clearwater River crossing and movement of equipment and has included information on the existing bridge specifications below, noting that information regarding the physical and biological characteristics of the Clearwater River in the immediate vicinity of the bridge crossing location is already contained within the Draft EIS. NexGen further acknowledges that information regarding the equipment to be transported over the Clearwater River bridge crossing and additional details on spill response is outside the requirements of an EA of a designated project under the *Canadian Environmental Assessment Act, 2012*. Responses to part 1, part 2, and part 3 of this IR are provided below. 1. Additional information related to the current bridge size is provided as follows: ▪ dimensions: 27.33 m (long) by 5.53 m (wide); ▪ capacity: 100,000 lbs (45,360 kg); and ▪ footprint: 150 m^2.	Section 11.3.1.2	**Context:** The Proponent has provided some additional information to address part one of the original IR regarding the current bridge crossing of the Clearwater River and hydrological and habitat information regarding the riverine environment at this location. However, no further information has been provided regarding the equipment or infrastructure that would be lifted across the river by crane or the size of the footprint for the work area to address part 2 of the original IR. Insufficient detail has been provided on the proposed approach/methodology for moving equipment/infrastructure by crane across the river, how frequently this should be conducted, or under what conditions upgrading the bridge would be deemed necessary. The magnitude of negative effects to the aquatic environment and receptors from spills or accidents due to the proposed crane approach is unclear. In Section 11.4.2 of the Draft EIS the	106-R1	Further information is required comparing the use of a crane to transport equipment across the river versus upgrading the existing bridge. This information should address the frequency, duration and magnitude of potential effects to fish and fish habitat from Project activities associated with each proposed approach and should include: ▪ An assessment of effects to the aquatic environment from potential accident scenarios related to each proposed approach, ▪ Information on the frequency heavy machinery would need to be transported across the Clearwater River which the existing bridge would not be able to support, and ▪ Specific information on mitigation measures and best practices that should be applied for each approach to be feasible.	Through further advancement of Project design and planning, NexGen confirms that no upgrades to the access road bridge that crosses the Clearwater River are required as part of the Project and that use of a crane will not be required to move Project equipment across the bridge. Therefore, the assessment undertaken for the Draft EIS is conservative and no further assessment of potential effects to the aquatic environment is required in the revised EIS. As an update to information previously provided in response to the original IR 106, NexGen notes that, in support of provincially approved exploration activities (and since the time of submitting the Draft EIS), improvements have been made to the access road bridge crossing at the Clearwater River such that the information provided in response to part 1 of IR 106 has changed as follows: dimensions: 27.43 m (long) by 5.45 m (wide); capacity: 320,465 lbs (145,360 kg); and footprint: 150 m^2. The bridge remains a clear span structure with no permanent footprint below the ordinary high-water mark of the Clearwater River.	n/a

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				Currently there is no information provided on the current bridge crossing for dimensions, capacity and river flows. There is also no information provided regarding the amount of equipment expected to be brought across the river, and which best management practices would be used. Further information on proposed spill management and monitoring would assist in analyzing the options presented.		Information about the physical and biological characteristics of the Clearwater River in the immediate vicinity of the bridge crossing location is provided in the Draft EIS Section 9 (Hydrology) and Draft EIS Section 11 (Fish and Fish Habitat), as well as Draft EIS Annex IV.2 (Hydrometric Monitoring Characterization Report) and Draft EIS Annex V.1 (Aquatic Environment Baseline Report). Draft EIS Section 9.4 (Existing Conditions) and Section 5.3 of Draft EIS Annex IV.2 provide information related to water flows, depths, and widths at the Clearwater River bridge crossing location. Baseline hydrometric station CR-WC-MS-03 is located on the Clearwater River immediately upstream of the bridge, and seasonal information on water surface elevation (i.e., water depth), discharge, and stream channel parameters (e.g., channel width) are summarized for this location. Additionally, Draft EIS Section 11.3.1.2 (Clearwater River Mainstem, Clearwater River below Patterson Lake) and Section 9.3.3.1 of Draft EIS Annex V.1 present a description of fish habitat conditions for the 1-km long section of the Clearwater River between Patterson Lake and Forrest Lake, which includes the bridge crossing location. Revised EIS Section 11.3.1.2 will be updated to indicate that the surveyed section of the Clearwater River below Patterson Lake includes the bridge crossing of the site access road. 2. At the current stage of planning for the Project, detailed information is not available on the types of heavy equipment or infrastructure that would need to be lifted over the river and the size of the work area required for staging and site access. The footprint of staging areas would be limited to the extent practicable to minimize the area of disturbance. Additional information will be provided during licensing activities for the Project, as applicable. 3. Standard best management practices and mitigations related to spills would be implemented in accordance with the Project Environmental Protection Program and supporting documentation. Further details on specific spills management and monitoring approaches that would be applied during this Project activity will be provided during Project licensing, as applicable. **<u>References</u>** *Canadian Environmental Assessment Act, 2012*. SC 2012, c 19, s 52. Repealed, 2019, c 28, s 9. Available at https://laws-lois.justice.gc.ca/eng/acts/C-15.21/20170622/P1TT3xt3.html		Proponent concluded that both proposed approaches (i.e. use of crane to transport equipment across the river versus upgrading the existing bridge) would cause negligible changes to fish habitat. Additionally, the Proponent has not specified best management practices and mitigations that would be applied during spills and accident scenarios. **Rationale:** The Proponent has provided some additional information to address the IR. However more information regarding the equipment that would need to be lifted by crane across the Clearwater River is needed to determine the associated effects to the environment, including frequency, duration, and magnitude of effects to fish and fish habitat from project-related activities from this proposed approach. It remains unclear what the likelihood of a negative effect from accidents and spills by using a crane to lift heavy equipment and infrastructure across the Clearwater River would be compared to the alternative approach of upgrading the existing bridge crossing. To adequately evaluate the approach, and resulting effects to the aquatic environment and receptors, the Proponent should provide additional information addressing the frequency, duration and magnitude of potential effects to fish and fish habitat from Project activities associated with each proposed approach.				
109	ECCC	Fish and fish habitat Change to an environmental component due to hazardous contaminants	Section 11.7	**Context**: There is the potential for a low level of risk to aquatic biota in the far future due to elevated copper concentrations in surface water due groundwater inputs from the Potentially Acid Generation Waste Rock Storage Area (PAG WRSA). Forage fish, benthic invertebrates and planktonic species are predicted to be at higher risk than predatory fish species. The	Provide the adaptive management plan, and include details on the monitoring and management of copper loadings to Patterson Lake for all Project stages including post-closure from the PAG WRSA.	NexGen notes the Environment and Climate Change Canada's (ECCC's) request is outside the scope the requirements of an EA of a designated project under the *Canadian Environmental Assessment Act, 2012*. For the purposes of the EA, information regarding NexGen's adaptive management process is provided in Draft EIS Section 23.5.3 (Adaptive Management). To assist the ECCC in understanding the risk to aquatic receptors, a draft version of the Adaptive Management Plan (AMP) for copper and cobalt will be provided to the CNSC, as available, noting this plan	n/a	**Context:** The Proponent has identified that copper and cobalt loadings from surface runoff and groundwater seepage from the Waste Rock Storage Areas (WRSAs) and the Underground Tailings Management Facility (UGTMF) will cause exceedances of water quality guidelines for the protection of aquatic biota including fish in the future. This is a potential adverse effect of the Project. The aquatic health	109-R1	Provide the draft Adaptive Management Plan for review to demonstrate how future effects to Patterson Lake will be mitigated. If the draft Adaptive Management Plan is not available at the time of response, present a discussion of the proposed improvements to the effectiveness of Project management and mitigation measures, and provide additional details on how the mitigation strategies will be improved.	As noted in NexGen's initial response to the original IR, NexGen has committed to developing the Adaptive Management Plan (AMP) and providing a draft of the AMP to the CNSC, as available, noting this plan would not form part of the revised EIS. NexGen further notes that, as per the Canadian Environmental Assessment (CEA) *Agency Operational Policy Statement on Adaptive Management Measures under the Canadian Environmental Assessment Act* (n.d.), AMPs are not requirements of an EIS but rather are applied as follow-up programs whereby monitoring is	n/a

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				Proponent states that they are "developing an adaptive management plan to reduce uncertainty and manage risks related to this pathway". **Rationale**: Further information on this topic would assist ECCC in assessing the risk to aquatic receptors.		would not form part of the revised EIS. The draft AMP for copper and cobalt would include mitigation details associated with elevated copper concentrations in surface water due to groundwater inputs from the potentially acid generating waste rock storage area. No changes are proposed in the revised EIS associated with this IR. **References** *Canadian Environmental Assessment Act, 2012*. SC 2012, c 19, s 52. Repealed, 2019, c 28, s 9. Available at https://laws-lois.justice.gc.ca/eng/acts/C-15.21/20170622/P1TT3xt3.html		assessment determined that the predicted magnitude of the effect was unlikely to result in adverse effects on populations and communities, but that there could be exceedances of sensitive endpoints for chronic exposure of benthic invertebrates, reproduction of zooplankton and growth and reproduction for fish. **Rationale:** A potential long-term future scenario adverse effect to the aquatic environment from the Project has been identified. The currently proposed mitigation measures of lined waste management areas and the use of an underground tailings facility still allows for seepage of contaminants to groundwater and transport to Patterson Lake. Therefore, the currently proposed mitigation measures and management are inadequate to address the contamination of Patterson Lake by the groundwater pathway. Additional information on proposed mitigation measures is needed to assess the potential adverse effects to aquatic biota in Patterson Lake in the future. The Proponent has committed to providing an Adaptive Management Plan, which is not yet available for review. A determination on the effectiveness of project management and mitigation measures to prevent future effects to the aquatic environment and receptors cannot be made until the proposed Adaptive Management Plan is available for review.			applied and evaluated to mitigated effects that are deemed to be uncertain at the EIS stage. NexGen confirms that the AMP is being designed according to the philosophy and requirements of the CEA Agency (n.d.), including the incorporation of key indicators with action thresholds and testable EA predictions that will be used to trigger additional feasible mitigations that are identified in the plan. The purpose of the AMP is not to prescriptively impose additional mitigations on the Project. A prescriptive approach would not align with the general philosophy of adaptive management, as summarized in Environment Canada (2009). Rather, the AMP provides a "systematic approach for improving environmental management by learning from management outcomes" (Environment Canada 2009). Further, in alignment with Environment Canada (2009), the AMP lays out an approach to "exploring alternative ways to meet management objectives, predicting the outcomes of each alternative based on the current state of knowledge, implementing one or more of these alternatives, monitoring to learn which alternative best meets the management objectives (and testing predictions), and using these results to update knowledge and adjust management actions". With respect to the protection of aquatic resources in Patterson Lake, NexGen disagrees with the reviewer's assertion that the proposed mitigation measures would not be protective of the environment. The EA has shown that the mitigation measures proposed for the Project would be protective of the aquatic environment. In addition to the mitigation measures noted by the reviewer (i.e., lining of waste management areas and use of an underground tailings facility), other mitigation measures that would be applicable to protecting the far-future surface water quality from potential effects from the waste rock storage areas (WRSAs) and underground tailings management facility (UGTMF) after Closure are included in Pathway ID F-01 of Draft EIS Section 11.4 (Project Interactions and Mitigations). These include: ▪ Installing an engineered cover of compacted clean material and growth medium layer on the potentially acid generating (PAG) WRSA and installing a growth medium cover on the non-potentially acid generating (NPAG) WRSA. ▪ Using engineered cemented paste backfill and tailings to control source concentrations. ▪ Applying binder to reduce permeability in backfill and tailings. ▪ Revegetating the NPAG and PAG WRSAs during reclamation to limit total suspended solids in surface runoff. ▪ Developing and implementing a Preliminary Decommissioning and Reclamation Plan. As noted in Draft EIS Appendix 23A (Summary of Project Environmental Design Features and Mitigation Measures), the level of effectiveness associated with these mitigation measures is considered 'high', with the exception of revegetation of the NPAG and PAG WRSAs, which is considered 'medium'. Specific to the assessment of effects, which includes the ecological risk assessment and the aquatic health assessment, Section 11A4 of Draft EIS Appendix 11A (Aquatic Health Assessment of the Potential for Adverse Effects of Predicted Far-Future Copper Concentrations in Patterson Lake]) states "[p]redicted copper concentrations in all scenarios, including the reasonable upper bound scenario, indicated no effects or unlikely effects. Therefore,	

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											there is a high degree of certainty that the potential effects on aquatic biota have not been under-predicted". NexGen further notes that the predictions in the EA have incorporated multiple levels of conservatism to ensure that effects to fish and fish habitat were not underestimated (Draft EIS Section 11.6 [Prediction Confidence and Uncertainty]). Under these conservative assumptions, residual adverse effects to fish and fish habitat VCs were predicted to be not significant (Draft EIS Section 11.5.4.2 [Significance Determination]). It is anticipated that adaptive management measures undertaken would further reduce these residual adverse effects. As described in Draft EIS Section 23.5.1 (Environmental Assessment Follow-Up Monitoring), follow-up monitoring programs would be designed to, among other things, determine the effectiveness of mitigation and/or provide appropriate feedback for modifying or adopting new mitigation designs, policies, and practices (e.g., implementation of adaptive management). Information on preliminary monitoring and follow-up programs for the Project are presented in Draft EIS Appendix 23B (Environmental Assessment Monitoring and Follow-up Programs Proposed for the Project) and include considerations for hydrogeology, surface water quality, sediment quality, fish and fish habitat, terrain and soils, and vegetation. Overall, the Draft EIS provides the level of information required within the scope of the *Canadian Environmental Assessment Act, 2012* and demonstrates that the Project would be protective of the environment. The AMP proposed for the Project is expected to further reduce potential environmental effects, and, once available, will be provided to the CNSC outside of the EA process. **<u>References</u>** *Canadian Environmental Assessment Act, 2012*. SC 2012, c 19, s 52. Repealed, 2019, c 28, s 9. Available at https://laws-lois.justice.gc.ca/eng/acts/C-15.21/20170622/P1TT3xt3.html. CEA Agency (n.d.). Operational Policy Statement on Adaptive Management Measures under the *Canadian Environmental Assessment Act*. Environment Canada. 2009. Environmental Code of Practice for Metal Mines.	
111	ECCC	Wildlife and Wildlife Habitat	Section 12 Table 14.4-1	The draft EIS states that erosion control techniques will be utilized but does not provide details on what these techniques are or how these techniques will prevent sediment from entering waters frequented by migratory birds or SAR.	Provide details on what methods will be used for erosion control and how they will prevent sediment from entering waters frequented by migratory birds and/or SAR. Explain what actions will be taken if the erosion control measures are not successful. **Suggestions for mitigation and follow-up measures** In development of the Environmental Protection Plan, ensure that clearing and grubbing activities are not conducted during the breeding bird season.	NexGen commits to implementing sediment and erosion control best practices and standard mitigations (e.g., temporary sediment ponds, silt curtains, sediment traps) during all Project phases. NexGen confirms that further details on specific erosion control methods and monitoring will be provided during the licensing and permitting activities for the Project, as applicable and commensurate with the stage of Project development. Pathway ID W-03 (Sensory disturbance) and Pathway ID W-05 (Injury and mortality from clearing) in Table 14.4-1 in Draft EIS Section 14.4 (Project Interactions and Mitigations) state that if sensitive species are confirmed in the Project footprint, activity restriction guidelines established by the Government of Saskatchewan (ENV 2017) would be applied for sensitive species; this mitigation is also stated in Table 23A-4 of Draft EIS Appendix 23A (Summary of	n/a	**Context:** The Proponent has committed to utilizing standard mitigations for erosion and sediment control during all phases of the Project and provided relevant examples. The Proponent also states that the details on mitigation methods and monitoring will be provided at a later stage of the Project. These measures, including adaptive management, are to be implemented through their Environmental Protection Plan, once finalized. A fulsome assessment of the mitigation measures to be implemented to address impacts to waters frequented by migratory birds and SAR requires details on methods and monitoring from the Environmental Protection Plan.	111-R1	Provide the Environmental Protection Plan including details on methods and monitoring related to erosion and sediment control measures with respect to how these measures will minimize effects to migratory birds and species at risk. If details on methods and monitoring cannot be provided at the time of response, present a discussion relating to how the mitigation methods and monitoring will be implemented with regards to potential effects and mitigation, and any additional mitigation measures and/or monitoring and follow up that will be implemented on a precautionary basis.	NexGen notes that the level of information provided in the Draft EIS is appropriate for the assessment of Project effects on people and the environment, including effects on species at risk. Specific to proposed mitigation measures, as stated in Draft EIS Section 6.10 (Prediction Confidence and Uncertainty), "[u]ncertainty in the effectiveness of mitigations was also incorporated into the assessment. If uncertainty was high, the analysis applied a precautionary approach and mitigation was not considered sufficient to remove a pathway. For example, if a mitigation was considered new or unproven technology or challenging to implement under certain conditions, then a pathway was conservatively considered to be primary". Therefore, NexGen is confident that the level of effectiveness of mitigation measures has been appropriately captured in the assessment of valued components and intermediate components.	Section 14.4

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						Project Design Features and Mitigation Measures). The intent is to minimize clearing during the nesting period and follow the Environment and Climate Change Canada (ECCC) guidelines (ECCC 2019); however, flexibility is required for activity timing restrictions due to uncertainties in final design logistical details and permitting timelines. If activities occur during the nesting period, NexGen would engage with the ECCC on required authorizations, as applicable. Examples of monitoring activities for terrain and soils are provided in Table 12.7-1 of Draft EIS Section 12.7 (Monitoring, Follow-Up, and Adaptive Management); these monitoring activities would also apply for monitoring erosion potential. As further noted in Draft EIS Section 12.7, results from monitoring conducted through application of the Environmental Protection Program and supporting documentation would be used to determine the effectiveness of mitigation. If required, additional mitigation measures and/or adaptive management would be applied. No changes are proposed in the revised EIS to address this IR. **References** ENV (Saskatchewan Ministry of Environment). 2017. Activity restriction guidelines for sensitive species. Fish, Wildlife and Lands Branch. Regina Saskatchewan. Accessed January 2020. Available at http://publications.gov.sk.ca/documents/66/89554-Saskatchewan%20Activity%20Restriction%20Guidelines%20for%20Sensitive%20Species%20-%20April%202017.pdf ECCC (Environment Canada and Climate Change). 2019. Guidelines to reduce risk to migratory birds. Accessed July 2021. Available at https://www.canada.ca/en/environment-climate-change/services/avoiding-harm-migratory-birds/reduce-risk-migratory-birds.html		**Rationale:** Receiving the Environmental Protection Plan will allow ECCC to verify how standard mitigation measures will be implemented to address potential impacts to waters frequented by migratory birds (such as waterfowl and waterbirds) and SAR (such as horned grebe or yellow rail). Without details on methods and monitoring. ECCC is unable to evaluate or provide advice on the efficacy of their methods in relation to minimizing harmful effects to migratory birds and species at risk.			NexGen further notes that the Environment and Climate Change Canada's (ECCC's) request for NexGen to provide the Environmental Protection Program is outside the scope the requirements of an EA of a designated project under the *Canadian Environmental Assessment Act, 2012*. However, to help provide a better understanding for the reviewer, NexGen has provided the information presented below. NexGen confirms that it would implement sediment and erosion control best practices and standard mitigations during all Project phases. In accordance with Section 5.1 (1) of the *Migratory Birds Act*, sediment and erosion control best practices and mitigation would be implemented to prevent sediment from being deposited in waters or an area frequented by migratory birds, or in a place from which sediment may enter such waters or such an area. Sediment and erosion control best practices and mitigation would also be implemented in accordance with Section 33 of the *Species at Risk Act*, where "[n]o person shall damage or destroy the residence of one or more individuals of a wildlife species that is listed as an endangered species or a threatened species…", and Section 58 of the *Species at Risk Act*, where "no person shall destroy any part of the critical habitat of any listed endangered species or of any listed threatened species". NexGen further confirms that it would implement sediment and erosion control best practices and standard mitigations for the protection of migratory birds and species at risk (SAR) including, but not limited to: ▪ To the extent practical, work in sensitive areas (i.e., erosive soils, wetland features, critical species habitat, and fish habitats) would be scheduled to avoid periods that may result in high flow volumes and/or increase erosion and sedimentation (e.g., spring freshet). ▪ Design stream crossing structures to limit the area disturbed and in a manner that protects the banks from erosion and maintains the flows; ▪ Install effective erosion and sediment control measures (e.g., drainage ditches, berms, sediment fencing, straw bales, erosion control cloths) to stabilize erodible and exposed areas. ▪ Keep erosion and sediment control measures in place until all disturbed ground has been stabilized. ▪ Minimize the duration of exposure of disturbed soils by implementing interim revegetation, where practical. ▪ Avoid placing soil stockpiles near waterbodies (i.e., maintaining 150 m buffer from waterbodies and watercourses), and near natural drainage features, unless required for temporary storage. To verify that mitigation measures are achieving their intended goals, sediment and erosion control measures would be monitored through compliance inspections and monitoring such as: ▪ regularly inspecting erosion and sediment control measures to confirm they are functioning as planned and performing any required maintenance, as needed; ▪ inspecting soil stockpile areas after heavy precipitation or high runoff events; and ▪ where sedimentation to waterbodies or watercourses could occur, regularly monitoring for signs of sedimentation and taking corrective action, if required. These sediment and erosion control practices will form part of NexGen's Integrated Management System (e.g., Environmental Protection Program and supporting documents). With respect to other Project activities potentially affecting wildlife SAR, NexGen will have standardized instructions to	

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											avoid, minimize, and document wildlife interactions for the safety of workers, visitors, and wildlife. For example, buffer zones would represent designated protective and avoidance areas around wildlife or wildlife features (e.g., nests, dens) that are meant to minimize disturbance to wildlife from site activities (Draft EIS Section 14.4 [Project Interactions and Mitigations]). Incidental sightings of wildlife SAR would be recorded and reported to the Saskatchewan Conservation and Data Center. A more comprehensive list of mitigation measures for wildlife SAR and migratory birds is provided in Attachment IR 111-R1, 121-R1, 207-R1, and 270-R1. Revised EIS Section 14.4 (Project Interactions and Mitigations) will be updated to include any newly proposed mitigation measures stated in Table 1 of Attachment IR 111-R1, 121-R1, 207-R1, and 270-R1. **References** *Canadian Environmental Assessment Act, 2012.* SC 2012, c 19, s 52. Repealed, 2019, c 28, s 9. Available at https://laws-lois.justice.gc.ca/eng/acts/C-15.21/20170622/P1TT3xt3.html. *Migratory Birds Convention Act, 1994*. SC 1994, c 22. Last amended 12 December 2017. Available at https://laws-lois.justice.gc.ca/eng/acts/m-7.01/. *Species at Risk Act*. SC. 2002, c 29. Last amended 23 April 2021. Available at https://laws-lois.justice.gc.ca/eng/acts/s-15.3/.	
112	ECCC	Wildlife and Wildlife Habitat/Wetland Function	Section 13 Section 14 Table 23A-5	The draft EIS states that the Project will avoid wetlands as much as practical, but there will be a permanent "loss of availability of approximately 28 ha of wetland ecosystems". The mitigation measures propose adherence to the Federal Policy on Wetland Conservation to have no net loss of wetlands, however the draft EIS also states in multiple places that reclamation rarely works or restores original function. The draft EIS also states that offsets may be required to meet the requirements of the Federal Policy on Wetland Conservation, but does not provide clear explanation of how offsets will be applied. It is unclear how the Proponent will ensure no net loss of wetlands with this Project.	Provide a wetland mitigation and offset plan that will describe how no net loss of wetland function will be achieved.	NexGen notes that a wetland offset is not currently required for the proposed Project and would only be developed after detailed design if effects to wetlands could not be avoided. The Project was designed to avoid and minimize effects on wetlands. As described in Draft EIS Section 13.4 (Project Interactions and Mitigations), mitigation during initial Project design included realigning the site access road between the gatehouse and mine terrace to avoid a wetland. NexGen acknowledges that Draft EIS Section 13.5.2.1 (Application Case) identifies that "the combined loss of burned and unburned wetland ELC [Ecological Land Classification] units in the RSA [regional study area] is 27.8 ha"; however, the assessment was conservative in that it defined a maximum disturbance area four times larger than the currently anticipated Project footprint. At this time, the anticipated Project footprint is estimated to affect 0.8 ha of wetlands, with the intention that detailed design would avoid effects to this wetland area, if practicable. Should detailed design show that disturbance to wetlands would be required, a mitigation and offsetting plan describing how no net loss of wetland function would be achieved would be prepared at that time. No changes are proposed in the revised EIS to address this IR.	n/a	**Context:** The Proponent has provided an explanation of wetland loss caused by the Project. They confirmed that after application of avoidance, 0.8 hectare of wetland may be impacted by the Project footprint. The Proponent also states that the yet to be finalized detailed design would avoid effects to this wetland area, if practicable. No Wetland Mitigation and Offsetting Plan that would contain such details currently exists. **Rationale:** Until detailed design features are available for review, there remains uncertainty surrounding Project-related impacts to wetlands, which serve as habitat for fish, migratory birds and species at risk. The Proponent has indicated that there is potential to avoid effects to that wetland area entirely. However, if the detailed design plan does not allow for avoidance, the Proponent has stated in their previous response that a mitigation and offsetting plan describing how no net loss of wetland function would be achieved would be prepared. ECCC will be able to evaluate or provide advice on the efficacy of the methods contained within the Wetland Mitigation and Offsetting Plan if the plan is received. If the details of the plan are unavailable, the Proponent can instead	112-R1	Provide a draft Wetland Mitigation and Offsetting Plan. If the plan is not available at the time of response, present a discussion of the uncertainty which is caused by the lack of a Wetland Mitigation and Offsetting Plan. This discussion should include potential effects, avoidance plans, offsetting ratio, mitigation measures and monitoring that may be implemented. A description of how no net loss of wetlands will be achieved should be included.	NexGen notes that the reviewer's request for a wetland mitigation and offsetting plan is outside the scope of the requirements of an EA of a designated project under the *Canadian Environmental Assessment Act, 2012* (CEAA 2012). To clarify NexGen's initial response to the original IR, NexGen's goal through future design phases will be to avoid the area within the current Project footprint (i.e., 0.8 ha) that exists in wetland ecosystems. For this reason, a wetland mitigation and offsetting plan is not currently anticipated to be required. However, should a design change be implemented that would require the disturbance of wetlands, NexGen would follow applicable regulatory requirements and develop a wetland mitigation and offsetting plan prior to any wetland disturbance. Notwithstanding the information above regarding lack of direct disturbance to wetlands, NexGen maintains that the Draft EIS provides a conservative assessment of Project effects to wetland ecosystems that resulted in a moderate to high degree of certainty in effects predictions (Draft EIS Section 13.6 [Prediction Confidence and Uncertainty]). Specifically, as stated in Draft EIS Section 13.5.2.1.1 (Ecosystem Availability), the use of a maximum disturbance area approximately four times larger than the current Project footprint would result in a loss of 26 ha of wetland habitat. While restoration of this habitat would be attempted during reclamation to achieve wetland species composition and ecological function similar to the current existing conditions, NexGen recognizes that successful reclamation of wetland habitats can be challenging. For this reason, the assessment conservatively assumed that the loss of Project-affected wetland ecosystems would be permanent and irreversible. The conclusions of the assessment on the wetland ecosystem valued component were derived on this basis (Draft EIS Section 13.5.2.3 [Residual Effects Classification and Determination of Significance]).	n/a

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								provide a detailed discussion, as outlined in the follow up IR, for review.			**References** *Canadian Environmental Assessment Act, 2012.* SC 2012, c 19, s 52. Repealed, 2019, c 28, s 9. Available at https://laws-lois.justice.gc.ca/eng/acts/C-15.21/20170622/P1TT3xt3.html.	
121	ECCC	Wildlife and Wildlife Habitat	Section 14	As per the CNSC Generic Guidelines for the Preparation of an Environmental Impact Statement pursuant to the Canadian Environmental Assessment Act, 2012: "The EIS will then describe mitigation measures that are specific to each environmental effect identified. Measures will be written as specific commitments that clearly describe how the proponent intends to implement them and the environmental outcome the mitigation is designed to address. The EIS will describe mitigation measures in relation to species and/or critical habitat listed under the Species at Risk Act (SARA). These mitigation measures will be consistent with any SARA permit, applicable recovery strategy and/or action plan." The draft EIS does not list all SAR, or the adverse effects to all SARA-listed species, and does not outline the measures that will be taken to avoid or mitigate these effects	1. Identify all SAR and their critical habitat and describe how they may be adversely affected by the Project. 2. Describe what measures will be taken to avoid or lessen the effects of each Project activity and phase, and how these effects will be monitored to ensure they are minimized or avoided.	NexGen confirms that information on species at risk (SAR) potential effects and mitigation measures are presented in the Draft EIS. 1. In Draft EIS Section 14 (Wildlife and Wildlife Habitat), all wildlife SAR that were confirmed to occur in the regional study area were assessed, including identification of critical habitat and mitigation measures. Selected valued components (VCs) assessed included SAR species woodland caribou (Draft EIS Section 14.5.1.1 [Application Case] and Draft EIS Section 14.5.1.2 [Reasonably Foreseeable Development Case]), little brown myotis (Draft EIS Section 14.5.6.1 [Application Case] and Draft EIS Section 14.5.6.2 [Reasonably Foreseeable Development Case]), olive-sided flycatcher (Draft EIS Section 14.5.7.1 [Application Case] and Draft EIS Section 14.5.7.2 [Reasonably Foreseeable Development Case]), and rusty blackbird (Draft EIS Section 14.5.8.1 [Application Case] and Draft EIS Section 14.5.8.2 [Reasonably Foreseeable Development Case]). Legally defined critical habitat is only applicable for woodland caribou, as presented in Draft EIS Section 14.3.1.1 (Habitat Availability). Species at risk not selected as VCs but assessed included northern myotis, common nighthawk, and barn swallow (Draft EIS Section 14.5.12 [Additional Species at Risk Screening Assessments] and Draft EIS Appendix 14A [Species at Risk Screening Assessment]). As presented in Draft EIS Section 13 (Vegetation), there are no vegetation SAR affected by the proposed Project. NexGen notes that yellow banded bumble bee, gypsy cuckoo bumble bee, transverse lady beetle, and nine-spotted lady beetle were not assessed in the Draft EIS but were identified by Environment and Climate Change Canada in IR 122 as potentially overlapping the regional area of the Project. Please refer to the response to IR 122 for context related to these arthropod SAR. 2. NexGen is committed to implementing the mitigation measures presented in Table 14.4-1 of Draft EIS Section 14.4 (Project Interactions and Mitigations) to avoid and minimize effects on SAR and other wildlife. Additional commitments to mitigation are provided in NexGen's responses to IR 38 and IR 127. Follow-up monitoring programs for all SAR and other wildlife will be developed as required as part of the federal licensing and provincial permitting requirements. No changes are proposed in the revised EIS to address this IR.	n/a	**Context:** The Proponent has only partially responded to part one and two of the IR. The CNSC guidelines state: *"the EIS will then describe mitigation measures that are specific to each environmental effect identified. Measures will be written as specific commitments that clearly describe how the proponent intends to implement them and the environmental outcome the mitigation is designed to address. The EIS will describe mitigation measures in relation to species and/or critical habitat listed under the Species at Risk Act (SARA). These mitigation measures will be consistent with any SARA permit, applicable recovery strategy and/or action plan."* The Proponent has provided some of the information required per the EIS guidelines. Table 14.4-1 in the draft EIS outlines some mitigation measures for each pathway. However, these mitigation measures do not provide sufficient detail to understand how these commitments will be implemented as per the EIS guidelines in italics above. Some mitigation measures are missing from the table that are mentioned in the text or are not included for all appropriate pathways. Also, the table does not contain a summary of species-specific mitigation measures, which are required to assess potential impacts to species at risk. **Rationale:** In order to meet the requirements of the EIS Guidelines and to assess potential impacts of the Project on migratory birds and SAR, the Proponent should include a summary table that lists each species at risk, the proposed mitigation measures, and a description of how the Proponent intends to implement them. Details on how the effectiveness of mitigation measures will be assessed should be included in Table 14.4-1 alongside how mitigation commitments will be implemented.	121-R1	1. Provide the following information as detailed in the EIS guidelines: *"the EIS will then describe mitigation measures that are specific to each environmental effect identified. Measures will be written as specific commitments that clearly describe <u>how</u> the proponent intends to implement them and the environmental outcome the mitigation is designed to address. The EIS will describe mitigation measures in relation to species and/or critical habitat listed under the Species at Risk Act (SARA). These mitigation measures will be consistent with any SARA permit, applicable recovery strategy and/or action plan."* 2. Prepare a summary table that lists each species at risk, the proposed mitigation measures, and a description of how the Proponent intends to implement them. This list should include all species at risk known to occur in the Project area, including boreal woodland caribou. 3. Revise Table 14.4-1 to include details on how mitigation commitments will be implemented (see also responses to IRs 123, 126, 270).	Responses to part 1 through part 3 of IR 121-R1 are provided below. 1. NexGen notes that information regarding the effects mitigation measures are intended to address and how mitigation measures would be implemented is provided in Table 14.4-1 of Draft EIS Section 14.4 (Project Interactions and Mitigations). Specifically, mitigation measures described in the "Environmental Design Features and Mitigation Measures" are intended to address the potential effects identified in the "Effects Pathway" column. Each mitigation measure is described in a manner that provides how the mitigation measure would be implemented. As an example, for Pathway ID W-01 (Habitat loss), a mitigation measure described is "reclaim and revegetate areas where non-permanent Project facilities have been decommissioned". For this mitigation measure, reclamation and revegetation would occur after facilities had been decommissioned and would be intended to reduce effects with respect to habitat loss. Mitigation measures intended to reduce effects on species at risk that exist or have the potential to exist in the area of the Project are discussed in either the appropriate species-at-risk valued component subsection in Draft EIS Section 14.5.1 (Residual Effects Analysis) or in Draft EIS Appendix 14A (Species at Risk Screening Assessment). In addition, to support the reviewer's request, NexGen has created Attachment IR 111-R1, 121-R1, 207-R1, and 270-R1, which provides general mitigation measures for both species at risk and migratory birds (Table 1) as well as species-specific mitigation measures for species at risk (Table 2). Any mitigation measures described in Table 1 of Attachment IR 111-R1, 121-R1, 207-R1, and 270-R1 that were not included in the Draft EIS will be added to Table 14.4-1 of revised EIS Section 14 (Project Interactions and Mitigations). Mitigation measures noted in Table 2 of Attachment IR 111-R1, 121-R1, 207-R1, and 270-R1 will be incorporated into the Project Environmental Protection Program and supporting documents. 2. To support the reviewer's request, NexGen has created Attachment IR 111-R1, 121-R1, 207-R1, and 270-R1, which provides general mitigation measures for both species at risk and migratory birds (Table 1) as well as species-specific mitigation measures for species at risk (Table 2). How mitigation measures would be implemented is described within the text for each mitigation measure. Any mitigation measures described in Table 1 of Attachment IR 111-R1, 121-R1, 207-R1, and 270-R1 that were not included in the Draft EIS will be added to Table 14.4-1 of revised EIS Section 14 (Project Interactions and Mitigations). Mitigation measures noted in Table 2 of Attachment IR 111-R1, 121-R1, 207-R1, and 270-R1 will be incorporated into the Project Environmental Protection Program and supporting documents.	Section 14.4, Table 14.4-1

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											3. As noted in part 1 and part 2 of this IR response, descriptions of how mitigation measures would be implemented are included within the text for each mitigation measure. NexGen confirms that any mitigation measures described in Table 1 of Attachment IR 111-R1, 121-R1, 207-R1, and 270-R1 that were not included in the Draft EIS will be added to Table 14.4-1 of revised EIS Section 14 (Project Interactions and Mitigations).	
123	ECCC	Wildlife and Wildlife Habitat	Section 14 Table 14.4-1 Table 23A-3	Light pollution and effects to migratory birds and SAR such as bats and caribou are identified in the draft EIS. Mitigation is described as 'limit light pollution to the extent practical…' but more detail will help ECCC to determine how light pollution will be limited and what mitigation measures will be utilized.	Explain how light pollution will be managed and what specific mitigation measures will be used to minimize effects to migratory birds and SAR birds and mammals.	NexGen recognizes that additional detail on the light pollution mitigation would result in higher confidence in the effectiveness of mitigations that would reduce effects to migratory birds and other species at risk. However, the proposed Project lighting design has not yet been completed. As stated in Table 14.4-1 of Draft EIS Section 14.4 (Project Interactions and Mitigations), Pathway ID W-03 (Sensory disturbance), NexGen is committed to limiting light pollution to the extent practicable for built (i.e., constructed) infrastructure. Additional details on light mitigation will be developed during detailed design of the Project and reflected in documents provided in support of federal licensing, as applicable. No changes are proposed in the revised EIS to address this IR.	n/a	**Context:** Project lighting has the potential to attract wildlife to structures or other Project components which can result in harm or mortality. The lighting design is in development and not available for review. The Proponent has committed to limiting light pollution to the extent practicable for built infrastructure and that additional details on light mitigation will be developed. However, no details have been provided on what these mitigation measures will be. **Rationale:** Without the ability to review the mitigation measures that will be developed, ECCC cannot advise on the effectiveness of mitigation measures to reduce effects to migratory birds e.g., shoreline or overwater nesting species) and species at risk (e.g., little brown bat, barn swallow, yellow rail) (see IR 121 Context and Rationale). A light pollution mitigation plan for migratory birds and bats should be developed. The plan should include details on how light pollution will be limited, and Table 14.4-1 should be updated to reflect these details and to allow for a fulsome assessment of the mitigation measures for these potential impacts.	123-R1	**1.** Develop a light pollution mitigation plan for migratory birds and bats. **2.** Revise Table 14.4-1 to include details on how light pollution will be limited.	The following response has been drafted to address both part 1 and part 2 of IR 123-R1. In response to the reviewer's request to consider additional mitigation measures with respect to light pollution, NexGen will include the following details regarding light mitigation measures in Table 14.4-1 of revised EIS Section 14.4 (Project Interactions and Mitigations): ▪ Other than where required to comply with regulatory guidelines (e.g., aviation safety) or worker health and safety, the following guidance will be used for Project lighting design when migratory birds may be present: o limit the use of decorative lighting and solid burning or slow pulsing warning lights; o to the extent possible, orient lights downward or use shielded fixtures and limit light use to areas where Project activities are occurring (Dick 2016); o to the extent feasible, use the amber light [spectrum >500 nanometre], limit blue spectral light, and do not use white light, (Dick 2016); and o turn off lights when not in use (e.g., use timers, motion sensors) (Dick 2016). NexGen confirms that detailed lighting design and procurement for the Project has not been completed at this time and likely would not be concluded until greater certainty is achieved regarding Project approvals and development. NexGen notes that the development of a migratory bird and bat light pollution mitigation plan for inclusion in the EIS is outside the scope the requirements of an EA of a designated project under the *Canadian Environmental Assessment Act, 2012*. For these reasons, a detailed light pollution and mitigation plan is neither available, nor required, as part of the Project EA. **<u>References</u>** *Canadian Environmental Assessment Act, 2012*. SC 2012, c 19, s 52. Repealed, 2019, c 28, s 9. Available at https://laws-lois.justice.gc.ca/eng/acts/C-15.21/20170622/P1TT3xt3.html. Dick R. 2016. Royal Astronomical Society of Canada Guidelines for Outdoor Lighting in Dark-sky Preserves (RASC-DSP-GOL). Adopted by the RASC March 2008 Revised Spring 2016. 38 pp. [accessed 26 March 2019].	Section 14.4
128	CNSC	Human Health with respect to radiation exposure	Human Health Accidents and Malfunction	**Context:** Camp workers at the proposed Project were assessed for both radiological and non-radiological exposures in the Environmental Impact Statement (EIS) for the Rook I Project. However, the potential radiological and non-radiological impacts of the project on the health and safety of all other persons that would be on-site (for example,	The proponent is requested to assess the potential radiological and non-radiological impacts of the project on the health and safety of all persons on- site, during normal operations and during accidents and malfunctions (persons on-site in this context are NEWs and persons who are not NEWs who may incur occupational exposures). The proponent should identify all	NexGen appreciates the reviewer's comment and the feedback received from the reviewer during regulatory engagement on this IR. Recognizing that detailed information on this topic will be provided as part of federal licensing, which is being conducted in an integrated manner with the Project EA, NexGen understands the CNSC's request is to provide a summary in the revised EIS (Section 15 [Human Health]) regarding the potential radiological and non-radiological effects of the Project on nuclear energy workers (NEWs) and non-NEWs.	Section 15; Appendix 15A (new)	The Proponent provided Attachment IR 128-1, which includes a summary of radiological and non-radiological effects on the health of nuclear energy workers (NEWs) and non-NEWs during normal operations and through the potential occurrences of accidents and malfunctions. This attachment is intended to be included as revised EIS Appendix 15A. However, the summary focuses on potential radiological effects	128-R1	In order to accept this response, CNSC staff request that the Proponent: 1) include a summary of the assessment of radiological effects of the Project on NEWs and non-NEWs in the context of equivalent doses for the lens of an eye, skin, and hands and feet during normal operations and through the potential occurrences of accidents and malfunctions.	The following response has been drafted to address both part 1 and part 2 of the IR. 1. NexGen notes that the reviewer's request is outside the scope the requirements of an EA of a designated project under the *Canadian Environmental Assessment Act, 2012* and the commitments made within the Project Description (NexGen 2019). For context however, operating experience at other uranium mines and mills indicates that exposure risks to eyes, skin, hands, and feet are low and standard personal protective equipment	Section 15.1.2

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				nuclear energy workers (NEWs) and persons not considered as NEWs (i.e., non-NEWs)), during normal operations and during accidents and malfunctions, were excluded from the EIS. The rationale provided by the proponent is in reference to CSA N288.6-12, as NEWs are not considered in the Standard. The exclusion of NEWs and non-NEWs who may be occupationally exposed to ionizing radiation and non-radiological hazards is contrary to the Project Description for the Rook I Project, which does identify in Section 4.2.5, Human and Ecological Health, the following: *Human and ecological health considerations will be evaluated through all phases of the Project and will consider the various potential impacts that the Project could have to various receptors. For example, specific to the direct operation of the Project, select occupations and personnel on-site could be exposed to radiation sources as part of their daily activities. These would include underground miners, ore and waste rock truck drivers and mill operators.* The proponent is reminded that the scope of the environmental assessment, as outlined in the Project Description for the Rook I Project, which was subsequently accepted by the Commission in its Record of Decision, provides the overarching framework for the EIS. Further, in the Record of Decision, it is stated that … *"CNSC staff submitted a detailed description of the primary project components and that it was satisfied that the project components and activities that NexGen listed in its project description were appropriate."* This would include the receptors identified in Section 4.2.5 as outlined above (i.e., specific to the direct operation of the Project, select occupations and personnel on- site could be exposed to radiation sources as part of their daily activities. These would include underground miners, ore and waste rock truck drivers and mill operators). **Rationale**: NexGen identified the scope of the Rook I Project in its submitted project description. Section 4.2.5,	associated hazards and screen them as to potential risks for bounding scenarios. All bounding scenarios should be further assessed in detail with adequate consequence criteria for their specific impacts/risks on the environment, human health, and workers' safety.	NexGen confirms that detailed information on the topic of this IR will be provided as part of the licensing application submission to the CNSC in support of Project Construction, and will include the deliverables for radiological and non-radiological hazards outlined below. For radiological hazards: ▪ radiological exposure assessment for underground workers; ▪ radiological exposure assessment for the process plant and paste tailings preparation workplace; ▪ radiological exposure assessment for the low-level radioactive waste incinerator; and ▪ radiological exposure assessment for accidents and malfunctions. For non-radiological hazards: ▪ workplace exposure to diesel and crystalline silica dust; ▪ hazard analysis reports; and ▪ human factors engineering documentation. Attachment IR 128-1 includes a summary of radiological and non-radiological effects on the health of NEWs and non-NEWs during normal operations and through the potential occurrences of accidents and malfunctions. This attachment will be included as revised EIS Appendix 15A.		of the Project in the context of effective doses to workers but neglected a discussion on equivalent doses for the lens of an eye, skin, and hands and feet. The Proponent also confirmed that detailed information on the topic of this IR will be provided as part of the licensing application submission to the CNSC in support of Project Construction and will include the deliverables for radiological and non-radiological hazards outlined below. For radiological hazards: ▪ radiological exposure assessment for underground workers; ▪ radiological exposure assessment for the process plant and waste tailings preparation workplace; ▪ radiological exposure assessment for the low-level radioactive waste incinerator; and ▪ radiological exposure assessment for accidents and malfunctions. For non-radiological hazards: ▪ workplace exposure to diesel and crystalline silica dust; ▪ hazard analysis reports; and ▪ human factors engineering documentation. The Proponent's commitments need to be specified in the EIS for completeness.		2) specify in the EIS that worker health, as it relates to normal operations and accidents and malfunctions, will be addressed independently as part of the CNSC licensing process as required.	(e.g., safety glasses, gloves, boots) worn in exposure areas would provide suitable protection for workers. This information was shared with and accepted by the CNSC during a licensing process comment disposition meeting for radiation protection on 16 October 2023.For these reasons, no further assessment is required to satisfy the requirements of the Project EA. 2. NexGen confirms that revised EIS Section 15.1.2 (Purpose and Approach to the Assessment) will include text acknowledging that worker health in respect to both normal operations and potential accidents and malfunctions will be addressed independently as part of the CNSC licensing process, as required. **References** *Canadian Environmental Assessment Act, 2012.* SC 2012, c 19, s 52. Repealed, 2019, c 28, s 9. Available at https://laws-lois.justice.gc.ca/eng/acts/C-15.21/20170622/P1TT3xt3.html. NexGen (NexGen Energy Ltd.). 2019. Project Description for the Rook I Project. Submitted to Saskatchewan Ministry of Environment and Canadian Nuclear Safety Commission. April 2019.	

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				Human and Ecological Health, includes consideration of various potential impacts that the Project could have to various receptors, with examples given including select occupations and personnel on-site that could be exposed to radiation sources and non-radiological hazards as part of their daily activities (*paraphrased by CNSC staff*). CNSC staff note that the CSA standard N288.6-12 addresses environmental risk assessments for Class I nuclear facilities and uranium mines and mills. It is agreed that the standard does state the following in 1.6 (Receptors): *NEWs are covered under the radiation protection program and health and safety program in place at the facility and therefore not considered in the Standard.* However, there is currently no radiation protection program or health and safety program in place; noting that the Rook I Project is currently undergoing the EIS review process. Therefore, there is no information contained in the EIS on the extent of potential radiological and non-radiological impacts the project may have on all persons on- site (NEWs and persons who are not NEWs), including during accidents and malfunctions (also noting that the camp workers included in the HHRA were not advanced to the accidents and malfunctions analyses).								
191	CNSC	Accidents and Malfunctions	Section 21.6.5 TSD VIII, Section 8	**Context:** Bounding Scenario 3 involves damage to equipment and vessels containing uranium-bearing solutions in the solvent extraction building, resulting in fire and release of uranium to the environment. The effects of this scenario were evaluated with the Areal Locations of Hazardous Atmospheres (ALOHA) model. The details of the assessment are provided in TSD VIII. In TSD VIII, the airborne source term for this scenario is estimated with equation developed by the United States Department of Energy (USDOE) where the respirable faction is assumed to only include particles of 10 µm and smaller. **Rationale:**	Provide rationale for why only 10 µm and smaller particles were considered for respirable fraction and explanation for the values of factors used for leak path factor calculation. **Requires Technical Discussion**: Yes	As noted in Section 8.2 of Draft EIS TSD VIII (Accidents and Malfunctions Report), a 10 µm diameter particle size, or smaller, is a commonly assumed size fraction as an inhalable particle as referenced by various organizations, including the United States Environmental Protection Agency (US EPA 2023). Uranium particles emitted from a solvent fire would be particles or aerosols that are formed during the fire. In most cases, these aerosols are sub-micron in size. In consideration of this typical size, the 10 µm diameter assumption is conservative since it assumes that all the particles are therefore inhalable. Additionally, as noted in Section 8.2 of Draft EIS TSD VIII, the value '1' has been used for the respirable fraction to develop the exposure source term. This value is conservative because it assumes that all the uranium content formed as particles is inhalable. With respect to the calculation of the leak path factor (LPF) for a confined building fire, the basis of the LPF was as follows: ▪ The American Society of Heating, Refrigerating, and Air-Conditioning Engineers Ventilation	n/a	NexGen's response does not include explanation for some values of factors for leak path factor calculation (i.e. the volume of air of 210 m^3, maximum air flow of 27 m^3, burning rate of 2.6 L/s) and the maximum uranium concentration of 8 g/L in the loaded solvent.	191-R1	Provide explanation for the following values of factors, the volume of air of 210 m^3, maximum air flow of 27 m^3, burning rate of 2.6 L/s, and the maximum uranium concentration of 8 g/L in the loaded solvent.	The following explanations are provided to support the values for leak path factor calculations. 1. Volume of air NexGen notes that the volume of air needed to support a burning rate of 20 L/s kerosene that was shown as 21 m^3/s in Section 8.2 of Draft EIS TSD VIII (Accidents and Malfunctions Report) should have been shown as 220 m^3/s. This correction will be made in Section 8.2 of revised EIS TSD VIII (Accidents and Malfunctions Report). The volume of air is based on the following assumptions and calculations: <u>Assumptions</u> ▪ Theoretical burning rate: 20 L/s kerosene (Draft EIS TSD VIII, Section 8.2) ▪ Kerosene density: 0.81 g/cm^3 (US DOL 2004) ▪ Kerosene average molecular weight: 170 g/mole (US DOL 2004) ▪ Molar volume: 22.4 L/mole ▪ Stoichiometric ratio: 37:2 - $2C_{12}H_{26}(l)+37O_2(g)\rightarrow 24CO_2(g)+26H_2O(g)$ ▪ O_2 to air ratio: 0.21	TSD VIII, Section 8.2

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				No rational was provided to support the consideration of only 10 µm and smaller particles. For material at risk, the total volume of the uranium-rich solvent of 100 m3 was used without explanation. It is also not clear where is the maximum uranium concentration of 8 g/L in the loaded solvent from. The calculation of leak path factor involves several factors either calculated or assumed (i.e. the volume of air of 210 m^3, 14 air changes, maximum air flow of 27 m^3, burning rate of 2.6 L/s), which are not clearly stated. As the airborne source term is an important factor for the effect assessment and should be calculated with transparent and justified information/data.		Standard 62.1 (ASHRE 2022) indicates that air exchange for closed industrial buildings is 4 air changes per hour (ACH). ▪ In case of fire, due to stack effects, the ACH is 3 to 4 times greater, and therefore 3.5 × 4 = 14 ACH was selected. NexGen also notes that the analysis was repeated for an unconfined fire assuming an LPF of 1 in the unconfined fire scenario, which had a similar minor to moderate consequence rating within a relatively short distance from the release as the confined scenario that assumed an LPF of 0.128. No changes are proposed in the revised EIS to address this IR. **References** ASHRE (American Society of Heating, Refrigerating, and Air-Conditioning Engineers). 2022. ANSI/ASHRAE Standard 62.1-2022, Ventilation and Acceptable Indoor Air Quality. Available at https://www.ashrae.org/technical-resources/bookstore/standards-62-1-62-2 US EPA (United States Environmental Protection Agency). 2023. Particulate Matter (PM) Basics. Last updated July 2023. Available at https://www.epa.gov/pm-pollution/particulate-matter-pm-basics					▪ Excess air – open burning: 15% Calculations ▪ Theoretical burning rate: 20 L/s x 1,000 g/L x 0.81 g/cm^3 = 16,200 g/s kerosene ▪ Theoretical burning rate: 16,200 g/s / 170 mole/g = 95.4 mole/s kerosene ▪ Approximate stoichiometric O_2: 95.4 mole/s x 37 / 2 = 1,770 mole/s O_2 ▪ Approximate stoichiometric O_2: 1,770 mole/s x 22.4 L/mole / 1,000 L/m^3 = 40 m^3/s O_2 ▪ Approximate stoichiometric air: 40 m^3/s O_2 / 0.21 O_2/air = 190.5 m^3/s air ▪ Stoichiometric air (incl. excess air): 190.5 m^3/s air x 1.15 = **220 m^3/s air** 2. **Maximum air flow** The maximum air flow was determined based on the following assumptions and calculations. Assumptions ▪ The volume of the solvent extraction building is 7,000 m^3. ▪ A total of 14 air exchanges per hour are assumed (ASHRE 2022). Calculations ▪ Limiting volumetric of air flow: 7,000 m^3 x 14/h = 98,000 m^3/h, and ▪ 98,000 m^3/h / 3,600 sec/h = 27 m^3/s 3. **Burning Rate** Using the methods described in Section 8.2 of Draft EIS TSD VIII and following the calculation shown in part 1 of this response, an air volume of 220 m^3/s would be required for a kerosene burn rate of 20 L/s. However, as shown in part 2 of this response and presented in Section 8.2 of Draft EIS TSD VIII, the maximum air flow for a confined solvent fire within the building would be 27 m^3/s; therefore, the actual burning rate would be 20 L/s / 220 m^3/s x 27 m^3/s = 2.5 L/s. NexGen notes that, due to the updated volume of air provided in part 1, the burning rate value of 2.5 L/s is slightly different than the 2.6 L/s presented in the Draft EIS. NexGen will update Section 8.2 of revised EIS TSD VIII to include the updated value. NexGen confirms that this change does not affect the uranium airborne source term value of 0.0024 kg/s (Draft EIS TSD VIII, Section 8.2); therefore, the assessment results for the solvent extraction fire or explosion bounding scenario would not change. 4. **Maximum Uranium Concentration in Loaded Solvent** NexGen confirms that, based on test work completed for the Project, 8 g/L represents the planned U_3O_8 concentration within clarified pregnant liquor solution reporting from the counter-current decantation circuit to the solvent extraction circuit. Therefore, 8 g/L U_3O_8 for loaded solvent represents the worst-case scenario for effects to the environment should an accident or malfunction occur. **References**	

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											ASHRE (American Society of Heating, Refrigerating, and Air-Conditioning Engineers). 2022. ANSI/ASHRAE Standard 62.1-2022, Ventilation and Acceptable Indoor Air Quality. Available at https://www.ashrae.org/technical-resources/bookstore/standards-62-1-62-2. USDOL (United States Department of Labor). 2004. Occupational Safety & Health Administration. Kerosene Fact Sheet. Available at http://niosh.dnacih.com/nioshdbs/oshameth/2139/2139.html. Accessed February 2024.	
198	ECCC	Fish and fish habitat Change to an environmental component due to hazardous contaminants	Section 22.6	**Context:** In Section 22.6, the Proponent provides risk level determinations for various natural hazards based on their likelihood of occurrence and potential consequences. This relies on the climate information and projections detailed in Appendix 22A wherein the potential for future increases in the frequency/magnitude of short-duration precipitation events and Probable Maximum precipitation (PMP) are noted. This potential is also noted in section 22.6.3. – Major Precipitation Events. **Rationale:** In Section 22.6 under "Water Management Infrastructure" (p.22), the Proponent notes "*Self-containment for runoff from mineralized materials has been sized to contain PMP events*". It is not clear if that PMP considers potential climate change.	Describe how future climate change has been factored into the consideration of the risk levels related to extreme precipitation, including possible increases in frequency and magnitude, for all of the Hazard Scenarios identified in Table 22.6.3. **Suggestions for mitigation and follow-up measures** Monitor all pumps and availability of contingency pumps. Redundant pumps may be necessary when the failure threatens the environment.	The following points outline how climate change has been factored into the consideration of the risk levels in Table 22.6-3 of Draft EIS Section 22.6.3.2 (Risk Measurement and Evaluation): ▪ A detailed climate change analysis was completed (Draft EIS Appendix 22A [Climate Change Assessment], Attachment 22A-1) to understand future climate variables. As outlined in Section 22A.5.1.3 of Draft EIS Appendix 22A, climate projections for a range of variables were identified at various percentiles (i.e., 5%, 10%, 50%, 75%, 90%, 95%, and 99%). The climate projections provided across various percentiles have been considered for all climate variables, including extreme weather events such as a probable maximum precipitation (PMP) event. The PMP was projected for climate change scenarios in the 2050s and 2080s (Draft EIS Appendix 22A, Section 22A5.3). ▪ The climate information provided in Draft EIS Appendix 22A has been applied to the Project design through design criteria and management practices (i.e., environmental design features and mitigation). The detailed climate change dataset (Draft EIS Appendix 22A, Attachment 22A-1) was developed for the Project to compare the climate projections with design parameters to evaluate the resiliency of the Project. ▪ The climate information provided in Draft EIS Appendix 22A has also been applied to various disciplines, including hydrology, and has been used throughout the effects assessment. How the disciplines considered climate projections from Draft EIS Appendix 22A in the individual effects assessments are summarized in Table 6A-1 of Draft EIS Appendix 6A (Climate Change Roadmap). ▪ NexGen confirms that Table 22.6-3 of Draft EIS Section 22.6.3.2 considers the detailed climate change analysis (i.e., the Project has been designed to withstand a PMP event, which includes consideration of climate change), as well as the consideration of climate change in the effects assessment by the relevant disciplines (refer to Table 6A-1 of Draft EIS Appendix 6A [Climate Change Roadmap]). ▪ Given that climate change is occurring but there remains uncertainty in the future projections of climate change, NexGen would consider climate risks as a part of the continual improvement process, as outlined in the Climate Adaptation Framework (Draft EIS TSD XXII). With respect to the reviewer's suggested mitigation and follow-up measures, details regarding pump monitoring and the sizing of pumps, requirement for contingency pumps, and considerations for other	n/a	**Context:** The Proponent has clarified that climate change effects on future PMP have been evaluated by examining projections for a range of percentiles. However, it remains unclear what range of the projections was applied in design decisions and evaluation of risk and how these ranges were selected. In the IR response for IR-198 they indicate that: "As outlined in Section 22A.5.1.3 of Draft EIS Appendix 22A, climate projections for a range of variables were identified at various percentiles (i.e., 5%, 10%, 50%, 75%, 90%, 95%, and 99%). The climate projections provided across various percentiles have been considered for all climate variables, including extreme weather events such as a probable maximum precipitation (PMP) event. The PMP was projected for climate change scenarios in the 2050s and 2080s (Draft EIS Appendix 22A, Section 22A5.3)." And that: "The climate information provided in Draft EIS Appendix 22A has also been applied to various disciplines, including hydrology, and has been used throughout the effects assessment. How the disciplines considered climate projections from Draft EIS Appendix 22A in the individual effects assessments are summarized in Table 6A-1 of Draft EIS Appendix 6A (Climate Change Roadmap)" "NexGen confirms that Table 22.6-3 of Draft EIS Section 22.6.3.2 considers the detailed climate change analysis (i.e., the Project has been designed to withstand a PMP event, which includes consideration of climate change), as well as the consideration of climate change in the effects assessment by the relevant disciplines (refer to Table 6A-1 of Draft EIS Appendix 6A [Climate Change Roadmap])." In the Proponent's response to IR-199 they indicate that:	198-R1	Clarify what percentiles of projected changes in extreme precipitation including PMP have been considered and utilized in design of relevant infrastructure and management and evaluation of risks.	NexGen acknowledges the reviewer's comment and, in addition to the information provided in the initial response to the original IR, provides the following information to respond to the reviewer's inquiry regarding how Project design has considered susceptibility to extreme precipitation events, including events associated with future climate change. NexGen confirms that the key infrastructure susceptible to extreme precipitation events would be site water management infrastructure. As presented in Section 5.1.2 of Draft EIS TSD XVIII (Site-Wide Water Balance and Water Quality Modelling Report), sensitivity analyses were conducted to confirm that the current site surface water management system design would be suitable to various precipitation events. With respect to the capacity of the water management system related to precipitation, two scenarios were considered: Scenario 6 and Scenario 8. Scenario 6 considered the susceptibility of surface water management infrastructure to a summer probable maximum precipitation (PMP) event (i.e., 489.2 mm precipitation). The model results confirmed that the site water management infrastructure design is appropriate but that operational refinement for flood storage dewatering is warranted during later stages of Project planning. Scenario 8 considered the susceptibility of surface water management infrastructure to extreme storm events that may occur in the future due to climate change. More specifically, the scenario considered a 12% increase to the PMP event (i.e., 547.9 mm), or the 50th percentile of predicted climate change values for the 2050s (i.e., the end of the Project lifespan) (Draft EIS Appendix 22A [Climate Change Dataset Summary Report], Section 10A5.3, Table 22A-22). The analysis found that containment ponds are projected to maintain sufficient storage containment but may result in loss of freeboard under some antecedent conditions during the Operations phase. However, while site runoff pond #1 is expected to contain the PMP event, there was an increased probability of potential overflow during the Operations phase. As the results of both Scenario 6 and Scenario 8 show that the surface water management infrastructure is predicted to withstand current and future PMP events, the design assumptions for the EA are appropriate. However, NexGen acknowledges that some uncertainty regarding surface water management system performance exists and notes that, while climate change is occurring, there is also uncertainty in the future projections of climate change. Therefore, NexGen would appropriately monitor and consider climate risks on Project surface water management infrastructure as a part of both future design phases and the continual improvement process, as outlined in the Climate Adaptation Framework (Draft EIS TSD XXII). NexGen also notes that the design bases and management strategies for site water management infrastructure designed to accommodate a 24-hour PMP	n/a

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						related Project infrastructure will be provided to the CNSC as part of the licence application.		"The likelihood and consequence rankings shown in the various tables in Draft EIS Section 22.6 (Assessment of Effects of Natural Hazards) are accurate because the current Project design criteria and management practices incorporates climate change, which is based on the climate change assessment (Draft EIS Appendix 22A) and considered the range of variables identified at various percentiles as noted above (i.e., not just the median). Consequently, the risk ranking, which is the product of likelihood and consequence ratings assigned for each hazard scenario, is appropriate and would remain unchanged with more extreme projected future climate changes." "The climate information provided in Draft EIS Appendix 22A has also been used by various discipline effects assessments (e.g., hydrology, surface water quality and sediment quality, fish and fish habitat, vegetation, wildlife) as described in Table 6A-1 of Draft EIS Appendix 6A (Climate Change Roadmap). As described in the discipline effects assessments, additional percentiles beyond the median have been considered to better understand climate related effects, especially for extreme events. A summary of the median (i.e., 50th) percentile projections has only been provided for a general context on future climate." Table 6A-1 of the EIS indicates that mean projections rather than a range have been applied in the hydrology and Surface Water sections (Sections 9 and 10). **Rationale:** It is unclear what percentiles of projected changes in extreme precipitation, including PMP, have been considered in the EIS. Clarification on the consideration and utilization of these percentiles in design of relevant infrastructure and the management and evaluation of risks is required to understand effects related to future extreme climate events.				event have been included in the licence application for the Project and would be subject to review and revision (as required) throughout the Project lifespan. If the size of the 24-hour PMP were to change as a result of climate change during the Project lifespan, mechanisms within the CNSC licensing process would require revisions to the site water management design bases and associated infrastructure (as required) to ensure adequate containment of mineralized contact water during extreme precipitation events and to maintain protection of the environment.	
199	ECCC	Fish and fish habitat Migratory birds Current use of lands and resources for traditional purposes	Section 22.6 Appendix 22A	**Context:** In Section 22.6, the Proponent indicates that they have considered the median in an ensemble of climate change projections for a number of climate parameters in their hazard scenario assessment. **Rationale:** Best practice for addressing the inherent uncertainty in future climate projections is to consider the range of projected changes in an	Describe how the overall risk levels (based on likelihood and consequence) for the various hazard scenarios that relate to climate outlined in the various tables in Section 22.6 would differ if more extreme projected future changes were considered (i.e., not just the median).	As outlined in Section 22A.5.1.3 of Draft EIS Appendix 22A (Climate Change Assessment), climate projections for a range of variables were identified at various percentiles (i.e., 5%, 10%, 50%, 75%, 90%, 95%, and 99%). The climate projections provided across various percentiles have been considered for climate variables, including extreme weather events such as probable maximum precipitation and World Meteorological Organization indices. The climate information provided in Draft EIS Appendix 22A has been applied to the Project design through design criteria and management practices	n/a	**Context:** The Proponent has fully responded to the IR. However, in the Proponent's response it is indicated that they "considered the range of variables identified at various percentiles as noted above (i.e., not just the median)". The Proponent also indicates that, "Given that climate change is occurring but there remains uncertainty in the future projections of climate change, NexGen would consider climate risks	199-R1	Clarify how projections for the three RCPs were treated and evaluated.	NexGen confirms that the approach used to develop the multi-model ensemble is aligned with guidance from the Intergovernmental Panel on Climate Change (IPCC 2007; IPCC 2013) to consider all available models and scenarios. As outlined in Attachment 22A-1 of Draft EIS Appendix 22A (Climate Change Dataset Summary Report), all models and scenarios are weighted equally as part of one ensemble. To clarify how the individual representative concentration pathways (RCPs) compare to the multi-model ensemble presented in Draft EIS Appendix 22A, NexGen has included Attachment IR 199-R1 to this response, which includes box and whisker figures that	n/a

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				ensemble of projections from a range of future emission scenarios and models. Evaluating the risk level based only on the median does not address the inherent uncertainty. A probability of occurrence has not been ascribed to the different future emission scenarios and they diverge increasingly beyond ~2040. The median projected change from the ensemble may not be the most likely to occur, which would result in unreliable predictions and the subsequent assessment of effects of the Project.		(i.e., environmental design features and mitigations). The detailed climate change dataset (Draft EIS Appendix 22A, Attachment 22A-1 [Detailed Climate Change Methodology]) was developed for the Project to compare the climate projections with design parameters to evaluate the resiliency of the proposed Project. The likelihood and consequence rankings shown in the various tables in Draft EIS Section 22.6 (Assessment of Effects of Natural Hazards) are accurate because the current Project design criteria and management practices incorporates climate change, which is based on the climate change assessment (Draft EIS Appendix 22A) and considered the range of variables identified at various percentiles as noted above (i.e., not just the median). Consequently, the risk ranking, which is the product of likelihood and consequence ratings assigned for each hazard scenario, is appropriate and would remain unchanged with more extreme projected future climate changes. The climate information provided in Draft EIS Appendix 22A has also been used by various discipline effects assessments (e.g., hydrology, surface water quality and sediment quality, fish and fish habitat, vegetation, wildlife) as described in Table 6A-1 of Draft EIS Appendix 6A (Climate Change Roadmap). As described in the discipline effects assessments, additional percentiles beyond the median have been considered to better understand climate related effects, especially for extreme events. A summary of the median (i.e., 50th) percentile projections has only been provided for a general context on future climate. Given that climate change is occurring but there remains uncertainty in the future projections of climate change, NexGen would consider climate risks as a part of the continual improvement process, as outlined in the Climate Adaptation Framework (Draft EIS TSD XXII).		as a part of the continual improvement process, as outlined in the Climate Adaptation Framework (Draft EIS TSD XXII)." **Rationale:** The Proponent indicates in the EIS that they evaluated projections for three Representative Concentration Pathways (RCPs). However, it is not clear how the different emission scenarios were considered. Specifically, it is unclear if the results for the three scenarios have been aggregated together. If this is the case, it is more difficult to separate the causes of uncertainty (e.g. differences between the scenarios) and therefore properly evaluate uncertainty in the projections.			show the range of projections across each RCP, as well as across the multi-model ensemble. **<u>References</u>** IPCC (Intergovernmental Panel on Climate Change). 2007. Climate Change 2007: Synthesis Report. Contribution of Working Groups I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, Pachauri RK, Reisinger A (eds.)]. IPCC, Geneva, Switzerland, 104 pp. Retrieved from https://www.ipcc.ch/report/ar4/syr/. IPCC. 2013. Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Accessed 2018. Available at http://www.ipcc.ch/report/ar5/wg1/.	
207	ECCC	Wildlife and Wildlife Habitat	Section 23	The Proponent states they are committed to developing the following plans: Environmental Monitoring Plan Environmental Protection Program Biodiversity Action Plan Effluent Monitoring Plan Decommissioning and Reclamation Plan	Provide the Environmental Monitoring Plan, Environmental Protection Program, Biodiversity Action Plan, Effluent Monitoring Plan, and Decommissioning and Reclamation Plan for review and provide detail on how these plans and programs will ensure the protection of SAR and migratory birds and their nests and wetland function, including how any residual effects will be mitigated.	NexGen notes the request for the provision of the Environmental Monitoring Plan, Environmental Protection Program, Biodiversity Action Plan, Effluent Monitoring Plan, and Decommissioning and Reclamation Plan is outside the scope of the requirements of an EA of a designated project under the *Canadian Environmental Assessment Act, 2012*. This request is also outside the scope of the Project Terms of Reference (Draft EIS Appendix 1A [Concordance Tables for the Terms of Reference and Generic Guidelines for Preparation of an Environmental Impact Statement], Table 1A-2), specifically as defined in Section 10. NexGen confirms that the Environmental Protection Program and supporting documentation (e.g., Environmental Monitoring Plan) and processes will outline considerations for the protection of species at risk, migratory birds and their nests, and wetlands. Examples of information that will be included within the Environmental Protection Program and supporting documentation specific to these topics will include: ▪ Minimizing and managing interactions for the safety of wildlife and workers, which will be described in processes (e.g., procedures) and include information on avoiding, minimizing, and	Appendix 5A (new)	**Context:** The Proponent has not provided the following requested plans: ▪ Environmental Monitoring Plan ▪ Environmental Protection Program ▪ Biodiversity Action Plan ▪ Effluent Monitoring Plan ▪ Decommissioning and Reclamation Plan The Proponent stated that this request is out of scope of the EA process. However, the Proponent states that Environmental Protection Program and supporting documentation (e.g., Environmental Monitoring Plan) and processes will outline considerations for the protection of species at risk, migratory birds and their nests, and wetlands. This will include wildlife monitoring, and surface water and groundwater monitoring to evaluate wildlife function. **Rationale:**	207-R1	Provide the following plans and supporting documentation. ▪ Environmental Monitoring Plan ▪ Environmental Protection Program ▪ Biodiversity Action Plan ▪ Effluent Monitoring Plan ▪ Decommissioning and Reclamation Plan Additionally, provide details on the methods of mitigation measures and monitoring plans. If this is not available, provide a discussion of the gaps in information including uncertainty related to potential effects, mitigation measures, and a follow up and monitoring plan. Where information is lacking, a precautionary approach is recommended.	As noted in NexGen's initial response to the original IR, the request for the provision of the Environmental Monitoring Plan, Environmental Protection Program, Biodiversity Action Plan, Effluent Monitoring Plan, and Decommissioning and Reclamation Plan is outside the scope of the requirements of an EA of a designated project under the *Canadian Environmental Assessment Act, 2012*. This request is also outside the scope of the Project Terms of Reference (Draft EIS Appendix 1A [Concordance Tables for the Terms of Reference and Generic Guidelines for Preparation of an Environmental Impact Statement], Table 1A-2), specifically as defined in Section 10. NexGen maintains that the level of information provided in the Draft EIS is appropriate to determine potential effects on the environment, including effects to species at risk, migratory birds, and wetlands. Each discipline assessment section describes the mitigation measures proposed to avoid or minimize effects to the environment (e.g., Draft EIS Section 13.4 [Project Interactions and Mitigations], Draft EIS Section 14.4 [Project Interactions and Mitigations]). With respect to mitigation measure uncertainty, as stated in Draft EIS Section 6.10 (Prediction Confidence and Uncertainty), "[u]ncertainty in the effectiveness of mitigations was also incorporated into the assessment. If uncertainty was high, the analysis applied a	EIS Section 14.4.1, Table 14.4-1

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						documenting wildlife interactions, as well as requirements for documenting wildlife sightings. ▪ Describing the risk-based set of integrated facilities, processes, and activities utilized to monitor various environmental media as they relate to the Project, including wildlife monitoring to verify compliance with the *Migratory Birds Convention Act, 1994* and *Species at Risk Act*, as well as surface water and groundwater monitoring to evaluate wildlife function. Detailed environmental management and monitoring plans, including the Environmental Monitoring Plan, Environmental Protection Program, Biodiversity Action Plan, Effluent Monitoring Plan, and Decommissioning and Reclamation Plan, will be developed and submitted to the CNSC and other regulatory authorities as part of the licensing and permitting processes for the Project, and reflect information commensurate with the stage of Project development. NexGen notes that a conceptual preliminary decommissioning and reclamation plan for the proposed Project will be included as revised EIS Appendix 5A (Conceptual Preliminary Decommissioning and Reclamation Plan). As this IR is out of the scope of the EA, no changes are proposed in the revised EIS other than the addition of Appendix 5A. **References** *Canadian Environmental Assessment Act, 2012*. SC 2012, c 19, s 52. Repealed, 2019, c 28, s 9. Available at https://laws-lois.justice.gc.ca/eng/acts/C-15.21/20170622/P1TT3xt3.html *Migratory Birds Convention Act, 1994.* SC 1994, c 22. Last amended 12 December 2017. Available at https://laws-lois.justice.gc.ca/eng/acts/m-7.01/ *Species at Risk Act.* SC. 2002, c 29. Last amended 12 August 2021. Available at https://laws-lois.justice.gc.ca/eng/acts/s-15.3/		Without reviewing the requested plans, ECCC is not able to evaluate the efficacy of mitigation methods to protect SAR, migratory birds and wetlands in relation to this Project. If any of the details requested above cannot be provided at the time of response, a discussion of the gap in information should be presented. This discussion should include uncertainty related to potential effects, mitigation measures, and a follow up and monitoring plan.			precautionary approach and mitigation was not considered sufficient to remove a pathway. For example, if a mitigation was considered new or unproven technology or challenging to implement under certain conditions, then a pathway was conservatively considered to be primary". Draft EIS Section 6 (Environmental Assessment Approach and Methods) provides additional context describing how a precautionary approach to assessment was undertaken. In addition to this context, the "Prediction Confidence and Uncertainty" subsections of each discipline assessment section (i.e., Draft EIS Section 7 [Air Quality, Noise, and Climate Change] to Draft EIS Section 19 [Community Well-Being]) describe the specific sources of uncertainty associated with the assessment and how the EA addressed uncertainty to complete a precautionary approach. Additionally, the "Monitoring, Follow-Up, and Adaptive Management" subsections of each discipline assessment section included in the Draft EIS describe the monitoring programs proposed to address the uncertainties associated with the effects predictions and to evaluate the performance of the Project, including the applied mitigation measures. To address the reviewer's request, NexGen has provided Attachment IR 111-R1, 121-R1, 207-R1, and 270-R1, which includes further context regarding general migratory bird and species at risk mitigation measures as well as species-at-risk-specific mitigation measures. Any mitigation measures described in Table 1 of Attachment IR 111-R1, 121-R1, 207-R1, and 270-R1 that were not included in the Draft EIS will be added to Table 14.4 1 of revised EIS Section 14 (Project Interactions and Mitigations). Mitigation measures noted in Table 2 of Attachment IR 111-R1, 121-R1, 207-R1, and 270-R1 reflect mitigations that would be incorporated into the Project Environmental Protection Program and supporting documents. **References** *Canadian Environmental Assessment Act, 2012*. SC 2012, c 19, s 52. Repealed, 2019, c 28, s 9. Available at https://laws-lois.justice.gc.ca/eng/acts/C-15.21/20170622/P1TT3xt3.html.	
226	CNSC	Accidents and Malfunctions	TSD IX, Section 9.1.6.2	**Context:** It states on page 9.15 that "Sediment quality results are shown in Table 9-5 for post-remediation conditions. The results presented in the table are a summary of the three flow conditions for the predicted concentrations in Beaver River sediments. In general, using the results of the assessment, the minimum predicted uranium concentrate concentrations in the river sediments occurred under high flow conditions, where the smaller particles (less than 5 μm) are deposited over a larger area." **Rationale:** In Table 9-5, the minimum predicted uranium concentrate concentration in the river sediments did not occur under high flow conditions, rather	Clarify the values in Table 9-5 under average and maximum flow conditions.	NexGen acknowledges there is an error in the Draft EIS text referenced by the reviewer. For clarity, the values presented in Table 9-5 in Section 9.1.6.2 of Draft EIS TSD IX (Transportation Risk Assessment Report) are correct and the associated text in Section 9.1.6.2 of Draft EIS TSD IX will be updated in the revised EIS to state that the minimum predicted uranium concentrate concentrations in river sediments would occur under average flow conditions. The higher uranium concentrate concentration values in the maximum flow scenario compared to the average flow scenario reflect the fact that the released uranium concentrate would be spread over a wider area in the maximum flow scenario. As a result, remediation efficiency would be lower than for the average flow scenario. Greater remediation efficiency in the average flow scenario would result in lower post-remediation concentrations than for the maximum flow scenario.	TSD IX, Section 9 .1.6.2	The reviewer does not understand why the minimum predicted uranium concentrate concentrations in river sediments would occur under average flow conditions, but not under maximum flow conditions. The reviewer believes that the text in section 9.1.6.2 is correct and the values in Table 9-5 for average concentration in sediment and average concentration in pore water appears to be switched between the average flow condition and the maximum flow condition (please refer to the values in Tables 9-1, 9-3, 9-7 for similar release scenarios).	226-R1	Further clarify the values in Table 9-5 under average and maximum flow conditions.	NexGen confirms that, as noted by the reviewer, the minimum sediment concentration values would occur under the maximum flow conditions. NexGen acknowledges that, upon further review, errors were made in both Table 9-5 of Section 9.1.6.2 of Draft EIS TSD IX (Transportation Risk Assessment) and in NexGen's initial response to the original IR. Specifically, the average flow and maximum flow uranium concentrations in sediment values presented in Table 9-5 of Section 9.1.6.2 of Draft EIS TSD IX were reversed. To address the noted errors, NexGen will make corrections to Table 9-5 and provide the correct context in Section 9.1.6.2 of revised EIS TSD IX (Transportation Risk Assessment). NexGen confirms that these corrections would not change the outcome of the transportation risk assessment as conducted in the Draft EIS.	TSD IX, Section 9.1.6.2

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				under average flow condition. It appears that in Table 9-5, the values for average concentration in sediment and average concentration in pore water are switched between the average flow condition and the maximum flow condition.								
230	ECCC	Climate Change	TSD XII	**Context:** The Proponent provided a net-zero framework document, which was "developed based on the guidance provided in the *Draft Technical Guide Related to the Strategic Assessment of Climate Change*" (SACC). This net-zero framework indicates technologies and practices that could be implemented to reduce GHG emissions from the Project, including information on technical feasibility and GHG reduction potential, which constitutes steps 1-3 of the SACC's 6-step BAT/BEP Determination process. The net-zero framework is incomplete, in that it does not provide information on the complete BAT/BEP Determination, and does not demonstrate how the Project's net GHG emissions will equal 0 t CO2 eq by 2050 and thereafter for the remainder of the Project lifetime. Furthermore, the Proponent states "emissions associated with land use change, stationary combustion, waste incineration, industrial processes, and explosives have a relatively small combined contribution of 12.6% of annual emissions, and therefore have not been evaluated in the net-zero framework at this early stage". The final row in Table 5 (electrification) of the net-zero framework, the Proponent lists several projects where electrification of on-site mobile equipment is being planned or implemented. The upcoming Jansen underground potash mine, which has placed an order for electric vehicles[5] was not included in the table. **Rationale:** While ECCC recognizes that this Project falls under CEAA 2012, the principles of the SACC and Draft Technical Guide should be followed by the Proponent in order to support Canada's ability to meet its environmental obligations and commitments in respect of climate change. The requested information will assist the Proponent in selecting appropriate mitigation measures to reduce GHG emissions from the Project.	1. Update the net-zero framework to align with the principles of sections 3.1 and 3.5.1 of the Draft Technical Guide, by including the following: ▪ The information requirements outlined in section 3.5.2 of the Draft Technical Guide, including completion of the full 6-step BAT/BEP Determination process; ▪ Consideration of all main emission sources defined in the Draft Technical Guide as those that are anticipated to contribute to 1% or more of total Project GHG emissions. 2. Include the upcoming Jansen underground potash mine in the preliminary alternative technologies and practices assessment, which is summarized in Table 5.	NexGen notes the reviewer's comment and acknowledges that guidance is available for completing a net-zero plan according to the requirements of the *Impact Assessment Act*. However, the reviewer's request is outside the scope of the requirements of an EA of a designated project under the *Canadian Environmental Assessment Act, 2012* (CEAA 2012), and the Project is not subject to the Strategic Assessment of Climate Change (SACC) guidance (ECCC 2020, 2021). To show commitment to being net-zero by 2050, NexGen has gone above and beyond the CEAA 2012 requirements by providing additional information related to the options available to move towards a net-zero commitment. The net-zero framework provided in Draft EIS TSD XII (Net-Zero Framework) is appropriate to the early stage of the Project and outlines how the SACC guidance has been used to inform this framework. The net-zero framework is outside of the scope of the climate change effects assessment and would not change the conclusions of Draft EIS Section 7.4 (Climate Change). Outside of the EA process, NexGen's commitments to environmental, social, and corporate governance, and sustainability will be used to guide decision-making related to achieving net-zero by 2050. These commitments are not included in regulatory process for the Project but can be found on NexGen's sustainability webpage (https://www.nexgenenergy.ca/sustainability/default.aspx) as well as in Draft EIS Section 1 (Introduction). NexGen acknowledges that the Jansen underground potash mine is planning on the electrification of its mining fleet. This information will not be included in Table 5 in revised EIS TSD XII as it does not change the conclusions of this framework, and multiple examples of implementation of electrification are already provided. Table 5 in Draft EIS TSD XII is intended to be a preliminary list of technologies and practices and is not meant to provide an exhaustive list of all examples for each technology option. As important context to supporting Canada's ability to meet its environmental obligations and commitments in respect of climate change, as described in Draft EIS Section 4.2 (Purpose of the Project), the Project represents a substantial and consistent potential source of uranium for meeting the expected growing global demand for electricity. The Project could contribute to the Government of Canada's ability to meet its environmental obligations and commitments with respect to climate change by displacing high-greenhouse gas (GHG) intensity, fossil fuel (i.e., coal and natural gas) electrical generation in favour of low-GHG emitting, renewable energy options. No changes are proposed in the revised EIS to address this IR.	n/a	**Context:** The Proponent has not responded to either part of the previous IR. The Proponent has provided a net-zero framework document, which was "developed based on the guidance provided in the *Draft Technical Guide Related to the Strategic Assessment of Climate Change*". This net-zero framework indicates technologies and practices that could be implemented to reduce GHG emissions from the Project, including information on technical feasibility and GHG reduction potential, which constitutes steps 1-3 of the SACC's 6-step BAT/BEP Determination process. However, the Proponent's framework makes no direct commitment to achieve net-zero emissions by 2050. As a result, the net-zero framework is incomplete. It does not provide information on the complete BAT/BEP determination and does not demonstrate how the Project's net GHG emissions will equal 0 t CO2 eq by 2050 and thereafter for the remainder of the Project lifetime. Additionally, the Proponent has not addressed the previous request to consider all main emission sources anticipated to contribute 1% or more of the total project GHG emissions. **Rationale:** A net-zero framework which includes a commitment to achieve net-zero emissions by 2050, information on the complete BAT/BEP determination, and demonstration of how the Project's net GHG emissions will be 0 t CO2 eq by 2050 should be provided to complete the net-zero framework. Alongside a consideration of all main emission sources anticipated to contribute 1% or more of the total project GHG emissions, this complete net-zero framework will assist in estimating the impacts that may occur due to the GHG emissions from the Project. ECCC recognizes that this Project falls under CEAA 2012. However, if the Proponent's goal is to achieve net-zero emissions by 2050, the SACC and Draft Technical Guide will be useful in preparing a Project-specific net-zero plan, as they contain the most up-to-date guidance on this subject. This guidance should be followed by the	230-R1	1. Clarify whether the Project is intending to achieve net-zero emissions by 2050. 2. Update the net zero framework to align with the principles of sections 3.1 and 3.5.1 of the Draft Technical Guide by including the following: ▪ The information requirements outlined in section 3.5.2 of the Draft Technical Guide, including completion of the full 6-step BAT/BEP Determination process, ▪ a consideration of all main emission sources defined in the Draft Technical Guide that are anticipated to contribute to 1% or more of total Project GHG emissions.	Responses to part 1 and part 2 of this IR are provided below. 1. NexGen notes that the Canadian target of achieving net-zero emissions by 2050 does not apply to individual projects; rather this target applies collectively to all emission sources within Canada. Regardless, as currently proposed, the Project would align with net-zero initiatives and support Canada's ability to meet its environmental obligations and commitments in respect of climate change. The Project represents a substantial and consistent potential source of uranium for meeting the expected growing global demand for electricity (Draft EIS Section 4.2 [Purpose of the Project]). The Project could contribute to the Government of Canada's ability to meet its environmental obligations and commitments with respect to climate change by displacing high-greenhouse gas (GHG) intensity, fossil fuel (i.e., coal and natural gas) electrical generation in favour of low-GHG emitting, renewable energy options. To achieve decarbonization at the lowest possible cost in Canadian provinces, a diverse set of low carbon technologies, including nuclear, will need to be implemented (Canadian Nuclear Association 2017). In Canada, various climate scenarios for low GHG economy modelling analyses indicate the importance of nuclear energy installation before mid-century to meet the Paris Agreement targets (Draft EIS Section 4.3 [Alternatives to the Project]). Therefore, the Project benefits on climate change mitigation significantly outweigh Project effects and would align with net-zero initiatives. 2. NexGen confirms that work on the net-zero framework is planned to be advanced in parallel to, and commensurate with, the appropriate stage of Project engineering design and planning and is not complete at this time. The net-zero framework is being advanced in accordance with section 3.5.2 of the Draft Technical Guide Related to the Strategic Assessment of Climate Change (ECCC 2021) and in consideration of all main emission sources that are anticipated to contribute to 1% or more of the total Project GHG emissions, as defined therein. As noted in the initial response to the original IR, and as acknowledged in the reviewer's subsequent rationale, the reviewer's request is outside the scope of the requirements of an EA of a designated project under the *Canadian Environmental Assessment Act, 2012* (CEAA 2012), and the Project is not subject to the Strategic Assessment of Climate Change (SACC) guidance (ECCC 2020, 2021). Therefore, NexGen will not be updating the net-zero framework in the revised EIS. **References** *Canadian Environmental Assessment Act, 2012*. SC 2012, c 19, s 52. Repealed, 2019, c 28, s 9. Available at https://laws-lois.justice.gc.ca/eng/acts/C-15.21/20170622/P1TT3xt3.html. Canadian Nuclear Association. 2017. Vision 2050: Canada's Nuclear Advantage. Available at	n/a

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				Note 5: https://im-mining.com/2022/06/20/sandvik-secures-major-bev-loader-order-for-bhps-jansen-potash-mine/		**References** *Canadian Environmental Assessment Act, 2012*. SC 2012, c 19, s 52. Repealed, 2019, c 28, s 9. Available at https://laws-lois.justice.gc.ca/eng/acts/C-15.21/20170622/P1TT3xt3.html ECCC (Environment and Climate Change Canada). 2020. Strategic Assessment of Climate Change. October 2020. Available at https://www.strategicassessmentclimatechange.ca/ ECCC. 2021. Draft Technical Guide Related to the Strategic Assessment of Climate Change. August 2021. Available at https://www.canada.ca/en/environment-climate-change/corporate/transparency/consultations/draft-technical-guide-strategic-assessment-climate-change.html *Impact Assessment Act*. SC 2019, c 28, s1. Last amended 28 August 2019. Available at https://laws-lois.justice.gc.ca/eng/acts/I-2.75/		Proponent to support Canada's ability to meet its environmental obligations and commitments in respect of climate change, including Canada's commitment to achieving net-zero emissions by 2050.			www.readkong.com/page/vision-2050-canada-s-nuclear-advantage-using-nuclear-9950301. ECCC (Environment and Climate Change Canada). 2020. Strategic Assessment of Climate Change. October 2020. Available at https://www.strategicassessmentclimatechange.ca/. ECCC. 2021. Draft Technical Guide Related to the Strategic Assessment of Climate Change. August 2021. Available at https://www.canada.ca/en/environment-climate-change/corporate/transparency/consultations/draft-technical-guide-strategic-assessment-climate-change.html.	
244	ECCC	Fish and fish habitat Change to an environmental component due to hazardous contaminants	TSD XVIII, Section 4.1.2	**Context**: Seepage from site water ponds is described as a model input based on whether ponds are lined or unlined. **Rationale**: In accordance with comment ECCC-SW-04, ECCC reminds the Proponent that the *Metal and Diamond Mining Effluent Regulations* (MDMER) requires all mine effluent and seepage from the mine site that contains deleterious substances be discharged through a final discharge point.	Provide additional information on how water will be released into the receiving environment from the west bermed runoff collection area with consideration of MDMER requirements and update modelling as necessary.	NexGen notes that the west bermed runoff collection area would receive runoff from the local contributing area (i.e., non-contact water) as well as water from site runoff pond #2 (referred to as contact water pond #2 in Draft EIS Section 5.4.5 [Site Water Management], Figure 5.4-12) that is suitable release to the environment (i.e., release water) (Draft EIS Section 5.4.5; Draft EIS TSD XVIII [Site-Wide Water Balance and Water Quality Modelling Report], Section 4.4.1.4). NexGen would apply to designate the outflow from contact water pond #2 as a final discharge point. This location represents a final point of control, and a location where water would be monitored and analyzed to confirm all discharge criteria, including Metal and Diamond Mining Effluent Regulations limits excluding total suspended solids (TSS), are met. As the water in the west bermed runoff collection area would be discharged to ground from contact water pond #2, TSS would be removed from the water before reaching fish habitat. If these remaining limits are not met within contact water pond #2, water from this pond would be pumped to the effluent treatment plant rather than being discharged to the west bermed runoff collection area. This added context will be included in Section 10A3.3 of revised EIS Appendix 10A (Surface Water Quality Modelling Report) and in Section 3.4 and Section 4.4.1.4 in revised EIS TSD XVIII (Site-Wide Water Balance and Water Quality Modelling Report). **References** Metal and Diamond Mining Effluent Regulations. SOR/2002-222 under the *Fisheries Act*. Last amended June 18, 2020. Available at https://laws-lois.justice.gc.ca/eng/Regulations/SOR-2002-222/index.html	Appendix 10A, Section 10A3.3; TSD XVIII, Section 3.4, 4.4.1.4	**Context:** The Proponent provided the additional information requested in the response to the IR. However, the provided information raises further questions about seepage from the west bermed runoff collection area. In their response the Proponent states: " NexGen notes that the west bermed runoff collection area would receive runoff from the local contributing area (i.e., non-contact water) as well as water from site runoff pond #2 (referred to as contact water pond #2 in Draft EIS Section 5.4.5 [Site Water Management], Figure 5.4-12) that is suitable release to the environment (i.e., release water) (Draft EIS Section 5.4.5; Draft EIS TSD XVIII [Site-Wide Water Balance and Water Quality Modelling Report], Section 4.4.1.4)." It is noted that the runoff from the local contributing area includes runoff from the site access road and the site road to the Explosives Magazine Storage Area. Site infrastructure runoff water has the potential to contain deleterious substances from Project-related activities (ex. Road salting, spills or leaks from vehicles, etc.) and must be managed. Therefore, potential additions of deleterious substances from mine related activities could be introduced to the water within the west bermed runoff collection area after the proposed Final Discharge Point (FDP) at the outflow of contact water pond #2. Non-contact water runoff from site infrastructure and seepage from the west bermed runoff collection area meets the requirements of the MDMER definition of mine effluent and has the	244-R1	1. Provide an updated site water management plan that includes management of the site infrastructure runoff water (i.e. non-contact water) from the west bermed runoff collection area. 2. Propose a new FDP location downstream of the west bermed runoff collection area outflow that would allow for sampling and monitoring for COPCs required for effluent characterization. 3. Provide design specifications for the west bermed runoff collection area that would prevent seepage of potentially deleterious substance containing non-contact water to confirm the protection of the receiving environment.	Responses to part 1 through part 3 of IR 244-R1 are provided below. 1. NexGen confirms that, with respect to the context provided by the reviewer regarding the explosives storage area and associated access road, no deleterious substance sources in runoff would exist; therefore, runoff would be non-mineralized contact water, which would be appropriate for collection in the west bermed runoff collection area. The potential of water quality deleterious substances from the explosives storage area would be limited to those associated with potential spills, which would be mitigated by area-specific management practices for stockpiled materials that will be developed in accordance with applicable regulatory requirements, including the *Explosives Act* and The Mines Regulations, 2018. The potential for spills of explosive materials have been considered in the Project design. As noted in the response to IR 185, the storage of explosives is heavily regulated to minimize risks. Explosives would be managed as per the *Explosives Act*, as well as CAN/BNQ 2910-500/2015 Explosives – Magazines for Industrial Explosives. Potential spills would be contained and managed according to the Rook I Environmental Protection Program to avoid the release of any nitrogen compounds to the environment. The explosives magazine would be designed and constructed with a lined sump capable of storing a 1:100 year, 24-hour precipitation event, and water that has contacted spilled material would be collected and trucked to the settling pond for subsequent treatment and testing prior to discharge through a final discharge point (FDP). In summary, runoff from the explosives magazine or associated access road is not expected to contain deleterious substances, and thus does not require control and management through a FDP. NexGen notes that Figure 5 of Draft EIS TSD XVIII incorrectly shows that Element R52 would contain mineralized contact water rather than non-mineralized contact water; this will be corrected in Figure 5 of revised EIS TSD XVIII.	Section 5.4.5.2; TSD XVIII

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								potential to contain deleterious substances. **Rationale:** The additional information provided by the Proponent confirms that seepage from the west bermed runoff collection area is not being managed. Site infrastructure runoff water has not been considered for the management of the west bermed runoff collection area, and the potential for deleterious substances in this runoff water could impact the receiving aquatic environment. The proposed location of the FDP at the outflow of contact water pond #2 prior to the west bermed runoff collection area will not be protective of the receiving aquatic environment.			2. NexGen maintains that an additional FDP downstream of contact water pond #2 (e.g., a FDP downstream of the west bermed runoff area) is not required as, under the currently proposed surface water management system, water released to the receiving environment would not contain deleterious substances above Project thresholds. As noted in NexGen's initial response to the original IR 244, water reporting to contact water pond #2 (i.e., site runoff pond #2) is considered the final point of control and would be tested to confirm that effluent release criteria other than total suspended solids (TSS), including requirements under the Metal and Diamond Mining Effluent Regulations, are met prior water being released to the west bermed runoff collection area, where this water would diffuse passively (i.e., to ground; there would be no overland path for water containing TSS to travel to Patterson Lake). In other words, contact water pond #2 represents FDP (i.e., control point) where water would be monitored prior to release to the environment. Should water quality in contact water pond #2 not meet Project thresholds, water would be pumped to the settling pond for treatment in the effluent treatment plant and re-tested to confirm compliance prior to discharge to Patterson Lake (Draft EIS Section 5.4.5.2 [Surface Water Management]). NexGen further notes that the monitoring ponds that receive water from the effluent treatment plant also represent an FDP where water would be monitored prior to release to the environment. These two FDPs (i.e., contact water pond #2 and the monitoring ponds) would represent monitoring locations/points of control for all Project site contact water. NexGen acknowledges that the statement "[t]he west bermed runoff collection area would be located on the west side of the Project site. This collection area would receive runoff from the local contributing area as well as overflow from contact water pond #2, if required" (Draft EIS Section 5.4.5.2, Table 5.4-4) could be interpreted as there is a possibility that water not meeting Project threshold criteria could be discharged into the west bermed runoff collection area. For this reason, Table 5.4-4 in revised EIS Section 5.4.5.2 (Surface Water Management) will be updated to state "[t]he west bermed runoff collection area would be located on the west side of the Project site. This collection area would receive runoff from the local contributing area as well as discharges from contact water pond #2 (i.e., a final point of control), provided Project discharge criteria are met". In addition, NexGen will also update Figure 5 of Section 3.4 of revised EIS TSD XVIII (Site-Wide Water Balance and Water Quality Modelling Report) to show the Project site water process flow more clearly. 3. As described in part 1 and part 2 of this response, other than TSS, no deleterious substances would be released to the west bermed runoff collection area. With respect to TSS, releases to the west bermed runoff collection area would be directly to ground, with no overland pathway to Patterson Lake. Therefore, TSS would settle out prior to water diffusing to Patterson Lake through the shallow groundwater pathway.	

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											As the west bermed runoff collection area would not receive potentially deleterious substances above Project thresholds other than TSS, the provision of design factors to control the release of deleterious substances is not required. **<u>References</u>** *Explosives Act*. RSC 1985, c E-17. Current to 28 July 2020. Available at https://laws-lois.justice.gc.ca/eng/acts/e-17/. The Mines Regulations, 2018. RRS c S-15.1 Reg 8 under *The Saskatchewan Employment Act*. Effective April 6, 2019. Available at https://www.canlii.org/en/sk/laws/regu/rrs-c-s-15.1-reg-8/latest/rrs-c-s-15.1-reg-8.html. SCC. 2015. CAN/BNQ 2910-510/2015: Explosives – Quantity Distances.	
253	ECCC	Fish and fish habitat Change to an environmental component due to hazardous contaminants	TSD XXI, Section 4.2.3.2	**Context**: Un-ionized ammonia and Total Suspended Solids (TSS) have not been included in Table 4-2 pg. 46, which makes it unclear if risk from un-ionized ammonia and TSS have been assessed. **Rationale**: Un-ionized ammonia and TSS are prescribed deleterious substances under Schedule 4 of the *Metal and Diamond Mining Effluent Regulations* (MDMER) and therefore should be put forward for assessment.	Provide an assessment of TSS and un-ionized ammonia.	NexGen appreciates the reviewer's comment and clarifies that un-ionized ammonia predictions are provided in Table 10A-11 and Table 10A-12 in Draft EIS Appendix 10A (Surface Water Quality Modelling Report) for Patterson Lake during the Project lifespan and in the far future. All predictions of un-ionized ammonia are below the Canadian Council of Ministers of the Environment water quality guideline (CCME 2010) used for the Project (at a pH of 7 and temperature of 15°C). Total suspended solids was not assessed in Draft EIS TSD XXI (Environmental Risk Assessment); however, total suspended solids was assessed in Draft EIS Section 10.5 (Surface Water Quality). No changes are proposed in the revised EIS to address this IR. **<u>References</u>** CCME (Canadian Council of Ministers of the Environment). 2010. Canadian Water Quality Guidelines for the Protection of Aquatic Life: Ammonia. Accessed August 2023. Available at https://ccme.ca/en/res/ammonia-en-canadian-water-quality-guidelines-for-the-protection-of-aquatic-life.pdf	n/a	**Context:** Additional information is needed to satisfy the original IR. The Proponent has not provided an assessment of un-ionized ammonia and total suspended solids (TSS) within the Environmental Risk Assessment (ERA) following standardized methodology. Un-ionized ammonia and TSS are Contaminants of Potential Concern (COPC) identified to be within effluent from both the mining effluent treatment plant and the effluent from the sewage treatment plant. Both were identified for further evaluation in Section 10.2.8.2 of the draft EIS for further assessment in receiving environment surface water quality. From the surface water quality assessment in Section 10.5 and Appendix A of the Draft EIS, predicted changes to receiving environment concentrations of un-ionized ammonia and TSS from effluent discharges were expected to be negligible if there were no predicted exceedances of effluent concentrations or baseline receiving environment concentrations of un-ionized ammonia and TSS, this should have been specified in the Tier 1 screening phase of the ERA. However, as stated in the original IR, un-ionized ammonia and TSS have not been included in Table 4-2 Section 4.2.3.2 of the ERA, which makes it unclear if risk from un-ionized ammonia and TSS have been assessed and deemed negligible or if they have not been assessed. **Rationale:** The Proponent has confirmed that an assessment of un-ionized Ammonia and TSS were not conducted in the ERA. As with the other identified COPCs within effluent in Section 10.2.8.2 of the draft EIS, accurate methodology	253-R1	Update the ERA to follow the correct methodology for the assessment of un-ionized ammonia and TSS. If corrections are required, detail any other report sections that are affected and ensure that all sections impacted by the error are updated.	NexGen appreciates the reviewer's comment and confirms that neither total suspended solids (TSS) nor un-ionized ammonia represent constituents of potential concern (COPCs) that require detailed assessment in the environmental risk assessment (ERA). As noted in Table 10A-36 of Section 10A7.4.2 of Draft EIS Appendix 10A (Surface Water Quality Modelling Report), average baseline measured concentrations of TSS in Patterson Lake are 1 mg/L. In the Application Case, the predicted TSS concentration at the edge of the treated effluent regulated mixing zone is less than 2 mg/L (i.e., the Project is predicted to increase TSS concentrations in Patterson Lake by 1 mg/L or less). Therefore, the predicted TSS concentration at the edge of the regulated mixing zone is well below the Canadian Council of Ministers of the Environment (CCME) guideline for protection of aquatic life of baseline plus 5 mg/L. For this reason, TSS was not considered a COPC for further quantitative evaluation in the ERA. Ammonia was assessed in the ERA as total ammonia-N and compared against the CCME water quality guideline of 5.74 mg/L. As noted in the footnote to Table 4-1 of Section 4.2.3.1 of Draft EIS TSD XXI (Environmental Risk Assessment), the guideline for un-ionized ammonia of 0.019 mg/L was converted to total ammonia-N at a pH of 7 and temperature of 15°C to arrive at this total ammonia threshold. Conversely, predicted total ammonia-N at the edge of the treated effluent regulated mixing zone can be converted to un-ionized ammonia using the equations in CCME (2010) and assuming a pH of 7 and temperature of 15°C as follows: pKa = 0.0901821 + 2729.92/T = 9.5641366 (equation 1) where: pKa = dissociation constant T = 288.15 K (15°C) and $f = 1/[10^{(pKa-pH)}+1] = 0.0027207$ (equation 2) where: f = fraction of total ammonia that is un-ionized	TSD XXI, Section 4.2.3.1 TSD XXI, Section 4.3.2.2

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								should be followed for the assessment of un- ionized ammonia and TSS in the ERA to confirm that there are no negative effects to the aquatic receiving environment and receptors.			pKa = dissociation constant from equation 1 pH = 7 Using this approach, the predicted total ammonia-N concentration at the edge of the treated effluent regulated mixing zone is 0.498 mg/L, which is well below the CCME water quality guideline of 5.74 mg/L. In terms of un-ionized ammonia, total ammonia-N was converted to total ammonia by dividing by 0.8224 (i.e., the atomic mass of nitrogen divided by the molar mass of ammonia), and then total ammonia was converted to un-ionized ammonia by multiplying by 'f' from equations 1 and 2. Based on this calculation, the estimated un-ionized ammonia concentration at the edge of the regulated mixing zone is 0.00165 mg/L (0.00136 mg/L as N), which is well below the CCME un-ionized ammonia guideline of 0.019 mg/L (0.0156 mg/L as N). Therefore, both total and un-ionized ammonia are predicted to remain below applicable CCME guidelines, and un-ionized ammonia was not considered a COPC for further quantitative evaluation in the ERA. NexGen acknowledges that the information stated above could have been more clearly presented in the Draft EIS. Therefore, the following changes will be made to revised EIS TSD XXI: ▪ Table 4-1 in Section 4.2.3.1 (Screening Value Selection) will be updated to include the CCME (2002, 2010) guidelines as screening criteria for TSS and un-ionized ammonia. ▪ Table 4-2 in Section 4.2.3.2 (Constituents in Surface Water) will be updated to include TSS and un-ionized ammonia as constituents considered for the screening evaluation. A footnote will also be added to Table 4-2 associated with un-ionized ammonia edits that states "a pH of 7 and a temperature of 15°C were assumed to convert total ammonia to un-ionized ammonia". As TSS and un-ionized ammonia were not determined to represent Project COPCs, no further edits are required to the EIS other than the items noted above. **<u>References</u>** CCME. 2002. Canadian Water Quality Guidelines for the Protection of Aquatic Life – Total Particulate Matter. https://ccme.ca/en/res/total-particulate-matter-en-canadian-water-quality-guidelines-for-the-protection-of-aquatic-life.pdf. CCME. 2010. Canadian Water Quality Guidelines for the Protection of Aquatic Life – Ammonia. Available at https://ccme.ca/en/res/ammonia-en-canadian-water-quality-guidelines-for-the-protection-of-aquatic-life.pdf.	
254	ECCC	Fish and fish habitat Change to an environmental component due to radiological contaminants	TSD XXI, Section 4.2.3.3	**Context:** It is unclear from this section and Table 4-3 pg. 50 that the selection of sediment Constituents of Potential Concern (COPCs) has taken into consideration elevated baseline concentrations of arsenic, barium, iron, lead, manganese, zinc, lead-210, polonium-210 and radium-226 that were found during baseline monitoring. Inconsistencies between the sediment quality thresholds applied	Provide further information regarding if elevated baseline sampling concentrations for sediment COPCs were considered as part of the screening process. Update the results of the assessments if required.	NexGen appreciates the reviewer's comment and clarifies that based on Draft EIS Annex V.1 (Aquatic Environment Baseline Report), the only constituents that exceeded sediment quality guidelines in baseline monitoring were arsenic, cadmium, lead-210, polonium-210, and vanadium (in Naomi Lake and Clearwater River only). With the exception of vanadium, the other constituents that exceeded sediment quality guidelines at baseline were considered further in the screening assessment in Section 4.2.3.3 and Table 4-3 of Draft EIS TSD XXI (Environmental Risk Assessment).	n/a	**Context:** In Section 10.3.1.2 Water Quality existing conditions of the draft EIS, baseline water quality concentrations of iron (eight lakes and watercourses), manganese (lakes downstream and in the Regional Study Area), lead (Forest and Beet Lakes), nickel (Patterson Lake – Local Study Area), and arsenic (Patterson Lake) exceeded water quality guidelines for the protection of aquatic life. In Section 10.3.2 Sediment Quality existing condition of the draft EIS, baseline sediment concentrations	254-R1	Assess iron in the ERA and sediment quality modelling (i.e. quantitative risk assessment) for the sediment quality assessment.	NexGen concurs with the reviewer that if a constituent of potential concern (COPC) exceeds screening criterion in one medium, it should be assessed for all media that are likely to contribute to exposure points (CSA N288.6-22, Section 7.2.5.4.2 [CSA Group 2022]). NexGen confirms that, for constituents that were identified as COPCs in the Draft EIS (i.e., exposure situations that exceeded a screening criterion), this guidance was followed for the environmental risk assessment (ERA). All COPCs identified in surface water (Draft EIS Section XXI [Environmental Risk Assessment], Section 4.2.3.2) were also assessed in sediment (Draft EIS Section XXI, Section 4.2.3.3), and vice versa, as well as in additional food chain pathways.	n/a

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				and the thresholds chosen within the EIS are noted. **Rationale**: The Proponent should ensure the most stringent environmental sediment quality objectives available are used and consistently maintained across different assessments for the EIS. Use of the most stringent guidelines will allow for the most protective assessment to analyze risks to the receiving environment.		The results of predicted vanadium concentrations in surface water are shown in Attachment 10A-2 of Draft EIS Appendix 10A (Surface Water Quality Modelling Report). The maximum projected vanadium concentration in Patterson Lake North Arm – West Basin during Project phases is approximately 0.0002 mg/L, which is well below the Project threshold of 0.12 mg/L. With respect to sediment, the predicted sediment concentrations in Table 4-3 in Section 4.2.3.3 of Draft EIS TSD XXI are total concentrations, inclusive of baseline concentrations. Based on the upper-bound concentration of vanadium in treated effluent (i.e., 2.07×10^{-03} mg/L) shown in Table 4-2 in Section 4.2.3.2 of Draft EIS TSD XXI, which represents far-future conditions, the upper-bound water concentration for vanadium in Patterson Lake North Arm – West Basin is predicted to be 1.3×10^{-04} mg/L in the Application Case, which considers existing baseline concentrations and the Project's treated effluent discharge. The predicted maximum sediment concentration of vanadium would be 9.5 mg/kg dry weight (dw), which is well below the sediment quality guideline of 31.8 mg/kg dw from Burnett-Seidel and Liber (2013). As stated in Section 4.2.3.3 of Draft EIS TSD XXI, "Burnett-Seidel and Liber (2013) was selected as the preferred source, as the reported NE2 [no-effect] and REF [reference] values are specifically applicable to Saskatchewan waterbodies." Burnett-Seidel and Liber (2013) guideline values were used even if these values were higher than Canadian Council of Ministers of the Environment guideline values because the former have been developed specifically for assessing the effects of uranium mining in the region. NexGen confirms that the results of the assessment remain unchanged based on this IR; therefore, no changes are proposed in the revised EIS. **<u>References</u>** Burnett- of Seidel C, Liber K. 2013. Derivation of no-effect and reference-level sediment quality values for application at Saskatchewan uranium operations. Environ. Monit. Assess. 185, 9481 – 494.		of arsenic and polonium-210 in Patterson Lake and baseline sediment concentrations of arsenic and vanadium in Naomi Lake exceeded guidelines. As per CSA N288.6-22 Section 7.2.5.4.2, "If COPCs exceed the screening level for one medium, they should be carried forward into the EcoRA [ecological risk assessment] for all media that are likely to contribute to exposure. For example, for a given COPC, if a water screening benchmark is exceeded, the same COPC should be carried forward for sediment if its concentration was above the detection limit." However, in Table 4-3 Section 4.2.3.3 Constituents in Sediment in the Environmental Risk Assessment (ERA), iron and manganese were not assessed. Both parameters were screened out because concentrations in effluent did not exceed guidelines, however baseline concentrations were not adequately considered as per CSA 288.6-22 methodology. While manganese only exceeded water quality guidelines in the RSA and not Patterson Lake, iron was identified as having baseline water quality threshold exceedances in eight waterbodies and watercourses throughout the LSA and RSA including Patterson Lake. **Rationale:** The Proponent has not provided rationale for the exclusion of iron from further assessment in sediment quality modelling and the ERA. Based on the requirements of CSA N288.6-22, iron should be evaluated further due to exceedances of water quality guidelines in baseline surface water quality data. Iron concentrations exceed water quality thresholds in baseline surface water quality throughout the LSA. Due to the exclusion of iron from the sediment quality assessment and ERA, a determination of effects to sediment quality and aquatic biota cannot be made.			With respect to iron, it is important to note that an updated Federal Environmental Quality Guideline (FEQG) has been drafted that follows the CCME species sensitivity distribution protocol (ECCC 2019). The updated guideline is dependent on dissolved organic carbon (DOC) and pH. For a pH of 7.0 and using the lower end of the site-specific DOC range from 2.4 mg/L to 13 mg/L (Draft EIS Appendix 10A [Surface Water Quality Modelling Report], Section 10A3.2), the calculated FEQG is 1,588 µg/L for a DOC of 2.4 mg/L. The equation utilized is as follows: FEQG (µg/L) = exp(0.671[ln(DOC)] + 0.171[pH] + 5.586). Under the most recent draft FEQG for iron, there would be no baseline exceedances of iron in the waterbodies in the LSA and RSA, and there would be no need to identify iron as a COPC. NexGen acknowledges that the CCME guideline for iron is 0.3 mg/L; however, this guideline was developed in 1987, and the draft FEQG guideline follows the most recent CCME species sensitivity distribution protocol. Additionally, the FEQG website (GoC 2024) states under the question "[h]ow do FEQGs differ from Canadian Environmental Quality Guidelines" that "[c]urrently, under the Chemicals Management Plan, there is an additional need to develop FEQGs to support federal environmental quality monitoring, risk assessment and risk management activities on substances for which CCME guidelines do not yet exist or are not reasonably expected to be updated in the near future". Therefore, NexGen maintains that the Draft FEQG guideline should be used in preference over the CCME guideline. From a human health perspective, Health Canada has not set a maximum acceptable concentration for iron (the current value represents an aesthetic objective). Iron is an essential element with no evidence for toxic effects unless large quantities of iron are ingested. To show that predicted iron concentrations in sediment in Patterson Lake North Arm – West Basin are below sediment quality guidelines, the following estimation has been performed: $C_{sediment,iron} = C_{water,iron} * K_d$ where: $C_{water,iron}$ = 8.84E-02 mg/L (Patterson Lake North Arm – West Basin, Max Upper Bound [Draft EIS TSD XXI, Table 4-2) K_d = 5000 L/kg (CSA N288.1-20 [CSA Group 2020]) $C_{sediment,iron}$ = 4.42E+02 mg/kg dw There are no federal or provincial guidelines for iron in sediment; therefore, the lowest effect level (LEL) for iron of 2.00E+04 mg/kg from Ontario was utilized (MOEE 1993). The predicted sediment concentration in Patterson Lake North Arm – West Basin is well below the sediment LEL; therefore, no impacts from iron on the aquatic environment are expected. NexGen confirms that the results of the assessment would remain unchanged based on the information in this IR response; therefore, no changes are required in the revised EIS. **<u>References</u>** CSA Group (Canadian Standards Association Group). 2020. CSA N288.1-20: Guidelines for Calculating Derived	

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											Release Limits for Radioactive Material in Airborne or Liquid Effluents for Normal Operation of Nuclear Facilities. CSA Group. 2022. CSA N288.6-22: Environmental Risk Assessments at Nuclear Facilities and Uranium Mines and Mills. ECCC (Environment and Climate Change Canada). 2019. Federal environmental quality guidelines – Iron. May. Available at https://www.canada.ca/en/environment-climate-change/services/evaluating-existing-substances/federal-environmental-quality-guidelines-iron.html. GoC (Government of Canada). 2024. Federal Environmental Quality Guidelines (FEQGs). Accessed March 2024. Available at https://www.canada.ca/en/health-canada/services/chemical-substances/fact-sheets/federal-environmental-quality-guidelines.html#a3. MOEE (Ministry of Environment and Energy). 1993. Guidelines for the Protection and Management of Aquatic Sediment Quality in Ontario. Ontario Ministry of Environment and Energy.	
270	ECCC	Wildlife and Wildlife Habitat	Annex VIII.2, Section 10	Surveys confirm common nighthawk occupies the SSA and the LSA. Aerial foraging and road-roosting behavior make this species susceptible to collision.	Provide a mitigation plan to address potential mortality risk to common nighthawk.	Table 14.4-1 in Draft EIS Section 14.4 (Project Interactions and Mitigations) and discussion in Pathway ID W-18 (Vehicle injury and mortality) in Draft EIS Section 14.4.2 (Secondary Pathways) describe mitigations to reduce potential mortality risk to common nighthawk. Key mitigations that would be included as part of the Project Environmental Protection Program and supporting documentation that will be developed in support of federal licensing include providing awareness training, giving wildlife the right of way, identifying wildlife use areas, reporting observations, and adjusting speed limits. No changes are proposed in the revised EIS to address this IR.	n/a	**Context:** The Proponent commits to developing key mitigations (which are currently not all provided for review) that would be included as part of the Project Environmental Protection Program (EPP). The EPP would also include providing awareness training, giving wildlife the right of way, identifying wildlife use areas, reporting observations, and adjusting speed limits. The key mitigation measures that will be included in the EPP to avoid harm to Common Nighthawk are insufficient. Common Nighthawk is a migratory bird listed as threatened under the *Species at Risk Act* and therefore more prone to adverse effects. **Rationale:** ECCC is not able to evaluate the effects and efficacy of mitigation methods without information regarding mitigation measures that will be employed if a Common Nighthawk nest is found on a roadway, airstrip, or other cleared area with vehicle traffic in order to provide a fulsome assessment of the efficacy of the key mitigation measures. Additionally, Table 14.4-1 in the draft EIS should be revised to include mitigation measures specific to Common Nighthawk, or minimally reference the Saskatchewan setback guidelines which include Common Nighthawk, to avoid vehicle injury or mortality, including nests on Project roadways or infrastructure (pathway W-18) so that the EIS is more inclusive of Common Nighthawk mitigation measures.	270-R1	1. Provide information regarding mitigation measures that will be employed if Common Nighthawk nest is found on a roadway, airstrip, or other cleared area with vehicle traffic. 2. Update Table 14.4-1 in the draft EIS to include Common Nighthawk -specific mitigation (or minimally reference the Saskatchewan setback guidelines which include Common Nighthawk) to avoid vehicle injury or mortality, including nests on Project roadways or infrastructure (pathway W-18).	NexGen confirms that proposed mitigation measures specific to common nighthawk are discussed in Section 14A.3 of Draft EIS Appendix 14A (Species at Risk Screening Assessment) and presented in Table 2 of Attachment IR 111-R1,121-R1, 207-R1, and 270-R1. In addition to these specific measures, mitigation for all wildlife species at risk and all migratory birds (including migratory bird species at risk) are also provided in Table 14.4-1 of Draft EIS Section 14.4 (Project Interactions and Mitigations) and Table 1 of Attachment IR 111-R1, 121-R1, 207-R1, and 270-R1. Mitigation measures specific to common nighthawk include: ▪ Avoid vegetation clearing, where possible, during the migratory bird nesting period (early May to late August). If vegetation clearing occurs during the common nighthawk breeding season (early May to late August), avoid activities within 200 m of active nests (Government of Saskatchewan 2017). If sites cannot be avoided, consult the ENV or ECCC, as applicable. ▪ If active common nighthawk nests are found on mine roads, the airstrip, or mine and mill terrace areas, the nesting area will be identified and avoided to the extent possible. NexGen notes that there are no additional practical mitigations for common nighthawk nesting in active areas such as site access roads or the airstrip. However, it is predicted that the frequency of traffic and level of activity at the Project would likely cause common nighthawk to avoid nesting in these areas. Therefore, the risk of injury/mortality to nesting and foraging common nighthawks is expected to be negligible. NexGen confirms that mitigation measures described in Table 1 of Attachment IR 111-R1, 121-R1, 207-R1, and 270-R1 that were not included in the Draft EIS will be added to Table 14.4-1 of revised EIS Section 14.4 (Project Interactions and Mitigations). Mitigation measures noted in Table 2 of Attachment IR 111-R1, 121-R1, 207-R1, and 270-R1 will be incorporated into the Project Environmental Protection Program and supporting documents.	n/a

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272 (Link IR-5)	ECCC		Section 5.3.2 Section 5.5.3 Section 13.4					**Context:** The Proponent has committed to the development of a Decommissioning and Reclamation Plan that references revegetation of disturbed areas, as well as conducting progressive reclamation and revegetation of all non-permanent alterations to the Project area. However, no details have been provided related to how these areas will be reclaimed (e.g., what plant species will be used, if they plan to restore to previous habitat type, or what restoration methods will be used), specifically in the context of reclaiming caribou critical habitat. **Rationale:** Caribou critical habitat will be directly impacted within the Project footprint and restoration of these areas back to habitat that will develop the biophysical attributes required by caribou will minimize loss of critical habitat and maintain habitat integrity and connectivity. The SK2 caribou range is above the target disturbance threshold of 35% (Federal Recovery Strategy, 2020), therefore all further disturbance of caribou critical habitat should be restored.	(Link IR-5)	**Information Requirement:** Provide details for the revegetation of non-permanent alterations within the Project footprint with respect to caribou critical habitat. Include details such as what plant species and restoration methods will be used and if the restored areas will resemble the previous habitat type.	NexGen notes that, as woodland caribou is designated as a species at risk under the *Species at Risk Act*, NexGen has committed to developing and implementing a Caribou Mitigation and Offsetting Plan (CMOP) that will be developed through engagement with the ENV and Indigenous Groups (Draft EIS Section 14.5.1.1.1 (Habitat Availability). NexGen further notes that, as a condition of provincial EA approval, the CMOP must be submitted for Ministry of Environment (ENV) approval prior to NexGen initiating the Project Construction phase (ENV 2023). NexGen confirms that the CMOP continues to be developed with input from Indigenous Groups and based on meetings held with provincial regulators in 2022 and 2023, including a workshop held on 30 October 2023 with representatives of Indigenous Groups, the ENV, the CNSC, and ECCC. NexGen will continue to invite the ECCC to attend Caribou Working Group meetings. More information regarding the CMOP is presented in NexGen's response to IR 5-R1. As the Caribou Mitigation and Offsetting Plan is being developed with input from Indigenous Groups and provincial and federal regulatory agencies and would require approval by the ENV prior to Construction to verify suitable mitigation measures would be implemented, adequate information has already been provided for the purposes of EA review. However, consistent with the topic raised by the reviewer, NexGen will provide additional context regarding overall Project decommissioning and reclamation in revised EIS Appendix 5A (Conceptual Preliminary Decommissioning and Reclamation Plan). In summary, reclamation would be focused on returning the landscape to pre-Project ecosystems (to the extent possible), with revegetation activities proceeding as areas become available for reclamation. Target ecosites would be selected using the Field Guide to the Ecosites of Saskatchewan's Provincial Forests (McLaughlan et al. 2010) by matching predicted edaphic (i.e., influenced by soil) conditions of areas to be reclaimed to their respective ecosite. Industry best management practices for revegetation include the following: ▪ monitoring of planting activities by a qualified professional; ▪ establishing a diversity of plant species richness and structural diversity; ▪ minimizing bare ground and subsequent weed invasion; ▪ promoting the use of local seed sources to maintain the genetic integrity of revegetation plant material; and ▪ promoting early recolonization of reclaimed land by wildlife with a focus on species of primary interest for traditional land use. NexGen notes that the information presented in revised EIS Appendix 5A is preliminary in nature, with further versions of the Decommissioning and Reclamation Plan to be developed as the Project progresses through its lifespan, ultimately culminating in a Final Decommissioning and Reclamation Plan. In an effort to facilitate more effective future Project reclamation, NexGen also initiated a reclamation trial in 2023 designed to return a previously disturbed exploration-related borrow area to original conditions. The research area was instrumented with soil sensors (coupled with adjacent meteorological instruments) to gain understanding of site surface water balances. The initial revegetation target for this site is a BP2 jack pine/lichen ecosite and its characteristic tree and shrub species (e.g., jack pine, bearberry, blueberry, lingonberry, prickly rose). Revegetation is expected to take place through three mechanisms:	

Environmental Impact Statement – Federal Indigenous Review Team Information Request Responses – Round 2

No.	Department	Project Effects Link	Reference to EIS, appendices, or supporting documentation (if applicable)	Context and Rationale	Information Requirement	NexGen Response	Section in EIS	Justification/Rationale	Follow up IR #	Follow up Information Request	NexGen Response	Section in EIS
											1. Natural regeneration from placed upland surface soils. 2. Direct transplants of surface mats of lichen and associated vascular plants (to test the use of this technique for possible Project application). 3. Planting of container seedlings (planned for spring 2025). In support of this reclamation trial, NexGen and members of the Clearwater River Dene Nation collected seeds of jack pine, green alder, blueberry, and bearberry in October 2023; some of this seed is currently being grown into seedlings. Information gained from the borrow area reclamation trial will feed into the ongoing reclamation research that is part of the Project Decommissioning and Reclamation Plan development. **References** *Species at Risk Act*. SC. 2002, c 29. Last amended 23 April 2021. Available at https://laws-lois.justice.gc.ca/eng/acts/s-15.3/. ENV (Saskatchewan Ministry of the Environment). 2023. Notice of Ministerial Decision Pursuant to Section 15 *The Environmental Assessment Act* NexGen Energy Limited Rook I Project. McLaughlan MS, Wright RA, Jiricka RD. 2010. Field guide to the ecosites of Saskatchewan's provincial forests. Prince Albert, SK: Saskatchewan Ministry of Environment, Forest Service. 338 p.	

n/a = not applicable (i.e., no changes required in the revised EIS).

Rook I Project

Environmental Impact Statement

Annex 1 Responses:
Supplemental Information

Attachment IR 4-R1, 26-R1

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Attachment IR 4-R1, 26-R1

1 Introduction

NexGen Energy Ltd. (NexGen) is proposing to develop a new uranium mining and milling operation in northwestern Saskatchewan, called the Rook I Project (Project). The proposed Project is subject to both provincial and federal Environmental Assessment (EA) processes, would be licensed as a nuclear facility by the Canadian Nuclear Safety Commission (CNSC), and would be subject to various provincial and federal permits and approvals.

NexGen submitted a Draft Environmental Impact Statement (EIS) to the Saskatchewan Ministry of Environment (ENV) and Canadian Nuclear Safety Commission in 2022. Through the technical review of the Draft EIS, NexGen received information requests (IRs) and advice to proponent comments from the Federal-Indigenous Review Team (FIRT), which is led by the CNSC. Results of the FIRT technical review were provided in two Annexes; Annex 1 was composed of IRs and Annex 2 was composed of advice to proponent comments for NexGen's response. In September 2023, NexGen provided detailed responses to the FIRT IRs and advice to proponent comments.

On 12 February 2024, the CNSC provided the results of their review of NexGen's IR and advice to proponent comment responses. The IRs were categorized by the CNSC as accepted (i.e., requiring no additional response), not accepted with the technical approach deemed acceptable by the CNSC and the IR indicated as being able to be resolved once a revised EIS is provided by NexGen, or not accepted with additional response required by NexGen. For the IRs that were not accepted with additional response required, a second round of follow-up IRs were provided by the CNSC.

Attachment IR 4-R1, 26-R1 provides supporting information for NexGen's response to IR 4-R1 and IR 26-R1. The specific parts of IR 4-R1 and IR 26-R1 are as follows:

1. Provide details on how the advective flux of 0.55 m^3/d from the UGTMF and 2.7 m^3/d from the RMW to Patterson Lake were determined (Figure A-17 of Appendix A of Draft EIS TSD XIV). Details related to how mass flux from the UGTMF to Patterson Lake will occur over time should be provided. The requested details should be included within the body of text in Appendix A, with a summary of key parameters and results provided in the body of the EIS.

2. Provide details on how the flooding of the mine during closure will impact regional hydrogeology, specifically related to the migration of contaminants from the UGTMF and RMW to Patterson Lake by the groundwater pathway.

3. Clarify if contamination sourced from the RMW by the groundwater pathway has been included within the term UGTMF in section 10.5.1 of the EIS. If the RMW was not considered as a source of contamination to Patterson Lake by the groundwater pathway in Section 10.5.1 of the EIS, it should be added.

4. Include a table summarizing the predicted mass flux of contaminants from the UGTMF and RMW to Patterson Lake over time.

5. Provide justification for the assumption in the groundwater flow model of an equivalent porous media approach for groundwater transport through the shear and fault zones. The model should give due consideration for fracture dominated transport, either by directly modelling as fracture flow or through a robust justification for how the parameters used in the existing equivalent porous media model are reflective of fracture-dominant transport.

6. Provide additional information on the assumption that dispersity is 10% of the flow pathway for vertical flows from the UGTMF to Patterson Lake. Provide a reference for the validity of this approach that is either peer reviewed, or which demonstrates that it is an established method. The supporting documentation for the use of this method to estimate dispersivity should indicate that it is valid for situations that are comparable to the Project site, notably vertical groundwater flows that are likely to be fracture dominated.

7. Provide additional details on why the hydraulic conductivity value of the sandstone unit in the model is two orders of magnitude above the geometric mean.

8. Provide details on the source of the values selected for the hydraulic conductivity of the fault and shear zones.

9. If multiple calibrated model solutions were trialed, provide details, including why the parameters that were selected are considered the most appropriate model solution. If multiple calibrated model solutions were not trialed, provide information to support that the calibrated parameter values represent a unique calibration solution.

10. Where model parameters were obtained from site analogues or literature values, provide additional details that establish why the selected site analogues are valid for the Project site.

11. For fault and shear zone features that extend out of the local area, provide a clear explanation of the method used to determine the location, size, angle, and parameters that were used in the model to describe these zones. Provide the reasoning for the use of different hydraulic conductivity values for the fault and shear zones within the local area vs outside the local area.

12. In the sensitivity analysis, provide a justification for the magnitude of variability considered for each parameter. The justification should include consideration of how the value for each parameter was selected (field data, model calibration, etc.) and the level of uncertainty associated with each parameter. The magnitude of variability used for sensitivity analysis for each parameter should be chosen with respect to the level of confidence in the accuracy of each parameter value.

Section 2 and Section 3 provide NexGen's response to directly address the 12 parts of IR 4-R1 and IR 26-R1.

2 Response to Information Request

Part 1 - Provide details on how the advective flux of 0.55 m^3/d from the UGTMF and 2.7 m^3/d from the RMW to Patterson Lake were determined (Figure A-17 of Appendix A of Draft EIS TSD XIV). Details related to how mass flux from the UGTMF to Patterson Lake will occur over time should be provided. The requested details should be included within the body of text in Appendix A, with a summary of key parameters and results provided in the body of the EIS.

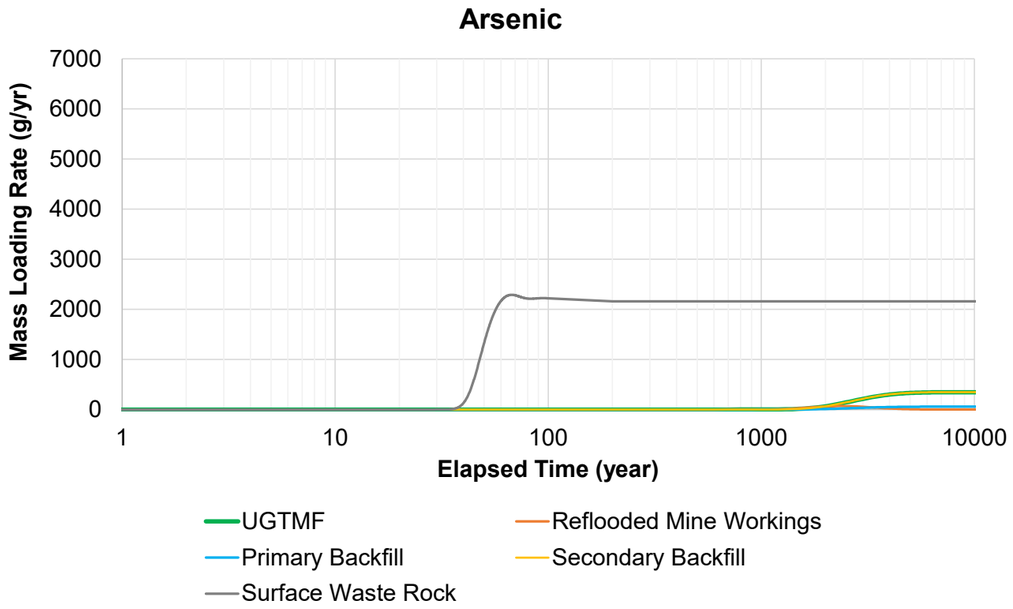
NexGen confirms that the advective fluxes presented schematically in Figure A-17 of Draft EIS TSD XIV (Groundwater Flow and Solute Transport Modelling Report) are the predicted fluxes from the groundwater model following reflooding of the underground. The underground was sub-divided into four areas (i.e., underground tailings management facility [UGTMF], primary backfill, secondary backfill, and reflooded mine workings) and a local water budget was completed for each of those regions to extract the predicted flow for each zone.

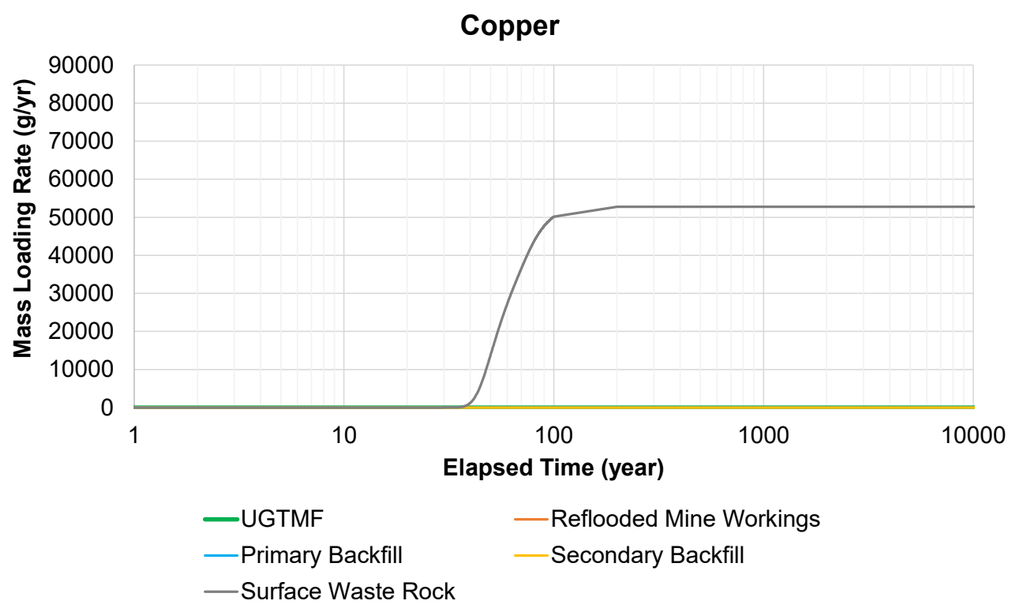
Figure A-21 of TSD XIV presents a summary of the predicted mass loading rates over time to Patterson Lake from the combined sources presented in Figure A-17 (i.e., UGTMF, primary backfill, secondary backfill, reflooded mine workings, background groundwater, and surface waste). Figure 1 of this attachment presents the requested mass flux over time for the UGTMF to Patterson Lake, as well as for the reflooded mine workings, primary backfill, and surface waste rock for arsenic, copper, uranium, and radium.

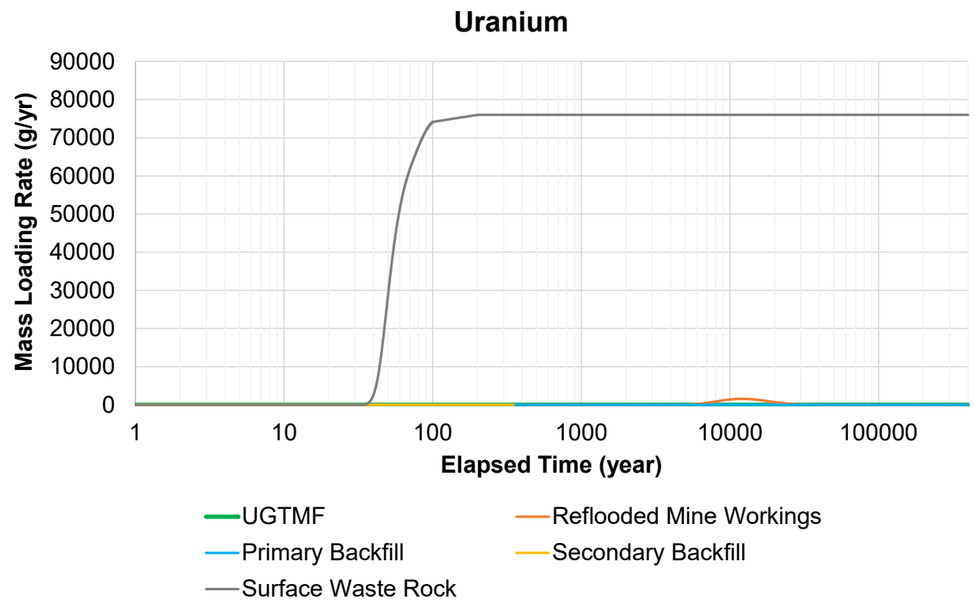
To provide the details requested by the reviewer regarding advective flux, text in Section 3.3 of revised EIS TSD XIV (Groundwater Flow and Solute Transport Modelling Report) will be modified to state the following:

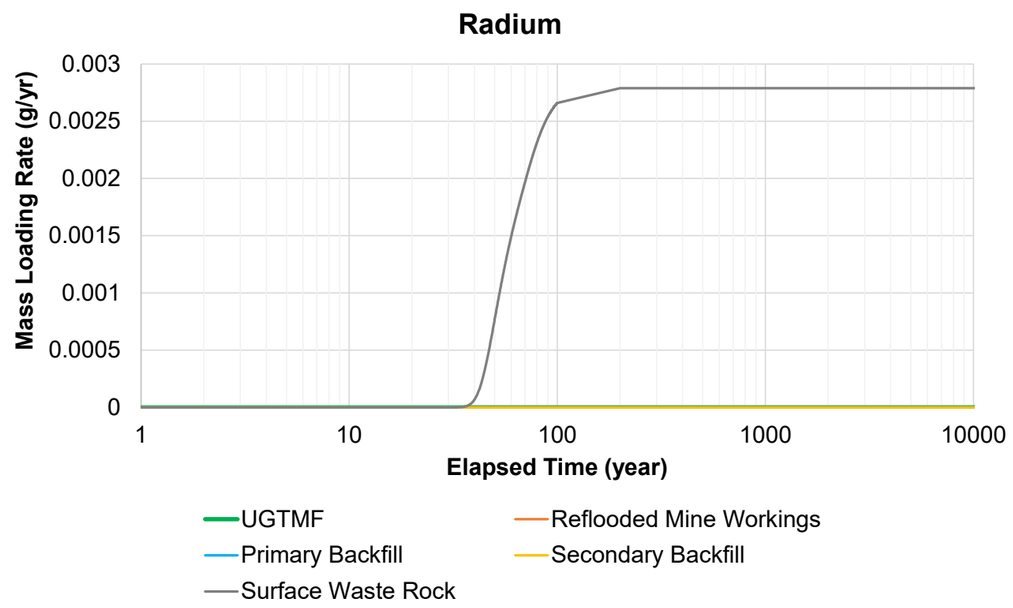
“Figure A-17 provides a schematic illustration of the GoldSim solute transport model identifying the source, pathways, and downstream receptor. Advective fluxes presented in Figure A-17 for the underground (i.e., UGTMF, primary backfill, secondary backfill, and reflooded mine workings) are predicted flow rates from the groundwater model following reflooding of the mine workings. As summarized in Figure A-17, the predicted flux through the UGTMF, primary backfill, secondary backfill, and reflooded mine workings are 0.55 m^3/day, 0.32 m^3/day, 0.15 m^3/day, and 2.7 m^3/day, respectively. Pathways and travel length were derived from the groundwater model through particle tracking analysis as detailed in Section 3.3.2, Groundwater Flow Pathways, and Section 4.4, Pathways Delineation and Travel Times.”

To provide the details requested by the reviewer regarding mass flux, Figure 1 of this attachment will be included as Figure A-21b of Appendix A of revised EIS TSD XIV (note: as a result of this edit, Figure A21 of Draft EIS TSD XIV will become Figure A-21a of revised EIS TSD XIV), and the first sentence in Section 4.5 of revised EIS TSD XIV will be modified as follows to reference the new figure: “The simulated peak solute mass loading rates are provided in Table 4, along with the scenarios described in Section 4, Results, and plotted for selected solutes in Figure A-21a and Figure A-21b”.









CLIENT
NexGen Energy Ltd.

CONSULTANT
wsp

YYYY-MM-DD	2024-04-16
PREPARED	RS
DESIGN	RS
REVIEW	JL
APPROVED	JL

PROJECT
NEXGEN ENERGY LTD.
ROOK I

TITLE
SIMULATED MASS LOADING RATES BY SOURCE TO PATTERSON LAKE – PLOTS FOR SELECT SOLUTES

PROJECT No.	PHASE	Rev.	FIGURE
22522691	3100.3130	0	1

Part 2 - Provide details on how the flooding of the mine during closure will impact regional hydrogeology, specifically related to the migration of contaminants from the UGTMF and RMW to Patterson Lake by the groundwater pathway.

NexGen notes that residual changes to the groundwater system during closure are described in Draft EIS Section 8.5.1 (Application Case).

During Operations, seepage to the underground would result in depressurization of the surrounding bedrock, which would be observed as a reduction in groundwater elevation. The reduction in hydraulic head is primarily limited to the basement rock as the overlying sandstone is several orders of magnitude more transmissive (Section 4.2 and Figure A-8 of Draft EIS TSD XIV). The maximum predicted drawdown in hydraulic head within the sandstone was less than 5 m in the immediate area of the mine workings.

At the end of operations and after active depressurization of the underground, the underground would progressively reflood through passive groundwater inflow. Following reflooding of the underground, groundwater that flows through or past the underground workings is predicted to discharge to Patterson Lake, which surrounds the underground to the north, west, and south. The groundwater migration pathways were predicted using particle tracking analysis in the groundwater model. Overall, groundwater migrates upward primarily through the fault and shear zones, which are more permeable than the surrounding basement rock, then laterally through the sandstone, before discharging to Patterson Lake. Based on the predicted hydraulic gradients, hydraulic conductivity values, pathway dimensions, and effective porosity values applied to the pathways (i.e., porosity of 0.015 for the fault zone and 0.098 for the sandstone), the approximate advective groundwater travel time from the upper horizon of the mine to the discharge location at Patterson Lake is estimated to be approximately 1,000 years.

Part 3 - Clarify if contamination sourced from the RMW by the groundwater pathway has been included within the term UGTMF in section 10.5.1 of the EIS. If the RMW was not considered as a source of contamination to Patterson Lake by the groundwater pathway in Section 10.5.1 of the EIS, it should be added.

Mass loading (contamination) from the reflooded mine workings, primary backfill, secondary backfill, UGTMF and surface waste storage was considered as a source of contamination to Patterson Lake by the groundwater pathway in Draft EIS Section 10.5.1 (Application Case) and further detailed in Section 10A6.3.3 of Draft EIS Appendix 10A (Surface Water Quality Modelling Report). Text in revised EIS Section 10.5.1 (Application Case) will be expanded to list the sources individually rather than solely referencing the UGTMF.

Part 4 - Include a table summarizing the predicted mass flux of contaminants from the UGTMF and RMW to Patterson Lake over time.

Given the number of data points representing the predicted mass flux over time up to 400,000 years, the requested mass flux of contaminants from the UGTMF and reflooded mine workings have been presented graphically in Figure 1 for select parameters rather than in a table (selected parameters are consistent with those presented in Figure A-21 of Draft EIS TSD XIV). Table 4 of Draft EIS TSD XIV presents a summary of combined peak mass loading rates for each solute. Figure 1 of this attachment will be included as Figure A-21b of Appendix A of revised EIS TSD XIV, and the first sentence in Section 4.5 of revised EIS TSD XIV will be modified as follows to reference the new figure: “The simulated peak solute mass loading rates are provided in Table 4, along with the scenarios described in Section 4, Results, and plotted for selected solutes in Figure A-21a and Figure A-

21b". As noted in part 3 of this response, the full dataset of groundwater sources has been carried forward to the surface water quality model.

Part 5 - Provide justification for the assumption in the groundwater flow model of an equivalent porous media approach for groundwater transport through the shear and fault zones. The model should give due consideration for fracture dominated transport, either by directly modelling as fracture flow or through a robust justification for how the parameters used in the existing equivalent porous media model are reflective of fracture-dominant transport.

At the scale of the Project groundwater model, a representative elemental volume (REV) in the bedrock would be on the order of tens to hundreds of metres and within this volume would be multiple local fractures/joints. The bulk properties of this rock would be captured in the scale of packer testing estimates of hydraulic conductivity, which were conducted at a similar scale of tens of metres.

Overall, local joints and structure are considered weaker controls on groundwater flow in comparison to the larger scale shear and fault zones present near the underground, which have been interpreted to act as preferential pathways for groundwater flow. Although each of the shear and faults zones are modelled as an equivalent porous media, the faults and shear zones near the underground were defined explicitly in the model based on mapped extents from borehole data and incorporated individually into the groundwater model as elements of higher hydraulic conductivity. The geometric mean of the 23 packer tests within the fault zones indicate a hydraulic conductivity of 9×10^{-8} m/s, with an overall range of 8×10^{-10} m/s to 7×10^{-6} m/s. The geometric mean of the 40 tests within the shear zone indicate a hydraulic conductivity of 3.1×10^{-8} m/s and overall range of 5×10^{-11} m/s to 6×10^{-6} m/s. This indicates the faults and shear zones may not be as permeable or continuous along their entire length with sections that are more or less transmissive than the calculated average hydraulic conductivity. Although it is recognized that properties may not be uniform along the fault and shear zone lengths, refinement of the variation in transmissivity is not considered to be practical or reasonable. Instead, each of the faults were conservatively assumed to be continuous along their length, which results in stronger hydraulic connection of the underground to Patterson Lake. To account for uncertainty in model input parameters as part of the sensitivity analysis, an alternative scenario was modelled where in each of the faults incorporated in the model, the hydraulic conductivity was assumed to be five times higher than the calibrated value (Draft EIS TSD XIV, Section 5). The model results were found to be less sensitive (i.e., less than 5% difference) for simulations in which adjustments were made to the hydraulic conductivity of the units in comparison to sensitivity runs related to source terms (TSD XIV, Section 5). The influence of uncertainty in the porosity of the shear and fault zones on peak mass flux to Patterson Lake is presented in Part 10 of this IR response.

Part 6 - Provide additional information on the assumption that dispersity is 10% of the flow pathway for vertical flows from the UGTMF to Patterson Lake. Provide a reference for the validity of this approach that is either peer reviewed, or which demonstrates that it is an established method. The supporting documentation for the use of this method to estimate dispersivity should indicate that it is valid for situations that are comparable to the Project site, notably vertical groundwater flows that are likely to be fracture dominated.

The applied dispersivity value (10% of the advective length) is not specific to horizontal or vertical flow and instead represents the dispersivity along the direction of flow (primarily vertical through the fractures, and horizontal through the sandstone). The applied dispersivity of 10% is a general rule of thumb that was used in the absence of site-specific data. NexGen recognizes that this value is highly variable and can vary by several

orders of magnitude. The United States Environmental Protection Agency provides an online tool for site assessment calculation of longitudinal dispersivity using each of the following: the 10% rule, data from Gelhar, Welty, and Rehfeldt (1992), and the Xu and Eckstein (1995) formula. Using all three methods, the range of estimated dispersivity spanned over an order of magnitude higher and lower than the assumed value in the modelling assessment.

Dispersive mixing causes some contaminant molecules to move ahead of the average advective velocity along the hydraulic gradient and some molecules to move laterally to the hydraulic gradient. The net effect is to spread (i.e., disperse) the contaminant plume about the average advective front. Changes to the timing of the plume arrival front would not substantially affect the predicted peak concentrations (far future steady state) for the contaminants of concern from the UGTMF, reflooded mine workings, primary backfill, secondary backfill, and surface waste rock sources that would be driving water quality in Patterson Lake. Peak concentrations predicted by the groundwater model for the far future were input to the surface water quality model, including assessments for the best estimate and the sensitivity scenario wherein the upper bound source terms for the UGTMF, primary and secondary backfill, and waste rock were adopted. As described in Section 5 of Draft EIS TSD XIV, because the surface waste rock loadings represent a large portion of the overall mass loadings, the groundwater mass loading results were generally most sensitive to the upper bound waste rock source term.

Part 7 - Provide additional details on why the hydraulic conductivity value of the sandstone unit in the model is two orders of magnitude above the geometric mean.

NexGen confirms that the assigned hydraulic conductivity value is based on the model calibration process.

Data from eight packer tests in the sandstone unit ranged from 2.6 x 10^{-8} m/s to 9.3 x 10^{-7} m/s with a geometric mean value of 1.3 x 10^{-7} m/s. The limited in-situ hydraulic response data are considered to represent the lower end of the permeability for this unit. Data from laboratory permeability testing indicate higher hydraulic conductivity values (to the 10^{-5} m/s range) for the sandstone (NexGen 2019e). Packer test data is documented in Section 5.2.2.2 of Annex III (Hydrogeology Baseline Report).

The hydraulic conductivity of the sandstone was adjusted during model calibration to provide a reasonable match to the measured hydraulic heads in the sandstone unit. Figure A-5 of Draft EIS TSD XIV presents a conceptual cross-section of the hydraulic heads measured in the various hydrostratigraphic units. To represent the relatively flat horizontal gradient observed in the sandstone unit, where hydraulic heads were close to the surface water elevation in Patterson Lake, a relatively high hydraulic conductivity was required that was two orders of magnitude higher than the geometric mean of the packer test estimates and closer to the laboratory permeability testing.

Part 8 - Provide details on the source of the values selected for the hydraulic conductivity of the fault and shear zones.

The final values selected for the hydraulic conductivity of the fault and shear zones were derived from model calibration in consideration of the observed estimates from packer testing.

The geometric mean of the 23 packer tests within the fault zones indicate a hydraulic conductivity of 9 x 10^{-8} m/s, with an overall range of 8 x 10^{-10} m/s to 7 x 10^{-6} m/s. The geometric mean of the 40 tests within the shear zone indicate a hydraulic conductivity of 3.1 x 10^{-8} m/s and overall range of 5 x 10^{-11} m/s to 6 x 10^{-6} m/s. Packer test data is documented in Section 5.2.2.2 of Draft EIS Annex III.

The hydraulic conductivity of the fault and shear zones, along with properties of other hydrostratigraphic units, were adjusted during model calibration to enhance the match between simulated and observed groundwater elevations (statistical calculations and spatial distribution of residuals) and observed groundwater flow patterns (i.e., discharge areas, vertical flow directions, and depths to groundwater). From the automated parameter estimation process completed during calibration, the calibrated values for the basement rock, paleo-weathered basement rock, shear zone, and upper glacial drift units were at or slightly below the geometric mean value from the measured data. For the fault zone, the model value was slightly above the geometric mean value. As discussed in Part 7 of this response, for the sandstone unit, the model value was two orders of magnitude higher than the geometric mean value from the measured data.

Part 9 - If multiple calibrated model solutions were trialed, provide details, including why the parameters that were selected are considered the most appropriate model solution. If multiple calibrated model solutions were not trialed, provide information to support that the calibrated parameter values represent a unique calibration solution.

The groundwater flow model was calibrated using PEST optimization software[1], which iteratively adjusts model parameters (e.g., hydraulic conductivity, recharge) within user-defined constraints until the model error (i.e., the difference between measured and predicted hydraulic head) is minimized. The resultant final values of hydraulic conductivity at the end of the PEST optimization are not considered a unique calibration solution but rather a best estimate based on available data (i.e., reproduction of measured hydraulic heads, flow directions, and hydraulic conductivities). These parameters were selected as they minimized the differences between measured and predicted hydraulic heads while reasonably representing observed groundwater flow directions.

Considering that it is not a unique calibration solution, nine sensitivity runs were considered in the solute transport modelling. The sensitivity scenarios selected parameters that would have the largest potential to alter mass loading rates to Patterson Lake: primarily, bedrock hydraulic conductivity; fault hydraulic conductivity; and source terms for the UGTMF tailings, primary and secondary backfill, and surface waste rock. The sensitivity analysis indicated that peak mass loading is generally most sensitive to the upper bound waste rock source term as the surface waste rock loadings represent a large portion of the total mass loadings through the groundwater pathway. Less than a 5% difference was observed for simulations in which adjustments were made to the hydraulic conductivity of the bedrock, fault zone, backfill, or UGTMF tailings.

Results from the Project groundwater solute transport model were used to represent groundwater discharges to Patterson Lake North Arm – West Basin. Results used included the best estimate from the groundwater model and a reasonable upper bound scenario from the sensitivity analysis (i.e., upper bound source term inputs from UGTMF, primary backfill, secondary backfill, and waste rock). The upper bound scenario was carried forward in surface water quality model sensitivity scenarios, as described in Section 10A1.1 of Draft EIS Appendix 10A.

Part 10 - Where model parameters were obtained from site analogues or literature values, provide additional details that establish why the selected site analogues are valid for the Project site.

The following parameters in the solute transport modelling were obtained from site analogues or literature values: effective porosity, density, adsorption-partition coefficient, and diffusivity.

Porosity and density values were aligned with values adopted for another site in the Athabasca Basin (i.e., Rabbit Lake), which were primarily based on laboratory testing in sandstone, fault zone, and regolith units. Given the

[1] https://pesthomepage.org/

similar lithologic units, this approach was considered reasonable and more applicable than generic literature values.

Where site analogue data was also available from the Rabbit Lake for similar lithologies (i.e., sandstone, fault zone, and regolith), adsorption-partition coefficients and diffusivity values were also based on published values on the analogue site data. As noted in Table 3 of Section 3.4 of Draft EIS TSD XIV, where site analogue data were not available from the Rabbit Lake study, diffusivity and/or adsorption-partition coefficients were assigned based published values in CRC (2004) and the Chemical Data Bases for the Multimedia Environmental Pollutant Assessment Systems (MEPAS) (Stenge and Paterson, 1989).

Uncertainty in the applied effective porosity, adsorption-partition coefficient, and diffusivity would affect the timing and spread of concentrations in the advective front. However, the uncertainty would not substantially affect the predicted peak (far future steady state) concentrations for the contaminants of concern driving water quality in Patterson Lake as the UGTMF, primary backfill, secondary backfill and surface waste rock sources are assumed to be constant sources. Peak concentrations predicted by the groundwater model for the far future were input to the surface water quality model, including estimates for the best estimate and the sensitivity scenario wherein the upper bound source terms for the UGTMF, primary and secondary backfill, and waste rock were adopted. As described in Section 5 of Draft EIS TSD XIV, because the surface waste rock loadings represent a large portion of the overall mass loadings, the groundwater mass loading results were generally most sensitive to the upper bound waste rock source term.

Part 11 - For fault and shear zone features that extend out of the local area, provide a clear explanation of the method used to determine the location, size, angle, and parameters that were used in the model to describe these zones. Provide the reasoning for the use of different hydraulic conductivity values for the fault and shear zones within the local area vs outside the local area.

As described in Section 2.3 of Draft EIS TSD XIV, within the vicinity of the Project, the fault and shear zone units were mapped individually in the three-dimensional geological model and have been incorporated in the groundwater model as independent material property zones.

Outside of the local area and area of mapping, the structures were inferred to extend further based geophysical survey data (Z-tipper axis electromagnetic and airborne magnetic data). The faults and shear zones were extended approximately 700 m to the northeast until they connected to the more permeable sandstone unit beneath Patterson Lake. To the south, the faults were assumed to extend approximately 4 km until they reached Patterson Lake. This is considered a reasonable distance to account for their potential influence on groundwater inflows to and from the underground in Operations and Closure.

To account for the presence of the unmapped faults, an ‘inferred fault zone’ was created with hydraulic conductivities optimized in the PEST calibration process within the bounds of the relative permeabilities of the individual fault and shear zones and the surrounding basement rock. A specific equivalent hydraulic conductivity was not calculated for the inferred fault zone. The zone would have enhanced permeability along the trend of the fault and shear zones and reduced permeability perpendicular to the fault and shear zones. The angle of the principal axis of hydraulic conductivity was rotated 43 degrees east from north to align with the approximate trend of the fault and shear zones.

Part 12 - In the sensitivity analysis, provide a justification for the magnitude of variability considered for each parameter. The justification should include consideration of how the value for each parameter was selected (field data, model calibration, etc.) and the level of uncertainty associated with each parameter. The magnitude of variability used for sensitivity analysis for each parameter should be chosen with respect to the level of confidence in the accuracy of each parameter value.

Uncertainties associated with the derivation of the UGTMF and stopes source terms generally relate to material representativity, system conceptualization and simplification, and numerical derivation of source terms. These uncertainties were identified and documented throughout the derivation process, particularly where assumptions and bounding arguments were made to simplify system behavior. The precautionary principle was consistently applied to ensure that assumptions and bounding arguments were conservative with respect to the source term outcome. Sensitivity analyses were used to identify sensitive parameters and develop an envelope of best-estimate and upper-case source terms where the upper-case source terms represent a conservative outcome that is commensurate with the level of uncertainty associated with the most sensitive parameters. For example, in the case of upper-case source terms, it is conservatively assumed that "first flush" mass release rates (i.e., the highest mass release rates) would be maintained over the modelling period, essentially defining an infinite, constant source term at maximum mass release rates. The envelope of best-estimate and upper-case source terms were applied in the groundwater solute transport model to ensure that propagation of uncertainties was carried forward in the assessment of valued components.

For the mass transport analysis, sensitivity analysis considered the properties most likely to affect mass flux to Patterson Lake (i.e., the hydraulic properties of the hydrostratigraphic units along the flow path through the fault zone and sandstone) as well as the source terms for the UGTMF, primary backfill, secondary backfill, and waste rock.

The calibrated horizontal sandstone hydraulic conductivity is on the upper end of hydraulic conductivity estimates derived from laboratory testing and packer testing (eight tests). A factor-of-five increase is considered outside measured data and therefore above the likely actual bulk properties of the unit. The factor-of-five increase in sandstone hydraulic conductivity is therefore considered reasonable for assessing uncertainty in this parameter. The fault zone horizontal hydraulic conductivity in the calibrated model is just over two times higher than the geometric average from 23 tests (2×10^{-7} m/s in the model versus 9×10^{-8} m/s geometric average). A factor-of-five increase adopted in the sensitivity analysis results in a hydraulic conductivity just over an order magnitude (i.e., 11 times) higher than the geometric average inferred from packer testing. Considering the number of tests (23) and the distribution of hydraulic conductivity estimates from this testing, the adopted hydraulic conductivity in the sensitivity analysis has a probability density function of less than 10% (Figure A-4 of Draft EIS TSD XIV) and is considered reasonable for evaluating uncertainty.

As a test of the sensitivity of the transport predictions, the cross-section area of the faults was assumed to be reduced by a factor of two. Relative to the nine sensitivity scenarios modelled, this scenario generally resulted in the least change in predicted mass flux, and further assessment was not conducted. Overall, it is not practical to measure fracture zone area at such a large scale; therefore, the model incorporates a best estimate based on mapped faults incorporated into the model. In general, the fault zones are conservatively modelled in the sense that they are assumed to extend beyond the limits of the underground to below Patterson Lake, and that over these distances, they are assumed to be continuous and permeable.

3 Additional Context

The groundwater model developed for the Project is based on a comprehensive set of data used to define the conceptual groundwater model and hydrostratigraphic units. Based on this field data and conceptual understanding of groundwater flow conditions, a groundwater model was developed to provide predictions of groundwater changes over the life of the Project and into the far future. Overall, the groundwater model is considered to be well calibrated, with good reproduction of hydraulic heads and flow directions across the study area.

A sensitivity analysis was conducted to assess the uncertainty in model predictions due to uncertainty in model input parameters. The worst case of the sensitivity runs, along with the best estimate from the calibrated model, were used as inputs to the surface water quality model, with the surface water quality model accounting for groundwater seepage loadings from the UGTMF, reflooded mine workings, primary backfill, secondary backfill, and surface waste rock. These two scenarios are considered reasonable for EA planning and mitigation.

The surface water quality modelling extended 357 years after Closure and modelled two time periods in the far future. The first time period was 157 years in duration and included the natural hydrological and hydrogeological processes from the site following Closure such as seepage from the underground and surface waste rock as modelled by the solute transport model for this period of time, and surface runoff from the covered and reclaimed areas of the Project to Patterson Lake North Arm – West Basin. The second modelled time period for the far future extended for 200 years past the first modelled time period and included natural hydrological and hydrogeological processes that account for maximum mass constituent of potential concern loadings associated with solute transport via the groundwater model applied to Patterson Lake North Arm – West Basin over the entire temporal extent of the model (i.e., 357 years). The modelling of the migration of UGTMF-affected groundwater by the groundwater solute transport model demonstrated that the time for this groundwater to reach the surface water occurs over a very large temporal scale (i.e., hundreds of thousands of years; Draft EIS Section 8 [Hydrogeology]), and that the maximum constituent of potential concern loadings generally occurred towards the end of the solute transport modelling period (i.e., up to 400,000 years). However, computational limits precluded the use of a temporal scale consistent with the solute transport model. Therefore, to evaluate the potential for effects on surface water quality, the maximum loadings (i.e., those reached towards the end of the groundwater solute transport model) were applied to the period of 157 to 357 years following Closure (i.e., the far future was effectively fast-tracked to the maximum loadings time period). This approach allows for a much shorter modelling timeframe to project the maximum potential changes to surface water quality in Patterson Lake in the far future and conservatively assumes that the underground groundwater loadings that occur hundreds of thousands of years in the future, including loadings from the UGTMF, overlap with loadings from the WRSAs.

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Attachment IR 32-R1

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Attachment IR 32-R1

1 Introduction

NexGen Energy Ltd. (NexGen) is proposing to develop a new uranium mining and milling operation in northwestern Saskatchewan, called the Rook I Project (Project). The proposed Project is subject to both provincial and federal Environmental Assessment (EA) processes, would be licensed as a nuclear facility by the Canadian Nuclear Safety Commission (CNSC), and would be subject to various provincial and federal permits and approvals.

NexGen submitted a Draft Environmental Impact Statement (EIS) to the Saskatchewan Ministry of Environment (ENV) and Canadian Nuclear Safety Commission (CNSC) in 2022. Through the technical review of the Draft EIS, NexGen received information requests (IRs) and advice to proponent comments from the Federal-Indigenous Review Team (FIRT), which is led by the CNSC. Results of the FIRT technical review were provided in two Annexes; Annex 1 was composed of IRs and Annex 2 was composed of advice to proponent comments for NexGen's response. In September 2023, NexGen provided detailed responses to the FIRT IRs and advice to proponent comments.

On 12 February 2024, the CNSC provided the results of their review of NexGen's IR and advice to proponent comment responses. The IRs were categorized by the CNSC as accepted (i.e., requiring no additional response), not accepted with the technical approach deemed acceptable by the CNSC and the IR indicated as being able to be resolved once a revised EIS is provided by NexGen, or not accepted with additional response required by NexGen. For the IRs that were not accepted with additional response required, a second round of follow-up IRs were provided by the CNSC.

Attachment IR 32-R1 has been developed to satisfy the request in IR 32-R1 to "provide further justification on the assessment of potential risk level of accidents and malfunctions on the camp workers or to provide an amended camp location assessment as required by the Saskatchewan Ministry of Environment".

2 Response to Information Request

Based on the justification/rationale provided for IR 32-R1, NexGen believes that the reviewer may be conflating the results of two separate analyses (i.e., the screening-level alternatives assessment for a Project worker camp location and the accidents and malfunctions assessment) that were completed in different manners and for different purposes. The screening level alternatives assessment was used to identity a preferred camp location based on various selection criteria, including environmental, technical, economic, and social assessment categories. This process included identification of technically and economically feasible options (i.e., alternative identification), and a prerequisite during the identification of the alternatives was consideration of fatal flaws that would automatically eliminate a potential alternative, such as unreasonable risks to camp resident health. For the selected camp location (or any camp location selected for alternative assessment), no such fatal flaws existed (i.e., camp resident health could be maintained). In contrast, the accidents and malfunctions assessment represents an in-depth evaluation of the risks (based on likelihood and consequence) associated with hazards that are outside the range of 'typical' day-to-day events. The results of the accidents and malfunctions assessment should not be used to inform the selection of preferred camp location alternative. Rather, the accidents and malfunctions assessment was conducted to consider the appropriateness and rigor of design mitigations and to identify risk so that it can be managed through appropriate and comprehensive controls (e.g., emergency response planning).

Although it is not required that the assessment of accidents and malfunctions inform the screening level alternatives assessment for the proposed camp location, NexGen has provided the following information to help respond to the review comments provided in IR 32-R1.

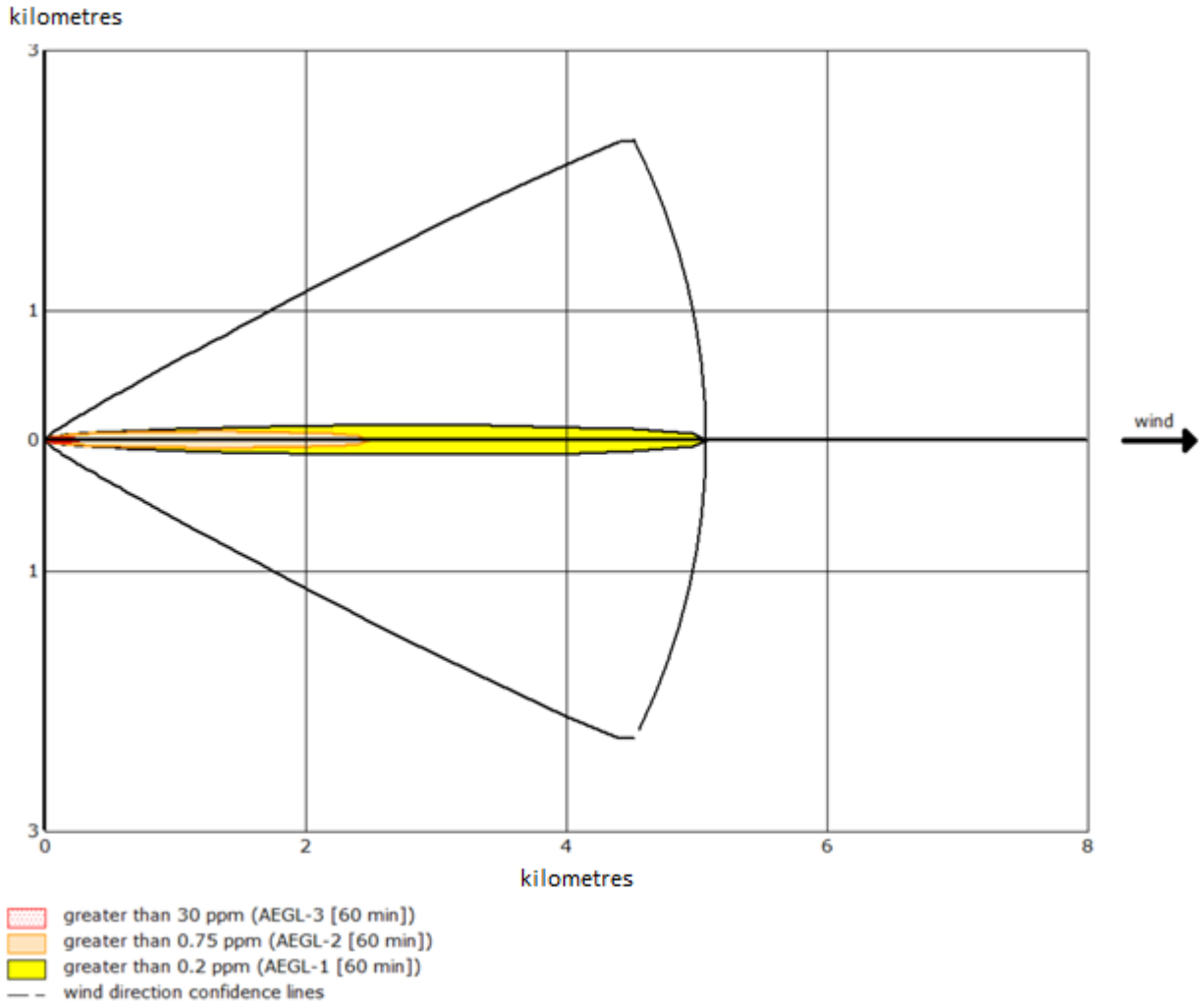
NexGen notes that the reviewer stated that worker health and safety was not considered in determining the preferred worker camp location. Consistent with the original response to IR 32, NexGen re-iterates that the assessment of the camp location included in Draft EIS Section 4.5.9 (Camp Location) considered worker health and safety as part of the worker safety and human health sub-category under the social category. As described in Draft EIS Section 4.4.2 (Selection Criteria), while each sub-category was considered, only differentiating criteria were carried forward for evaluation as part of each alternatives assessment. Further, consistent with what was noted in NexGen's initial response to IR 32 and is described in Draft EIS Section 5.3.1 (Design Standards), all Project infrastructure and facilities (including the camp location) would be developed and operated in accordance with provincial and federal design standards, regulatory guidance, and applicable building codes, which would include those that require that worker health and safety are protected (e.g., Occupational Health and Safety Regulations, 2020). As such, confirming worker health and safety is protected was not a differentiating factor between any of the alternatives and therefore not selected as a criteria in the camp location alternative assessment.

Draft EIS Section 21 (Accidents and Malfunctions) and Draft EIS TSD VIII (Accidents and Malfunctions Report) provided an assessment of potential Project accidents and malfunctions through a hazard identification evaluation process and subsequent quantitative analysis of several bounding scenarios. For the purpose of the accidents and malfunctions assessment, "a bounding scenario is used to represent an event in which its potential effects are considered to represent those associated with other accident and malfunction scenarios; or, alternatively, the potential effects of scenarios that are bounded by another are expected to fit within the envelope of those associated with the bounding scenario" (Draft EIS TSD VIII, Section 3.2.2). As noted by the reviewer, a bounding scenario that has particular relevance to the health and safety of workers is Bounding Scenario 6 (acid plant tail gas scrubber failure).

Section 11 of Draft EIS TSD VIII assessed the overall risk to the public for the acid plant tail gas scrubber failure. With respect to likelihood, the failure of acid scrubber has an annual probability of occurrence of $3x10^{-2}$. This probability is derived from comprehensive statistical analysis conducted over several decades of operational data and is referenced from the Center for Chemical Process Safety (AIChE-CCPS 1989). Further, this probability only considers the probability of the event in a generic sense, and not the specific probability of the conditions of the event whereby the camp workers could be subject to exposure. In this regard, it is important to note that exposure occurs when the wind direction is directed towards the receptors, such as a worker staying in the camp. Accordingly, under prevailing meteorological conditions, and assuming a conditional probability of 0.1 for wind direction towards the camp worker receptor, the annual probability of exposure due to such an event can be estimated to be $3x10^{-3}$, or “unlikely” (≤1 occurrence in 100 years and >1 occurrence in 1,000 years) per the likelihood index shown in Section 3.2 of Draft EIS TSD VIII. The probability can also be characterized for the worst-case meteorological conditions, where the probability is lower again, approximately 20 times less, at $1.5x10^{-4}$, or “highly unlikely” (<1 occurrence in 1,000 years).

With respect to consequence, it is inappropriate to map the dispersion modeling outcomes to the potentially affected areas for the purpose of assessing overall accident or malfunction risk. Although this approach is suitable for routine operations and continuous release scenarios, it fails to account for the probabilistic nature of risks associated with accidents. Specific to the acid plant tail gas scrubber failure scenario, Figure 1 shows the dispersion modeling results corresponding to worst-case weather conditions presented in Table 11-1 in Draft EIS TSD VIII. As this figure demonstrates, the affected area is limited to a narrow band aligned with the wind direction, with the greater effects (and thus, potential consequence) of the overall scenario limited in terms of geographic extent.

Figure 1: Sulphur Dioxide Dispersion for Worst-Case Weather Conditions



AEGL-1 The airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic non-sensory effects. However, the effects are not disabling and are transient and reversible on cessation of exposure.

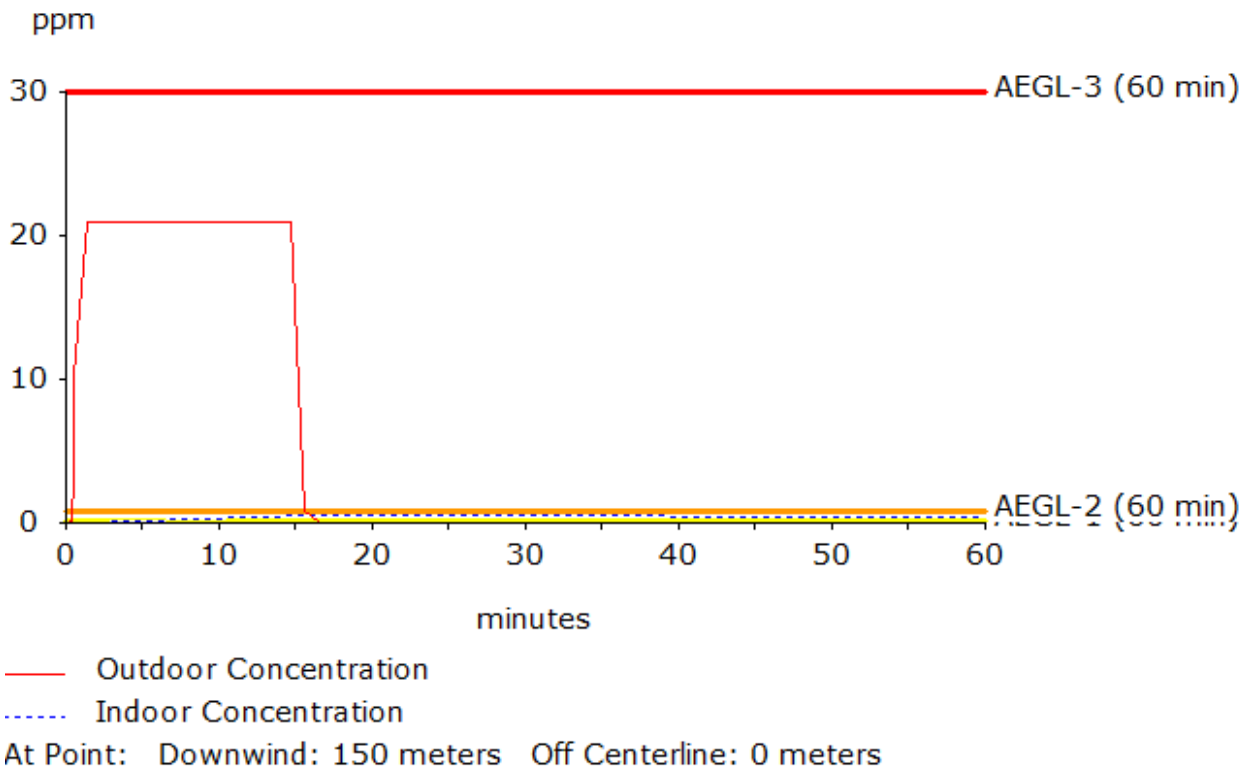
AEGL-2 The airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape.

AEGL-3 The airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience life-threatening health effects or death.

ppm = parts per million.

For additional context, Figure 2 illustrates the transient concentrations of outdoor and indoor pollutants at 150 m from the release source (note – the closest point at the proposed camp is located over 250 m from the proposed acid plant). The results indicate that although the outdoor concentration may surpass the AEGL-2 threshold for approximately 15 minutes, the maximum indoor concentration (noting that the camp habitants would be indoors) remains at 0.5 ppm, which is below the AEGL-2 threshold (i.e., would be within AEGL-1, where effects would be reversible and non-disabling). These concentrations would be lower at the camp location, which is farther than the 150 m modelled distance. Concentrations would be further lowered if the wind direction at the time of the postulated acid plant tail gas scrubber failure was not towards the camp.

Figure 2: Concentrations of Outdoor and Indoor Pollutants at 150 m from the Release Source



AEGL-1 The airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic non-sensory effects. However, the effects are not disabling and are transient and reversible on cessation of exposure (depicted as the yellow line).

AEGL-2 The airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape (depicted as the orange line).

AEGL-3 The airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience life-threatening health effects or death (depicted as the red line).

ppm = parts per million.

The model simulations described above provide only part of the determination of consequence for an acid plant tail gas scrubber failure. In the instance that such an event occurred, and for any accident or malfunction occurrence, emergency response planning would be implemented to minimize potential consequence to workers on site, including a potential worker staying at the camp. The emergency response planning would adopt a risk-based approach to emergency preparedness and response and would be developed with consideration for a range of potential emergency situations, including those identified within the assessment of accidents and malfunctions. Upon activation of a surface alarm or emergency announcement, non-emergency response workers and visitors, including camp residents and staff, would be required to shut down any equipment they are operating (if safe to do so) and proceed to their designated muster point. Muster points would be identified by posted signage throughout the site. Each muster point would have an alternative location in the event there is danger associated with the designated muster point. Workers or their designate-in-charge of short-term contractors or visitors would accompany short-term contractors or visitors to their designated or alternate muster station. At the camp, workers or their designate-in-charge of short-term contractors or visitors would confirm the presence of the short-term contractors or visitors at the assigned muster point. Head counts would be completed during emergencies and reported to the emergency operations centre. If the emergency requires evacuation, non-emergency response team workers would be evacuated either by ground or air. In advance of Operations, emergency response plans would also be updated to include details on managing emergencies involving sulfuric acid to comply with the Environmental Emergency Regulations (2019). With specific reference to a potential acid plant tail gas scrubber failure, in the event of a prolonged release, which is unlikely due to the limited inventory of SO_2 in the piping system and scrubber, the indoor concentration may gradually rise. Under this scenario, procedures within emergency response plans would trigger the requirement for a potential evacuation of the camp. However, adequate time would be available to implement the emergency response planning procedures, which is expected to minimize the effects (i.e., consequence) and corresponding risk to a worker staying at the camp. Therefore, the determination of consequence also needs to consider the emergency response measures that would be initiated to mitigate the effects from an accident or malfunction associated with the acid plant tail gas scrubber. Considering this holistic approach, the consequence rating of “minor to moderate” that was given in Section 11.4 of Draft EIS TSD VIII is reasonable and justifiable.

Overall, in consideration of the additional information provided above, the risk to a worker staying at the camp associated with an acid plant tail gas accident or malfunction would be as low as reasonably practicable. Therefore, the overall risk rating would be similar for workers staying at the camp as for a member of the public near the Project site (i.e., low to moderate). As described in Draft EIS Section 21.6.9 (Summary of Bounding Scenarios), this was deemed to represent a tolerable level of risk in consideration of proposed safeguards and design features.

3 References

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Attachment IR 40-R1

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Attachment IR 40-R1

1 Introduction

NexGen Energy Ltd. (NexGen) is proposing to develop a new uranium mining and milling operation in northwestern Saskatchewan, called the Rook I Project (Project). The proposed Project is subject to both provincial and federal Environmental Assessment (EA) processes, would be licensed as a nuclear facility by the Canadian Nuclear Safety Commission (CNSC), and would be subject to various provincial and federal permits and approvals.

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Attachment IR 40-R1 represents NexGen's response to IR 40-R1 and includes additional information to support the statement that "… the rate of sulphide oxidation is lower than the rate of silicate weathering" and how this information is linked to the classification of potentially acid generating (PAG) and non—potentially acid generating (NPAG) waste rocks.

2 Information Request Responses

2.1 Context and Objectives

As noted in Draft EIS TSD XVII (Waste Rock and Underground Wall Rock Source Term Predictions Report), the proposed non-potentially acid generating (NPAG) waste rock classification consists of two individual criteria: total sulphur <0.1 wt% and a neutralization potential (NP) over acid potential (AP) ratio of >3. Waste rock must comply with either of the criteria to be classified as NPAG. Related to this classification, information request IR 40 was provided by Environment and Climate Change Canada (ECCC) requesting information related to how the metal-leaching (ML) and acid rock drainage (ARD) cutoff criteria for sulphur that is used to classify waste rock as potentially acid generating (PAG) or NPAG were derived. NexGen responded by confirming that various standard static and kinetic geochemical tests were conducted on a range of samples representing waste rock from the Project and that the results were considered in the derivation of the classification criteria. NexGen also confirmed the following:

- The bulk mineralogy of waste rock samples that classify as NPAG is consistent with that of the Proterozoic crystalline basement rock, consisting predominantly of silicate-based minerals with only trace carbonate species and pyrite.
- Kinetic test results of two waste rock samples containing <0.1 wt % sulphide sulphur show pH trends that suggest the rate of sulphide oxidation is lower than the rate of silicate weathering. This supports the use of sulphur content as a classification criterion for NPAG waste rock.

Following NexGen's response to IR 40, ECCC requested further clarity on the rate of sulphide oxidation in comparison to the rate of silicate weathering to support the ML/ARD classification criteria. More specifically, ECCC requested additional information to support the statement that "… the rate of sulphide oxidation is lower than the rate of silicate weathering" and that the information provided should also be linked to the classification of potentially acid generating (PAG) and NPAG rocks.

The objectives of this attachment are to:

1. Clarify the mechanism through which silicate weathering can buffer acidity produced from sulphide oxidation in waste rock with low sulphur (Section 3.1).
2. Provide additional information on measured kinetic rates for sulphide oxidation and silicate weathering in low sulphur content (i.e., NPAG) waste rock materials (Section 3.2).
3. Clarify how the above mechanism and data support the use of the sulphur criterion in the ML/ARD classification of waste rock from the Project (Section 3.3).

2.2 Silicate Neutralization Potential

2.3 Silicate Minerals and Neutralization Mechanisms

In the absence of carbonate minerals, silicate minerals (e.g., feldspar, mica, olivine, amphibole, pyroxene, chlorite, serpentine) can play a vital role in neutralizing acidity generated by sulphide oxidation in mining environments (Jambor et al. 2002; Price 2009). Silicate minerals can either consume acidity generated by sulphide oxidation through direct acid-consuming reactions or by meteoric weathering reactions with carbon dioxide (e.g., Plumlee 1997; INAP 2014; Day and Kennedy 2015). Neutralization of acidity through acid-consuming reactions typically result in buffering the drainage solutions at highly acidic pH (pH <2.5) levels (INAP 2014).

The chemical reactions involved in meteoric weathering of silicate minerals by carbonic acid (i.e., atmospheric carbon dioxide dissolved in water) in the infiltrating rainwater is shown in Eq. 1 (Penman et al. 2020) and Eq. 2 (Day and Kennedy 2015). These reactions generate bicarbonate that can then interact with dissolved acidity or alkalinity to buffer the pH of the percolating water at near neutral levels (Eq. 3; Day and Kennedy 2015). The weathering reactions between carbonic acid (meteoric waters) and silicate minerals, including aluminosilicate minerals (e.g., Eq. 1 – wollastonite and Eq. 2 - anorthite), can be written as follows:

$$Eq.1: CaSiO_3 + CO_2 + 3H_20 -> H_4SiO_4 + 2HCO_3^- + Ca^{2+}$$

$$Eq.2: CaAl_2Si_2O_8 + 2H_2O + 2H_2CO_3 \rightarrow Ca^{2+} + 2Al(OH)_3 + 2SiO_2 + 2HCO_3^-$$

The yielded bicarbonate can in turn be involved in buffering contact water pH through reversible reactions such as:

$$Eq.3: Ca^{2+} + HCO_3^- \leftrightarrow CaCO_3 + H^+$$

The rates of meteoric weathering of silicate and aluminosilicate minerals (i.e., Eq. 1, Eq. 2, and Eq. 3) in mine wastes are typically several orders of magnitude slower than carbonate dissolution rates (e.g., Jambor 2003; Price 2009). However, for waste rock materials that are characterized by low total sulphur and NP dominated by acid-consuming silicate minerals, the potential exists to generate bicarbonate alkalinity from meteoric weathering of silicate minerals at a sufficient rate to buffer the acidity produced by sulphide oxidation (Jambor 2003; Price 2009; INAP 2014). Furthermore, the silicate mineral reservoir is far greater than the acid that could be generated by sulphide oxidation, resulting in an effectively perpetual source of alkalinity. This buffering was shown to be effective through the work done by Day and Kennedy (2015) at a mine site in northern Minnesota. This study demonstrates that for waste rock materials with low total sulphide content (<1 wt%) and NP dominated by acid-consuming silicate minerals, meteoric weathering of silicate minerals by carbonic acid can deliver sufficient dissolved bicarbonate to offset the acidity generated by the oxidation of the sulphide minerals and buffer the pH of the percolating water to near neutral levels.

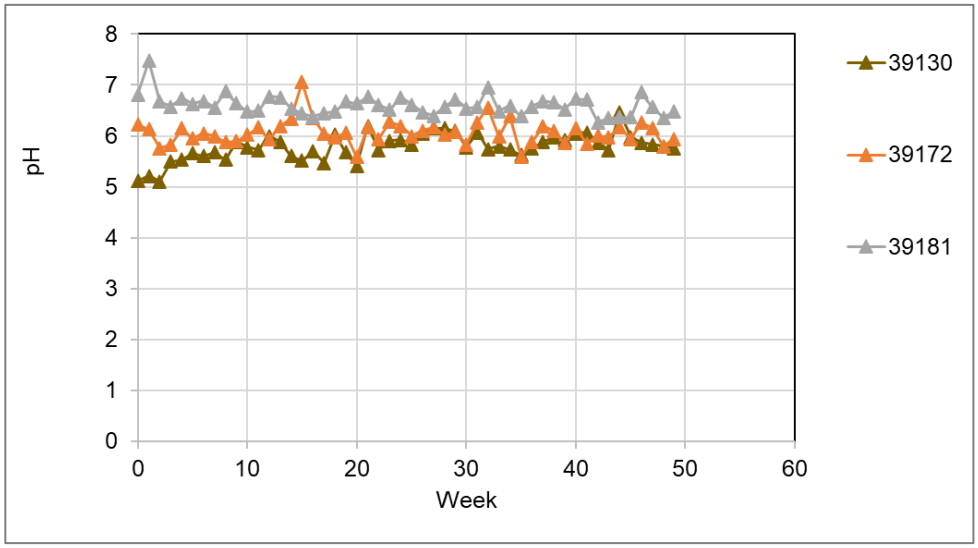
2.4 Application to the Non-Potentially Acid Generating Waste Rock Storage Area

The rate of meteoric weathering of silicate minerals (and by extension the rate of bicarbonate alkalinity produced) in a waste rock environment is determined by several factors including the type of silicate minerals, porewater composition and its flux, mineral surface area and texture, climate, and biological activity (White and Brantley 1995, 2003). Similarly, the rate of sulphide oxidation in a waste rock environment is determined by several factors including the type of sulphide minerals, distribution in the rock matrix, mineral texture, reactive surface areas, porewater composition and its flux, oxygen supply, climate, and biological activity (INAP 2014).

Although the bulk material rates under site conditions are not yet known for the NPAG waste rock storage area, kinetic tests conducted on waste rock with low sulphur (sulphide sulphur <0.1 wt%) provide an indication of these rates under laboratory conditions. Kinetic test results for humidity cells 39130, 39172, and 39181 (SRK Consulting 2023) indicate pH trends supporting the rationale that the rate of sulphide oxidation of the waste rock

materials in the cells is balanced with alkalinity produced from the weathering of silicate minerals (Figure 1). Since the waste rock material does not contain any detectable carbonate minerals that can neutralize the acidity at the recorded pH levels, pH buffering (pH 5.8 – 6.5) of the leachates is expected to be associated with the weathering of the silicate minerals. For samples in Figure 1, XRD analysis revealed the presence of the following silicate and aluminosilicate minerals: anorthite (up to 4.4 wt%), muscovite (up to 16 wt%), biotite (up to 30 wt%), and chlorite (up to 14 wt%) (SRK Consulting 2023).

Figure 1: pH Time Series for Waste Rock Humidity Cells 39130, 39172, and 39181



2.5 ML/ARD Classification Criteria

In consideration of the information provided in Draft EIS TSD XVII and the additional details included within Attachment IR 40-R1, NexGen has implemented the following ML/ARD criteria to classify waste rock into PAG and NPAG materials:

- PAG if NP/AP or total inorganic carbon (TIC)/AP is ≤1 and sulphide sulphur is ≥0.1 wt%
- Uncertain ARD potential if NP/AP or TIC/AP is >1 and ≤3, and sulphide sulphur ≥0.1 wt%
- NPAG if NP/AP or TIC/AP is >3 or sulphide sulphur <0.1 wt%

Notes:

- Acid potential calculated from sulphur as sulphide where: AP (kg $CaCO_3$/t) = sulphide sulphur (%S) x 31.25.
- The results for both modified NP and TIC are considered.

The low sulphide criterion classifies waste rock, regardless of NP/AP ratio, into two categories: PAG and NPAG (SRK Consulting 2023). As a result, all waste rock materials that are classified as “uncertain ARD potential” based on NP/AP ratio, will be conservatively classified as PAG materials.

The use of both NP/AP ratios (also referred to as net potential ratios [NPR]) and a sulphur criterion is commonly used in the ML/ARD classification of mine waste rock and the proposed NPR values for the PAG/NPAG classification is consistent with industry best practices (INAP 2014; Price 2009).

The use of <0.1 wt% sulphide sulphur for the sulphur cutoff criteria is continuing to be monitored in ongoing kinetic testing of waste rock and will be further verified using field kinetic testing during Project Operations.

3 Conclusions

NexGen is confident that the use of a sulphide-based criterion that is based on the balance between alkalinity produced from the meteoric weathering of silicate minerals under site conditions and the low sulphide oxidation rate in waste rock containing low sulphide sulphur is valid for the ML/ARD classification of waste rock for the Project. The criterion value of 0.1% sulphide sulphur will be verified through ongoing kinetic testing.

In addition, NexGen is confident that the proposed ML/ARD classification system, including the use of both a NP/AP ratio and a sulphur criterion, will result in conservative classification of waste rock into PAG and NPAG materials.

4 References

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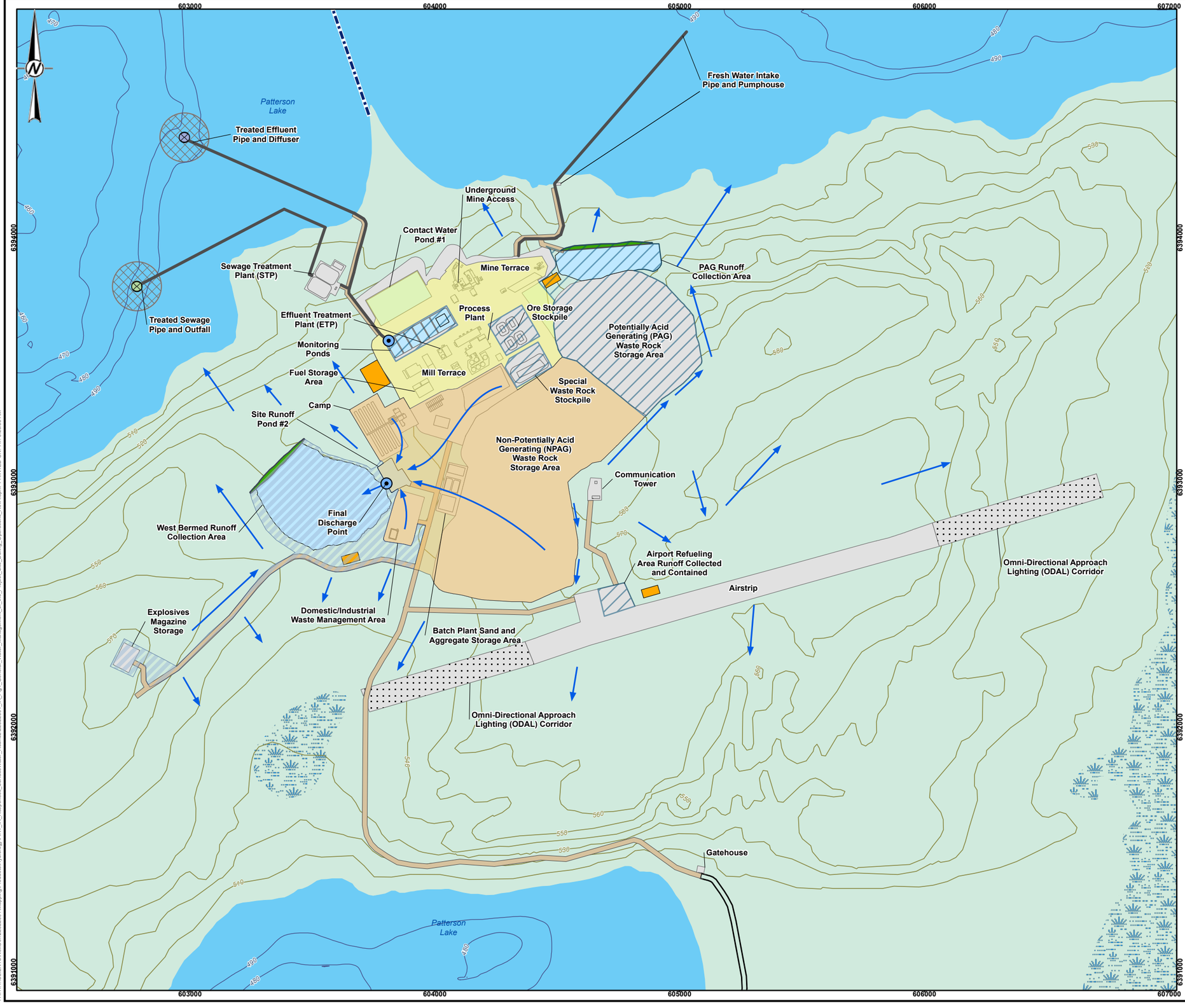
Attachment IR 46-R1



LEGEND

- BATHYMETRY CONTOUR ELEVATION (5 m INTERVAL)
- ELEVATION CONTOUR (10 m INTERVAL)
- GENERAL FLOW DIRECTION
- LAKE BASIN DIVISION
- WATERBODY
- WETLAND
- WOODED AREA
- FINAL DISCHARGE POINT
- INTAKE OR DISCHARGE PIPE
- ACCESS ROAD
- CONTACT WATER CONTAINMENT BERM
- OMNI-DIRECTIONAL APPROACH LIGHTING (ODAL) CORRIDOR
- PROJECT INFRASTRUCTURE
- SITE ROAD
- TOPSOIL STORAGE AREA
- WATER MANAGEMENT POND
- EFFLUENT TREATED PIPE DIFFUSER
- SEWAGE TREATED PIPE OUTFALL
- PROPOSED REGULATED MIXING ZONE
- DRAINAGE TO SITE RUNOFF POND #1
- DRAINAGE TO SITE RUNOFF POND #2
- SELF CONTAINED
- TO WEST BERMED RUNOFF COLLECTION AREA

DRAFT

0 0.5 1

1:15,500 KILOMETRES

REFERENCE(S)

1. PROJECT FEATURES OBTAINED FROM NEXGEN, APRIL 6, 2021 AND UPDATED JUNE 8, 2021 .
2. BASE DATA OBTAINED FROM GEOGRATIS, © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
3. BATHYMETRY CONTOURS DERIVED FROM DATA COLLECTED BY NEXGEN, 2016.

PROJECTION: UTM ZONE 12 DATUM: NAD 83

PROJECT

NexGen Energy Ltd

ROOK I PROJECT

TITLE

GENERAL WATER MANAGEMENT OF PROJECT SITE DURING OPERATIONS

CONSULTANT

wsp

PROJECT		22522691	PHASE		3100.3150
DESIGN	RP	2024-04-09	SCALE AS SHOWN		REV. A
GIS	AA	2024-04-23	**FIGURE 4**		
CHECK					
REVIEW					

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

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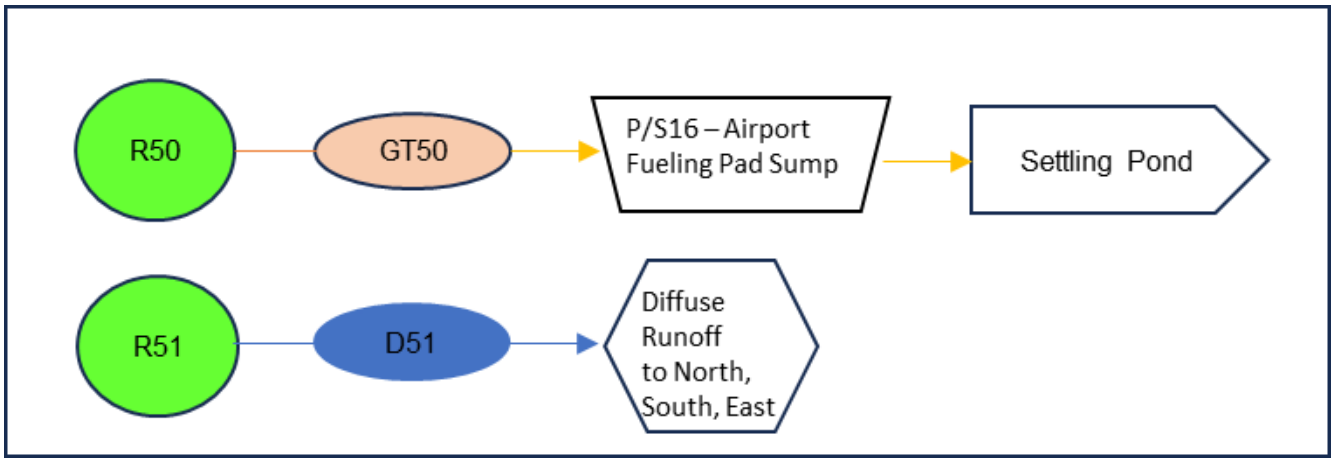
PATH: I:\CLIENTS\NexGen\22522691\Mapping\Product\Hydrology\FIR7_IR_Responses_SurfaceWater_Round2\22522691_IR_Fig4_General_Water_Management_of_the_Project_Site_During_Operations_RevA.aprx PRINTED ON: AT: 8:28:53 AM

Figure 2: Water Management - Airstrip



→ = non-mineralized contact water → = contact water.

Attachment IR 49-R1 79-R1, and 82-R1

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Attachment IR 49-R1, 79-R1, and 82-R1

1 Introduction

NexGen Energy Ltd. (NexGen) is proposing to develop a new uranium mining and milling operation in northwestern Saskatchewan, called the Rook I Project (Project). The proposed Project is subject to both provincial and federal Environmental Assessment (EA) processes, would be licensed as a nuclear facility by the Canadian Nuclear Safety Commission (CNSC), and would be subject to various provincial and federal permits and approvals.

NexGen submitted a Draft Environmental Impact Statement (EIS) to the Saskatchewan Ministry of Environment (ENV) and Canadian Nuclear Safety Commission (CNSC) in 2022. Through the technical review of the Draft EIS, NexGen received information requests (IRs) and advice to proponent comments from the Federal-Indigenous Review Team (FIRT), which is led by the CNSC. Results of the FIRT technical review were provided in two Annexes; Annex 1 was composed of IRs and Annex 2 was composed of advice to proponent comments for NexGen's response. In September 2023, NexGen provided detailed responses to the FIRT IRs and advice to proponent comments.

On 12 February 2024, the CNSC provided the results of their review of NexGen's IR and advice to proponent comment responses. The IRs were categorized by the CNSC as accepted (i.e., requiring no additional response), not accepted with the technical approach deemed acceptable by the CNSC and the IR indicated as being able to be resolved once a revised EIS is provided by NexGen, or not accepted with additional response required by NexGen. For the IRs that were not accepted with additional response required, a second round of follow-up IRs were provided by the CNSC.

Attachment IR 49-R1, 79-R1, and 82-R1 provides supporting information for NexGen's response to IR 49-R1, IR 79-R1, and IR 82-R1. In each of these IRs, Environment and Climate Change Canada (ECCC) has requested supporting data and information regarding the assessment of thallium on receiving waters as a result of the release of treated effluent to Patterson Lake.

2 Background

2.1 Thallium in the Environmental Impact Statement

In Draft EIS Section 10 (Surface Water Quality and Sediment Quality), NexGen presented a multi-step process to:

- characterize existing conditions in the environment (Draft EIS Section 10.3 [Existing Conditions]);
- identify potential Project interactions and mitigations (Draft EIS Section 10.4 [Project Interactions and Mitigations]);
- analyze and classify residual effects (Draft EIS Section 10.5 [Residual Effects Analysis);
- describe uncertainty and prediction confidence (Draft EIS Section 10.6 [Prediction Confidence and Uncertainty); and

- based on the previous steps, identify monitoring and follow-up programs (Draft EIS Section 10.7 [Monitoring, Follow-Up, and Adaptive Management]).

The methods applied to complete this multi-step process were outlined in Draft EIS Section 10.2 (Component Methods).

As described in Draft EIS Section 10.2.2.2 (Measurement Indicators), measurement indicators were used to characterize potential changes to surface water quality. Measurement indicators included:

- **Water quality constituent concentrations (i.e., risk to aquatic and terrestrial life):** includes nutrient, major ion, trace metal, and radionuclide concentrations in waterbodies and watercourses, which are compared to water quality thresholds (e.g., guidelines, objectives, standards) that apply to the protection of aquatic life and terrestrial life.
- **Drinking water quality constituent concentrations:** includes major ion, trace metal, and radionuclide concentrations in waterbodies and watercourses, which are compared to Canadian drinking water quality thresholds.
- **Productivity status constituent concentrations:** includes total phosphorus concentrations in waterbodies and watercourses, which are compared to Canadian waterbody trophic status[1] thresholds.

A series of water quality models were applied to predict constituent concentrations at various locations in the environment as described in Draft EIS Section 10.2.8.1 (Water Quality Model Development and Integration). These water quality models incorporated measured baseline data as described in Draft EIS Section 10.2.6 (Existing Conditions) and detailed in the Aquatic Environmental Baseline Report (Draft EIS Annex V.1). Project activities were included in the water quality models to predict potential effects to the receiving environment under different time frames and Project development scenarios.

The full list of constituents considered in the measurement indicators was reduced to a list of constituents of potential concern (COPCs) as described in Draft EIS Section 10.2.8.2 (Constituents of Potential Concern). The COPCs are a focused list of constituents determined through a screening process that potentially pose a risk to aquatic life, terrestrial life, and/or human health. Through this screening process, as illustrated in Figure 10.2-5 (Draft EIS Section 10.2.8.2.1 [Surface Water Quality Constituents of Potential Concern]), thallium was removed as a COPC on the basis that, where source data were available, concentrations were generally non-detectable and below the applicable guideline. Additionally, source terms for thallium were not available for all inputs to the site-wide water balance and water quality model (Draft EIS Technical Support Document [TSD] XVIII).

[1] Trophic status describes and classifies waterbodies and watercourses (e.g., lakes and rivers) based on their ability to support aquatic ecosystems (i.e., primary productivity). The ability of a lake to support aquatic biota, such as plants and algae, is dependent on nutrient concentrations and physical conditions, primarily phosphorus and nitrogen nutrients and water clarity, respectively. In Canadian waters, particularly waterbodies on the Canadian Shield, phosphorus is characterized as the principal limiting factor (i.e., limiting nutrient) for primary productivity (CCME 2004).

2.2 Information Request 79 Round 1 Request and Response

In Round 1, ECCC wrote the following for IR 79:

> Assess un-ionized ammonia, thallium and DOC [dissolved organic carbon] in the pathways analysis and surface water quality modelling for the surface water quality assessment.
>
> **Suggestions for mitigation and follow-up measures**
>
> Un-ionized ammonia, thallium, DOC and hydrocarbons should be included in follow-up surface water quality monitoring.

With regards to thallium, NexGen's response to IR 79 was:

> Thallium was evaluated as a constituent of potential concern (COPC) but was not carried forward in the surface water quality assessment (Draft EIS Section 10.2.8.2.1) because:
>
> - thallium was not identified as a deleterious substance under Metal and Diamond Mining Effluent Regulations (MDMER);
> - where source term data were available, thallium concentrations were generally non-detectable and below current applicable guidelines; and
> - where source term data for thallium were not available, it was assumed based on the available source data that any contributions from other sources would similarly be negligible.
>
> NexGen maintains that an update to the surface water quality assessment for the inclusion of thallium in the modelling is not required.
>
> Despite thallium, DOC [dissolved organic carbon], and hydrocarbons not being carried forward as COPCs in the surface water quality assessment (Draft EIS Section 10) and Draft EIS TSD XXI (Environmental Risk Assessment), NexGen confirms that ammonia (both total and un-ionized forms), thallium, DOC, and hydrocarbons would be included in verification and follow-up surface water quality monitoring programs for the Project. Monitoring commitments, such as meeting MDMER requirements, are presented in Draft EIS Section 10.7.2 (Surface Water Receiving Environment Monitoring).
>
> **References:**
>
> Metal and Diamond Mining Effluent Regulations. SOR/2002-222 under the *Fisheries Act*. Last amended June 18, 2020. Available at https://laws-lois.justice.gc.ca/eng/Regulations/SOR-2002-222/index.html.

2.3 Information Request 49-R1, 79-R1, and 82-R1 Round 2 Requests

In Round 2, ECCC wrote the following for IR 49-R1, IR 79-R1, and IR 89-R1, noting that only the questions relevant to thallium are presented:

IR	Follow Up Information Request
49-R1	1. Provide updated modelling and tables within Appendix G in Draft EIS TSD XVIII to include effluent characterization concentrations and proposed environmental release targets for the following parameters: TSS [total suspected solids], un-ionized ammonia, and thallium. 2. *[not relevant to thallium]* 3. Identify when it is predicted that effluent discharge flow rates from the mine site would meet the requirements for reporting under the MDMER and when effluent characterization concentrations or proposed environmental release targets for thallium will be provided. 4. Update the Draft EIS Section 5.4.5.4 to include information on predicted effluent characterization concentrations and environmental release targets for MDMER Schedule 4 and 5 parameters.
79-R1	1. Provide baseline receiving environment surface water quality data for thallium and the predicted effluent concentrations of thallium. 2. Update the surface water quality assessment and modelling as needed to incorporate data on thallium to confirm predictions of no adverse effects to the aquatic receiving environment. If additional corrections are required, detail any other report sections that are affected and ensure that all sections impacted by the omission of thallium data are updated.
82-R1	1. *[not relevant to thallium]* 2. *[not relevant to thallium]* 3. Provide baseline receiving environment surface water quality data and predicted effluent characterization concentrations of thallium. 4. Update the surface water quality assessment and modelling as needed to incorporate data on thallium and confirm predictions of no negative effects to the aquatic receiving environment and receptors.

3 Information Request Responses

3.1 Screening Thallium as a Constituent of Potential Concern

In response to the Round 2 IRs listed in Section 2.3, further details are provided in Section 3 regarding the original screening of thallium as a COPC. This information supplements the discussion in Draft EIS Section 10.2.8.2 and includes a comparison against more recent baseline and geochemical test work datasets that have been ongoing since the submission of the Draft EIS and validate the original screening.

3.2 Project Thresholds

To understand the potential environmental effects associated with Project activities, the concentrations of water quality, drinking water quality, and productivity status constituents that were predicted by water quality models under development scenarios were compared to environmental thresholds. A set of Project thresholds was derived according to the hierarchy described in Draft EIS Section 10.2.8.3.1 (Water Quality Thresholds). The selected thresholds generally consisted of the most stringent chronic (i.e., long-term) water quality guidelines for the protection of aquatic life sourced from either the Canadian Environmental Quality Guidelines for the protection of aquatic life (Canadian Council of Ministers of the Environment [CCME] 2021) or the Saskatchewan provincial objectives (WSA 2015, 2017). NexGen notes that in some cases, guidelines were not available for a given constituent and other thresholds were adopted; however, this condition is not relevant to thallium.

There is no Saskatchewan surface water quality objective for thallium; therefore, the CCME guideline of 0.8 micrograms per litre (µg/L; CCME 1999) was applied as the Project threshold.

Once derived, Project thresholds were applied in four main ways in the Draft EIS:

- to select COPCs (Draft EIS Section 10.2.8.2);
- to characterize existing conditions (Draft EIS Section 10.3.1 [Water Quality] and Draft EIS Annex V.1);
- to assess residual effects of the Project on surface water quality (Draft EIS Section 10.5); and
- to derive preliminary environmental release targets (Draft EIS TSD XVIII, Appendix H [Environmental Release Target Development], Section 3.0 [Applicable Water Quality Thresholds]).

3.2.1 Metal and Diamond Mining Effluent Regulations Limits

In addition to the Project thresholds, environmental release targets are limited to the lowest value of those derived from Project thresholds and end-of-pipe limits, including limits described in Schedule 4 (Maximum Authorized Concentrations of Prescribed Deleterious Substances) of the MDMER (Government of Canada 2023). The MDMER Schedule 4 limits exist for Prescribed Deleterious Substances listed in Section 3 (Analytical Requirements for Metal or Diamond Mining Effluent) of the MDMER.

Thallium is not a Prescribed Deleterious Substance under Section 3 of the MDMER; thus, the MDMER Schedule 4 does not apply to thallium. However, thallium is listed in Schedule 5 (Environmental Effects Monitoring Studies) of the MDMER as required for effluent monitoring and thus would be applicable to effluent monitoring for the Project, as explained in Section 4 of this memorandum.

3.3 Baseline Concentrations

Baseline concentrations of thallium in rivers and lakes within the Project local study area (LSA) and regional study area (RSA) are provided in Draft EIS Annex V.1. As listed in Table 3.2-2 of Draft EIS Annex V.1, total and dissolved thallium were measured at all aquatic baseline stations in 2018, 2019, and 2020. Detailed water chemistry results are provided in Appendix C of Draft EIS Annex V.1; the results demonstrate that thallium was consistently below the detection limit of 0.2 µg/L (i.e., at least 4 times lower than the CCME guideline) in all rivers and lakes in the area of the Project. The baseline dataset included 415 measured values from 4 watercourses and 11 waterbodies (Draft EIS Annex V.1, Table 3.2-1). Ongoing baseline data collection has validated these measured concentrations, with an additional 480 data points below 0.2 µg/L recorded in 2021, 2022, and 2023.

3.4 Rook I Project Sources to Effluent

As noted in the CCME fact sheet on thallium:

> Thallium is rarely present as large ore deposits, but can be recovered from sulphide ores of lead, copper, and zinc and may also be associated with cadmium, iron, and potassium minerals such as feldspars and micas. Thallium minerals such as crookesite, hutchinsonite, lorandite, and avicennite occur naturally but are rare (CCME 1999).

As these minerals were not detected in the Arrow deposit mineralogy (see Section 5.1.1 and 5.2.1 of the Rook I Project – Geochemical Characterization of Waste Rock [SRK 2023] and the newly included revised EIS Annex XI [Geology Baseline Report]), thallium is not expected to be present in quantities that pose a potential environmental risk. The CCME (1999) fact sheet further states that "*[n]atural inputs of thallium to aquatic environments occur by weathering processes and are not considered toxicologically significant*". As there are no imports of thallium to Project for industrial use, there is no conceptual pathway for thallium enrichment or contamination at the Project site.

The lack of a conceptual pathway for a source of thallium to the environment from Project activities is confirmed by monitoring data from all types of materials that could contribute to effluent during Construction, Operations, Decomissioning and Reclamation (i.e., Closure), and post-closure. Relevant environmental media have been sampled and analyzed for a suite of metals to screen and assess environmental risk, including data presented in the Draft EIS and ongoing characterization work, as presented in Table 1.

Table 1: Summary of Measured Water Concentrations of Thallium in Receiving Environment and Potential Future Sources of Effluent

Environmental Medium	Reported in Draft EIS	Validation Data Measured Since Draft EIS
Baseline data from waterbodies and watercourses in LSA and RSA	415 values from 4 watercourses and 11 waterbodies measured from 2018 to 2020 reported as <0.2 µg/L. **Reference:** Draft EIS Annex V.1, Appendix C.	480 values from 4 watercourses and 14 waterbodies measured from 2021 to 2023 reported as <0.2 µg/L.
Site runoff	-	9 measured values from 3 stations in 2023, all 9 reported as <0.2 µg/L.
Groundwater in glacial drift and bedrock monitoring wells	142 of 147 values measured in 2017 to 2020 below 0.8 µg/L. The five samples above 0.8 µg/L were all from the first sample collected in each well, likely reflecting well development conditions and not local groundwater concentrations. **Reference:** Draft EIS Annex III (Hydrogeology Baseline Report).	130 samples collected in 2021 to 2023, all below <0.2 µg/L, confirming that: (1) thallium is not measurable in groundwater in the LSA; and (2) first samples from each well likely was not representative.
Groundwater in Westbay well GAR-19-035 (i.e., representing mine development area)	1 measurement from each of 10 depth zones in 2020, all reported as <20 µg/L. **Reference**: Draft EIS Annex III.	7 seasonal samples from each of 10 depths (i.e., 70 samples) from 2020 to 2023, all reported as <0.2 µg/L to <20 µg/L, as detection limits improved with time.
Humidity cells of UGTMF and mine development area for waste rock characterization	262 samples measured in leachate from 13 humidity cells over 56 weeks; all values <0.8 µg/L, with most values reported as <0.005 µg/L. **Reference:** Raw data to support Draft EIS TSD XVII (Waste Rock and Underground Wall Rock Source Term Predictions Report); data not presented in TSD XVII.	304 samples measured in leachate from 9 humidity cells over subsequent 179 weeks; all values <0.8 µg/L, with most values <0.005 µg/L.
Overburden and cover materials	Shake flask extraction leachate of four samples of borrow material in 2021; all four were <0.2 µg/L. **Reference:** Okane (2020) that is referenced in TSD XVIII.	20 samples measured from each of 3 humidity cells over 35 weeks. All 60 values are <0.02 µg/L (52/60 are <0.005 µg/L).

µg/L = micrograms per litre; < = less than; LSA = local study area; RSA = regional study area (RSA); TSD = Technical Support Document; UGTMF = underground tailings management facility.

3.5 Conclusions of Constituent of Potential Concern Screening

Data gathered for the Draft EIS and more recent data measured from 2021 to 2023 validate the exclusion of thallium as a COPC for the EIS. Reported values are below detection limits. While detection limits vary, the vast majority of data points are below the CCME guideline and, in many cases, orders of magnitude below the CCME guideline. Therefore, there is negligible potential for adverse effects to surface water quality as a result of inputs of thallium to the receiving environment from the Rook I Project.

By extension, there is no need to develop environmental release targets for thallium. According to REGDOC-2.9.2, *Environmental Protection, Controlling Releases to the Environment* (CNSC 2021), which would be applied to Project effluents during licensing to guide the development of the Best Available Technology and Techniques Economically Available (BATEA) and licensed release limits, thallium would not be defined as a substance that requires control because the data indicate no potential for environmental risk.

4 Follow-Up Monitoring

Schedule 5, Part 1, Section 4(1) of the MDMER requires that thallium concentrations be measured as part of effluent characterization. Additionally, Schedule 3 of the MDMER prescribes analytical precision, accuracy, and detection limits for mine effluents; this schedule applies to thallium. The required detection limit for thallium is 0.4 µg/L, which is 50% of the CCME guideline value.

Compliance with the MDMER is a key consideration in the development of the Project effluent monitoring plan that will be applied to treated effluents, assuming approval by the CNSC, as part of licensing for each phase of the Project. Thallium would be monitored in the Project effluent treatment plant as per the requirements outlined in Schedule 3 and Schedule 5 of the MDMER. If this ongoing monitoring detects increasing trends or values of thallium above the CCME guideline, thallium would be added as a COPC to the next update of the Environmental Risk Assessment, which would occur every five years.

5 References

CCME (Canadian Council of Ministers of the Environment). 1999. Canadian Water Quality Guidelines for the Protection of Aquatic Life: Thallium. https://ccme.ca/en/res/thallium-en-canadian-water-quality-guidelines-for-the-protection-of-aquatic-life.pdf.

CCME. 2021. Canadian Environmental Quality Guidelines summary table. Accessed August 2021. Available at https://ccme.ca/en/summary-table/.

CNSC (Canadian Nuclear Safety Commission). 2021. REGDOC-2.9.2, Environmental Protection, Controlling Releases to the Environment. DRAFT. March 2021. Available at https://api.cnsc-ccsn.gc.ca/dms/digital-medias/REGDOC-2-9-2-controlling-releases-to-the-environment.pdf/object.

Government of Canada. 2023. Metal and Diamond Mining Effluent Regulations. SOR/2023-122.

Okane (Okane Consultants). 2020. Rook I Borrow Material Geochemical Analysis. December 2020.

SRK (SRK Consulting [Canada] Inc). 2023. Final Rook I Project - Geochemical Characterization of Waste Rock. CAPR001771. January 2023. In: NexGen Energy Ltd. Rook I Project Environmental Impact Statement Annex 1 Responses: Federal Indigenous Review Team Information Requests. Attachment IR 27/41/239/242-1. Submitted to Canadian Nuclear Safety Commission. October 2023.

WSA. (Saskatchewan Water Security Agency). 2015. Surface Water Quality Objectives, Interim Edition, EPB 356. Saskatchewan Environmental and Municipal Management Services Division, Water Security Agency. June 2015.

WSA. 2017. Saskatchewan Water Quality Objective for the Protection of Aquatic Life – Molybdenum. Fact Sheet. Report No. WSA 514.

Attachment IR 67-R1

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Attachment IR 67-R1

1 Introduction

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Attachment IR 67-R1 has been developed to resolve the question raised in IR 67-R1 and includes a table (Table 1-1) that provides the land use emissions in tonnes of carbon (tonnes C), with the emissions for land use change and one-time loss of carbon sink represented. These calculations are aligned with the guidance included in Section 5.1.2 of the *Strategic Assessment of Climate Change* (Environment and Climate Change Canada [ECCC] 2020) and the Tier 1 approach in Section 4.1 of the Draft *Technical Guide Related to the Strategic Assessment of Climate Change* (Environment and Climate Change Canada 2021).

Table 1-1: Project Land Use Change Emissions

Phase	Year	Annual Land Use Change Emissions		Annual Total Emissions (tonnes C)
		Carbon Sink Loss	Loss of Carbon from Disturbances	
Construction	Year -4	600	31,600	32,200
	Year -3	600	-	600
	Year -2	600	-	600
	Year -1	600	-	600
Operations	Year 1	600	-	600
	Year 2	600	-	600
	Year 3	600	-	600
	Year 4	600	-	600
	Year 5	600	-	600
	Year 6	600	-	600
	Year 7	600	-	600
	Year 8	600	-	600
	Year 9	600	-	600
	Year 10	600	-	600
	Years 11-24 (per year)[a]	600	-	600
Decommissioning and Reclamation	Years 25-29 (per year)[b]	600	-	600
	Years 30-39 (per year)[c]	600	-	600
Project Total Land Use Emissions (tonnes C)		**25,800**	**31,600**	**57,400**

Note: Total does not always equate to the sum of the numbers presented in the table due to rounding. The actual totals are based on calculations performed using a greater number of significant figures than those shown in the table. Refer to Draft EIS Appendix 7C (Greenhouse Gas Emissions Estimation Methodology Report) for a detailed description of the emission calculations.

a) It is assumed that the emissions from Year 10 are reflective of annual emissions for Years 11 to 24.

b) It is assumed that the land use emissions from Year-1 are reflective of annual emissions for Years 25 to 29.

c) The emissions sources during the Transitional Monitoring Stage (Years 30 to 39) include land use change. The annual land-use change emissions for Closure were conservatively estimated to be equal to the annual land-use change emissions from the loss of the carbon sink.

2 References

ECCC (Environment and Climate Change Canada). 2020. Strategic Assessment of Climate Change. October 2020. Available at https://www.strategicassessmentclimatechange.ca/.

ECCC. 2021. Draft Technical Guide Related to the Strategic Assessment of Climate Change. August 2021. Available at https://www.canada.ca/en/environment-climate-change/corporate/transparency/consultations/draft-technical-guide-strategic-assessment-climate-change.html.

Attachment IR 69-R1

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Attachment IR 69-R1

1 Introduction

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Attachment IR 69-R1 provides supporting information for NexGen's response to IR 69-R1. Specifically, Attachment IR 69-R1 responds to the reviewer's request that NexGen quantify potential health risks to receptors for nitrogen dioxide (NO_2), utilizing the Canadian Ambient Air Quality Standards for comparison against predicted air concentrations.

2 Response Context

NexGen maintains that the 1-hour and annual Saskatchewan Ambient Air Quality Standards (SAAQS) objectives for NO_2 of 300 µg/m^3 and 45 µg/m^3, respectively, represent appropriate screening values for the environmental risk assessment (ERA). As noted in Section 4.3.3.1 of Draft EIS TSD XXI (Environmental Risk Assessment), the SAAQS represent maximum concentrations in ambient air from all sources as

stipulated in The Clean Air Regulations (Government of Saskatchewan 2015). While the 1-hour and annual CAAQS values for NO_2 of 79 µg/m^3 and 23 µg/m^3, respectively, represent more stringent thresholds, as noted in Draft EIS Section 7.2.2.8.2 (Comparison to Canadian Ambient Air Quality Standards), achievement of the CAAQS is determined by provinces and territories using ambient concentrations measured in the air zones for a three-year period, not by comparison of modelled predictions at or beyond a facility boundary (CCME 2012, CCME 2020a,b). NexGen also notes that the CAAQS were not developed as facility-level regulatory standards (CCME 2019). Both of these aspects (i.e., using modelled results to potentially derive regulatory standards) would apply should the CAAQS be used to screen for potential Project effects in the ERA. Overall, the CAAQSs are meant to drive continuous improvement in air quality, be applied for air zone management, and, strictly speaking, only to be applicable once monitoring data are available. For this and the other reasons stated, use of the CAAQS for screening purposes is inappropriate. However, to provide information requested by reviewer, NexGen has conducted a comparison of Project-modelled 1-hour and annual NO_2 values to the CAAQS in Section 3 for discussion purposes. Additional discussions of key findings are provided in Section 4 and next steps in Section 5.

3 Comparison of Modelled Nitrogen Dioxide to the Canadian Ambient Air Quality Standards

The 1-hour and annual NO_2 screening for human and ecological receptor locations is presented in Table 1 for the Application Case (Construction and Operations) and the RFD Case. The data shown represent the 3-year average of the annual 98th percentile of the daily maximum 1-hour predicted concentrations and annual average predicted concentrations to facilitate comparison against the CAAQS (Draft EIS Section 7.2.5.1.1.2 [Application Case Criteria Air Contaminant Prediction Summary], Table 7.2-12).

As shown in Table 1, during Construction, there are predicted exceedances for 1-hour NO_2 CAAQS at seven of the Human Health Risk Assessment (HHRA) receptor locations and no predicted exceedances for annual NO_2 CAAQS. During Operations and for the RFD Case, there are predicted exceedances for 1-hour NO_2 CAAQS at the camp location (HHRA3) and the potential ecological receptor location near Patterson Lake (HHRA5) and no predicted exceedances for annual NO_2 CAAQS. During Construction, exceedances of the 1-hour NO_2 guideline are predicted to occur less than 1% of the time at all receptor locations other than at the Camp location, where exceedances are predicted to occur approximately 7% of the time. During Operations and the RFD Case, there are no predicted exceedances at receptor locations other than at the Camp location (6% of the time) and at the ecological receptor location at Patterson Lake (0.1% of the time). As noted above, there are no exceedances of the annual NO_2 CAAQS of 23 µg/m^3 at any receptor location during any phase of the Project under the Application Case or the RFD Case (maximum values range from 8.55 µg/m^3 to 14.7 µg/m^3 at the Camp location).

Table 1: Summary of 1-hour Nitrogen Dioxide Concentrations at Ecological Risk Assessment Receptor Locations for Construction, Operations, and Reasonably Foreseeable Development Case

Name	Description	Location		NO_2 Annual Concentration			NO_2 1-hour Concentration (3-year Average of the Annual 98th Percentile of the Daily Maximum 1-hour Concentrations)			Frequency of Exceedance of 1-hour limit (Based on Hours with Concentrations Exceeding 79 µg/m³)		
		X (m)	Y (m)	Construction [µg/m³]	Operations [µg/m³]	RFD - Operations [µg/m³]	Construction [µg/m³]	Operations [µg/m³]	RFD - Operations [µg/m³]	Construction [µg/m³]	Operations [µg/m³]	RFD - Operations [µg/m³]
HHRA1	Hodge Lake Reference	593,768	6,407,146	3.89	3.82	3.86	46.9	29.3	31.5	n/a	n/a	n/a
HHRA2	Broach Lake	600,359	6,398,266	4.10	3.91	3.98	**113.2**	48.8	50.2	0.2%	n/a	n/a
HHRA3	Camp	603,778	6,393,226	14.67	8.55	8.63	**244.1**	**148.0**	**148.0**	7%	6%	6%
HHRA4	Patterson Lake Human Health Receptors	598,658	6,387,580	3.95	3.82	4.07	71.7	28.2	76.0	n/a	n/a	n/a
HHRA5	Patterson Lake Ecological Receptors VC	602,320	6,392,289	4.49	4.01	4.10	**129.7**	**84.6**	**84.7**	0.5%	0.1%	0.1%
HHRA6	Forrest Lake	605,446	6,388,744	4.16	3.91	3.97	**121.6**	49.5	54.0	0.3%	n/a	n/a
HHRA7	Forrest Lake North	605,452	6,390,021	4.28	3.99	4.05	**127.9**	67.0	70.4	0.3%	n/a	n/a
HHRA8	Beet Lake	608,931	6,389,997	4.12	3.90	3.95	**114.5**	39.4	44.2	0.2%	n/a	n/a
HHRA9	Naomi Lake	614,179	6,390,462	3.94	3.84	3.87	**82.9**	31.4	33.5	0.1%	n/a	n/a
HHRA10	Clearwater River	626,340	6,380,517	3.87	3.80	3.82	39.6	22.6	24.2	n/a	n/a	n/a
HHRA11	Lloyd Lake	616,793	6,361,563	3.83	3.80	3.81	25.9	22.3	23.2	n/a	n/a	n/a

RFD = Reasonably Foreseeable Development Case; CAAQS = Canadian Ambient Air Quality Standard; NO_2 = nitrogen dioxide; µg/m³ = micrograms per cubic metre; n/a = not applicable.
Bolded and shaded indicate exceedance of 1-hr NO_2 CAAQS of 79 µg/m³ or annual NO_2 CAAQS of 23 µg/m³.

4 Discussion and Key Findings

As noted in Section 3, when compared to Project-modelled results, potential exceedances of the CAAQS are limited to 1-hour NO_2. Therefore, the following discussion is focused on potential short-term health effects.

Based on Health Canada's 2016 review of the health effects of NO_2 as an input to CAAQS development, Health Canada concluded that there is a causal relationship between exposure to short-term NO_2 and respiratory effects and that there is a likely causal relationship between exposure to short-term NO_2 and pre-mature mortality. Epidemiological studies of asthmatic individuals' exposures to short-term ambient NO_2 can result in asthma exacerbations such as decreased lung function, increased airway hyperresponsiveness, and airway inflammation. Adverse effects may include an increased risk of cardiopulmonary effects, and to a lesser extent, cardiovascular and respiratory mortality (Health Canada 2016). As such, individuals with pre-existing conditions such as asthma appear to be sensitive to exposure to short-term ambient NO_2. If individuals are present during periods when ambient NO_2 concentrations exceed the CAAQS, it is possible that some individuals with airway hypersensitivity such as asthma could experience minor irritation of the respiratory system (Draft EIS TSD XXI, Section 4.3.3.1).

However, other studies have shown that certain 1-hour NO_2 values in excess of the CAAQS are generally protective of human health. Hesterberg et al. (2009), as also reported in Health Canada (2016), completed a systematic review of over 50 studies of exposure to short-term NO_2 on healthy and asthmatic individuals. The Hesterberg et al. (2009) findings indicated that there is evidence of no-effect at low concentrations, and a range from 0.2 ppm (376 µg/m^3) to 0.6 ppm (1,128 µg/m^3) would be considered protective for short-term exposures. In addition, The World Health Organization (WHO) (2010) and United States Environmental Protection Agency (US EPA) (2008), as also reported in Health Canada (2016), concluded that healthy individuals generally do not experience adverse effects at concentrations up to 1 ppm (1,880 µg/m^3). NexGen notes that the Draft EIS 1-hour NO_2 screening value of 300 µg/m^3 is below each of these values.

In addition, NexGen notes that the Project NO_2 predictions are considered conservative and the modelling likely overestimates the exposure concentrations for these potential receptors. The key areas of conservatism in the assumptions for NO_2 emissions and modelling are summarized below (Draft EIS Section 7 [Air Quality, Noise, and Climate Change]).

- The emissions inventory was created for the highest intensity year (i.e., maximum concentrations) of Construction and Operations. Emissions in other years would have lower emission rates for NOx.
  - These maximum predictions would also be representative of the worst-case meteorological conditions, which would rarely occur.
- Conservative assumptions with respect to Project infrastructure and operational aspects were used to estimate the emissions from the Project, including the following:
  - The power plant was assumed to be operating at 90% load hourly throughout the year. The actual operating loads are expected to be lower than these rates most of the time.
  - The Project's mining fleet in the emission inventory considered vehicles equipped with Tier 2 and Tier 3 engines. Tier 4 engines, known for lower NOx emissions, would be procured and utilized to the greatest extent feasible.
  - All mobile equipment was assumed to operate simultaneously; it is not expected that all mobile equipment would be operating at same time.
  - The NOx emissions as a result of the explosives used in blasting were modelled for every hour continuously throughout the year. Actual blasting activities would be expected to occur no more than 5 times per day.

Overall, considering context provided in the discussion above, a quantitative assessment of 1-hour NO_2 in the ERA is not warranted and the overall conclusions of the HHRA remain unchanged (i.e., residual adverse effects to human health would be not significant). The predicted Project emissions for 1-hour NO_2 incorporated multiple conservative assumptions to ensure that effects were not underestimated. NexGen notes that there are occasional predicted exceedances of 1-hour NO_2 CAAQS during Construction and Operations; however, there are no exceedances of annual NO_2 CAAQs indicating no long-term effects would occur. Short-term exceedances would occur infrequently and would be reversible, and should potential effects to sensitive individuals occur, these effects would be expected to subside shortly after exposure. In addition, studies by Hesterberg et al. (2009), the US EPA (2008), and WHO (2010) all show that human health would generally be maintained at 1-hour NO_2 levels above both the CAAQS and predicted Project emissions at HHRA receptors. For these reasons, NexGen maintains that the assessment conducted in the ERA is appropriate. However, NexGen acknowledges that some individuals with pre-existing conditions such as asthma may be sensitive to exposure to short-term ambient NO_2. NexGen would implement both air quality (Draft EIS Section 7.2.8 [Monitoring, Follow-Up, and Adaptive Management]) and human health (including worker health) (Draft EIS Section 15.8 ([Monitoring, Follow-Up, and Adaptive Management]) monitoring programs to detect potential effects to human health and verify that EA predictions are valid.

5 Next Steps

Although further quantitative assessment of Project 1-hour and annual NO_2 emissions in the ERA are not necessary, NexGen will make the following revisions in revised EIS TSD XXI (Environmental Risk Assessment):

- As Health Canada has indicated that they no longer support the national one-hour maximum acceptable level of 400 µg/m^3 for NO_2 in ambient air (Health Canada 2016), text associated with this assertion will be removed from Section 4.3.3.1 (Nitrogen Dioxide).
- Context regarding the comparison of predicted Project NO_2 emissions to the CAAQS will be added to Section 4.3.3 (Screening of Atmospheric Constituents of Potential Concern) for information purposes; however, no other changes to the ERA in this regard (e.g., quantitative assessment of effects associated with 1-hour NO_2) will be completed.

6 References

The Clean Air Regulations. RRS c C-12.1, Reg 1. Repealed by c E-10.22, Reg 2 effective June 1, 2015. Available at https://www.canlii.org/en/sk/laws/regu/rrs-c-c-12.1-reg-1/latest/rrs-c-c-12.1-reg-1.html.

Health Canada. 2016. Human Health Risk Assessment for Ambient Nitrogen Dioxide. Healthy Environments and Consumer Safety Branch.

Hesterberg TW, Bunn WB, McClellan RO, Hamade AK, Long CM, Valberg PA.,2009. “Critical review of the human data on short-term nitrogen dioxide (NO2) exposures: evidence for NO2 no-effect levels.,” *Critical Reviews in Toxicology*, vol. 39, no. 9, pp. 743–81.

US EPA (United States Environmental Protection Agency). 2008. Integrated Science Assessment for Oxides of Nitrogen–Health Criteria. Research Triangle Park, NC: Report No. EPA/600/R08/071. Available: http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=194645#Download.

WHO (World Health Organization). 2010. WHO Guidelines for Indoor Air Quality: Selected Pollutants. World Health Organization, Regional Office for Europe.

Attachment IR 74-R1

Construction Guidelines for Pollution Control Facilities at Uranium Mining and Milling Operations

Saskatchewan Environment
and Resource Management

Shield EcoRegion

October, 2000

1.0 INTRODUCTION

The mining industry in Saskatchewan is regulated by the Operations Division of Saskatchewan Environment and Resource Management, pursuant to the *Environmental Management Protection Act* (*EMPA*) and the *Mineral Industry Environmental Protection Regulations(MIEP)*.

The MIEP Regulations (Section 6) require that a person who desires to construct, install, alter or extend a pollutant control facility shall apply in writing to the minister for approval to do so.

These guidelines were developed by the SERM Shield EcoRegion to guide SERM Project Officers when assessing applications to Construct Pollutant Control Facilities for uranium mining and milling operations, pursuant to the *MIEP Regulations.*

These guidelines are not intended to be prescriptive in nature but rather provide guidance to companies when designing facilities and developing construction applications and to SERM Project Officers when reviewing them.

2.0 GENERAL CONSTRUCTION OF FACILITIES

A definition of what constitutes a pollutant control facility can be found in Section 2(m) of the *MIEP Regulations*. The information to be submitted with an application for approval to construct is detailed in Section 6(2) of the *MIEP Regulations*.

Pollutant Control Facilities are to be constructed in a manner that complies with the following:

- All Environmental Impact Statement commitments made by a company
- All Joint Federal-Provincial Panel on Uranium Mining Developments in Northern Saskatchewan recommendations accepted by the Province
- Any conditions imposed by SERM, on the company, in a Ministerial Approval issued pursuant to *The Environmental Assessment Act*
- All applicable regulations under *EMPA* and *The Clean Air Act*

3.0 CONTAMINATED MATERIAL PIPELINES

Contaminated material pipelines can be defined as pipelines that convey contaminated water (exceeds *MIEP Regulation* discharge limits), ore slurry, tailings, hazardous substances, or other materials that would have a negative impact on the environment if released.

3.1 Secondary Containment

Secondary containment is required for pipelines conveying contaminated material in locations where a pipe rupture would release the material to the environment and be classified as a

reportable spill pursuant to *The Environmental Spill Control Regulations* (ex. a tailings pipe rupture within an open pit TMF would not constitute a release to the environment, a minewater pipe rupture adjacent to a road would).

It is possible that minewater at a uranium mine may meet discharge limits prior to treatment (during mine development or during inactive periods) however, secondary containment is recommended as the water would still be considered to be contaminated and any accidental release would be considered a reportable spill by SERM.

Secondary containment should be designed to adequately contain the contaminated material in the event of a pipeline rupture. The minimum permeability guideline for material to qualify for a secondary containment rating is 1×10^{-7} cm/second.

Examples of acceptable secondary containment would be:

- High density polyethylene (HDPE) pipe within a pipe arrangement
- Concrete utilidor
- Open ditch lined with material compacted to provide a permeability of 1×10^{-7} cm/second

3.2 Basic Construction Criteria for Contaminated Material Pipelines

- HDPE piping
- Designed for maximum anticipated flow
- Above ground (to allow for visual inspections)
- Heat traced, temperature monitored
- Flow detection instrumentation and flow reduction alarms
- Ability to shut down flow immediately upon leak detection
- Secondary containment capable of containing flow and pressure
- Pipe racks only where required, company must give rationale for pipe rack use at a particular location
- Retention ponds or collection sumps with high level alarms at low spots for long pipelines or pipeline sloped to collection pond
- Retention ponds, if used, to have single 80 mil HDPE or equivalent liner and be designed to exceed capacity of pipeline volume that would drain into it
- Designed to account for thermal expansion and contraction
- Flow velocity designed to minimize erosion and to ensure sufficient flow to avoid freezing during winter conditions

4.0 CONTAINMENT STRUCTURES

This section includes guidelines for the construction of structures designed to contain contaminated materials. Such structures would include: ponds for the storage or treatment of

water, pads for the storage of uranium ore, waste rock, and yellow cake, and dams, dykes or embankments for the retention of tailings or contaminated water.

4.1 Ponds

4.1.1 Pond Liners

The use of a single 80 mil HDPE liner is recommended for:

- Surface runoff collection ponds
- Treated Effluent Monitoring ponds
- Contingency ponds
- Retention ponds located along minewater pipelines

The use of a double 80 mil HDPE liner system is recommended for:

- Contaminated water collection ponds
- Sludge ponds
- Sedimentation ponds

Drainage collection to be installed between the double liners with inspection piezometers or sumps

4.1.2 Pond Sizing

Ponds are to be designed so that the likelihood of contaminated water being released to the environment due to foreseeable events including, but not limited to, increased mine water inflow, upset water treatment plant operation, extreme storm events, and pipeline breaks are minimized.

Design considerations for Contaminated Water Collection/Sedimentation Ponds include:

- Maximum operating capacity of water treatment plant (WTP)
- Maximum anticipated inflow of minewater
- Retention capacity in event of WTP failure
- Maintain 1 m freeboard during a 24 hr Probable Maximum Precipitation (PMP) event

Design considerations for Surface Runoff Ponds include:

- Retention of 24 hr PMP event over catchment area while maintaining adequate freeboard (1 m)

Other Ponds

- Anticipated volume and retention time of material to be stored
- Designed to retain 24 hr PMP event if overtopping would release contaminated water to the downstream environment

4.2 Stockpiles/Waste Pads

Standard 80 mil HDPE liners are recommended to stockpiles and pads at uranium operations. The use of bentonite liners are discouraged unless used as part of a double liner system involving a HDPE liner.

4.2.1 Criteria for Ore Stockpiles or Sludge Pads

- Double HDPE liner
- Designed to retain runoff/seepage from a 24 hr PMP event
- Adequate base and cover material to protect liner from damage
- Drainage collection to be installed between the double liners with inspection piezometers or sumps to monitor liner integrity

4.2.2 Criteria for Potentially Acid Generating Rock or Special Waste Stockpiles

- Single HDPE liner
- Designed to retain runoff/seepage from a 24 hr PMP event
- Adequate base and cover to protect liner from damage

4.2.3 Criteria for Clean Waste Rock Piles

- No liner required
- Drainage should be diverted to site surface runoff collection pond, where possible, otherwise drainage should be directed to a sedimentation pond to settle out solids prior to the water entering a surface waterbody
- Surface run-off should be diverted around clean waste piles

4.2.4 Criteria for Yellow Cake Storage Pads

- Pad to meet secondary containment criteria of 1×10^{-7} cm/second is recommended as release of yellow cake product outside of approved secondary containment would be a reportable spill

4.3 Dam/Dyke /Embankment Construction

4.3.1 Stability

- Minimum design safety factor of 1.5 against shallow or deep seated failure of dams and embankments.
- Minimum recommended slope for dykes, dams, and other embankments is 2:1
- Maximum reservoir level shall be kept at or below the top of the impervious core for embankment dams.
- Downstream slopes shall be protected where necessary against erosion caused by runoff, seepage flows, traffic, and frost

4.3.2 Seepage and Drainage Control

- Filters shall be placed between materials where significant migration of particles by seepage forces would be possible.
- The flow capacity of filters and drains shall be designed to accommodate the maximum anticipated seepage.

4.3.3 Flood Design

Dams and/or dykes associated with tailings management facilities, contaminated water impoundments or other facilities containing materials which would have deleterious effects on the downstream environment in the event of overtopping or rupture should be designed to withstand a 24 hr PMP event.

4.4 Monitoring Systems

Structures providing containment for contaminated water and materials are required to have a system of groundwater monitoring piezometers in place. Details regarding the location, construction, and sampling practices for groundwater piezometers can be obtained in the following SERM documents:

- Protocols for the Installation and Sampling of Monitor Wells, April 1989
- Environmental Monitoring Guidelines (For Operational Monitoring at Uranium and Gold Mining and Milling Operations in Saskatchewan), March 1989

5.0 WATER MANAGEMENT PRACTICES

Water management practices should be in place during construction and operation phases that minimize the amount of fresh water utilized, thereby reducing the amount of water requiring treatment and the chemical loading to the environment.

Such practices include:

- Diversion of as much water as possible away from the industrial area during construction and operation
- Recycling water as much as reasonably possible to minimize the usage of fresh surface water
- Segregation of contaminated water sources such as minewater and process water from collected surface runoff water and fresh water

Where applicable an estimated site water balance identifying water sources, expected water quality, and water management structures and practices to be employed is to be included in site construction application packages.

5.1 Water Management Design Criteria

- Ditches, swales and other structures to divert runoff from the industrial area should be in place prior to paving/construction.
- Surface runoff ponds to be completed prior to construction of the industrial apron
- Contaminated collection ponds, water treatment plant upgrades, and monitoring ponds to be completed prior to all construction activities which are expected to significantly increase water inflow to the system (ex. second mine shaft construction, open pit dewatering)
- Water storage/treatment capacity to exceed expected inflow at all times
- Ditches/swales to be designed for 1:100 storm event and armored to prevent erosion

6.0 CONTAMINATED WATER TREATMENT

The ALARA (as low as reasonably achievable) principle is to be followed in designing the treatment systems at uranium mine and mill sites.

Basic Design Criteria:

- Plant must be capable of producing effluent that meets the MIEP Wastewater limits
- Plant capacity designed with maximum flow (worst case scenario) criteria
- Site water handling to be designed to minimize the amount of water to be treated thereby reducing the chemical loading on the environment

7.0 HAZARDOUS SUBSTANCE WASTE DANGEROUS GOOD STORAGE

Approval to construct, install, alter, or expand a facility for the storage of hazardous substances

or waste dangerous goods is required pursuant to the *The Hazardous Substance Waste Dangerous Goods Regulations*. The requirements of these regulations are to be complied with by companies when designing storage facilities.

8.0 SEWAGE TREATMENT

Refer to the *Water Pollution Control & Waterworks Regulations* and *A Guide to Sewage Works Design, Feb. 1996.*

Basic sewage treatment plant design criteria at uranium operations include:

- All sewage and grey water from the mine and mill dry and other potentially contaminated sources is to diverted to mine water treatment plants
- Design plant capacity for maximum number of people on site (most likely during construction). A contingency (+10%) is recommended.
- Ability to upgrade system if required to meet increased demand
- Choice of sewage treatment system should be a proven technology suitable to northern climates
- Ultra-violet disinfection is encouraged to eliminate chlorine loading to environment
- Meters to gauge flows
- Effluent should meet guidelines for BOD, TSS, Coliform Bacteria
- Proposed effluent monitoring program to be included in construction application package
- Appropriate method of sludge disposal as identified in guidelines/regulations

9.0 POTABLE WATER/FIRE PROTECTION

Refer to the *Water Pollution Control & Waterworks Regulations, A Guide to Water Works Design, and the Saskatchewan Municipal Drinking Water Quality Objectives.*

Basic design criteria for potable water fire protection

- Design for maximum number of people on site (most likely during construction)
- Lake intakes to have appropriately sized fish screens
- Ability to upgrade system if required to meet increased demand
- Potable water treatment must include disinfection
- Treated effluent or contaminated water not to be used for fire protection
- Fire protection water does not need to be treated by potable system
- Must meet all applicable fire code requirements

10.0 SOLID WASTE MANAGEMENT

Companies are to provide a waste management plan for construction and operation phases, that

includes a waste minimization (recycling) plan based on the "4R's".

10.1 Domestic and Industrial Waste

Refer to *Municipal Refuse Management Regulations*.

10.2 Contaminated Waste

Radioactive or chemically contaminated wastes generated during construction and operation are to be stored/disposed of separately from other waste materials.

Contaminated waste disposal areas should be located at a specially designed landfill area for contaminated wastes that includes leachate collection or within the confines of areas that have already been impacted, such as:

- Tailings management areas
- PAG or mineralized waste pad

11.0 CONSTRUCTION MONITORING

Construction monitoring to be conducted by company staff or by consultants retained by the company to ensure approved construction specifications are met. This is to include:

- Placement and compaction of materials
- Grading of aggregate, sand etc.
- Liner installations, drain installations between double liners

QA/QC for such activities and installations are to be included in construction packages submitted to SERM for review

All liners to be installed according to manufacturer's specifications for its intended use

Company is to provide monthly construction updates to SERM

Upon completion of the facility, the Company is to provide overall completion report detailing QA/QC conducted, any changes to the originally approved design, and include an as-built drawing.

Attachment IR 75-R1

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Attachment IR 75-R1

1 Introduction

NexGen Energy Ltd. (NexGen) is proposing to develop a new uranium mining and milling operation in northwestern Saskatchewan, called the Rook I Project (Project). The proposed Project is subject to both provincial and federal Environmental Assessment (EA) processes, would be licensed as a nuclear facility by the Canadian Nuclear Safety Commission (CNSC), and would be subject to various provincial and federal permits and approvals.

NexGen submitted a Draft Environmental Impact Statement (EIS) to the Saskatchewan Ministry of Environment (ENV) and Canadian Nuclear Safety Commission (CNSC) in 2022. Through the technical review of the Draft EIS, NexGen received information requests (IRs) and advice to proponent comments from the Federal-Indigenous Review Team (FIRT), which is led by the CNSC. Results of the FIRT technical review were provided in two Annexes; Annex 1 was composed of IRs and Annex 2 was composed of advice to proponent comments for NexGen's response. In September 2023, NexGen provided detailed responses to the FIRT IRs and advice to proponent comments.

On 12 February 2024, the CNSC provided the results of their review of NexGen's IR and advice to proponent comment responses. The IRs were categorized by the CNSC as accepted (i.e., requiring no additional response), not accepted with the technical approach deemed acceptable by the CNSC and the IR indicated as being able to be resolved once a revised EIS is provided by NexGen, or not accepted with additional response required by NexGen. For the IRs that were not accepted with additional response required, a second round of follow-up IRs were provided by the CNSC.

Attachment IR 75-R1 provides supporting information for NexGen's response to IR 75-R1. The specific parts of IR 75-R1 are as follows:

1. Explain why the rating curve formulae for stations CR-WC-MS-02 and CR-WC-MS-06 do not match the plotted line for the open water rating curve. If corrections are required, detail any other report sections that are affected and ensure that all sections impacted by the error are updated.

2. Provide an explanation for rating curve shifts that are not associated with data. Provide details on the monitoring strategy that will be utilized to deal with the unpredictable backwater effects that have led to frequent rating curve shifts. New data that supports the original rating curves should be presented in figures. If general rules on rating curve shifts have been developed, provide all relevant details.

3. Provide details on where and how data derived from rating curves (i.e. the continuous discharge values for CR-WC-MS-01 to 06) are used in the hydrological model in the draft EIS Appendix 9A. Describe how the seasons with the most variable rating curve shifts (i.e. summer and fall) could be affected by this uncertainty.

Section 2 through Section 4 directly address each of the three parts of FIRT IR 75-R1.

2 FIRT IR 75-R1 – Part 1

This section provides NexGen's response to IR 75-R1 – part 1.

2.1 Follow up Information Request

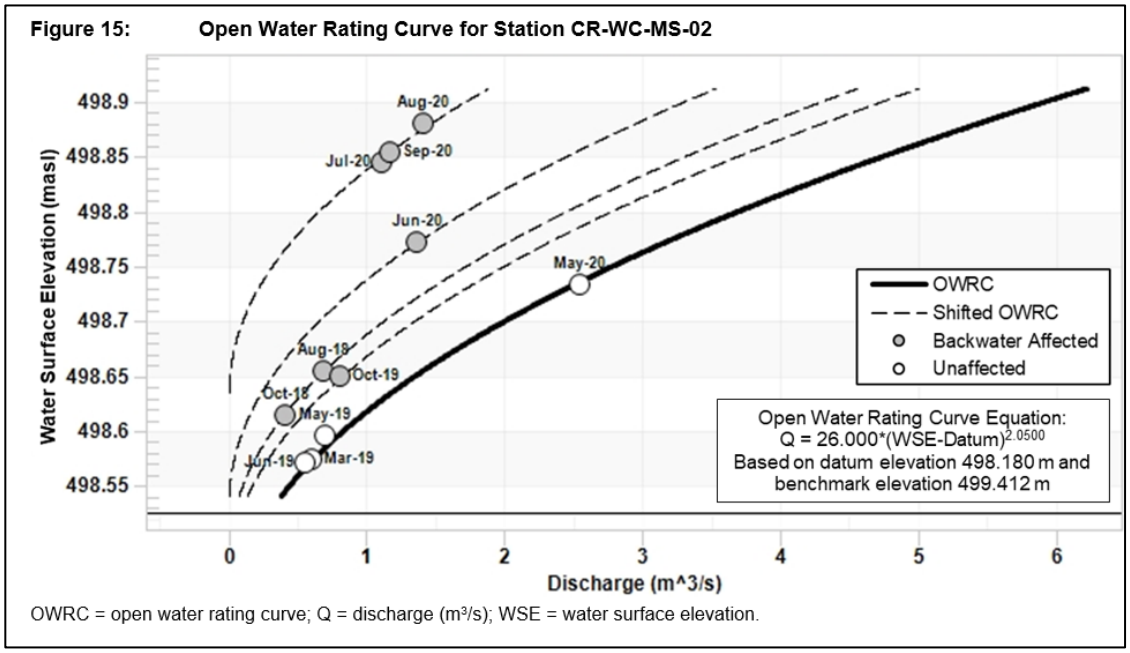
"*Explain why the rating curve formulae for stations CR-WC-MS-02 and CR-WC-MS- 06 do not match the plotted line for the open water rating curve. If corrections are required, detail any other report sections that are affected and ensure that all sections impacted by the error are updated.*"

2.2 Analysis and Response

2.2.1 CR-WC-MS-02

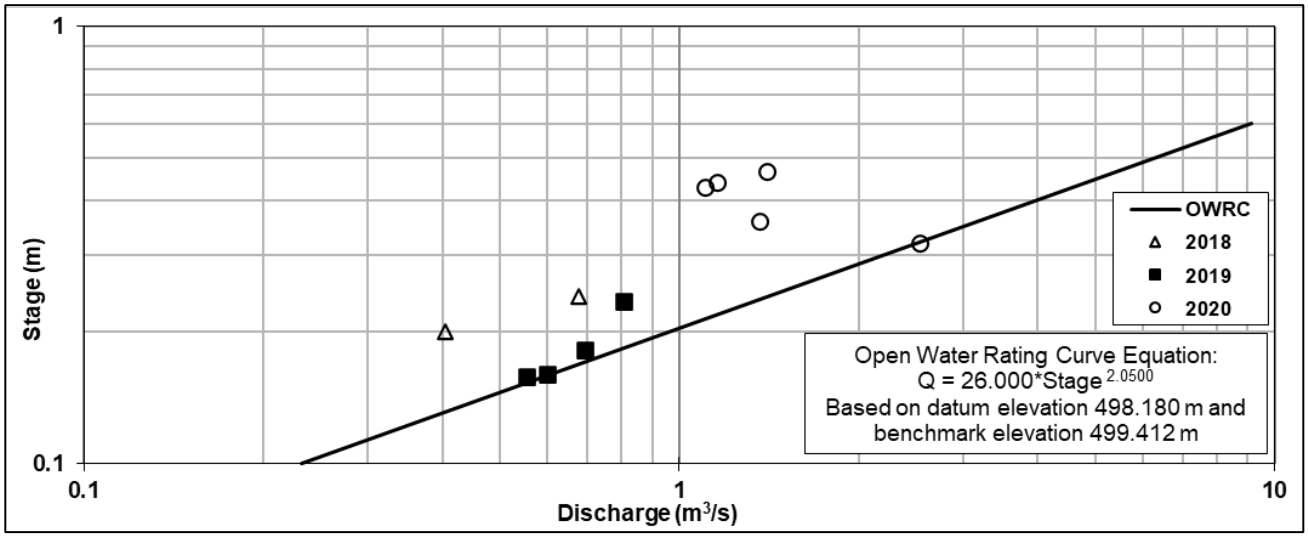
The open water rating curve (OWRC) presented as Figure 15 in Draft EIS Annex IV.2 (Hydrometric Monitoring Characterization Report) for Station CR-WC-MS-02 is presented in Figure 1. An analysis was completed to confirm that the base rating curve plotted for CR-WC-MS-02 matches the plotted line for the open water rating curve, as shown in Figure 2. The analysis confirmed that the base rating curve plotted is consistent with the formula provided on the plot of the base open water rating curve (OWRC). No change is required in response to the comment.

Figure 1: Figure 15 from Annex IV.2



OWRC = open water rating curve; Q = discharge (m³/s); WSE = water surface elevation.

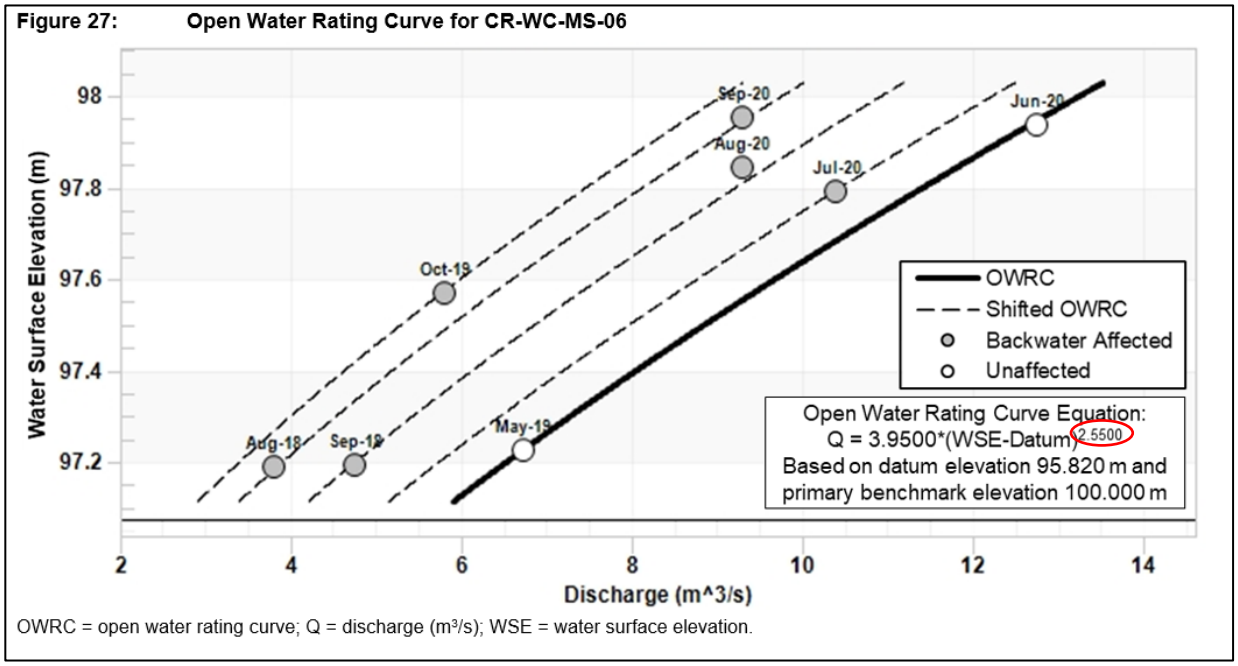
Figure 2: Completed Analysis for CR-WC-MS-06



2.2.2 CR-WC-MS-06

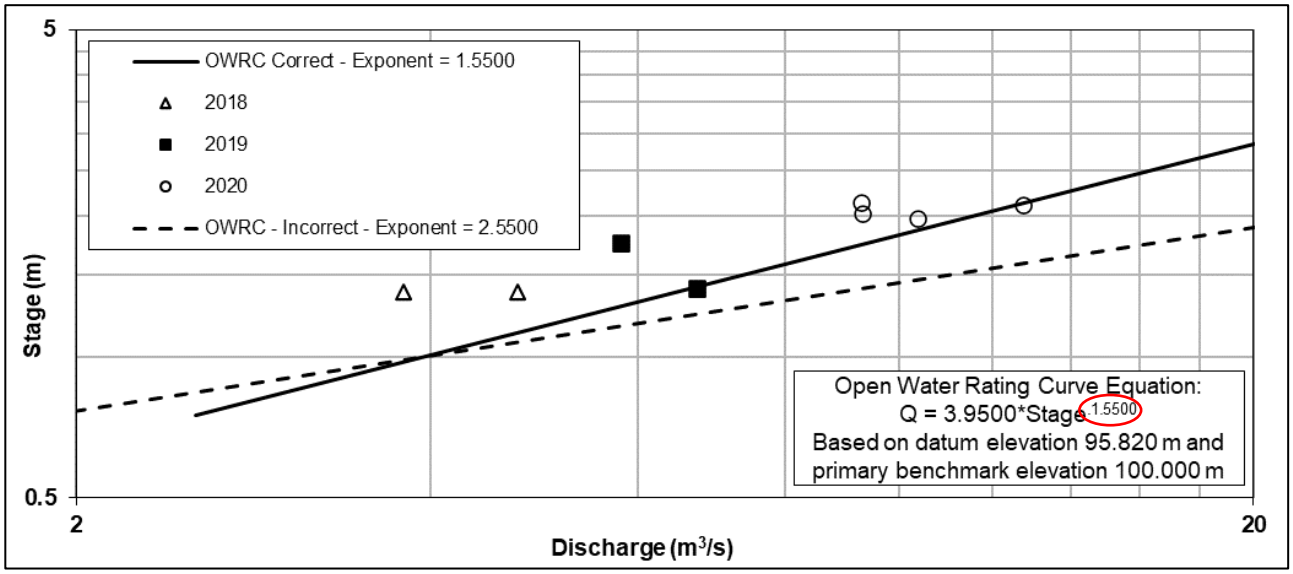
The OWRC presented as Figure 27 in Draft EIS Annex IV.2 for Station CR-WC-MS-06 is presented in Figure 3. An analysis was completed to confirm that the base rating curve plotted for CR-WC-MS-06 matches the plotted line for the open water rating curve, as shown in Table 1. During the analysis, it was identified that there was a typographical error in the exponent of the rating curve where the correct exponent of "1.5500" was incorrectly stated as "2.5500" in the legend of Figure 27. The error was isolated to the figure presentation and did not represent the exponent value that was used in the analysis. In the example cited by the reviewer in the context to this IR, using the exponent value of 1.55 yields a discharge rate of 8.03 m^3/s at a water surface elevation of 97.4 m, which matches the discharge value on the figure.

Figure 3: Excerpt from Annex IV.2



OWRC = open water rating curve; Q = discharge (m^3/s); WSE = water surface elevation.

Figure 4: Completed Analysis for CR-WC-MS-06



2.3 Conclusion

The rating formulae referenced by the reviewer in part 1 of IR 75-R1 were analyzed, which confirmed the original analysis and presentation of results for CR-WC-MS-02. NexGen notes that the reviewer was correct that the formula did not match the OWRC for CR-WC-MS-06; this was due to an editorial error and did not affect the analysis. NexGen will make the appropriate correction in Figure 27 of Section 5.3.1.6 of revised EIS Annex IV.2 (Hydrometric Monitoring Report). No further changes to the EIS are required with regards to the OWRC applied to CR-WC-MS-02 or CR-WC-MS-06.

3 FIRT IR 75-R1 – Part 2

This section provides NexGen's response to IR 75-R1 – part 2.

3.1 Follow up Information Request

"*Provide an explanation for rating curve shifts that are not associated with data. Provide details on the monitoring strategy that will be utilized to deal with the unpredictable backwater effects that have led to frequent rating curve shifts. New data that supports the original rating curves should be presented in figures. If general rules on rating curve shifts have been developed, provide all relevant details*."

3.2 Key Context

In response to context provided by the reviewer in IR 75-R1, NexGen provides the following points of clarification:

- CR-WC-MS-06 is located on the Clearwater River above the Mirror River Confluence, at the downstream boundary of the Regional Study Area. It is not an inflow to Patterson Lake; rather, station CR-WC-MS-02 is located on the Clearwater River above Patterson Lake and is a critical inflow to Patterson Lake.
- Three paired measurements (i.e., both water surface elevation and discharge measured at the same place and time) were collected in 2019 at CR-WC-MS-02 in May, June, and October and were used to support the rating curve shifts in the EIS.

Water surface elevation values were converted to stage values by subtracting a consistent offset (i.e., stage datum) at each hydrometric station; the stage datum was generally a value slightly below the minimum bed elevation at the watercourse so that stage values were always positive and representative of the maximum water depth across the watercourse. Stage was related to discharge using an empirical equation referred to as the OWRC, developed based on sets of manual stage and discharge measurements at each station.

As described in Section 4.5.2.1 of Draft EIS Annex IV.2, rating curves were developed in Aquarius software and following guidance in WSC (2016). At several stations, stage-shifts were applied to correct the base rating curve to the value of stage-discharge points that were at least 0.003 m above (or less frequently, below) the curve. Several stations experienced seasonal backwater due to aquatic vegetation growth in the channel in the summer months or due to ice in the channel or downstream, and a few stations were occasionally backwatered by downstream waterbodies, particularly when lake water levels increased. Negative shift values indicate backwater conditions when the stage is higher for a given discharge. Stage-shifts were applied for most field visits, though not for the stage-discharge points that defined the base rating curve, which had no shift applied. Stage-shifts were also occasionally applied between field visits at transitions such as before and after spring thaw or when backwater conditions were increasing (e.g., prior to documentation of aquatic vegetation growth or beaver dams downstream of a station, as water levels rose in downstream waterbodies).

3.3 Analysis and Response

3.3.1 Regarding Rating Curve Shifts Not Associated with Data

Shifts are typically timed with field visits or other known events that cause the stage-discharge pair to deviate from the rating curve (e.g., ice formation and ablation). Stage-shifts were occasionally applied between field visits when no specific data point was available at transitions such as before and after spring thaw or when

backwater conditions were increasing (e.g., prior to documentation of aquatic vegetation growth or beaver dams downstream of a station, as water levels rose in downstream waterbodies).

Both CR-WC-MS-02 and CR-WC-MS-06 are backwatered by downstream waterbodies, particularly during prolonged wet periods when water levels are increased. CR-WC-MS-06 also experiences complex rating conditions due to seasonal backwater caused by aquatic vegetation and ice. In the case of CR-WC-MS-02, at the inflow to Patterson Lake, stage shifts were informed by paired stage-discharge measurements and continuous water level monitoring in Patterson Lake.

3.3.2 Regarding Monitoring Strategy

The monitoring strategy applied in recent years includes a combination of remote sensing data, automated instrumentation, and field visits to inform rating curve shifts to deal with variable backwater effects. Remote sensing information is used to provide insight into seasonal changes to ice conditions in the reaches of the Clearwater River; automated instrumentation, including hydrometric stations equipped with satellite communications, provide real time data on water temperature and water level; and periodic field visits provide additional paired measurements of stage and discharge at critical times of the year.

The monitoring strategy adopted for baseline data collection and currently ongoing monitoring includes the following field visits:

- **Winter Hydrometric (February):** Mid-winter hydrometric monitoring in February to inform over-winter rating curve shifts for stations that are safely accessible in winter with a focus on the outflow of Patterson Lake. This visit targets collecting paired measurements of stage and discharge in mid-winter.
- **Late Winter Hydrometric Trip (mid-March):** Late winter hydrometric monitoring in March to inform over-winter rating curve shifts for stations that are safely accessible in winter with a focus on the outflow of Patterson Lake. This visit targets collecting paired measurements of stage and discharge in late winter as ice conditions transition on the Clearwater River below Patterson Lake.
- **Open Water Hydrometric Trip #1**: The purpose of this trip is for post-winter maintenance inspection, installation of seasonal instrumentation, and observation of spring freshet conditions. This trip is completed in the second week of June to target all hydrometric stations, activate seasonal hydrometric stations, complete post-winter maintenance inspections, and collect measurements of the receding spring freshet as soon as ice-free conditions are present on Broach Lake, Patterson Lake, Beet Lake, and Naomi Lake.
- **Open Water Hydrometric Trip #2**: This trip is completed in the first week of July to target all hydrometric stations during summer conditions. The purpose of this trip is for maintenance intervention acting on the findings of the spring maintenance inspection and observation of midsummer conditions when vegetation is fully developed.
- **Open Water Hydrometric Trip #3**: This trip is completed in the final week of September to target all hydrometric stations during fall conditions and to remove seasonal stations. The purpose of this trip is for seasonal maintenance and observation of fall conditions when vegetation has senesced.

3.3.3 Regarding Rules on Rating Curve Shifts including all Relevant Details

Backwater can cause discharge to be overestimated for a given stage value. There is more uncertainty in the results at certain streamflow stations that experienced, or were inferred to have had, backwater conditions during the open-water periods. All streamflow stations experience backwater during ice-covered conditions. Stations with noted potential for backwater conditions included:

- Observations of dense aquatic vegetation in the channel at CR-WC-MS-06 and CR-WC-TI-02.
- Observed or inferred conditions during ice-covered periods at all the streamflow stations.
- Due to the low gradients in this area, the location of tributary inflow stations near the confluence with the Clearwater River and/or upstream of its waterbodies causes increased uncertainty for the monitoring periods between field measurements (e.g., CR-WC-MS-02 is located upstream of Patterson Lake and was backwatered as lake levels increased in 2020; CR-WC-MS-06 can be influenced by the Mirror River downstream).

Backwater effects are alleviated using frequent (i.e., seasonally distributed five times per year; Section 3.3.2) field measurements of coincident stage and discharge, which allow the base stage-discharge curves (unaffected by backwater) to be shifted upward to provide a more correct derived discharge. Hydrometric monitoring for this program included frequent measurements at key locations such as along the Clearwater River main stem in the local study area, which improves confidence in the results and reduces uncertainty. Stage-shifts are a method used to improve the discharge data derived from the stage-discharge rating curves. Stage-shifts were used for the stage-discharge paired measurements in which the stage was 5% above or below the rating curves (WSC 2012, 2016). Typically, the magnitude of negative stage-shifts varies based on the degree of vegetation growth, ice effects, and/or downstream water conditions. In general, shifts are used during open water conditions, but on occasion, a shift is required to correct for ice conditions during winter. Positive stage-shifts are required during spring freshet when there are high flow velocities and during other flood conditions and gradually returns to the base curve as velocities return to normal.

3.3.4 Regarding New Data that Supports the Original Rating Curves Should be Presented in Figures

Rating curves have developed over time and the rating curves at the hydrometric stations used for calibration and validation of the Regional Hydrological Model were improved in 2021 and 2022 with the collection of additional baseline data. Section 4 of this memorandum provides detail on comparison of the revised data to the data presented in Draft EIS Annex IV.2.

3.4 Conclusion

The rating conditions at some stations are complex and, in some cases, subject to variable backwater from waterbodies. Additional monitoring and rules on rating curves shifts have improved the fit and basis for continuous discharge records. The implications of new data on rating performance are presented in Section 4.

4 FIRT IR 75-R1 – Part 3

This section provides NexGen's response to IR 75-R1 – part 3.

4.1 Follow up Information Request

"*Provide details on where and how data derived from rating curves (i.e. the continuous discharge values for CR-WC-MS-01 to 06) are used in the hydrological model in the draft EIS Appendix 9A. Describe how the seasons with the most variable rating curve shifts (i.e. summer and fall) could be affected by this uncertainty.*"

4.2 Key Context

The follow-up information request relates to the rating curves developed as part of baseline hydrometric monitoring and specifically whether an update to the rating curves to include additional monitoring in the years since 2020 would lead to changes in regional hydrological modelling and how that might propagate to subsequent models.

The rating curves presented in Draft EIS Annex IV.2 are for converting continuous measurements of water surface elevation at the hydrometric station to discharge. The rating curves presented in Section 5.3 of Draft EIS Annex IV.2 were not used in the Regional Hydrological Model (Draft EIS Appendix 9A [Hydrological Modelling Summary Report]) as the hydrological model does not calculate flows from watercourse water level using a rating curve for riverine sections. Rather, the hydrological model calculated change in lake storage based on a daily net balance of tributary inflows, rainfall and snowmelt inputs, lake evaporation losses, groundwater exchange, and lake outflow. The tributary inflows to each lake were estimated from both the terrestrial landscape and runoff routed from upstream waterbodies, accounting for physical hydrological processes active in the contributing watershed. Rating curves were only used in the model at lake outflows as discussed in Section 9A3.7 of Draft EIS Appendix 9A. Therefore, the rating curve equations presented in Section 5.3 of Draft EIS Annex IV.2 were not directly used in the modelling for the Draft EIS. However, the observed discharge hydrographs presented in Draft EIS Annex IV.2 were used for the purposes of model calibration at CR-WC-MS-06. The assessment of model calibration is provided in Section 9A3.8 of Draft EIS Appendix 9A. Rating curves at the hydrometric stations used for calibration and validation of the Regional Hydrological Model were improved in 2021 and 2022 with the collection of additional data. The updated rating curves allowed for the derivation of updated continuous measured discharge record over the calibration period, which may change the calibration performance.

4.3 Analysis and Response

As referenced in Figure 5, Figure 6, Figure 7, and Figure 8, an assessment was completed to evaluate the changes to the rating curve in 2021 and 2022 and adjustments to resultant hydrographs on the assessment of the calibrated model performance at the model evaluation nodes used in the Draft EIS. The model nodes used in the Draft EIS for evaluation were those with sufficient observed data to support quantitative performance evaluations and the most important to supporting quantitative assessment of Project effects and cumulative effects.

Figure 5: Comparison of Measured Discharge and Continuous Discharge Developed using the Draft EIS Rating Curves and the 2022 Rating Curve at the Clearwater River below Broach Lake (CR-WS-MS-01)

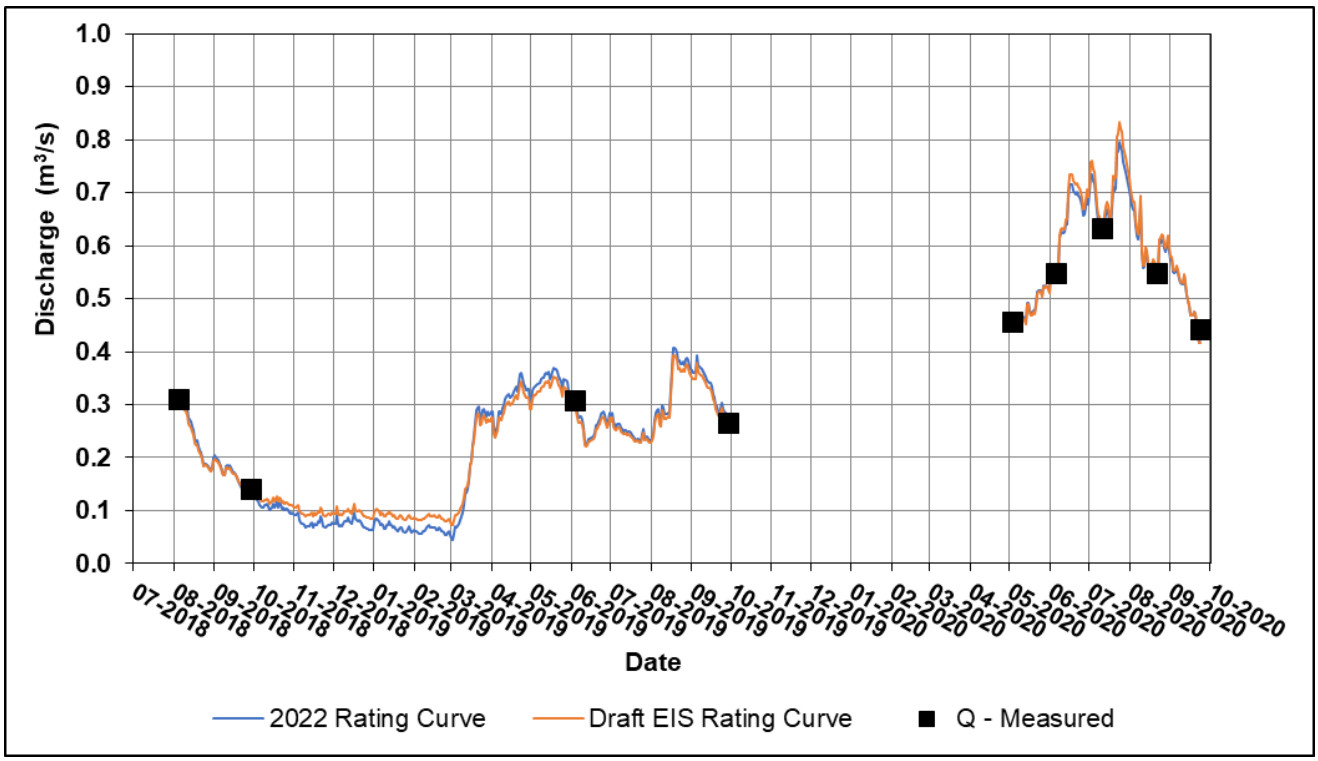


Figure 6: Comparison of Measured Discharge and Continuous Discharge Developed using the Draft EIS Rating Curves and the 2022 Rating Curve at the Clearwater River above Patterson Lake (CR-WS-MS-02)

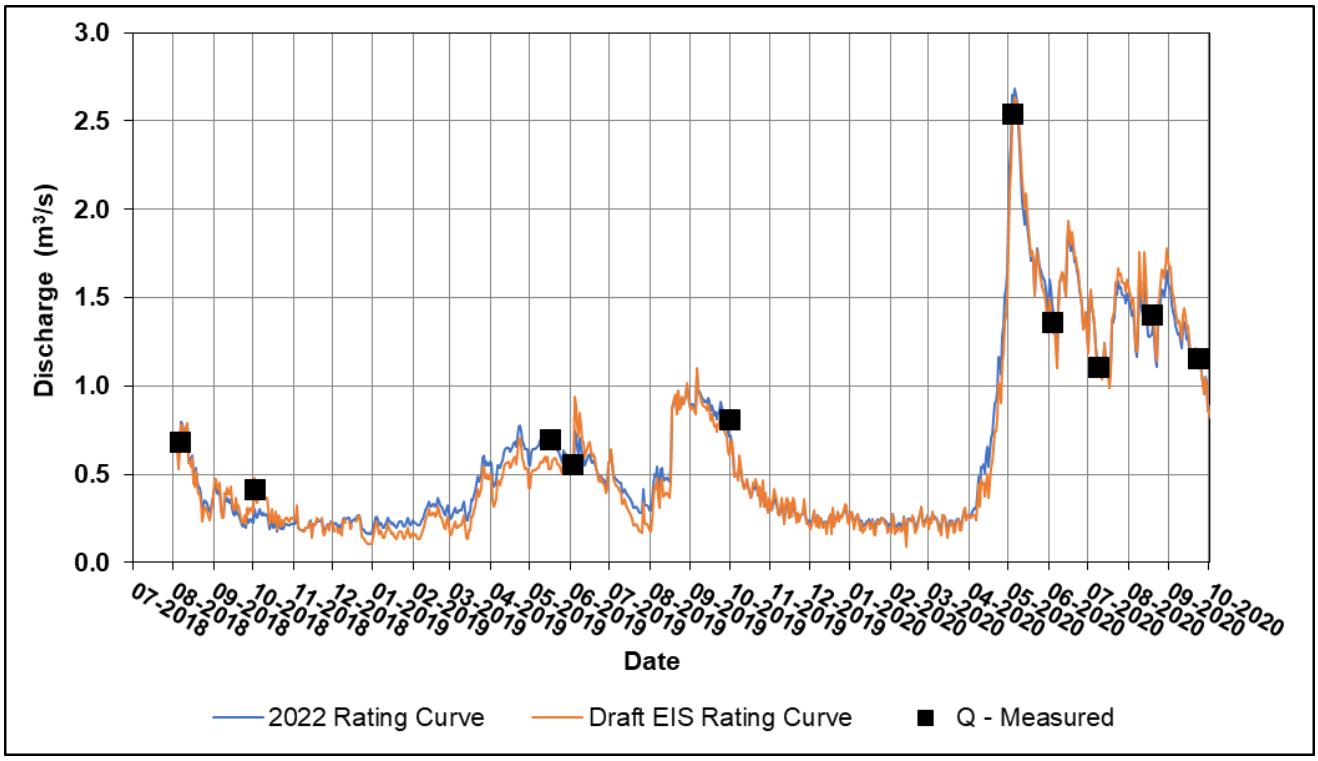


Figure 7: Comparison of Measured Discharge and Continuous Discharge Developed using the Draft EIS Rating Curves and the 2022 Rating Curve at the Clearwater River below Patterson Lake (CR-WS-MS-03)

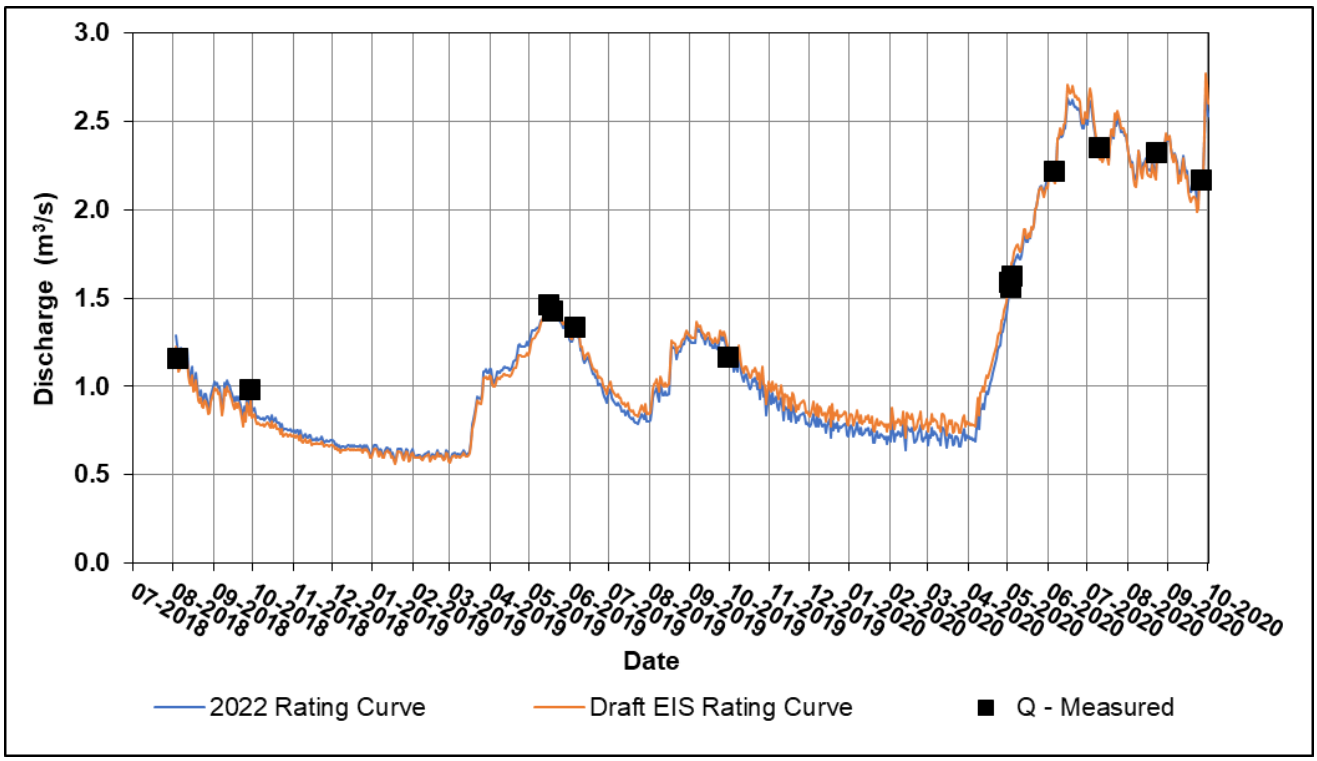
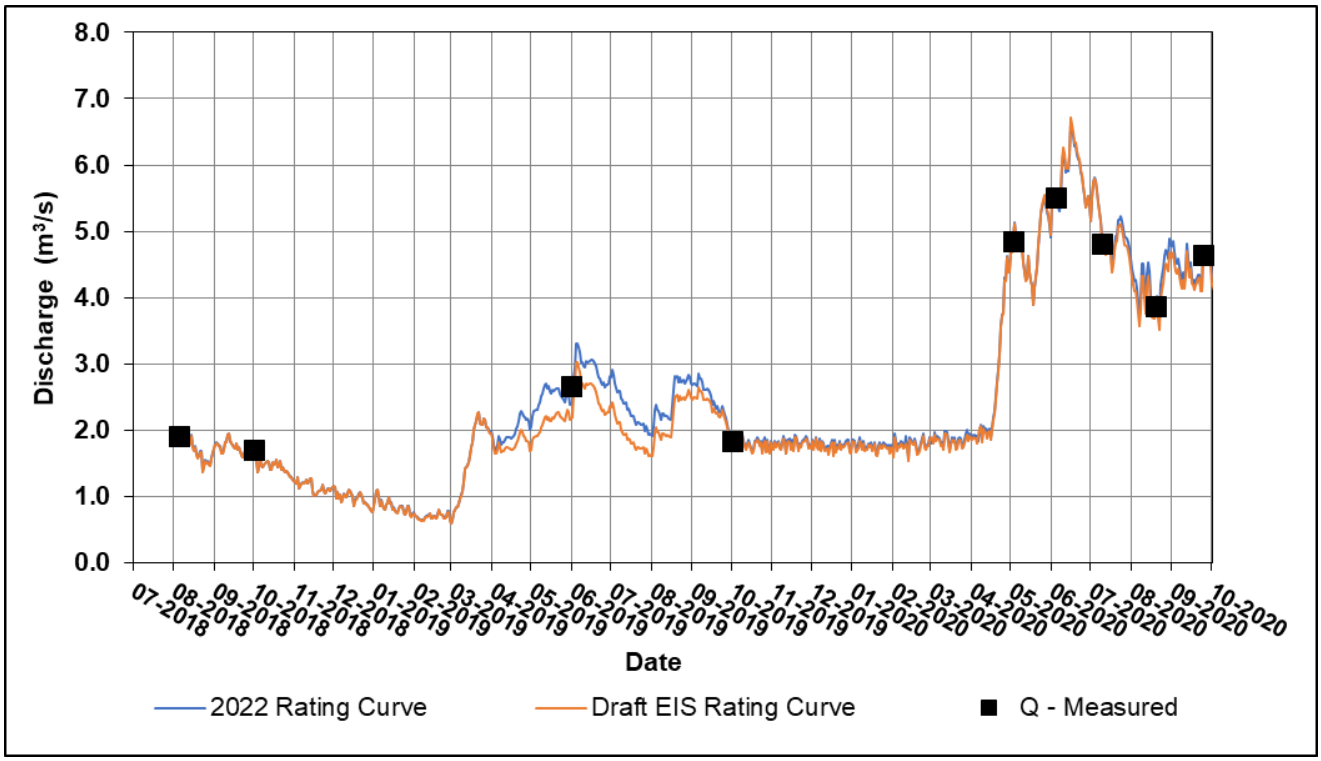


Figure 8: Comparison of Measured Discharge and Continuous Discharge Developed using the Draft EIS Rating Curves and the 2022 Rating Curve at the Clearwater River below Beet Lake (CR-WS-MS-04)



The evaluation of calibration performance of the Draft EIS hydrological model is summarized in Table 1. The model nodes used for evaluation were those with sufficient observed data to support quantitative assessment of the Regional Hydrological Model performance and those stations that were most important for quantitative assessment of Project effects and cumulative effects (i.e., inflows to and outflows from Patterson Lake). The effect of updated rating curves on calibrated model performance was evaluated by comparing calibration results using hydrographs developed using the Draft EIS rating curves and calibration results using hydrographs developed using the updated 2022 rating curves. The comparison adopted the same set of quantitative metrics and calibration period as used in the Draft EIS.

The calibration results presented in Draft EIS Appendix 9A are shown in Table 1 (reproduced from Table 9A-11 of Draft EIS Appendix 9A). The calibration results based on the updated 2022 rating curves are presented in Table 2. An evaluation of change for each performance metric is provided in Table 3. Results indicate a marginal decrease in calibration performance; however, the changes to performance metrics are small or negligible in magnitude and do not impact the overall rating. For the evaluation node CR-WC-MS-03, the decrease of Nash-Sutcliffe efficiency from 0.76 to 0.72 changed the performance rating of “Very Good” to “Good.” For all other evaluation nodes, the performance rating remained unchanged.

The influence of the updated rating curves and hydrographs on the performance of the model-simulated water relative to the observed or estimated water yield from the hydrometric monitoring program varied by station. Annual water yield simulation improved at the Clearwater River above Patterson Lake (CR-WC-MS-03) and remained relatively unchanged at the three other evaluation nodes, leading to a small improvement overall.

Table 1: Quantitative Summary of Calibration Results at the Model Evaluation Nodes – Draft EIS Rating Curves

Station	Δ_{mean} (m^3/s)	NRMSE	R	NSE	Performance Rating
CR-WC-MS-01	0.04	0.26	0.92	0.70	Good
CR-WC-MS-02	0.16	0.46	0.78	0.72	Good
CR-WC-MS-03	0.10	0.13	0.92	0.76	Very good
CR-WC-MS-04	0.46	0.21	0.85	0.63	Satisfactory

Δ_{mean} = mean residual, NRMSE = normalized root mean square error, R = correlation coefficient, NSE = Nash Sutcliffe efficiency.

Note: The performance ratings adapted for evaluating calibration were as follows: an NSE less than 0.50 is considered unsatisfactory, an NSE between 0.50 and 0.65 is considered satisfactory, an NSE between 0.65 and 0.75 is considered good, and an NSE greater than 0.75 is considered very good (Moriasi et al. 2007). An NSE of 1 would correspond to a perfect match of modelled discharge and observed data.

Table 2: Quantitative Summary of Calibration Results at the Model Evaluation Nodes – 2022 Rating Curves

Station	Δ_{mean} (m^3/s)	NRMSE	R	NSE	Performance Rating
CR-WC-MS-01	0.04	0.27	0.89	0.74	Good
CR-WC-MS-02	0.16	0.40	0.77	0.70	Good
CR-WC-MS-03	0.10	0.15	0.86	0.72	Good
CR-WC-MS-04	0.55	0.23	0.82	0.60	Satisfactory

Δ_{mean} = mean residual, NRMSE = normalized root mean square error, R = correlation coefficient, NSE = Nash Sutcliffe efficiency.

Note: The performance ratings adapted for evaluating calibration were as follows: an NSE less than 0.50 is considered unsatisfactory, an NSE between 0.50 and 0.65 is considered satisfactory, an NSE between 0.65 and 0.75 is considered good, and an NSE greater than 0.75 is considered very good (Moriasi et al. 2007). An NSE of 1 would correspond to a perfect match of modelled discharge and observed data.

Table 3: Evaluation of Change due to Updating Rating Curves and Associated Hydrographs

Station	Δ_{mean} (m^3/s)	NRMSE	R	NSE	Performance Rating
CR-WC-MS-01	No Change	Marginal decrease in performance	Small decrease in performance	Marginal increase in performance	Good
CR-WC-MS-02	No Change	Marginal increase in performance	Negligible change in performance	Marginal decrease in performance	Good
CR-WC-MS-03	No Change	Marginal decrease in performance	Small decrease in performance	Marginal decrease in performance	Changes from "Very Good" to "Good"
CR-WC-MS-04	Overall increase to average residual	Marginal decrease in performance	Small decrease in performance	Marginal decrease in performance	No change

Δ_{mean} = mean residual; NRMSE = normalized root mean square error; R = correlation coefficient; NSE = Nash Sutcliffe efficiency.

Note: The performance ratings adapted for evaluating calibration were as follows: an NSE less than 0.50 is considered unsatisfactory, an NSE between 0.50 and 0.65 is considered satisfactory, an NSE between 0.65 and 0.75 is considered good, and an NSE greater than 0.75 is considered very good (Moriasi et al. 2007). An NSE of 1 would correspond to a perfect match of modelled discharge and observed data.

4.4 Conclusion

The purpose of the hydrology assessment for the Draft EIS is to establish effects on hydrology as an intermediate component and provide information to support other valued component (VC) assessments. This assessment has shown that although additional information has been gained in recent years, an update to the baseline hydrometric monitoring station rating curves with new information would not result in a meaningful change to the Regional Hydrology Model used for the Draft EIS nor to the other models that depend on it. Therefore, updates to the Regional Hydrological Model or subsequent models are not required for the revised EIS.

As part of ongoing monitoring, the rating curves used in the Draft EIS have been updated with additional monitoring data collected in 2021 and 2022. The updated rating curves change the daily observed discharge hydrographs used for model calibration and evaluation of calibration performance. However, the updates made to rating curves and hydrographs based on additional data collected in 2021 and 2022 do not result in a material change in performance of the Regional Hydrological Model. The resulting changes to the observed hydrographs are not of a magnitude that impacts model calibration, hydrological model simulation results for baseline conditions, or the hydrological effects assessment, nor do they propagate to other subsequent models. The calibration used in the Draft EIS remains acceptable for describing the hydrological conditions in the spatial domain of the model, even when considering updated hydrometric monitoring data collected to 2022.

Overall, the understanding of regional hydrology will continue to improve over time; however, the baseline data adopted for the Draft EIS to support effects assessment remains an appropriate representation of regional hydrological conditions. Implementation of the Environmental Protection Program and Environmental Monitoring Plan would provide the necessary data to manage potential residual effects on hydrology and verify the effectiveness of Project mitigation measures. Monitoring would also address residual uncertainty by following up on baseline data collected to verify the prediction of minimal changes in water flows and levels during the Project lifespan.

5 References

Moriasi DN, Arnold JG, Van Liew MW, Bingner RL, Harmel RD, Veith TL. 2007. Model Evaluation Guidelines for Systematic Quantification of Accuracy in Watershed Simulations. Transactions of the American Society of Agricultural and Biological Engineers. Vol. 50(3): 885-900.

WSC (Water Survey of Canada) 2012. Hydrometric Manual Data Computations. qSOP-NA037. Water Survey of Canada, Environment Canada. 114p.

WSC. 2016. Hydrometric Manual – Data Computations: Stage-discharge Model Development and Maintenance. qSOP-NA049-01-2016. Water Survey of Canada, Environment Canada. 40p.

Attachment IR 83-R1

Table 1: Radionuclide Bioaccumulation Factors and Dose Coefficients

Radionuclide	Biv (L/kg)	DCF External (Gy/y)/(Bq/kg)	DCF Internal (Gy/y)/(Bq/kg)
Pb-210	3.00E+02	2.15E-06	5.47E-04
Po-210	5.00E+02	4.30E-11	5.40E-04
Th-230	8.00E+01	7.19E-08	4.80E-04

Biv = bioaccumulation factor; DCF = dose conversion factor.

Table 2: Radionuclide Sum of Fractions

Radionuclide	Concentration at Edge of ETP RMZ (Table 10.5-4 of Draft EIS) (Bq/L)	Selected Benchmark (Bq/L)	Source	Sum of Fractions
Pb-210	2.6	2.20E+01	BCG RESRAD-BIOTA	1.18E-01
Po-210	0.044	1.35E+01	BCG RESRAD-BIOTA	3.26E-03
Th-230	0.085	9.51E+01	BCG RESRAD-BIOTA	8.94E-04
Ra-226	0.023	0.11	ENV	2.09E-01
Summed				3.31E-01

ETP = effluent treatment plant; RMZ = regulated mixing zone; EIS = Environmental Impact Statement.

Attachment IR 111-R1, 121-R1, 207-R1, and 270-R1

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Attachment IR 111-R1, 121-R1, 207-R1, and 270-R1

1 Introduction

NexGen Energy Ltd. (NexGen) is proposing to develop a new uranium mining and milling operation in northwestern Saskatchewan, called the Rook I Project (Project). The proposed Project is subject to both provincial and federal Environmental Assessment (EA) processes, would be licensed as a nuclear facility by the Canadian Nuclear Safety Commission (CNSC), and would be subject to various provincial and federal permits and approvals.

NexGen submitted a Draft Environmental Impact Statement (EIS) to the Saskatchewan Ministry of Environment (ENV) and CNSC in 2022. Through the technical review of the Draft EIS, NexGen received information requests (IRs) and advice to proponent comments from the Federal-Indigenous Review Team (FIRT), which is led by the CNSC. Results of the FIRT technical review were provided in two Annexes; Annex 1 was composed of IRs and Annex 2 was composed of advice to proponent comments for NexGen's response. In September 2023, NexGen provided detailed responses to the FIRT IRs and advice to proponent comments.

On 12 February 2024, the CNSC provided the results of their review of NexGen's IR and advice to proponent comment responses. The IRs were categorized by the CNSC as accepted (i.e., requiring no additional response), not accepted with the technical approach deemed acceptable by the CNSC and the IR indicated as being able to be resolved once a revised EIS is provided by NexGen, or not accepted with additional response required by NexGen. For the IRs that were not accepted with additional response required, a second round of follow-up IRs were provided by the CNSC.

Attachment IR 111-R1, 121-R1, 207-R1, and 270-R1 provides supporting information for NexGen's responses to IR 111-R1, 121-R1, 207-R1, and IR 270-R1. Table 1 summarizes general mitigation measures for wildlife species at risk (SAR) and migratory birds that would be implemented through the Environmental Protection Program and supporting documents during Construction, Operations, and Closure. The mitigation measures shown in Table 1 may also be found in Table 14.4-1 of revised EIS Section 14.4 (Project Interactions and Mitigations) and revised EIS Appendix 23A (Summary of Project Environmental Design Features and Mitigation Measures). In addition to the general mitigation measures shown in Table 1, Table 2 provides species-specific mitigation measures; these mitigation measures will form part of the Project Environmental Protection Program and supporting documents.

Table 1: Proposed General Mitigation Measures for Wildlife Species at Risk and Migratory Birds

Species	Presence in the RSA Confirmed by Baseline Surveys[a]	Provincially Tracked[b]	Federally Listed (Schedule 1, SARA)[c]	Proposed Mitigation Measure
All wildlife species at risk	n/a	n/a	n/a	General mitigation measures for species at risk include the following: ▪ Limit the Project footprint to the extent practical using practices such as: o optimizing the use of cleared areas for Project activity; o using existing road infrastructure, including the existing access road and bridge crossing; o storing tailings underground; o designing an efficient infrastructure footprint (i.e., buildings clustered together); and o align the fibre optic line right-of-way adjacent to the existing highway and access road. ▪ Reduce sensory disturbance through the following measures: o Where practical, maintain overflight altitudes of >300 m above ground level. o Enclose or dampen equipment in process buildings where the total sound power level is expected to be more than approximately 80 A-weighted decibels, where feasible. o Limit idling of vehicles and equipment to the extent practical. o Limit light pollution to the extent practical for built infrastructure. ▪ Reduce air emission effects via inhalation through the following measures: o Apply water and/or suppressants to site roads, the access road, and airstrip as necessary. Dust suppressants would minimize environmental risk and be government approved for use. o Limit vehicle speed on unpaved roads to reduce fugitive dust during Construction and Operations. ▪ To avoid and limit attraction of wildlife to the Project site: o Implement a Project-specific Conventional Waste Management Plan. o Collect domestic (e.g., food) and industrial (e.g., used oil and lubricants) waste and temporarily store in wildlife-proof containers, incinerate on site, transport off site for recycling, or dispose of at a licensed disposal facility, as appropriate. ▪ Implement sedimentation and erosion control best practices and standard mitigation (e.g., temporary sediment ponds, silt curtains, sediment traps) during all Project phases. ▪ To the extent practical, skirt buildings and stairs to the ground to limit opportunities for use as shelter by wildlife. ▪ Implement progressive reclamation and revegetation of disturbed areas no longer required. ▪ Reclaim and revegetate disturbed areas where non-permanent Project facilities have been decommissioned. ▪ Implement an Environmental Protection Program that includes no harassing, feeding, or approaching wildlife. ▪ Implement a Project-specific Environmental Protection Program, which includes the following mitigation measures to minimize the risk of injury or mortality to people and wildlife: o advising staff, contractors, and visitors to take all reasonable precautions to avoid wildlife collisions; o providing wildlife with the right of way; o identifying wildlife use areas and movement corridors/crossings along the access road and providing appropriate signage in high wildlife use areas (including consideration of Canadian toad); o maintaining gaps in the road berms and snowbanks to facilitate wildlife crossing and escape routes; o stopping and reporting/communicating when wildlife is observed on or adjacent to the road and allow animals to move away before continuing to drive; o reporting any wildlife collisions observed along any road immediately; and

Species	Presence in the RSA Confirmed by Baseline Surveys[a]	Provincially Tracked[b]	Federally Listed (Schedule 1, SARA)[c]	Proposed Mitigation Measure
				○ adjusting speed limit in accordance with conditions (e.g., wildlife use of road, road conditions, grade, weather, and loads on vehicle). ▪ Implement an Environmental Protection Program with restricted activity periods to limit effects on denning animals and nesting migratory birds during sensitive time periods (e.g., per Nesting Zone B6 [ECCC 2018] guidelines and the Migratory Birds Convention Act 1994). If sensitive periods cannot be avoided, pre-clearing wildlife sweeps will be completed by qualified professionals and buffers applied, as required. ▪ If sensitive species are confirmed in the Project footprint, apply activity restriction guidelines for sensitive species established by the Government of Saskatchewan (2017) to the Project, as required. ▪ If in specific situations where the setback distance(s) cannot practically be applied, contact the ENV early in the planning stage to minimize effects on sensitive species. Species at risk mitigation measures specific to contact water management ponds include: ▪ lined contact water ponds would either be fenced or fit with animal egress matting or ramps; ▪ implement a Project-specific Environmental Protection Program that would include process for wildlife and bird deterrents around contact water ponds (e.g., cannons, bangers, sonic guns), including prior to and during the nesting periods for Zone B6 (late April to mid August; ECCC 2018) and the northern and southern migration periods; ▪ conduct wildlife patrols regularly during waterbird nesting periods for Zone B6 (late April to mid-August; ECCC 2018) and the northern and southern migration periods to monitor effectiveness of deterrents and apply adaptive management, as necessary; and ▪ regular monitoring would be conducted to evaluate effectiveness of deterrents and water quality, and adaptive management would be applied, as necessary.
Migratory birds (including species at risk)	n/a	n/a	n/a	General mitigation measures that apply to migratory birds include the following: ▪ Design power lines to meet avian-safe standards in compliance with applicable laws, regulations, and permits to prevent electrocutions (e.g., cover jumper wires, conductors, and equipment), discourage perching and prevent collisions (e.g., install markers to enhance the visibility of lines in key movement corridors and staging areas). ▪ To minimize bird and bat collisions with the communication tower: ○ limit the tower lighting to only what is required for aviation safety (e.g., flashing light on the top of the tower); ○ minimize guy wires on the communication tower and install markers to enhance the visibility of any guy wires that may be required; and ○ follow avian-safe standards in compliance with applicable laws, regulations, permits, and best management practices to prevent electrocution (e.g., cover jumper wires, conductors, equipment) and avoid attraction by lights. ▪ Other than were required to comply with regulatory guidelines (e.g., aviation safety) or worker health and safety, the following guidance will be used for Project lighting design when migratory birds may be present: ○ limit the use of decorative lighting and solid burning or slow pulsing warning lights; ○ to the extent possible, orient lights downward or use shielded fixtures and limit light use to areas where Project activities are occurring (Dick 2016); ○ to the extent feasible, use the amber light [spectrum >500 nanometre], limit blue spectral light, and do not use white light, (Dick 2016); and ○ turn off lights when not in use (e.g., use timers, motion sensors) (Dick 2016). ▪ Do not allow hunting by employees in areas within the Project footprint.

Species	Presence in the RSA Confirmed by Baseline Surveys[a]	Provincially Tracked[b]	Federally Listed (Schedule 1, SARA)[c]	Proposed Mitigation Measure
				▪ Implement an Environmental Protection Program with restricted activity periods to limit effects on denning animals and nesting migratory birds during sensitive time periods (e.g., per Nesting Zone B6 [ECCC 2018] guidelines and the *Migratory Birds Convention Act 1994*). If sensitive periods cannot be avoided, pre-clearing wildlife sweeps will be completed by qualified professionals and buffers applied, as required. ▪ If bats or birds are observed nesting, roosting, or hibernating, do not disturb them, to the extent practicable. Contact the ENV and ECCC to discuss measures for the removal/relocation and to identify further measures that could prevent future access. Damage or danger permits may be obtained, if required. Migratory bird mitigation measures specific to contact water management ponds include: ▪ lined contact water ponds would either be fenced or fit with animal egress matting or ramps; ▪ implement a Project-specific Environmental Protection Program that would include process for wildlife and bird deterrents around contact water ponds (e.g., cannons, bangers, sonic guns), including prior to and during the nesting periods for Zone B6 (late April to mid August; ECCC 2018) and the northern and southern migration periods; and ▪ conduct wildlife patrols regularly during waterbird nesting periods for Zone B6 (late April to mid-August; ECCC 2018) and the northern and southern migration periods to monitor effectiveness of deterrents and apply adaptive management, as necessary.

a) Based on Annex VIII.1 (Wildlife Baseline Report [Mammals, Waterfowl, and Raptors]), Annex V.1 (Aquatic Environment Baseline Report), Annex VIII.2 (Wildlife Baseline Report 2 [Amphibians, Birds, and Bats]), and Annex VIII.3 (Wildlife Baseline Report [Bird Migration and Bats]).
b) Provincial rank definitions (SKCDC 2020; 2021): S1 = Critically Imperilled / extremely rare; S2 = Imperilled / very rare; S3 = Vulnerable / rare to uncommon; S4 = Apparently secure; S5 = Secure / Common; B = for a migratory species, rank applies to the breeding population in the province; M = for a migratory species, rank applies to the transient population in the province; N = for a migratory species, rank applies to the non-breeding population in the province; X = believed to be extinct or extirpated from the province; U = status is uncertain in Saskatchewan because of limited or conflicting information (unrankable); NR = rank is not yet assigned or species has not yet been assessed (not ranked).
c) Government of Canada 2023.
SARA = *Species at Risk Act*; ENV = Saskatchewan Ministry of Environment; ECCC = Environment and Climate Change Canada; n/a = not applicable.

Table 2: Proposed Specific Mitigation Measures for Wildlife Species at Risk

Species	Presence in the RSA Confirmed by Baseline Surveys[a]	Provincially Tracked[b]	Federally Listed (Schedule 1, SARA)[c]	Proposed Mitigation Measure
Woodland caribou (*Rangifer tarandus caribou*)	Confirmed[d]	S3	Threatened	▪ Develop and implement a Caribou Mitigation and Offsetting Plan. ▪ Avoid direct disturbance to wetlands, to the extent possible. ▪ Reduce vehicle-wildlife collisions by maintaining gaps in road berms and snowbanks to facilitate wildlife crossing and escape routes, incorporating road pull-outs at regular intervals when clearing snow, implementing speed limits, and providing appropriate signage in high wildlife use areas. ▪ Design above-ground infrastructure so that the need for wildlife crossing structures is minimized. ▪ Install a gate at the site entrance (i.e., gatehouse) to control public access. ▪ The general mitigation measures for species at risk as described in Table 1 would apply.
Barren-ground caribou (*Rangifer tarandus groenlandicus*)	Potential (winter)	S3N	n/a	▪ Collar data suggest that the winter ranges of barren-ground caribou do not currently overlap with the Patterson Lake area. In addition, much of the LSA has been burned by wildlife fire in the last 40 years and barren-ground caribou would be expected to avoid the Patterson Lake area resulting in little to no interaction with the Project (Draft EIS Section 14.2.2 [Valued Components, Measurement Indicators, and Assessment Endpoints]). If barren-ground caribou return to the Patterson Lake area during the Project lifespan, the mitigation measures implemented for woodland caribou would be expected to also avoid and limit effects to barren-ground caribou. The general mitigation measures for species at risk as described in Table 1 would apply.
Wolverine (*Gulo gulo*)	Potential	S2	Special Concern	▪ If vegetation removal needs to occur during early January to late March, implement pre-clearing wildlife sweeps for wolverine dens. If wolverine dens are detected, avoid clearing activities within 750 m of the dens (as per grizzly bear den setbacks in Government of Alberta 2024) from early October to late April. If sites cannot be avoided, consult the ENV or ECCC, as applicable. ▪ Reduce vehicle-wildlife collisions by maintaining gaps in road berms and snowbanks to facilitate wildlife crossing and escape routes, incorporating road pull-outs at regular intervals when clearing snow, implementing speed limits, and providing appropriate signage in high wildlife use areas. ▪ Design above-ground infrastructure so that the need for wildlife crossing structures is minimized. ▪ Implement a Project-specific Conventional Waste Management Plan to avoid and limit attraction of wolverine to the site. ▪ To the extent practical, skirt buildings and stairs to the ground to limit opportunities for use as shelter by wolverine. ▪ The general mitigation measures for species at risk as described in Table 1 would apply.
Little brown myotis (*Myotis lucifugus*)	Confirmed[d]	S4B, S4N	Endangered	▪ Avoid clearing maternity roost habitat, to the extent possible, during the bat maternity roosting period (early May to late August). If vegetation removal needs to occur during maternity roosting period, implement pre-clearing wildlife sweeps for maternity trees. If maternity roosts are detected, avoid construction activities within 500 m of roosts, year-round (Government of Saskatchewan 2017). If sites cannot be avoided, consult the ENV or ECCC, as applicable. ▪ If bats are observed roosting or hibernating, do not disturb them, to the extent practicable. Contact the ENV and ECCC to discuss measures for the bats' removal/relocation and to identify further measures that could prevent future access. ▪ Minimize the use of guy wires to reduce the risk of bat collisions. ▪ For worker protection and prevention of the spread of rabies and white nose syndrome, contact the ENV and ECCC if any sick, injured, or dead bats are observed. Only trained and rabies-vaccinated staff or contractors would be allowed to handle bats. Submit bat carcasses for testing of rabies and/or white nose syndrome, as appropriate, based on communications with the ENV and ECCC.

Species	Presence in the RSA Confirmed by Baseline Surveys[a]	Provincially Tracked[b]	Federally Listed (Schedule 1, SARA)[c]	Proposed Mitigation Measure
				▪ The general mitigation measures for species at risk as described in Table 1 would apply.
Northern myotis (*Myotis septentrionalis*)	Confirmed[d]	S3	Endangered	▪ Avoid clearing maternity roost habitat, to the extent possible, during the bat maternity roosting period (early May to late August). If vegetation removal needs to occur during maternity roosting period, implement pre-clearing wildlife sweeps for maternity trees. If maternity roosts are detected, avoid construction activities within 500 m of roosts, year-round (Government of Saskatchewan 2017). If sites cannot be avoided, consult the ENV or ECCC, as applicable. ▪ If bats are observed roosting or hibernating, do not disturb them, to the extent practicable. Contact the ENV and ECCC to discuss measures for the bats' removal/relocation and to identify further measures that could prevent future access. ▪ Minimize the use of guy wires to reduce the risk of bat collisions. ▪ For worker protection and prevention of the spread of rabies and white nose syndrome, contact the ENV and ECCC if any sick, injured, or dead bats are observed. Only trained and rabies-vaccinated staff or contractors would be allowed to handle bats. Submit bat carcasses for testing of rabies and/or white nose syndrome, as appropriate, based on communications with the ENV and ECCC. ▪ The general mitigation measures for species at risk as described in Table 1 would apply.
Pileated woodpecker (*Dryocopus pileatus*)	Potential	S3	n/a	▪ Pileated woodpecker nesting cavities must be registered in the Abandoned Nest Registry and be confirmed to not be used by any migratory bird species for 36 months before the tree with the nesting cavity can be removed (ECCC n.d.). If sites cannot be avoided, consult the ENV or ECCC, as applicable. ▪ The general mitigation measures for species at risk as described in Table 1 would apply. Note: Pileated woodpecker was not detected during baseline field surveys. However, surveys for active and inactive pileated woodpecker nests will be completed prior to vegetation removal in the limited areas of the Project footprint that contain habitats that have potential to support pileated woodpecker nests (i.e., deciduous and mixedwood forests with large diameter deciduous trees; approximately 2.1 ha).
Common nighthawk (*Chordeiles minor*)	Confirmed[d]	S4B, S4M	Special Concern	▪ Avoid vegetation clearing, where possible, during the migratory bird nesting period (early May to late August). If vegetation clearing occurs during the common nighthawk breeding season (early May to late August), avoid activities within 200 m of active nests (Government of Saskatchewan 2017). If sites cannot be avoided, consult the ENV or ECCC, as applicable. ▪ If active common nighthawk nests are found on mine roads, the airstrip, or mine and mill terrace areas, the nesting area will be identified and avoided to the extent possible. ▪ The general mitigation measures for species at risk as described in Table 1 would apply.
Olive-sided flycatcher (*Contopus cooperi*)	Confirmed[d]	S4B, S4M	Special Concern	▪ Avoid vegetation clearing, where possible, during the migratory bird nesting period (early May to late August). If vegetation clearing occurs during breeding season, avoid construction activities within 300 m of active nests (Government of Saskatchewan 2017). The applicable nest setback buffer should be confirmed by a qualified avian biologist based on indicators such as alert and flush distances of birds at the nest. If sites cannot be avoided, the ENV or ECCC would be consulted, as applicable. ▪ The general mitigation measures for species at risk as described in Table 1 would apply.
Bank swallow (*Riparia riparia*)	Potential	S4B, S5M	Threatened	▪ Avoid vegetation clearing, where possible, during the migratory bird nesting period (early May to late August). If sites cannot be avoided, the ENV or ECCC would be consulted, as applicable. ▪ To deter bank swallows from nesting, maintain material stockpile slopes at a grade of less than 70 degrees (ECCC 2021).

Species	Presence in the RSA Confirmed by Baseline Surveys[a]	Provincially Tracked[b]	Federally Listed (Schedule 1, SARA)[c]	Proposed Mitigation Measure
				▪ The general mitigation measures for species at risk as described in Table 1 would apply.
Barn swallow (*Hirundo rustica*)	Confirmed[d]	S4B, S4M	Threatened	▪ Avoid vegetation clearing, where possible, during the migratory bird nesting period (early May to late August). If sites cannot be avoided, the ENV or ECCC would be consulted, as applicable. ▪ Minimize habitat creation and human-wildlife interactions for the Project through design; specifically, by evaluating opportunities to include screening on vents and entranceways to rafters/attics, keeping doors closed, tarping/wrapping structures, screening cracks/holes/vents where birds can enter, moving pallets and equipment close to the ground, and keeping heavy equipment free of mud. ▪ The general mitigation measures for species at risk as described in Table 1 would apply.
Rusty blackbird (*Euphagus carolinus*)	Confirmed[d]	S3B, SUN, S3M	Special Concern	▪ Avoid vegetation clearing, where possible, during the migratory bird nesting period (early May to late August). If sites cannot be avoided, the ENV or ECCC would be consulted, as applicable. ▪ Avoid direct disturbance to wetlands, to the extent possible. ▪ The general mitigation measures for species at risk as described in Table 1 would apply.
Common goldeneye (*Bucephala clangula*)	Confirmed[d]	S5B, S3N, S3M	n/a	▪ Avoid vegetation clearing, where possible, during the migratory bird nesting period (early May to late August). If vegetation clearing occurs during the breeding season, avoid construction activities near active nests. Nest setback buffer should be confirmed by a qualified avian biologist based on indicators such as alert and flush distances of birds at the nest. If sites cannot be avoided, the ENV or ECCC would be consulted, as applicable. ▪ Implement the use of bird deterrents (e.g., cannons, bangers, sonic guns) around contact water ponds during the northern and southern migration periods. ▪ Conduct wildlife patrols regularly during waterbird nesting periods (early May to late August) to monitor effectiveness of deterrents and apply adaptive management, as necessary. ▪ The general mitigation measures for species at risk as described in Table 1 would apply.
Red-throated loon (*Gavia stellata*)	Confirmed[d]	S1B, S1M	n/a	▪ Avoid vegetation clearing, where possible, during the migratory bird nesting period (early May to late August). If vegetation clearing occurs during the loon breeding season (mid-May to mid-July), avoid construction activities within at least 200 m of nests (Government of Saskatchewan 2017). If sites cannot be avoided, the ENV or ECCC would be consulted, as applicable. ▪ Implement the use of bird deterrents (e.g., cannons, bangers, sonic guns) around contact water ponds during the northern and southern migration periods. ▪ Conduct wildlife patrols regularly during waterbird nesting periods (early May to late August) to monitor effectiveness of deterrents and apply adaptive management, as necessary. ▪ The general mitigation measures for species at risk as described in Table 1 would apply.
Horned grebe (*Podiceps 7uratus*)	Confirmed[d]	S5B, S5M	Special Concern	▪ Avoid vegetation clearing, where possible, during the migratory bird nesting period (early May to late August). If vegetation clearing occurs during the breeding season, avoid construction activities within at least 200 m of active nests (Government of Saskatchewan 2017). The nest setback buffer should be confirmed by a qualified avian biologist based on indicators such as alert and flush distances of birds at the nest. If sites cannot be avoided, the ENV or ECCC would be consulted, as applicable. ▪ Implement the use of bird deterrents (e.g., cannons, bangers, sonic guns) around contact water ponds during the northern and southern migration periods. ▪ Conduct wildlife patrols regularly during waterbird nesting periods (late April to mid-August) to monitor effectiveness of deterrents and apply adaptive management, as necessary. ▪ The general mitigation measures for species at risk as described in Table 1 would apply.

Species	Presence in the RSA Confirmed by Baseline Surveys[a]	Provincially Tracked[b]	Federally Listed (Schedule 1, SARA)[c]	Proposed Mitigation Measure
Red-necked phalarope (*Phalaropus lobatus*)	Potential (migration)	S4B, S3M	Special Concern	▪ Avoid vegetation clearing, where possible, during the migratory bird nesting period (early May to late August). If sites cannot be avoided, the ENV or ECCC would be consulted, as applicable. ▪ Implement the use of bird deterrents (e.g., cannons, bangers, sonic guns) around contact water ponds during the northern and southern migration periods. ▪ Conduct wildlife patrols regularly during waterbird nesting periods (early May to late August) to monitor effectiveness of deterrents and apply adaptive management, as necessary. ▪ Avoid direct disturbance to wetlands, to the extent possible. ▪ The general mitigation measures for species at risk as described in Table 1 would apply.
Yellow rail (*Coturnicops noveboracensis*)	Potential	S3B, S3M	Special Concern	▪ Avoid vegetation clearing, where possible, during the migratory bird nesting period (early May to late August). If vegetation clearing occurs during the yellow rail breeding season (May 1 to July 15), avoid construction activities within 350 m of active nests (Government of Saskatchewan 2017). If sites cannot be avoided, the ENV or ECCC would be consulted, as applicable. ▪ Avoid direct disturbance to wetlands, to the extent possible. ▪ The general mitigation measures for species at risk as described in Table 1 would apply.
Whooping crane (*Grus americana*)	Potential (migration)	SXB, S1M	Endangered[e]	▪ Avoid vegetation clearing, where possible, during the migratory bird nesting period (early May to late August). If sites cannot be avoided, the ENV or ECCC would be consulted, as applicable. ▪ Implement the use of bird deterrents (e.g., cannons, bangers, sonic guns) around contact water ponds during the northern and southern migration periods. ▪ Avoid direct disturbance to wetlands, to the extent possible. ▪ The general mitigation measures for species at risk as described in Table 1 would apply.
Osprey (*Pandion haliaetus*)	Confirmed[d]	S2B, S2M	n/a	▪ Avoid vegetation clearing, where possible, during the migratory bird nesting period (early May to late August). If vegetation clearing occurs during the osprey breeding season (early May to mid-August), avoid construction activities within 1,000 m of active nests (Government of Saskatchewan 2017). If sites cannot be avoided, the ENV or ECCC would be consulted, as applicable. ▪ The general mitigation measures for species at risk as described in Table 1 would apply.
Peregrine falcon (*Falco peregrinus anatum*)	Potential (migration)	S1B, SNRM	Special Concern	▪ No species-specific applicable mitigation measures are proposed for peregrine falcon. The general mitigation measures for species at risk as described in Table 1 would apply. Note: no nesting habitat is available in the LSA.
Short-eared owl (*Asio flammeus*)	Potential	S3B, S2N, S3M	Special Concern	▪ Avoid construction activities within 500 m of short-eared owl nests during the breeding season (late March to early August) (Government of Saskatchewan 2017). If sites cannot be avoided, the ENV or ECCC would be consulted, as applicable. ▪ The general mitigation measures for species at risk as described in Table 1 would apply.
Great grey owl (*Strix nebulosa*)	Confirmed[d]	S3	n/a	▪ Avoid construction activities within 400 m of great grey owl nests during the breeding season (late March to early August) (Government of Saskatchewan 2017). If sites cannot be avoided, the ENV or ECCC would be consulted, as applicable. ▪ The general mitigation measures for species at risk as described in Table 1 would apply.
Northern leopard frog	Potential	S3	Special Concern	▪ Avoid construction activities within 500 m of northern leopard frog breeding and overwintering habitat year-round (Government of Saskatchewan 2017). If sites cannot be avoided, the ENV or ECCC would be consulted, as applicable.

Species	Presence in the RSA Confirmed by Baseline Surveys[a]	Provincially Tracked[b]	Federally Listed (Schedule 1, SARA)[c]	Proposed Mitigation Measure
(*Lithobates pipiens*)				▪ Avoid direct disturbance to wetlands, to the extent possible. ▪ The general mitigation measures for species at risk as described in Table 1 would apply.
Ashton cuckoo bumble bee (*Bombus bohemicus*)	Potential	S1	Endangered	▪ No species-specific applicable mitigation measures are proposed for Ashton cuckoo bumble bee. The general mitigation measures for species at risk as described in Table 1 would apply.
Yellow-banded bumble bee (*Bombus terricola*)	Potential	S4	Special Concern	▪ No species-specific applicable mitigation measures are proposed for yellow-banded bumble bee. The general mitigation measures for species at risk as described in Table 1 would apply.
Transverse lady beetle (*Coccinella transversoguttata*)	Potential	S4	Special Concern	▪ No species-specific applicable mitigation measures are proposed for transverse lady beetle. The general mitigation measures for species at risk as described in Table 1 would apply.
Nine-spotted lady beetle (Coccinella novemnotata)	Potential	S4	Endangered	▪ No species-specific applicable mitigation measures are proposed for nine-spotted lady beetle. The general mitigation measures for species at risk as described in Table 1 would apply.

a) Based on Annex VIII.1 (Wildlife Baseline Report [Mammals, Waterfowl, and Raptors]), Annex V.1 (Aquatic Environment Baseline Report), Annex VIII.2 (Wildlife Baseline Report 2 [Amphibians, Birds, and Bats]), and Annex VIII.3 (Wildlife Baseline Report [Bird Migration and Bats]). Confirmed = detected. Potential = not detected.

b) Provincial rank definitions (SKCDC 2020; 2021): S1 = Critically Imperilled / extremely rare; S2 = Imperilled / very rare; S3 = Vulnerable / rare to uncommon; S4 = Apparently secure; S5 = Secure / Common; B = for a migratory species, rank applies to the breeding population in the province; M = for a migratory species, rank applies to the transient population in the province; N = for a migratory species, rank applies to the non-breeding population in the province; X = believed to be extinct or extirpated from the province; U = status is uncertain in Saskatchewan because of limited or conflicting information (unrankable); NR = rank is not yet assigned or species has not yet been assessed (not ranked).

c) Government of Canada 2023.

d) Species confirmed in LSA (Annex VIII.1; Annex V.1; Annex VIII.2; Annex VIII.3).

e) Whooping crane is also listed as endangered under Saskatchewan's *The Wildlife Act.*

SARA = *Species at Risk Act*; ENV = Saskatchewan Ministry of Environment; ECCC = Environment and Climate Change Canada; n/a = not applicable.

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Attachment IR 199-R1

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Attachment IR 199-R1

1 Introduction

NexGen Energy Ltd. (NexGen) is proposing to develop a new uranium mining and milling operation in northwestern Saskatchewan, called the Rook I Project (Project). The proposed Project is subject to both provincial and federal Environmental Assessment (EA) processes, would be licensed as a nuclear facility by the Canadian Nuclear Safety Commission (CNSC), and would be subject to various provincial and federal permits and approvals.

NexGen submitted a Draft Environmental Impact Statement (EIS) to the Saskatchewan Ministry of Environment (ENV) and CNSC in 2022. Through the technical review of the Draft EIS, NexGen received information requests (IRs) and advice to proponent comments from the Federal-Indigenous Review Team (FIRT), which is led by the CNSC. Results of the FIRT technical review were provided in two Annexes; Annex 1 was composed of IRs and Annex 2 was composed of advice to proponent comments for NexGen's response. In September 2023, NexGen provided detailed responses to the FIRT IRs and advice to proponent comments.

On 12 February 2024, the CNSC provided the results of their review of NexGen's IR and advice to proponent comment responses. The IRs were categorized by the CNSC as accepted (i.e., requiring no additional response), not accepted with the technical approach deemed acceptable by the CNSC and the IR indicated as being able to be resolved once a revised EIS is provided by NexGen, or not accepted with additional response required by NexGen. For the IRs that were not accepted with additional response required, a second round of follow-up IRs were provided by the CNSC.

2 Response to Information Request

Attachment IR 199-R1 has been developed to resolve the question raised in IR 199-R1 and includes figures (i.e., Figure 1 to Figure 4) that provide a visual comparison of the ensemble projects and individual representative concentration pathway (RCP) scenarios for mean annual temperature and annual total precipitation for the 2050s and 2080s. In addition, text is provided below to explain how the three RCPs were treated and evaluated as part of the multi-model ensemble.

As explained in Section 22A-1-1.2.2.1 of Attachment 22A-1 of Draft EIS Appendix 22A (Climate Change Dataset Summary Report):

"Since no one model or climate scenario can be viewed as completely accurate, the IPCC (Intergovernmental Panel on Climate Change) recommends that climate change assessments use as many models and climate scenarios as possible, or a "multi-model ensemble". For this reason, the multi-model ensemble approach was used to delineate the probable range of results and better capture the actual outcome (an inherent unknown).

Seventy-two potential members of the multi-model ensemble were reviewed to confirm whether the general temperature and precipitation ranges reasonably matched the observed ranges of climate for the region. Monthly averages were used to capture the known seasonality of the region."

All model projections from all three RCPs considered were treated equally within one ensemble and descriptions of this ensemble and its projections are provided in Draft EIS Appendix 22A. All available projections provided by Environment and Climate Change Canada at the time of the study were considered.

To illustrate how the individual RCPs compare to the multi-model ensemble, the following box and whisker plots present the 5th, 25th, 50th, 75th and 95th percentiles for the model projections from the individual RCPs as well as the ensemble. In addition to the percentiles, the maximum and minimum of the ensemble were also provided in Draft EIS Appendix 22A to capture the full range of projections. As outlined in Draft EIS Appendix 6A (Climate Change Road Map), each discipline incorporated climate projections into their studies according to their impact assessment methods and requirements. In addition, as outlined in Draft EIS Section 22 (Assessment of Effects of the Environment on the Project), Project design will consider how climate may impact design criteria throughout the Project lifespan.

Figure 1: Mean Annual Temperature Ensemble Comparison for the 2050s

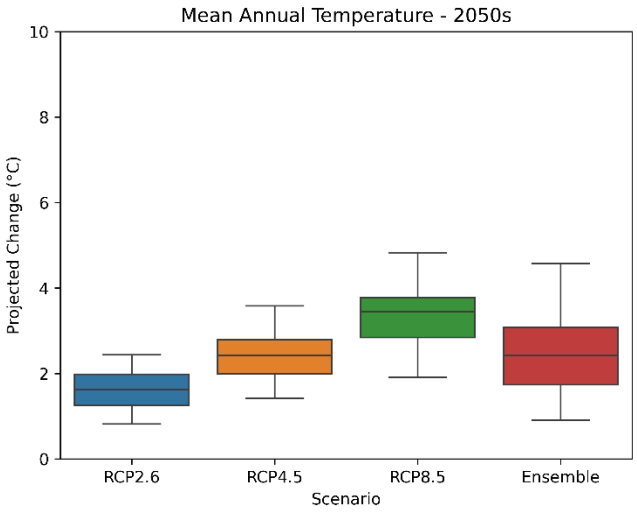

Figure 2: Mean Annual Temperature Ensemble Comparison for the 2080s

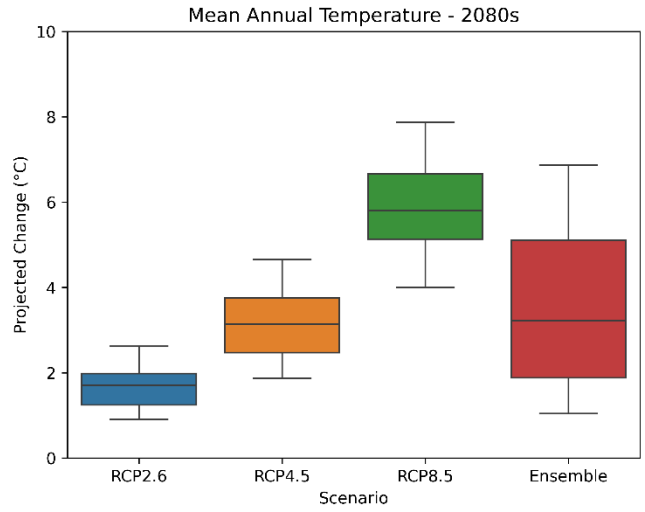

Figure 3: Annual Total Precipitation Ensemble Comparison for the 2050s

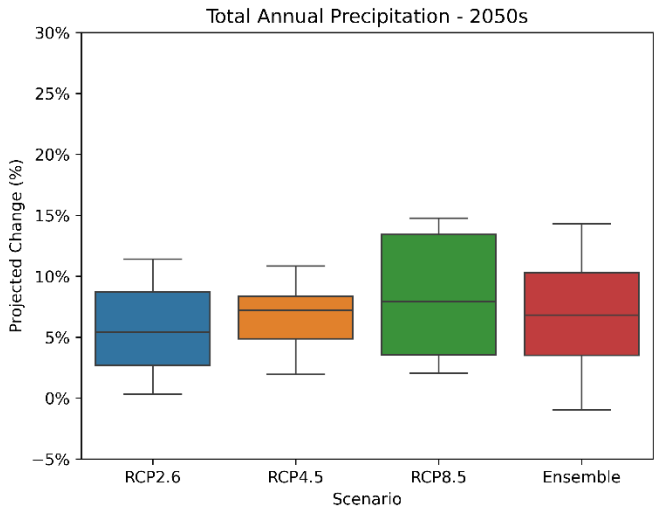

Figure 4: Annual Total Precipitation Ensemble Comparison for the 2080s