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ACFN Technical Review of NexGen Rook 1 Uranium Mine Application

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Technical Review of NexGen Rook 1 Uranium Mine Application

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Appendix A: Aqua Environmental Associates (AEA)

Hydrology technical review of NexGen Rook 1 Uranium Mine Application

By: Martin Carver (AEA)

Overarching Comments / General Concerns

The EIS hydrology and climate-change components contain data and assessment gaps and methodological deficiencies that likely mean EIS effects assessments are unreliable and may underestimate potential effects. Shortcomings in methods involve model validation, characterization of future climates in effects assessments and temporal scope for change in future climates. Inadequate baseline data, particularly at Project-specific monitoring stations undermines the reliability of outputs from hydrologic simulation modelling, particularly for smaller streams. A predevelopment baseline is not provided. The absence of systematic documentation of Indigenous navigability and its requirements is of concern given the importance of water-based access for carrying out Traditional-use activities. Multiple deficiencies are present in some EIS effects assessments leading to serious concerns for the reliability of EIS findings. This finding contrasts with the claims of "high confidence" put forth in the EIS hydrology section regarding its outputs used in effects assessments.

A1	Topic – Inadequate Baseline Information to Support Effects Assessments
EIS Section(s)	Section 9.2.6.1
Subsection, page no.	Pages 9-19 to 9-21, 9-53 to 9-54
Terms of reference	

Rationale / Review Comments:

Baseline data are a cornerstone in a project environmental assessment. Baseline data provide pre-impact information that informs effects assessments. Through simulation modelling, baseline data make it possible to predict project effects using simulation modelling. In the case of the environmental assessment of the NexGen Rook One Project (Project), characterization of the present conditions (Base Case) is established from simulation modelling which relies on the same baseline data.

The LSA and RSA lack suitable long-term hydrologic and climate monitoring stations. The Project has implemented monitoring at various locations within the RSA to provide baseline data for the Project environmental assessment (Table 9.2.2, p9-20). It appears that two years of this monitoring has informed the findings of the EIS, however, the EIS provides various accounts of the duration of this monitoring:

- "the initial baseline period is represented by more than two years of hydrology data" (p9-97)
- "The model was calibrated (i.e., trained) using three years of site-specific hydrometric measurements collected within the RSA." (section 9A5, p68)
- "a period of two years from August 2018 to August 2020" (p9-96)
- "baseline monitoring programs were completed over the period of August 2018 to September 2020" (p9-19)

Although the duration of the monitoring remains somewhat unclear from the information provided in the EIS, it is evident that the extent of available baseline data is insufficient to meet the needs of the environmental assessment. A minimum of five years of hydroclimatic data are needed from affected sites, depending on the nature of the years monitored. The two years of data available provide only one complete open-water season. The other year of data is taken from two different hydrologic years. The EIS claims that 2018 was a dry year and 2020 was a wet year (p9-25) yet, in both these years, the monitoring program was only partial (between 4 and 8 months in duration). Despite the short-term and fragmented limitations of the site-specific monitoring data available within this environmental assessment, curiously, the EIS refers to its baseline monitoring programs as "extensive" (p9-19; p9-96).

In addition to the inadequate baseline data, the EIS also does not provide a pre-development baseline against which to compare the assessment cases. The (simulated) Base Case represents existing conditions which include "the combined effects from previous and existing human disturbances" (p9-16). It is an impacted case. It is important when evaluating impacts to Traditional-use activities that a pre-development baseline be available to effects assessments to enable full characterization of the incremental losses that may have occurred

within the system of Traditional-use activities. Preparation of a pre-development baseline may also provide the opportunity to better validate the simulated Base Case (Tables 9.3-6 through 9.3-9) against Traditional Ecological Knowledge. It appears that this effort to better verify the Base Case simulation has not been carried out within the EIS.

Information Requests:

a) In the absence of a pre-development baseline, explain how cumulative effects on Traditional-use activities can be fully and appropriately determined.

A2	**Topic – Inadequate Scope of Calibration and Validation of Hydrologic Model**
EIS section	Section 9.2.6.2.6; Section 9.8; Section 9A5
Subsection, page no.	Pages 9-24 & 9-25; Pages 9-96 to 9-98; Page 68 (section 9A5)
Terms of reference	

Rationale / Review Comments:

The EIS relies on simulation modelling to determine expected Project impacts. Hydrologic models require adequate calibration and validation data to provide reliable outputs suitable for EIS effects assessments. In discussing the application of its GoldSim modelling platform, the EIS states (p9-25):

> "A key modelling assumption was that parameters and processes inferred from the calibration at several hydrometric station locations for a short period of record (i.e., two years) could be effectively and accurately applied to a longer period (i.e., 43 years) at the same locations, as well as other ungauged (i.e., unmeasured) locations. As meteorological and hydrological conditions were variable during the calibration period, with both low and high flow periods, and as ungauged locations are in a similar terrain as the gauged sub-watersheds, this assumption is reasonable."

This "key modelling assumption" is invalid. Elsewhere (item A1), it is shown that the two years' baseline data available in the EIS are inadequate for characterizing hydrologic units within the RSA. The above passage asserts that hydrologic variability during the monitored period justifies this assumption. All natural hydrologic measurements are variable and have highs and lows thus this characteristic is ubiquitous in hydrologic data and does not signal adequacy. What is significant in this situation is that the period of the monitoring is short and is thus challenged - without a compelling quantitative rationale based in the data – to provide a sufficient range of conditions to appropriately calibrate models that will then be applied over a timescale more than 20 times longer than the duration of the monitoring data.

After calibration using the two years of site-specific data (including data for the RSA's smaller hydrologic systems), the EIS indicates (section 9A5, p68) that the model "was then validated using regional data at regional scales from long-term monitoring stations." This reference to "regional scales" indicates that the model was not validated using data from smaller streams

which are not of regional scale. This compromises further the validity of the modelled outputs for the smaller watercourses assessed in the EIS because it would imply, effectively, that the simulation model has not been validated for application to these systems.

Despite these limitations in the baseline data (item A1) and in the validation of the GoldSim model, the EIS claims that "predictions based on the methods adopted carry a high degree of confidence." (p9-96). This rating is unjustified as discussed elsewhere (item A6).

Rationale / Review Comments:

a) Confirm whether the hydrologic model was validated at non-regional scales. If it wasn't validated, also explain why it was subsequently applied in the EIS effects assessments at these non-regional scales.

A3	**Topic – Underestimation of Climate Change in Effects Assessments through Application of Mean Values**
EIS section	Appendix 22A5.1; Section 9.4
Subsection, page no.	Pages 36 & 37 (Appendix 22A5.1); Pages 9-60 to 9-65
Terms of reference	

Rationale / Review Comments:

Climate is changing rapidly around the world and particularly in northern regions such as in the Project LSA and RSA. Climate plays an important role in numerous aspects of the environmental assessment and in shaping the findings of the EIS. The EIS recognizes this by assembling a detailed climate change assessment (Appendix 22A and Attachment 22A-1) that includes an ensemble of model outputs representing potential climate futures.

Although the EIS brings together many appropriate data and methods from the Intergovernmental Panel on Climate Change (IPCC), the EIS applies the ensembles of climate projections incorrectly within the EIS effects assessments, leading to underestimates within effects assessments and potentially mistaken interpretations of effect significance.

EIS Appendix 22A appropriately creates ensembles of outputs from climate models, providing distributions of projected future temperature and precipitation within the RSA for the 2050s and 2080s. Rather than carrying forward the range of potential future climates, the EIS determines a mean of the projected climates and carries this through the effects assessments rather than the full range of the model outputs. Further, the EIS mistakenly claims (p9-60) that this provides "the most probable of the climate change scenarios." This suggests a critical gap in EIS understanding of how to apply GCM outputs in resource assessments.

Ouranos is a leading Canadian hub for advancing scientific understanding of climate change and its appropriate application in adaptation and resource development. In its *Guidebook on Climate Scenarios* (Charron 2016), Ouranos states: "It is important to understand that none of these future climates should be considered a prediction: all the future climates projected

by different climate models with different GHG forcing scenarios ***should be considered equally plausible***." (Emphasis added). It is incorrect for the EIS to create a mean from the GCM outputs. Instead, the range of outputs should be carried through the effects assessments and appropriately interpreted in the outputs of the respective effects assessments.

A second major problem with the EIS' application of the GCM ensembles is its equal consideration and averaging of all three emissions scenarios. Representative Concentration Pathways (RCPs) have been developed by the IPCC to represent contrasting global greenhouse gas (GHG) emissions scenarios. In simple terms, RCP 4.5 corresponds approximately to an emissions trajectory that would occur if all of the commitments under the Paris Accord were met. Currently, humanity is far from reaching this ambition of 1.5C temperature rise and is instead much closer to a 3C rise. RCP2.6 would come about under a future with drastic cuts in carbon emissions that are not happening and show little sign of coming about. RCP8.5 is generally referred to as the Business-as-Usual scenario and refers to the continuation of the historic pattern of high growth in GHG emissions. The global population is following an emissions scenario that is between RCP4.5 and RCP8.5. Current peer-reviewed science involved in projecting climate change typically provides outputs for RCP4.5 and RCP8.5 and typically provides these two results separately. RCP2.6 is often set aside because there is no evidence emerging that this will come about. However, the EIS includes RCP2.6 in its ensemble of GCM outputs. This would not be a problem if the EIS didn't also collapse all its ensemble data (from Appendix 22A) into a mean for use in the effects assessments. The combined effect is to understate the extent of climate change that should be considered in the effects assessments.

Appendix 22A appears to agree with this revised methodology when it states in its introduction (p1):

- "Recognizing the inherent uncertainty with projections, the results in this report are based on projections from multiple climate models and scenarios, or a multi-model ensemble as recommended by IPCC (2013)."
- "Golder and Associates Ltd. (Golder) has developed this detailed climate change dataset based on recent best guidance found in literature, including best guidance accepted by the Intergovernmental Panel on Climate Change (IPCC). The approach used is consistent with the guidance developed by the Mining Association of Canada (MAC 2021) by providing the necessary information for performing climate risk assessments. ***This dataset is intended to be used across disciplines as part of the Project Environmental Impact Statement where climate variables in current and future periods play a role.***" (Emphasis added – the document makes no mention of using only the mean)

In addition, Golder and Associates, the author of the EIS, has produced a methods manual for the Mining Association of Canada (MAC 2021) which also confirms this practice:

> "Application of the multi-model ensemble approach to the variables described above produces a range of results. To help address uncertainty, it is necessary to calculate statistics that describe the range in projected relative change across the ensemble members as a whole (minimum, maximum, mean, median, and percentiles)."

Golder & Associates does not recommend using one mean value as a surrogate for the entire ensemble.

This concern in how future climates are portrayed in the EIS is a cross-cutting problem that affects all EIS assessments using future climates as an input variable. The scope for potential change in climate will continue to be underrepresented if this mistake remains unaddressed. For example, Tables 9.4-1 through 9.4-4 do not appropriately indicate the range of possible futures associated with the assessed stream reaches.

To correct this error in the EIS, the full range of future climates should be characterized based on the ensemble compilations. Results for each emissions scenario should continue to be distinguished as they are currently in Figure 22A-26. Given that emissions are tracking between RCP4.5 and RCP8.5, it is sensible for these two to be the focus of the GCM outputs, though the RCP2.6 can be included (and contextualized) if desired. The expanded outputs can then be brought back to all climate-related effects assessments for revision.

References

Charron I 2016. *A Guidebook on Climate Scenarios: Using Climate Information to Guide Adaptation Research and Decisions*, 2016 Edition. Ouranos, Montreal PQ, 94p.

Intergovernmental Panel on Climate Change (IPCC) 2013. *Climate Change 2013 The Physical Science Basis Summary for Policymakers*. Working Group 1 Contribution to the Fifth Assessment Report, October 2013, 27 p.

Mining Association of Canada (MAC) 2021. *Guide on Climate Change Adaptation for the Mining Sector*, prepared by Golder and Associates, 148 p.

Information Requests:

a) Revise EIS section 9 (hydrology) to include the range of future climates, carrying forward this range through to the end of the effects assessments.

A4	**Topic – Disregard in Assessment Cases for Changes in Climate during Final Twelve Years of Project Lifespan**
EIS section	Section 9.2.7; Section 6.10; Appendix 22A
Subsection, page no.	Page 9-27; Page 6-34
Terms of reference	

Rationale / Review Comments:

In considering future climates in the hydrology effects assessments, the EIS focuses exclusively on outputs for the 2050s, setting aside altogether the outputs for them being available in the EIS Appendix A22 alongside the projections for the 2050s. In section 9.2.7, a simple statement is provided as rationale that maintains that the 2050s "represent a reasonable upper bound in terms of climate change during the Project lifespan." (p9-27). Under current scheduling, the Project is expected to have a lifespan that continues to (at least) 2067. The implied rationale in the EIS is that because the year 2067 is within the 30-year period (2041-2070) that "the 2050s" generally represents, that the 2050s outputs

therefore represent the full temporal range of the project lifespan. However, this reasoning is obviously flawed.

Climate change does not jump from one projection in the 2050s (and during each year of 2041-2070) then in 2071 to the next projection associated with the 2080s (and during each year of 2071 to 2100). Although its actual pattern of annual advance is unknown, under the modelled inputs it will advance in a somewhat distributed manner between the two benchmark periods. The year 2055 is the centre of the 2041-2070 grouping. The year 2085 is the centre of the subsequent 2071-2100 grouping. If one is interested in a year beyond 2055, then account should be made for the passage of time between the two projection periods. An approach based on linear interpolation would determine an average of 1/30th of the difference between the 2050s and 2080s and then allocate that amount to each year in the beginning of the next 30-year period. In the present case, and following this methodology, with a project lifespan to 2067, then at least 12/30 of the change between 2050s and 2080s should be added to the outputs for the 2050s. Alternatively, if the EIS truly wishes to be conservative (see below), then it could simply use the outputs for the 2080s exactly as already provided in Appendix A22.

It is also increasingly recognized that the GCM projections themselves are underestimating the climate changes that are most likely to occur. There is a significant body of authoritative scientific evidence in this regard - see, for example, Brown and Caldeira (2018) and Steffen et al. (2018) and many other peer-reviewed publications. Given the rapid advance of climate disruption, it is suggested that it would be more reasonable to simply use the outputs for the 2080s. This would also accommodate delays in eventual site reclamation which could take longer than the projected 2067 date.

The EIS repeatedly claims that it is aligned with the precautionary principle and its effects assessments are conservative because they overestimate effects. For example, the EIS states (p6-3): "To align with the precautionary principle a conservative approach is applied in EAs when information is limited so that effects are typically overestimated." Again, on p6-34, the EIS states: "The assessment applied a precautionary approach to address uncertainty by using the largest magnitude, duration, and geographic extent of potential adverse effects when a range of possible outcomes could be possible." In addition, it is repeated in effects assessments and specifically in the hydrology section (see section 9.2.11). Given its approach to dealing with the change in climate associated with the years after 2055, and given the increments in change associated with those additional years, the EIS is evidently not as conservative as it believes.

References

Anthony KW, W Anthony, T Schneider von Deimling, I Nitze, S Frolking, A Emond, R Daanen, P Anthony, P Lindgren, B Jones and G Grosse 2018. 21st-century modeled permafrost carbon emissions accelerated by abrupt thaw beneath lakes. *Nature Communications*. 3262:9 p.

Brown PT and K Caldeira 2018. Greater future global warming inferred from Earth's recent energy budget. *Nature* 552:45-50.

Steffen W *et al*. 2018. Trajectories of the Earth system in the Anthropocene. *Proceedings of the National Academy of Sciences of the USA*, doi/10.1073/pnas.1810141115.

Information requests:

a) Revise the future projected climate to include the full extent of climate change expected during Project lifespan – ie, to 2067 rather than to 2055.

b) Revise EIS section 9 (hydrology) to include the full temporal range of projected climates (to 2067) carrying forward this range through to the end of the effects assessments.

A5	**Topic – Unassessed Navigation Requirements of Traditional-Use Activities**
EIS section	Section 6.3.1 (p6-12), Section 6.3.2 (p6-12); Section 9 Executive Summary (pi-iii); Section 9.3.2.1 (p9-39 & 9-40); Section 9.3.2.2 (p9-48 to 9-51); Section 9.3.6 (p9-58); Section 9.6.3 (p9-85 to 9-91); Section 16.2.2.3 (p16-15); Section 16.2.7 (p16-26); Section 16-5
Subsection, page no.	See line directly above
Terms of reference	

Rationale / Review Comments:

The practice of Traditional-use activities within the RSA depends in part on water-based travel. The Project will both withdraw water from and return water to Patterson Lake for mining, fire-protection and domestic-use purposes. Stream diversions and erosion may result in sedimentation that can affect navigability. In addition, water levels and flow rates will adjust through time to climate change with significant seasonal changes (both positive and negative – see section 9.6.3) during Project lifespan. As a result, there is the potential for changes in navigability during Project lifespan in locations downstream of the Project site, particularly in nearby shallow lakes and river reaches.

The EIS recognizes that there are navigability requirements in the LSA and RSA (section 9, Executive Summary, p i): "The waterbodies in ***the LSA and RSA are used by humans for navigation***, recreation, and fishing and the river is an important aspect of culture and heritage. Upstream of Patterson Lake, the channel is wide but relatively shallow, and it has a lower gradient downstream of Patterson Lake. In general, boat navigation upstream of Patterson Lake is ***more difficult than navigation downstream***." (emphasis added). Later in the Executive Summary (section 9, p.iii), it concludes that because the changes are "within the range of natural seasonal and annual variability", they are "not expected to affect navigation". This interpretation is repeated with respect to changes in channel morphology whereby the EIS (p.iii) states "these changes are within the range of natural variation and are not expected to be large enough in magnitude to change how the watercourses are used by humans for navigation."

Despite recognizing the Traditional-use value associated with navigation, the EIS does not establish navigation as a Valued Component. Instead, it defines "Indigenous land and resource use" as a Valued Component because "access to traditional land and resource areas would be affected by Project activities." (Table 6.3-1, p6-12). The EIS recognizes the

potential for impact to this essential characteristic of downstream waterbodies when, in relation to this Valued Component, it identifies a measurement indicator as "Changes to access to and area available for Indigenous land and resource use".

The EIS states that "Clearwater River below Forrest Lake is a broad channel with two constriction points" yet does not provide an assessment on these points that may be seasonally limiting to navigability. In addition, because of backwater effects from Beet Lake, this section of the Clearwater River was not hydrometrically monitored under even the short period of the baseline program.

Section 9.3.2 describes the hydrographic setting of the project within the RSA and including some areas potentially sensitive to Indigenous navigation. For example, the East Basin of the Patterson Lake North Arm is described as "relatively shallow and has a lower volume than the other two basins." Just downstream and with documented Traditional-use activities, the North Basin of Forrest Lake is smaller and shallow, located along the Clearwater River. "North Basin is separated from the South Basin by a sand bar consisting of sandy material. Water depths over the sand bar are typically less than 1.0 m." (p9-39).

EIS pages 9-48 through 9-51 describe the progress of Clearwater River as it travels downstream in the RSA. The description indicates a highly variable system including components that are sensitive to disruption and loss of water. Section 9.3.6 (p9-58) provides additional, somewhat randomly presented, navigability information about these reaches of the Clearwater River and including speculation of its navigability. Again, although this section clearly recognizes the importance of navigability of this river, there is no authoritative reference to an appropriate assessment, to a Traditional-use study, or to Transport Canada. Instead, a collection of stream channel parameters is provided in Table 9.3-10 to "help to support interpretation of navigability by boat." (p9-58).

Water-based access and navigation should be a Valued Component. Instead, "changes to access to and area available for Indigenous land and resource use" is an aggregated measurement indicator that connects "Indigenous land and resource use" (a Valued Component) with its assessment endpoint "continued ability to participate in Indigenous land and resource use activities". (Table 16.2-1, p16-15). Water-based access and navigation is not assessed as a Valued Component and, instead, a few elements of this aspect of the Indigenous land-use system are spoken to here and there in the EIS (e.g., in section 9) but without a coherent framework of effects assessment. In its residual effects analysis for the Indigenous land and resource use Valued Components relative to existing conditions (p16-27), the residual effects focus on LSA/footprint impacts and do mention water-based implications of changing water quantity.

In section 4 of *ACFN Advice to Alberta Regarding LARP* (ACFN 2010), it is stated: "Critical waterway zones are identified within 5km of major streams and waterways that are important hunting, transportation, and access zones and/or drinking water sources. These critical waterways include the Athabasca, Firebag, Maybelle, Old Fort Richardson, and Clearwater rivers." (LARP = Lower Athabasca Regional Plan). It also states: "ACFN recommends that within these zones, water quality and quantity should be carefully monitored and managed to maintain opportunities for the use of rivers in the practice of ACFN rights." (p18)

The ACFN is not considered a "primary" Indigenous Group under the EIS (Table 1.2-2, p1-26) but is considered an "Other Indigenous Group" who are identified for information sharing due

to having a "potential overlap with traditional territory but no access link or known residency/land use" (Table 2.4-4, p2-20).

References

Athabasca Chipewyan First Nation (ACFN) 2010. *ACFN Advice to Alberta Regarding LARP*. Submission to Alberta Land-Use Secretariat, November 22, 2010, 37 p.

Information Requests:

a) Provide an Indigenous navigation effects assessment including a thorough and systematic description of the navigation requirements of Traditional-use activities

A6	**Topic – Unjustified High Prediction Confidence in Hydrology Component**
EIS section	Section 9.8; Section 9.2.11
Subsection, page no.	Page 9-96; Page 9-32;
Terms of reference	

Rationale / Review Comments:

Section 9.8, *Prediction Confidence and Uncertainty*, opens with the following statement (p9-96):

> "The methods adopted for this assessment included extensive baseline studies as well as quantitative modelling and resulted in an understanding of the hydrological system, provided context for natural variability and responses to climate, and allowed for the quantitative assessment of Project effects. Therefore, predictions based on the methods adopted carry a high degree of confidence."

It is unclear how the high degree of confidence results from the listing given in the sentence. Also, with respect to residual uncertainty, section 9.2.11 further claims (and repeated elsewhere in the EIS, *e.g.*, p6-34):

> "The assessment applied a precautionary approach to address uncertainty by identifying the greatest magnitude, duration, and geographic extent of potential adverse effects when a range of possible outcomes was possible. Consequently, uncertainty was addressed in a manner that increased the level of confidence that residual effects were conservatively estimated."

It is not clear that this has been carried out in the EIS as outlined. For example, as explained in items A3 and A4, this approach to uncertainty was not applied in relation to incorporating climate change into the effects assessments.

Given the EIS shortcomings in methods, data, and assessments, it is inappropriate for the EIS to claim to be "precautionary" and to be "conservative" by overestimating project effects.

Overall, the EIS lacks a compelling rationale to assert a high degree of confidence in its hydrology effects assessments.

Information Requests:

a) Given the short duration of the Project-specific baseline data, the inappropriate consideration of projected climates within the effects assessments, and the lack of RSA model validation at non-regional scales, explain how the EIS can justify claiming a high confidence for its hydrology predictions.

Appendix B:

Thompson Aquatic

Surface Water and Sediment Quality review of NexGen Rook 1 Uranium Mine Application

Appendix B Thompson Aquatic

Surface Water and Sediment Quality review of NexGen Rook 1 Uranium Mine Application

By Megan Thompson (Thompson Aquatic)

Overarching Comments / General Concerns

Surface Water and Sediment Quality are classified as intermediate components and not valued components (VCs) in the EIS. The findings of this assessment are carried forward to other VC assessments, including VCs for fish and fish habitat, vegetation, wildlife, human health, and Indigenous land and resource use.

The Project is likely to primarily influence water and sediment quality via direct discharges of treated domestic sewage and mine water effluent to Patterson Lake during the life of the Project, and via seepage from underground waste rock storage facilities into the far future. Certain constituents, especially cobalt and copper, were predicted to increase in concentration in Patterson Lake basins and downstream areas for decades and even centuries into the future.

The Project base case/existing condition was developed in the assessment using a reasonable baseline data set for lakes and rivers in the Project area, although wetlands don't seem to have been included in the surface water and sediment quality assessment. Summaries and characterizations of baseline data included some poor data analysis practices and require justification or correction.

Certain potential Project-related impacts were not adequately considered (e.g., acidification of water bodies, changes to water temperature as a result of climate change, far future effects on sediment quality). In addition, summaries of predicted effects, especially as part of residual effect classification, were confusing and appeared to contradict earlier descriptions of effects.

B1)	**Threshold for total phosphorus**
EIS Section	Section 10: Surface Water Quality and Sediment Quality
Subsection, Page #	10.2.8.3.3 Productivity Status Thresholds, p. 10-48 to 10-49 Table 10.2-8 10.3.1.3 Productivity Status Constituent Concentration, p. 10-62 to 10-64 Table 10.3-7
Terms of Reference	-

Rationale / Review Comments:

NexGen has defined thresholds values for its use in the water and sediment quality impact assessments. This included a threshold for total phosphorus, which was designated as a constituent of potential concern (COPC) due to role as a "fertilizer" for algae, potentially leading to unusual or undesirable algal blooms, and generally to productivity enrichment or eutrophication effects.

Most existing government guidelines for total phosphorus are narrative statements or frameworks, because whether a given concentration will lead to eutrophication effects is dependent on multiple factors, including the corresponding concentrations of nitrogen, water temperature and light regimes, the physical characteristics of a waterbody and the structure and function of its food web. The threshold adopted by NexGen was 20 µg/L, based on Ontario government guidance that reads as follows:

> "*Current scientific evidence is insufficient to develop a firm Objective at this time. Accordingly, the following phosphorus concentrations should be considered as general guidelines which should be supplemented by site-specific studies:*
> *- To avoid nuisance concentrations of algae in lakes, average total phosphorus concentrations for the ice-free period should not exceed 20 µg/L;*
> *- A high level of protection against aesthetic deterioration will be provided by a total phosphorus concentration for the ice-free period of 10 µg/L or less. <u>This should apply to all lakes naturally below this value</u>;*
> *- Excessive plant growth in rivers and streams should be eliminated at a total phosphorus concentration below 30 µg/L.*" (MOEE, updated 2021) (emphasis added)

The threshold of 10 µg/L total phosphorus is also used as a transition value between the oligotrophic and mesotrophic status of water bodies as defined by the CCME and presented in Table 10.2-8 of the Project EIS.

Given that NexGen has described base case mean total phosphorus concentrations in all sampled water bodies in the Project area as at or below 10 µg/L, the relevant threshold according to the MOEE guidance would be 10 µg/L, and not 20 µg/L. According to the base case data summarised on Table 10.3-7, only one lake (Lake G) had a concentration of 20 µg/L, and that was the maximum measured value. While the lake was classified as mesotrophic by NexGen on the basis of this maximum value, the mean value would support a classification of oligotrophic, a more appropriate trophic status for this lake. Importantly, Patterson Lake data indicated all concentrations were less than or equal to 10 µg/L, and this is the focal location of expected effects on total phosphorus concentrations, where domestic sewage and treated effluent from the Project will be released.

For these reasons, NexGen should modify its Project-specific threshold for total phosphorus to 10 µg/L. Total phosphorus loading and eutrophication effects can have long-lasting impacts on aquatic ecosystems, including fish and aquatic invertebrates, as well as influencing redox conditions that influence the availability of metals and trace elements in water and sediments. This is especially relevant given the descriptions of existing effects and

recent change to water quality in Patterson Lake and other water bodies provided by Indigenous community members in Section 10.3.1 (p. 10-53 to 10-54). Climate change will also increase the likelihood of eutrophication effects occurring if water temperature increases, even where total phosphorus concentrations remain constant. The Project effects assessment and ongoing monitoring and management activities in the Project area should therefore adopt the more conservative and appropriate threshold of 10 µg/L.

Information Requests:

a) Please revise the total phosphorous water quality Project Threshold to 10 µg/L, from 20 µg/L.

B2)	**Sediment quality Project Thresholds missing**
EIS Section	Section 10: Surface Water Quality and Sediment Quality
Subsection, Page #	10.2.8.3.4 Sediment Quality Thresholds Table 10.2-9
Terms of Reference	-

Rationale / Review Comments:

The selected sediment quality Project Thresholds shown in Table 10.2-9 seem to be incomplete. The text preceding the table indicated that sediment thresholds would be selected from one of three guidance sources, however for several constituents no threshold was selected from the available options (e.g., cadmium, lead, nickel, selenium, vanadium). It isn't clear why no threshold was adopted in these cases.

Information Requests:

a) Please explain why sediment quality Project Thresholds were not selected for constituents with existing guidance thresholds available.

B3)	**Treatment of censored data**
EIS Section	Section 10: Surface Water Quality and Sediment Quality
Subsection, Page #	10.3.1.2 Water Quality (Risk to Aquatic Life and Terrestrial Life) and Drinking Water Quality Constituent Concentrations, p. 10-57 10.3.1.3 Productivity Status Constituent Concentration, p. 10-62
Terms of Reference	-

Rationale / Review Comments:

In the EIS section dealing with base case water and sediment quality, the described treatment of below detection limit analytical values (or censored data) is not appropriate. Substitution of non-detect values with the detection limits value or half of the detection limits value generally introduces an upward bias to water and sediment quality data. A common approach is to impute the values of non-detect observations, or to use rank-based analyses (as discussed for example in Helsel 2012, and Helsel et al 2020, and implemented, for example, in the NADA R package by L. Lee).

Preferred summary statistics are therefore percentiles, including the median as a measure of central tendency, instead of a mean. Where a large proportion of the data set for a particular parameter are made up of censored data, it is usually not acceptable to report any summary statistics or to use the data in further analyses.

In the context of the Project impact assessment, introducing an upward bias in water and sediment quality parameter data sets would lead to an inflated base case and would increase the risk of not detecting real change in the environment through follow-up monitoring programs. This should be avoided by NexGen.
In addition, for certain parameters, such as total phosphorus, which are commonly measured and important indicators of aquatic ecosystem health as well as of potential adverse impacts on those ecosystems, NexGen is encouraged to seek out a laboratory capable of low-level analyses for analytical services. Detection limits for measured parameters should not be close or equivalent to applicable guidelines or thresholds for those parameters, wherever possible.

Information Requests:
a) Please revise the water and sediment quality data compilations and related analyses, so that censored data points are not substituted at all. Please instead use the above-mentioned newer and more robust approaches for the water and sediment quality data used in this study.
b) For any future monitoring, please plan analytical sample analyses accordingly, so that whenever possible detection limits are not near to or above the applicable thresholds. In interpreting data, please note that there is a large degree of uncertainty inherent in values near the detection limit, including when detection limits are below but close to thresholds.

B4)	**Standardization – sediment quality data**
EIS Section	Section 10: Surface Water Quality and Sediment Quality
Subsection, Page #	10.3.2 Sediment Quality
Terms of Reference	-

Rationale / Review Comments:
For sediment quality analyses, including QA/QC samples, the effect of particle size should be accounted for in summarizing and analyzing constituent concentration data. Especially where data are pooled or compared between sites or between years, observations should be corrected for a value like % sand or % silt. Standardizing does not make sense when comparing against toxicity-based thresholds, however.
Particle size can be a dominant influence on most constituent concentrations, especially trace elements, and organic contaminants. Sediment % organic matter or total organic carbon can also be an important influence on concentrations, but also tend to negatively correlate with larger particle sizes.

Information Requests:
a) Please clarify – were sediment concentration data standardized to particle size for the purposes of sediment quality QA/QC and comparisons or summaries between sites and years?

B5)	**Pooling of data for summaries**
EIS Section	Section 10: Surface Water Quality and Sediment Quality
Subsection, Page #	10.3.1.2 Water Quality (Risk to Aquatic Life and Terrestrial Life) and Drinking Water Quality Constituent Concentrations Tables 10.3-3 through 10.3-6, p. 10-58 to 10-61
Terms of Reference	-

Rationale / Review Comments:
Base case data for water quality were summarised as means and percentiles, and % observations above thresholds, for groups of lake and river sites in several tables. The groups for each of the four tables were as follows:

- Broach Lake, Lake H, and Lake G
- Patterson Lake (all basins)
- Forrest Lake and Beet Lake
- Naomi Lake, Clearwater River below Beet Lake and, Reference Lake

No explanation as to why these sampling sites were combined and data pooled in this way, and the assessment that follows does not use these groupings. Generally speaking, it is not a good idea to summarize data across lakes and rivers, or even across more than one lake, unless such a grouping is based on a scientific or technical reason. As it stands, the specific condition of each of these water bodies is obscured and confusingly mixed with those of other water bodies. In addition, it is generally not recommended to combine data from multiple sites along a river system, unless it can be shown that the data for each constituent from each site are not statistically different.

Information Requests:
a) Please justify the pooling of the site data in calculating and presenting base case summary statistics, including as a base case for further impacts assessment steps.
b) If this pooling cannot be justified, please recalculate and present summary statistics for each lake, lake basin (in the case of Patterson Lake), and each river sampling site separately.

B6)	**Natural**
EIS Section	Section 10: Surface Water Quality and Sediment Quality
Subsection, Page #	Executive summary and throughout, p. ii
Terms of Reference	-

Rationale / Review Comments:
In summarizing existing conditions, NexGen states that ion and metal concentrations that occur in the base case (existing conditions) at concentrations exceeding guidelines reflect "*naturally occurring elevated concentrations of these waterbodies and watercourses in the LSA*." However, in the description of the assessment methods presented in Section 6.6. (p. 6-22), existing conditions are described as representing the outcome of historical and current environmental and socio-economic pressures that have shaped the observed condition of each VC and intermediate component. It is poor practice to refer to existing or base case conditions as "naturally occurring" or "natural" without supporting evidence. NexGen should refrain from doing so.

Information Requests:
a) Please refrain from refer to existing or base case conditions as "naturally occurring" or "natural" without supporting evidence. It is contrary to the stated assessment approaches and methods and is also invalid.

B7)	**Acidification not assessed**
EIS Section	Section 10: Surface Water Quality and Sediment Quality
Subsection, Page #	10.4 Project Interactions and Mitigations

	Table 10.4-1
Terms of Reference	-

Rationale / Review Comments:
While emission of criteria air contaminants from the Project, and their deposition on waterbodies was identified by NexGen as a primary effects pathway for surface water and sediment quality, there appears to have been no consideration or assessment of the potential for emissions to cause acidification effects in water bodies. Given the low pH measured in most of the lakes and rivers sampled for this study, and their classification as soft waters, presumably with low buffering capacity, the pathway for acidification effects is not only valid, but the effect may also be reasonably probable depending on the anticipated Project and cumulative emissions.

Information Requests:
a) Please include in the impact assessment an assessment of the potential for acidification of lakes and rivers as a result of emissions from the Project depositing to surface water systems.

B8)	**Effects on sediment quality**
EIS Section	Section 10: Surface Water Quality and Sediment Quality
Subsection, Page #	Section 10.2.5, p. 10-20
Terms of Reference	-

Rationale / Review Comments:
NexGen states that Project-specific effects on sediment quality won't occur after the life of the Project because direct effects of the Project are limited to this period. However, Project effects are expected to continue into the far future for water quality, due to seepage from various waste rock stored underground. It isn't clear why the same would not also be true for sediment quality, especially because COPCs can partition from water to sediments.

Information Requests:
a) Please explain the decision to remove consideration of Project effects on sediment quality following the life of the Project. Why would water quality effects continue, but not sediment quality effects?

B9)	**Climate change effects on water temperature are not clearly assessed, and water temperature influences on water quality may not have been considered**
EIS Section	Section 10: Surface Water Quality and Sediment Quality Appendix 6A
Subsection, Page #	Table 6A-1, p. 2 10.5.2.1.6 Climate Change Sensitivity Scenario, p. 10-110 to 10-112
Terms of Reference	

Rationale / Review Comments:
It isn't clear from the discussion of the reasonably foreseeable development (RFD) assessment case in the study, which included climate change effects, whether climate change-induced changes in water quality were simulated/predicted. The discussion of climate change scenarios indicated that higher air temperatures are predicted, which should also result in higher surface water temperatures. Higher water temperature, in turn, would influence aspects of water quality such as dissolved oxygen (warmer water holds less

oxygen) and algal growth (potentially leading to eutrophication effects). Higher water temperature would also increase the toxicity of ammonia to aquatic life, and negatively impact fish habitat suitability for cool and cold-water fish species. Warming water also has the potential to change lake-wide mixing and stratification regimes, which would influence whether and how the effluent releases impact Patterson Lake, for example. However, the main focus of the climate change model scenarios completed by NexGen in this study section seems to be changes to water quantity measures, and not water temperature.

Information Requests:

a) Please clarify, were climate change-induced effects on surface water temperatures included in climate change scenarios assessed for Project and cumulative effects?

b) If the answer to a) is no, please include climate change-induced effects on surface water temperatures in the assessment of impacts to water quality and surface water systems from the Project, other developments and climate change.

B10)	**Snow quality effects as a secondary pathway**
EIS Section	Section 10: Surface Water Quality and Sediment Quality
Subsection, Page #	10.4.2 Secondary Pathways, p. 10-71
Terms of Reference	-

Rationale / Review Comments:

NexGen has classified deposition of air emissions on land as a secondary pathway and asserts that concentrations of COPCs in snow would be low enough to be effectively diluted during spring thaw with runoff to lakes and rivers (freshet). However, NexGen provides no evidence for this assumption. Snow quality in the Project area must be monitored in the future to confirm that this pathway is not more significant than NexGen asserts it to be.

Information Requests:

a) Please confirm that snow quality will be monitored in future to confirm that air emissions to land and subsequently to surface water systems is unlikely to result in non-negligible residual effects on surface water and sediment quality.

B11)	**Risk of eutrophication effects not properly characterized**
EIS Section	Section 10: Surface Water Quality and Sediment Quality
Subsection, Page #	10.5.1.2.6 Sensitivity Analysis, p. 10-96 Figure 10.5-12
Terms of Reference	-

Rationale / Review Comments:

In assessing the potential for a shift in water body trophic status under the Application Case reasonable upper bound sensitivity scenario, the regional predictive model indicated that total phosphorus concentrations in two Patterson Lake basins would increase during the lifespan of the Project to the extent that a switch to a higher trophic status was likely (i.e., oligotrophic to mesotrophic). The model indicated that total phosphorus concentrations would return to oligotrophic in the far future, but also that "*the modeling did not account for uptake by algae, so basin-wide concentrations have a high likelihood of being overestimated by this approach – changes to trophic status are unlikely*." (p. 10-96)

This latter statement in the quotes above is incorrect for two reasons:

- The measure total phosphorus <u>includes algal phosphorus</u>. Water samples are digested before the analysis, which lyses algal and cyanobacteria cells, and means that algal

phosphorus is included in the total measure. Therefore, uptake by algae does not need to be accounted for in modeling in order to accurately predict the risk of eutrophication effects posed by total phosphorus concentrations, and;

- The uptake of total phosphorus by algae is an important mechanism by which lake trophic status changes, it is part of the trophic status of a lake. It <u>is</u> the impact. It is precisely the overgrowth of algae, cyanobacteria and macrophytes that induces additional negative eutrophication effects, including reduced oxygen availability in the water column and, possibly, the release of neurotoxins to water.

The inclusion of the statement in question in this report indicates a lack of familiarity with aquatic ecosystem function, and eutrophication specifically, and is simply wrong. It also points out the problems that arise when total phosphorus is used as the sole indicator of trophic status and the potential for eutrophication in surface waters. Other measures such as other nutrient concentrations, water temperature, light, as well indicators and direct measures of phytoplankton and macrophyte biomass and community composition, and even productivity estimates obtained by measures of light and dark respiration and photosynthesis can be incorporated into models that better predict trophic status in lakes. Models that simulate biological productivity, oxygen consumption and trophic status in lakes are available. As it stands, the reliance on total phosphorus as an indicator of trophic status under the Project base case and assessment scenarios limits the accuracy of trophic status predictions. However, since total phosphorus was the selected productivity status indicator for the Project assessment, then predicted shifts in trophic status according to that indicator should not be explained away, especially using an invalid understanding of aquatic ecology. NexGen must assess the predicted trophic status shift in the Patterson Lake basins for residual effects.

Information Requests:

a) Please remove the final sentence in the paragraph proceeding Figure 10.5-12. It is scientifically invalid.

b) Please assess the predicted trophic status shift in the Patterson Lake basins for residual effects, without explaining away the likelihood of such a shift. This applies to the Application Case reasonable upper bound and the cumulative (RFD) scenarios.

c) Please note that, light of the above, the following statement in Section 10.5.3.1.1 (p. 10-114) appear to be incorrect:

"*The Project effects on the measurement indicators during the lifespan of the Project for the reasonable upper bound sensitivity scenario would be consistent with the effects described for the Application Case, albeit with higher projected COPC concentrations.*"

This statement fails to acknowledge the predicted shift in trophic status under the reasonable upper bound scenario. Please revise it to include this predicted impact.

B12)	**Unclear whether mitigations included in predictive modeling**
EIS Section	Section 10: Surface Water Quality and Sediment Quality
Subsection, Page #	10.5.3 Residual Effects Classification, p. 10-112 to 10-113
Terms of Reference	-

Rationale / Review Comments:

In its introduction to residual effects classification, NexGen lists several mitigations that can influence the water quality of the Project receiving environment. However, it isn't clear

whether each of these mitigations were incorporated into the predictive models used in the previous effects assessments, especially the site-wide water balance and water quality model.

Information Requests:

a) Please clarify, of the mitigations listed in point form in section 10.5.3, where any included in the predictive models, especially the Project site wide model? If any were included in the model and subsequently the model predictions, then would any of these mitigations contribute to a further decrease when determining residual effects?

B13)	**Assessment Case characterization of residual effects**
EIS Section	Section 10: Surface Water Quality and Sediment Quality
Subsection, Page #	10.5.3.1.1 Application Case, p. 10-113 to 10-114
Terms of Reference	-

Rationale / Review Comments:

The summary of the Application Case water quality predictions presented in section 10.5.3.1.1 seem to contain contradictions, and may not align with previously presented modeling results. Specifically, the following excerpt is confusing:

> "*The maximum duration of Project-related changes to these measurement indicators in the Application Case would be 75 years, which includes the 43-year period of the Project (i.e., from Construction through to the end of Closure) where maximum COPC concentrations were projected, followed by a period of 32 years where COPC concentrations decrease to near Base Case concentrations. For this reason, the assessment results indicate that the Project-related changes to COPC concentrations in Patterson Lake and downstream waterbodies in the LSA are reversible because COPC concentrations would achieve near Base Case concentrations after the cessation of site discharges at the end of Operations. For the water quality constituent concentrations and drinking water quality constituent concentrations measurement indicators, residual effects from Operations would reach a pseudo-steady-state for applicable COPC concentrations in 2100; these residual effects are most obvious in Patterson Lake*." (p. 10-113 to 10-114) (emphasis added)

It isn't clear – are the changes in COPC concentrations expected to return to Base Case and are therefore reversible, or are they expected to reach a pseudo-steady-state at different concentrations and are therefore not reversible? For reference, under the Application Case, it appears that cobalt and copper concentrations in Patterson Lake will be much higher than the Base Case for centuries after the end of the Project life (i.e., Figure 10.5-8). It also appears that they will exceed the Project thresholds.

Information Requests:

a) Please clarify, are predicted changes to each COPC in water under the Application Case ad RFD scenario expected to return to base case concentrations, or reach a pseudo-steady-state? If it is the latter, will the pseudo-steady-state establish at a concentration higher than the base case or the Project threshold? A table might help to present the results for each COPC.

b) In each case, please clarify, are the effects considered reversible?

B14)	**Conservatism**
EIS Section	Section 10: Surface Water Quality and Sediment Quality
Subsection, Page #	10.6.1.4 Regional Surface Water Quality Model, p. 10-123
Terms of Reference	-

Rationale / Review Comments:

In a discussion of the regional surface water quality model, NexGen claims that the prediction of effects from the nearby Fission Project were conservative, in part because effluent concentrations from the Fission project were assumed to be equivalent to the median effluent concentrations from the Project. But, why would an assumption like that, using the median quality from another project, be considered conservative?

Information Requests:

a) Please explain, how is the approach discussed above conservative, and not just reasonable?

References

Helsel, D. R. (2011). Statistics for Censored Environmental Data Using Minitab® and R: Second Edition. John Wiley and Sons. https://doi.org/10.1002/9781118162729

Helsel, D. R., Hirsch, R. M., Ryberg, K. R., Archfield, S. A., & Gilroy, E. J. (2020). Statistical methods in water resources. https://doi.org/10.3133/tm4a3

MOEE (Ontario Ministry of the Environment and Energy). 2021. Table 2 - Table of PWQOs and Interim PWQOs. Available at : https://www.ontario.ca/page/water-management-policies-guidelines-provincial-water-quality-objectives#fn121

Appendix C:

Integrated Toxicology Solutions

Toxicology technical review of NexGen Rook 1 Uranium Mine Application

Appendix C: Integrated Toxicology Solutions

Toxicology technical review of NexGen Rook 1 Uranium Mine Application

By: Mandy Olsgard

Overarching Comments / General Concerns

Generally, the methods adopted in the Environmental Risk Assessment (ERA; TSD XXI) to support the Human Health Risk Assessment (Section 15) consider industry best practices and do not consistently reflect conservative approaches.

The least conservative approaches, that have the greatest potential to underestimate project related risks, were identified in the methods used to screen complex mixtures associated with Project activities to identify a shorter list of Constituents of Potential Concern (COPCs). These non-conservative approaches could minimize the risk assessment results related to project influences on chemical concentrations of chemicals in air, surface water, sediment, and soil.

While screening methods to identify COPCS are not recommended by Athabasca Chipewyan First Nation (ACFN), it is recognized that these approaches may be acceptable under certain instances as per Health Canada (2021) and is economically advantageous to proponents. However, the methods adopted by the proponent have not considered the following and likely underestimated the assessment of risks to human health.

Lack of consideration for the additivity of chemicals with similar target organs/ effects/ mechanism of action in complex mixtures (Health Canada 2021)

Lack of consideration for persistence and bioaccumulative substances (CEPA 1999 SOR/2000-107, and

Exclusion of published guidelines with lower screening values for surface water and air (i.e. United States Environmental Protection Agency (US EPA) and World Health Organization (WHO))

It is also concerning that the potential risks to humans related to exposure to arsenic, molybdenum, and uranium in various age groups at Patterson, Beet and Lloyd Lakes are not accurately reflected in sections discussing the conclusions and do not appear to be of concern to the proponent.

Finally, the ERA in general does not appear to reflect the full time period over which risks to human health may occur as the life of the Project was limited to 43 years but groundwater modelling indicates that chemicals released from the waste rock and underground tailings

management areas would reach Patterson Lake over longer time periods (77-> 1000 years) indicating there are potential long term influences of the project on the surface water and sediment quality in this culturally important area that could pose risks to successive generations of Indigenous people.

Based on these findings, it is recommended that the ERA (TSD XXI) and Sections 14 and 15 which rely on this study be updated to more accurately reflect the COPCs which could pose potential non-carcinogenic and carcinogenic risks to ACFN members and other Indigenous groups which rely on Patterson, Beet and Lloyd Lakes and the surrounding uplands to exercise their Rights through traditional ways of life, including the consumption of natural surface water, traditional foods and medicines.

C1	Topic: Relevant Standards, Codes and Guidelines
EIS Section(s)	1
Subsection, Page #	Section 1.3.4; 15.2.8
Terms of Reference	

Rationale / Review Comments:

Section 1.3.4 does not identify that the following federal risk assessment guidance documents were relied upon to prepare the EIS;

- Guidance for Evaluating Human Health Impacts in Environmental Assessment: Human Health Risk Assessment
- Federal contaminated site risk assessment in Canada: Guidance on human health preliminary quantitative risk assessment (PQRA), version 2.0
- Federal contaminated site risk assessment in Canada: Guidance on Human Health Preliminary Quantitative Risk Assessment (PQRA) Version 3.0.
- Federal Contaminated Site Risk Assessment in Canada: Supplemental Guidance on Human Health Risk Assessment of Air Quality, Version 2.0
- Federal Contaminated Site Risk Assessment in Canada: Supplemental Guidance on Human Health Risk Assessment for Country Foods (HHRA Foods) [Health Canada, 2011]
- Federal Contaminated Site Risk Assessment in Canada: Interim Guidance on Human Health Risk Assessment for Short-Term Exposure to Carcinogens at Contaminated Sites
- Framework for addressing and managing aquatic contaminated sites under the Federal Contaminated Sites Action Plan (FCSAP) V2.1
- Federal Contaminated Sites Action Plan (FCSAP) - ecological risk assessment guidance, modules 1 to 7.
- Canadian Council of Ministers of the Environment (CCME). Ecological Risk Assessment Guidance Document (2020).

Further to this, it is unclear why the HHRA adopted methods prescribed in "CSA N288.6-12 Environmental Risk Assessments for Class I Nuclear Facilities and Uranium Mines and Mills (CSA Group 2012)" when human health risk assessment guidance is available.

Information Requests:

a) Please update section 1.3.4 to include available federal human health and ecological risk assessment guidance documents, and
b) Confirm that federal health risk assessment guidance was relied on to conduct the HHRA (Section 15) and ERA (TSD XXI), please specify where federal guidance was modified or not adopted to undertake the ERA.

C2	**Topic: Contaminants of Potential Concern (COPC) identification relied on predicted exceedances of screening values**
EIS Section(s)	Section 15; TSD XXI (ERA)
Subsection, Page #	15.2.8.2; 4.2.3; 4.3.3
Terms of Reference	

Rationale / Review Comments:

The HHRA focused on evaluating potential risks related to COPCs that were identified as only those contaminants that exceeded screening values for predicted atmospheric and aqueous releases. This approach is limited and may lead to an underestimation of potential risks to human health as screening values for air, surface water, sediment and groundwater do not account for the bioaccumulation and persistence of contaminants within food webs. Using this approach, predicted concentrations of contaminants in air, surface water, sediment and groundwater that were below the proponent identified screening values were excluded from the HHRA. This approach is flawed in that concentrations of bioaccumulative and persistent substances may present risks to human health at concentrations lower than screening levels due to biomagnification in food chains. While the HHRA did predict biomagnification of COPCs to assess risks, this modelling and subsequent risk assessment was only completed for COPCs which passed the screening process and potential health risks for COPCs which were below screening values were not assessed and are unknown. This is a gap in the HHRA results as presented in the EIS.

As per the Canadian Environmental Protection Act (CEPA; 1999) Persistence and Bioaccumulation Regulations (SOR/2000-107) Persistence and Bioaccumulation should be determined using the following characteristics. This approach was not adopted by the proponent to support the HHRA in the EIS.

3 A substance is persistent when it has at least one of the following characteristics:

(a) in air,

(i) its half-life is equal to or greater than 2 days, or

(ii) it is subject to atmospheric transport from its source to a remote area;

(b) in water, its half-life is equal to or greater than 182 days;

(c) in sediments, its half-life is equal to or greater than 365 days; or

(d) in soil, its half-life is equal to or greater than 182 days.

4 A substance is bioaccumulative

(a) when its bioaccumulation factor is equal to or greater than 5 000;

(b) if its bioaccumulation factor cannot be determined in accordance with a method referred to in section 5, when its bioconcentration factor is equal to or greater than 5 000; and

(c) if neither its bioaccumulation factor nor its bioconcentration factor can be determined in accordance with a method referred to in section 5, when the logarithm of its octanol-water partition coefficient is equal to or greater than 5.

The above-described approach would also be affected by any screening methods to identify COPCs which were applied in each of the sections related to assessing atmospheric and aqueous releases. Screening within media specific assessments (i.e., surface water, air) could lead to the exclusion of COPCs (based on risks to aquatic life) that could still pose a potential risk to human health. The assumption that aquatic life is the most sensitive receptor group is not supported by toxicity data that clearly shows humans are more sensitive to carcinogenic substances as well as other non-carcinogenic substances (i.e., cadmium, chromium). The sensitivity of various receptor groups can quickly be established by comparing published guidelines for the protection of aquatic life to drinking water quality guidelines which are derived for the protection of human health.

- United States Environmental Protection Agency (US EPA). 2015 (updated 2021). National Recommended Water Quality Criteria - Human Health Criteria Table.
- World Health Organization (WHO). 2017 (updated 2022). Guidelines for drinking-water quality, 4th edition, incorporating the 1st addendum.

Information Requests:

a) It is requested that the proponent re-evaluate the predictive modelling data for air, surface water (end of pipe), sediment and soils in the ERA to first identify bioaccumulative and persistent substances as per CEPA Persistence and Bioaccumulation Regulations (SOR/2000-107) and include these as COPCs, without the application of any additional screening criteria.
b) If the proponent chooses to identify COPCs by comparing predicted concentrations of COPCs to screening values, it is requested that additional criteria from the US EPA and WHO be included.

C3	**Topic: HHRA relies on spatial and temporal boundaries defined in the EIS Sections related to COPC modelling for air, water, and soil quality.**
EIS Section(s)	Section 15
Subsection, Page #	15.2.3 (Table 15.2-2; Figure 15.2-1); 14.2.4
Terms of Reference	

Rationale / Review Comments:

As stated by the proponent "spatial boundaries were largely influenced by the study areas for the aquatic and terrestrial environments", therefore, any topics and information requests identified by ACFN on Sections 6,7,8,9,10,11, 12, 13, and 14 must be considered and, reflected in the ERA (TSD XXI), wildlife assessment (Section 14)) and finally the HHRA (Section 15). Any issues related to the spatial boundaries (LSA and RSA) and predicted concentrations of COPCs from the modelling exercises which resulted in modifications to Sections 6,7,8,9,10,11, 12, 13, and 14 can affect the risk predictions in the ERA (TSD XXI) and HHRA (Section 15) and must be considered in all modelling predictions, spatial and temporal boundaries, and COPCs relied on to undertake the HHRA.

Information Requests:

a) It is requested that the proponent provide a summary of ACFN identified issues related to the spatial and temporal boundaries and predicted concentrations of COPCs in air, soil, and water modelling (Sections 6,7,8,9,10,11, 12, 13, and 14).
b) Based on the summary of issues, it is requested that the proponent update the ERA (TSD XXI) and the HHRA (Section 15) accordingly and,
c) Provide a summary of how updates based on ACFN comments affected the predicted risks (i.e. HQs, ILCRs, Radiation Dose) in the HHRA.

C4	**Topic: Pre-development assessment case not included**
EIS Section(s)	Section 15
Subsection, Page #	15.2.5
Terms of Reference	

Rationale / Review Comments:

As stated by the proponent, industrial development (i.e., Cluff Lake Uranium Mine, linear disturbance) in the LSA and RSA has impacted the condition of the environment. ACFN does not consider the impacts from previous development acceptably mitigated and has provided comments on issues related to the long-term monitoring and management of this contaminated site.

As such, ACFN does not accept the impacted condition of the area in which the project development is proposed and would like to understand how the proposed Project would further alter their traditional territory compared to pre-development conditions. This information is required to evaluate future risk-based monitoring, mitigation, and management plans (if the project were to receive approval) and ensure remediation and reclamation criteria which are applied to the Project support address cumulative effects in the LSA and RSA and return the environment (land, water, biota, people) to conditions that would have been present prior to industrial development.

Information Requests:

a) It is requested that the proponent provide an additional assessment case "pre-development", and
b) results from this additional assessment case are used to develop risk-based adaptive monitoring, management and mitigation plans that address cumulative effects and support collaboration between industrial stakeholders to reclaim the environment to pre-disturbance condition.

C5	**Topic: Project life (43 years) is shorter than predicted timeframe for project effects on groundwater and surface water (77 – > 1000 years)**
EIS Section(s)	TSD XXI (ERA); Section 15
Subsection, Page #	Section 4.2.1 pg 4.3
Terms of Reference	

Rationale / Review Comments:

Predictive modelling indicates that chemical constituents from the UGTMF will influence groundwater and discharge into Patterson Lake in ~1000 years, similarly chemicals associated with the waste rock piles which seep to groundwater were predicted to discharge

to Patterson Lake in shorter timeframes, 43 years at the North end and 77 years in the South end. The modelling indicates that the Project life, which includes decommissioning and reclamation is. much longer than the 43 years identified by the proponent and relied on in the ERA (including HHRA and EcoRA). By adopting a shorter Project life (43 years) the ERA components which rely on this temporal scale could underestimate project related risks which could limit the efficacy and protective nature of risk-based project monitoring, mitigation, and management activities.

Information Requests:

a) It is recommended that the proponent adjust the Project life to align with outputs from the predictive modelling which indicate project related contaminants released from the UGTMF and waste rock seepage to groundwater may intercept Patterson Lake and affect surface water quality and risks to human health from contamination of traditional foods from 77 to > 1000 years. At a minimum, the ERA should extend to 77 years when groundwater influences from the waste rock pile are predicted to discharge to the south end of Patterson Lake and would overlap with the predicted future development case.

C6	**Topic: Baseline condition was not reflected in estimates of risk**
EIS Section(s)	TSD XXI (ERA); Section 15
Subsection, Page #	Executive Summary, pg ii
Terms of Reference	

Rationale / Review Comments:

It is unclear why project Hazard Quotients (HQs) were evaluated against a threshold of 0.2 when the proponent states that the site is well characterized, and baseline condition has been established. As per Health Canada (2021), it is acceptable to compare predicted exposures to 20% of the tolerable daily intake (TDI) but that this is recommended in cases where baseline or reference conditions have not been established. Health Canada (2021) guidance recognizes the importance of considering total exposures which consider the contribution from exiting conditions and incremental risks from project development to provide the most accurate representation of potential risks to human health. The proponent appears to have relied on the potential risks to human health from exposure to baseline conditions as justification for why the proposed project is acceptable.

Information Requests:

a) Please provide a comparison of the predicted risks from exposure to the project only scenario to the scenario which accounts for exposure to baseline conditions and the project related effects by comparing to the HQ of 1.0 (for all exposure pathways) to indicate if the adopted methods are a representative measure of the predicted risks to human health.

C7	**Topic: Screening methods to identify COPCS and assessment of risks does not reflect Health Canada guidance for complex mixtures and lacks conservatism**
EIS Section(s)	TSD XXI (ERA); Section 15
Subsection, Page #	4.2.3; 4.3.3
Terms of Reference	

Rationale / Review Comments:

As per Health Canada Human Health Risk Assessment guidance (2021), unless there is compelling science of other factors for additivity, for simultaneous exposure to multiple

COPCs, non-cancer HQs should be assumed to be additive and summed for those chemicals which have similar target organs/effects/mechanisms of action. Similarly, carcinogens with the same target organ and form of cancer, the risks should be assumed to be additive and summed.

The ERA does not consider the potential for additive risks from exposure to multiple substances with similar target organs/ effects/ mechanism of action and likely underestimates the potential non-carcinogenic and carcinogenic risks associated with the project.

Further, the screening methods used to identify COPCs associated with surface water and air emissions from the project did not consider additivity and contaminants associated with the project that would likely contribute to health risks have been excluded from the HHRA and EcoRA.

Information Requests:

a) It is recommended that the screening process to identify COPCs associated with surface water, sediment, air ,and soil be re-evaluated to consider complex mixtures as per Health Canada guidance and identify individual COPCs and mixture based COPC classes that reflect similar target organs/ effects/ mechanism of action and that these new COPCs be reflected in an updated HHRA and EcoRA.

C8	**Topic: Screening to identify COPCs associated with aqueous sources includes mixing zones and does not reflect conservative approach**
EIS Section(s)	TSD XXI (ERA); Section 15
Subsection, Page #	4.2.3.2
Terms of Reference	

Rationale / Review Comments:

The proponent indicates that COPCs associated with surface water for evaluation in the HHRA were identified by comparing predicted concentrations of chemicals at the end of pipe, boundary of the mixing zone and in surface run off to the identified water quality objective (WQO). But it is unclear if COPCs were identified using each of the criteria or if they were applied as a hierarchy and that COPCs were identified only if the exceedances at the end of pipe were also identified at the boundary of the mixing zone. Identifying COPCS using screening processes is an inherently non-conservative approach as it constrains the number of contaminants associated with the project which are assessed for potential health risks. To ensure screening does not underestimate project related risks to health, conservative assumptions such as screening using the maximum predicted concentrations, such as those at the end of pipe, are recommended.

Information Requests:

a) Please clarify if the screening process identified COPCS which exceeded screening values at each of the identified areas (end of pipe, boundary of mixing zone, runoff) or if a COPC was only identified if predicted concentrations exceeded at each of the areas.
b) If the response indicates that COPCs were identified only if predicted concentrations exceeded screening values at the end of pipe and boundary of the chronic mixing zone, please re-screen the predicted concentrations and identify COPCS as those project related contaminants which exceeded screening values at the end of pipe.

C9	Topic: Air quality screening values to identify COPCs do not consider lowest published values by the World Health Organization (WHO)
EIS Section(s)	TSD XXI (ERA)
Subsection, Page #	Section 4.3.3
Terms of Reference	

Rationale / Review Comments:

The World Health Organization (WHO) conducted a systematic review of the accumulated evidence for air contaminants and published revised air quality guidelines (AQGs) for sulphur dioxide, nitrogen dioxide and particulate matter (2.5 and 10) based on clearer insights about sources of emissions and the contribution of air pollutants to the global burden of disease. Several of the WHO AQG are lower than those identified in Table 4-6 and used by the proponent to identify COPCS related to air emissions (as shown in the table from WHO 2021 below).

Pollutant	Averaging time	2005 AQGs	2021 AQG level
$PM_{2.5}$, $\mu g/m^3$	Annual	10	5
	24-hour[a]	25	15
PM_{10}, $\mu g/m^3$	Annual	20	15
	24-hour[a]	50	45
O_3, $\mu g/m^3$	Peak season[b]	–	60
	8-hour[a]	100	100
NO_2, $\mu g/m^3$	Annual	40	10
	24-hour[a]	–	25
SO_2, $\mu g/m^3$	24-hour[a]	20	40
CO, mg/m^3	24-hour[a]	–	4

Information Requests:

a) It is recommended that the AQGs published by the WHO be added to the sources of air quality screening values and considered in the selection of final screening values to identify air related COPCs.

C10	Topic: Air modelling does not meet requirements for comparison to federal CAAQS
EIS Section(s)	TSD XXI (ERA)
Subsection, Page #	4.3.2
Terms of Reference	

Rationale / Review Comments:

As stated by the proponent, the air dispersion modelling does not meet the minimum requirements to allow for comparison to the Canadian Ambient Air Quality Standards (CAAQS), which generally require 3 years of data (modelled or measured). It is unclear why the proponent has not modelled for a longer period as the Project life was identified as 43 years and this would require comparison to federal standards.

Information Requests:

a) Please provide rationale describing how the air dispersion modeling study is representative of long-term exposures and supports the assessment of health risks.

b) It is recommended that the air dispersion modelling be updated to a 3-year period to allow for comparison to federal air quality standards (CAAQS) and that this comparison be undertaken and results reflected in the EIS.

C11	**Topic: Soil screening values to support the identification of COPCS related to air deposition do not consider bioaccumulation in traditional foods**
EIS Section(s)	TSD XXI (ERA)
Subsection, Page #	4.3.3
Terms of Reference	

Rationale / Review Comments:

Predicted concentrations of Total Suspended Particles (TSP) were predicted to exceed screening values for deposition (Section 4.3.3.1) based on this exceedance, deposition of dust to soil and potential risks of bioaccumulation of COPCs in traditional foods was evaluated by comparing the predicted concentration of metals to soil quality guidelines. This method is supported and appropriate, however, the CCEM soil quality guidelines for the protection of human health are limited and do not consider bioaccumulation of contaminants from soil to foods as stated in "A Protocol for the Derivation of Environmental and Human Health Soil Quality Guidelines" (CCME, 2006). As per the CCME derivation protocol, to evaluate potential risks to humans from consumption of traditional foods which may take up contaminants from soil, soil quality guidelines must be derived using the calculations provided in "Derivation of Soil Quality Guidelines for Soil and Food Ingestion". The proponent has not derived soil quality guidelines to consider this exposure pathway and the air associated COPCs may not reflect all metals potentially deposited to soils that could cause risks to human health (in addition to COCPS which should be included based on complex mixture additivity discussed in comment C8).

Information Requests:

a) It is recommended that the ERA be updated with soil screening values derived using the CCME (2006) guidance for metals associated with air deposition of total suspended particles,
b) the derived values be included in the screening process to identify air associated COPCs, and
c) the HHRA be updated to reflect any additional COPCs which were identified though this conservative approach.

C12	**Topic: Air quality COPCS excludes known carcinogenic substances**
EIS Section(s)	TSD XXI (ERA)
Subsection, Page #	4.3.3
Terms of Reference	

Rationale / Review Comments:

As discussed previously, there are concerns related to the lack of screening to identify COPCS which consider additivity from complex mixtures. Further to this, screening values for metals in air using the identified guidelines do not reflect Health Canada Toxicity Reference Values which identifies additional substances as carcinogenic via inhalation exposure, specifically cadmium, chromium, and nickel. Considering that the HHRA identified potential carcinogenic risks from exposure to arsenic, a conservative approach to assess carcinogenicity would be to

include all carcinogenic substances regardless of whether predicted concentrations exceeded the identified screening value.
Information Requests: a) It is recommended that the ERA be updated with all known carcinogenic substances as per Health Canada TRV guidance (2021), and b) the HHRA be updated to reflect carcinogenic substances which may act through additive mechanisms.

References

Health Canada. 2017. Guidance for Evaluating Human Health Impacts in Environmental Assessment: Human Health Risk Assessment

Health Canada. 2021. Federal contaminated site risk assessment in Canada: Guidance on Human Health Preliminary Quantitative Risk Assessment (PQRA) Version 3.0.

Canadian Council of Ministers of the Environment (CCME). 2020. Ecological Risk Assessment Guidance Document.

Federal Contaminated Sites Action Plan (FCSAP). Ecological risk assessment guidance, modules 1 to 7.

Canadian Environmental Protection Act (CEPA). 1999. Persistence and Bioaccumulation Regulations (SOR/2000-107)

United States Environmental Protection Agency (US EPA). 2015 (updated 2021). National Recommended Water Quality Criteria - Human Health Criteria Table.

World Health Organization (WHO). 2017 (updated 2022). Guidelines for drinking-water quality, 4th edition, incorporating the 1st addendum.

Canadian Council of Ministers of the Environment (CCME). 2006. A Protocol for the Derivation of Environmental and Human Health Soil Quality Guidelines.

Appendix D:

Management and Solutions in Environmental Science (MSES)

Vegetation, Wetlands, Reclamation, and Wildlife technical review of NexGen Rook 1 Uranium Mine Application

Appendix D: Management and Solutions in Environmental Science (MSES)

Vegetation, Wetlands, Reclamation technical review of NexGen Rook 1 Uranium Mine Application

By Sheri Gutsell (MSES)

Overarching Comments / General Concerns

NexGen assumes that the Project will have minimal impacts on upland, wetland, and riparian ecosystems, biodiversity, and traditional use plant species. This is primarily because they assume that the plant communities to be disturbed by the Project can be reclaimed. Indigenous communities have expressed that the land should be returned to its former condition, which means that the composition and diversity of plant species and associated plant communities present before disturbance should be present again once the Project area has been decommissioned and reclaimed. However, many of the species that are predominant (e.g., lichen, mosses) in the plant communities affected by the Project (e.g., jack pine/lichen, black spruce/Labrador tea/feathermoss) are difficult to re-establish. Given this difficulty, it seems that the impact on upland, wetland, and riparian ecosystems, biodiversity, and traditional use plant species should be considered significant.

D1)	**More detail needed on using non-native plant species in reclamation**
EIS Section	Section 13: Vegetation
Subsection, Page #	Subsection 13.4 Project Interactions and Mitigation, Table 13.4-1, pages 79 & 81
Terms of Reference	

Rationale / Review Comments:

One of the mitigations listed for the Project effects pathways, "*Terrain Alteration*" and "*Invasive Species*" is, "*use native species or non-aggressive, non-native species appropriate for the conditions for revegetation*." It is not clear under what conditions it would be appropriate to use non-native plant species instead of native plant species when revegetating during reclamation, when preventing the introduction of invasive species also is a goal. There is a concern that any non-native plant species used during reclamation would become part of the reclaimed plant community such that the species composition of the reclaimed plant community would be different from the corresponding pre-disturbance plant community.

Information Requests:

a) Please explain which non-native plant species may be used in reclamation and why that species would be used instead of a native plant species.

b) For each non-native plant species to be used, explain how that species will be prevented from becoming established within the reclaimed plant community and altering species composition relative to pre-disturbance.

D2)	**Evidence for effectiveness of mitigations for fugitive dust & constituent emissions**
EIS Section	Section 13: Vegetation
Subsection, Page #	Subsection 13.4 Project Interactions and Mitigation, Table 13.4-1, page 80 & Subsection 13.4.2 Secondary Pathways, page 88
Terms of Reference	

Rationale / Review Comments:

There are several mitigations listed for the Projects Effects pathways, "*Fugitive dust and constituent emissions*" that would result from various Project activities. NexGen states that "*mitigations in the environmental protection plan is expected to be effective at reducing the magnitude and spatial extent of fugitive dust deposition*." (Page 88). However, they provided no evidence that these mitigations are effective at preventing significant impacts on the nutritional quality, growth, or survivorship of plant species, particularly those that have been shown to be sensitive to dust and other emissions.

One of the mitigations for fugitive dust and constituent emissions is to "*limit vehicle speed on unpaved roads*." (Page 80). There will be enforcement of "*a 25 km/hr speed limit for heavy equipment involved in material movement and earthworks on the mine/mill terrace*." (Page 80). However, this speed limit will not apply to site road traffic or the haul route from the headworks to the waste rock piles. If site roads and the haul route from the headworks to the waste rock piles are unpaved, it is not clear why the speed limit will not apply.

Information Requests:
a) Please provide evidence from the scientific literature that the mitigations for fugitive dust and constituent emissions will be successful in preventing dust or other emissions from coating the leaves of plant species in the vicinity of Project construction and operations activities.
b) Please provide evidence from the scientific literature that mitigations for fugitive dust and constituent emissions are effective at preventing significant impacts on the nutritional quality, growth, and survivorship of plant species, particularly those that have been shown to be sensitive to dust and other emissions.
c) If site roads and the haul route from the headworks to the waste rock piles are unpaved, please provide justification for why the speed limit of 25 km/hr will not apply in these areas.
d) Will all other mitigations in the Project effects pathway (Table 13-4.1) be applied to site roads and the haul route from the headworks to the waste rock piles to prevent dust, radon, and other emissions from being generated and impacting nearby plant species?

D3)	**How will natural propagation and regeneration be promoted?**
EIS Section	Section 13: Vegetation
Subsection, Page #	Subsection 13.14 Project Interactions and Mitigation, Table 13.4-1, page 81
Terms of Reference	

Rationale / Review Comments:
One of the mitigations listed for the Projects Effects pathway, "*Loss from fibre optic line*" is to "*promote natural propagation and regeneration to enhance reclamation along the access road and other Project right-of-ways*." (Page 81). It is not clear what techniques will be used to *promote* propagation and regeneration.

Information Requests:
a) Please explain how NexGen will *promote* propagation and regeneration.
b) Please provide evidence from the scientific literature or data from other projects to show the effectiveness of the techniques used to promote propagation and regeneration.

D4)	**Invasive species not carried forward in the assessment of Project impacts**
EIS Section	Section 13: Vegetation
Subsection, Page #	Subsection 13.4.2 Secondary Pathways, page 91, and Subsection 13.3.1.3, page 52
Terms of Reference	

Rationale / Review Comments:
For the effects pathway, "*Invasive species,*" it was concluded that because of NexGen's implementation of best management practices and mitigation, it is "*expected to avoid and minimize the introduction and spread of weed species in the maximum disturbance area of the Project and result in minor changes to the condition of upland, wetland, and riparian ecosystems and traditional use plants*." (Page 91). Therefore, invasive species was not carried forward in the assessment of Project impacts. However, as discussed elsewhere in the application, "*human-disturbed areas are susceptible to the introduction and establishment of invasive and non-native plant species…. One nuisance species and one noxious species was*

observed in the areas associated with existing and reclaimed anthropogenic disturbances during 2018 field surveys…. Additional introduced species were observed in association with anthropogenic disturbances and areas that have been actively seeded during reclamation." (Page 52). The fact that non-native and invasive species have been found in the disturbed areas of the Project, and that it is well-known that these species successfully establish within nearly all human-disturbances, including in reclamation sites, it seems that any amount of best management practises and mitigation will not prevent the establishment and growth of these species in the Project area during Project operations and in reclamation. Their presence in reclamation will alter the species composition of reclaimed plant communities relative to pre-disturbance plant communities, potentially affecting the composition of reclaimed upland, wetland, and riparian plant communities, and the availability of traditional use plant species. Therefore, it seems appropriate that the invasive species pathway should be carried forward in the assessment of Project impacts.

Information Requests:

a) Given the prevalence of invasive species in the disturbed areas of the Project, and their prevalence in human-disturbed areas generally, including in reclamation sites, will NexGen consider carrying forward the invasive species pathway in the assessment of Project effects?

D5)	**Residual effects classification likely inaccurate for some reclaimed ELC units**
EIS Section	Section 13: Vegetation
Subsection, Page #	Subsection 13.5.1.2.1, Table 13.5-3, page 114, and Subsection 13.5.1.1.1, page 101, Subsection 13.5.3.3.1, Table 13.5-9, page 144
Terms of Reference	

Rationale / Review Comments:

In the classification of residual effects on upland and riparian ecosystems, NexGen states that the availability of upland and riparian ecosystems is *reversible* within reclaimed ELC units (Table 13.5-3 and Table 13.5-9). This relies on their assumption that the reclamation of areas disturbed by the Project (where there are non-permanent Project facilities) will result in the re-establishment of plant communities that are similar in species composition and diversity to those found before disturbance by the Project. However, as discussed elsewhere in the application, reclaimed "*upland ecosystems would likely differ in species composition from those present before disturbance*." (Page 101). In fact, many of the plant species (e.g., lichen, feathermosses) that predominate within the plant communities most affected by the Project (i.e., jack pine/lichen, black spruce/Labrador tea/feathermoss) are known to be difficult to re-establish, including many traditional use plant species. Indigenous communities have "*commented that the land should be returned to its former condition after exploration activities in general and during Project closure*.." (Page 101). This means that the species composition and diversity of plant communities present before disturbance should be present again once the Project area has been decommissioned and reclaimed. Given that this is unlikely for reasons described above, it would seem that the impacts on upland and riparian ecosystems will not be reversible.

Information Request:
a) Given that many of the predominant species (i.e., lichens, mosses) found in the plant communities to be disturbed by the Project footprint, including traditional use plant species, are difficult to re-establish in reclamation, please provide justification for the prediction that the impacts on the availability of upland and riparian ecosystems are reversible.

D6)	**Residual effects classification likely inaccurate for biodiversity**
EIS Section	Section 13: Vegetation
Subsection, Page #	Subsection 13.5.5, Effects on Biodiversity, page 166
Terms of Reference	

Rationale / Review Comments:
The residual effects classification concludes that effects of the Project on biodiversity will be low in magnitude because effects on biodiversity are "*reversible in the long term for some natural ecosystems and plant communities that can regenerate or can be reclaimed.*." (Page 166). However, given that many of the predominant plant species (e.g., lichen, feathermosses) in ELC units to be reclaimed (e.g., jack pine/lichen, black spruce/Labrador tea/feathermoss) are difficult, if not impossible, to re-establish, it is not clear how biodiversity will not be significantly reduced. If NexGen believes that effects on biodiversity are reversible, then evidence from the scientific literature showing that these species (e.g., lichen, feathermosses) can be re-established within reclamation sites must be provided.

Information Requests:
a) Please provide evidence from the scientific literature that the plant species that predominate pre-disturbance plant communities (e.g., lichen, feathermosses) can be re-established within reclamation sites in the boreal forest.

Appendix D (Continued): Management and Solutions in Environmental Science (MSES)

Wildlife technical review of NexGen Rook 1 Uranium Mine Application

By Shannon Gavin (Wildlife), MSES Inc
Abbie Stewart (Appendix 14B)

Overarching Comments / General Concerns

The wildlife assessment focused on changes in habitat availability, habitat distribution and population resilience of the following Valued Components (VCs): woodland caribou, moose, grey wolf, black bear, beaver, little brown myotis bats, olive-sided flycatcher, rusty blackbird, common goldeneye, mallard, and Canadian toad. With the exception of woodland caribou, project and cumulative effects from project activities are predicted to not significantly impact wildlife VCs and all (except caribou) were predicted to remain self-sustaining. For woodland caribou, the SK2 conservation unit is designated as not self-sustaining under current conditions and therefore the assessment predicted that the Project and Reasonably Foreseeable Development (RFD) cases (including anticipated forestry activity south of the Regional Study Area) would lead to significant impacts to the population.

The discussion on the existing conditions and factors that may be affecting wildlife and wildlife habitat was detailed and included support from research and Indigenous Knowledge (IK). For most of the wildlife VCs, it was predicted that existing anthropogenic disturbances and fire are having impacts to wildlife habitat use to some degree but that the effects were likely not enough to see measurable changes at the population level. Assessing the rate of change in habitat loss or other parameters before disturbance to existing conditions would help our understanding of local and regional changes in wildlife.

A common prediction for most of the wildlife VCs included the assumption that wildlife will access suitable habitat within the broader regional area given the predicted loss of local habitat around Patterson Lake. Quantitative information on connectivity, movement and access to these habitats was limited. The potential loss of the movement route called the Narrows used by caribou, moose and black bears and limitations posed for movement east-west between Patterson Lake and Forrest Lake are not discussed in terms of availability of other movement routes in the RSA.

Certain impact pathways that could affect wildlife were deemed to have negligible effects based on mitigation implementation and not carried forward for further assessment (e.g., exposure to contaminants). More details are needed to better understand how these potential health risk pathways and predicted impacts to wildlife and their habitat will be monitored by NexGen

D7	Topic: Baseline Case and Existing Wildlife Impacts
EIS Section(s)	Section 6.5 Assessment Cases
Subsection, Page #	Section 6.5.1, page 1-26
Terms of Reference	

Rationale / Review Comments:

The base case is defined as describing the existing environment in the Local Study Area (LSA) and Regional Study Area (RSA) including impacts from previous land alterations that may have influenced/impacted wildlife. The magnitude of those changes is qualitatively considered as part of the impact assessment evaluating impacts from the Project and in the Reasonably Foreseeable Project scenarios. Many statements in the Wildlife section refer to wildlife being affected in some way from previous land clearing or sensory disturbance yet is assumed that those impacts have been small in the broader regional context and population level. Without a comparison of some of those changes (e.g., quantitative measurement of loss) from before development to existing conditions, the degree of existing impacts on wildlife may be underestimated.

Information Requests:

a) Please quantitatively assess changes in wildlife habitat from pre-disturbance to existing conditions to understand the degree and rate of change in wildlife habitat quality and quantity. If not, please provide rationale.

D8	Topic: VC Selection
EIS Section(s)	Section 14.2.2. Valued Components, Measurement Indicators, and Assessment Endpoints
Subsection, Page #	Section 14.2.2.1.1.4 Indigenous Considerations, pg 14-14, Table 14.2-1
Terms of Reference	

Rationale / Review Comments:

Some wildlife species noted by Indigenous Groups during engagement as species that are harvested were excluded from the final list of VCs selected because they were 1) mentioned less frequently by Indigenous Groups and/or 2) were represented by other wildlife species and vegetation ecosystems. An example of this situation includes the exclusion of spruce grouse and ptarmigan as VCs The EIS states that impacts to grouse are representative of the effects on upland and wetland ecosystems (pg 14-14) and then in Table 14.2-1 also olive-sided flycatcher (pg 14-16). More details would be helpful to understand how these other VCs reflect changes to a ground nesting bird including potential impacts from increases in smaller bodied predators attracted to vegetation clearings and edge habitat.

Information Requests:

a) Please discuss further how Project Application and RFD impacts on upland and wetland ecosystems are indicative of impacts on grouse and ptarmigan.

D9	Topic: VC Selection
EIS Section(s)	Section 14.2.2. Valued Components, Measurement Indicators, and Assessment Endpoints
Subsection, Page #	Section 14.2.2.1.1.4 Indigenous Considerations, pg 14-14, Table 14.2-1
Terms of Reference	

Rationale / Review Comments:

Fisher and marten were not included as a VC because assessments for caribou, little brown myotis, and upland and riparian ecosystems VCs were determined to be representative of effects on fisher and marten. Both species frequently use late-successional coniferous and mixed forest stands with diverse structures (e.g., standing dead and live trees, etc).

Information Requests:

a) Please summarize magnitude of Project and RFD impacts to fisher and marten given the predictions and significance outcomes for caribou, little brown myotis and upland habitats assessments.

D10	Topic: Risk to Wildlife Health
EIS Section(s)	Section 14.4 Project Interaction and Mitigations
Subsection, Page #	Section 14.4.1 No Pathways pg 14-156
Terms of Reference	

Rationale / Review Comments:

The wildlife assessment focused on primary pathways of Project impacts which included changes to wildlife habitat availability, distribution, and population (i.e., via survival and reproduction). Lower-level pathways were not carried forward. One of those pathways involved changes to ice thickness that could affect wildlife travel over the frozen lake. The pathway was not assessed further because the final Effluent Treatment Plan (ETP) diffuser design would avoid changes to ice cover, The EIS does not provide any context as to how those designs would mitigate changes to ice cover.

Information Requests:

a) Please provide explanation as to how the ETP final diffuser design will mitigate changes to ice thickness.

D11	Topic: Risk to Wildlife Health
EIS Section(s)	Section 14.2.2 Valued Components, Measurement Indicators and Assessment Endpoints
Subsection, Page #	Table 14.2-1 pg 14-15
Terms of Reference	

Rationale / Review Comments:

In Table 14.2-1, rationale for whether a species was selected as a VC or not is provided including whether that species was considered as a receptor for the ecological risk assessment. Concerns regarding risks to wildlife health and to people who consume those resources was identified during engagement. Since health risks to wildlife were considered a secondary pathway, there is minimal information regarding risks within the Wildlife section of the EIS (Section 4.5). The range of species considered as receptors for the ecological risk assessment appears to cover large mammals to birds (as indicated by comments in Table 14.2-1). However, on page 14-19, Golder states that ecological health risks were examined for 16 aquatic, semi-

aquatic, and terrestrial wildlife species including amphibians. There is no indication in Table 14.2-1 for Canadian toad or Northern leopard frog as species used in the risk assessment.

Given the communities feedback on concerns about exposure of wildlife to contaminants, it is not clear what potential contaminant pathways will be monitored in NexGen's monitoring and follow up programs. In Section 23.4.1.1, the EIS states that health risks would be monitored under the Environmental Protection Program and data collected that would verify predictions made in the risk assessment but there are no details as to whether all wildlife receptors from the risk assessment will be monitored or a select few. How will wildlife be monitored to assess potential health risks to exposure?

**Please note: Technical review of the ecological risk assessment was assumed to be completed by other relevant discipline expert.

Information Requests:

a) Please clarify what species were included in the ecological risk assessment.
b) Please describe what wildlife species will be monitored and how they will be monitored to verify the predictions in the risk assessment.

D12	**Topic: Risk to Wildlife Health**
EIS Section(s)	Section 14.4. Project Interactions and Mitigations
Subsection, Page #	Section 14.4.2 Secondary Pathways, pg 14-164 and 14-167
Terms of Reference	

Rationale / Review Comments:

Air quality modelling indicated that particulate matter (PM_{10}) is predicted to exceed air quality standards within the Patterson Lake North Arm area during both construction and operations. It is stated that since the exceedances occur mostly within the Patterson Lake North Arm, there will be minimal changes to vegetation ecosystems. As well, after implementation of mitigation and environmental design features that any vegetation changes would be too small to be measurable relative to existing conditions and therefore, the Project will have a negligible residual effect on wildlife habitat availability and distribution. It is not clear if there are health risks to wildlife from ingesting aquatic or riparian vegetation in this area.

Water quality modelling indicated that cobalt and copper may exceed threshold guidelines but that the risk assessment indicated that these exceedances would not cause adverse effects on wildlife health. More context around these conclusions is needed.

Information Requests:

a) Please discuss whether the PM_{10} exceedances may pose a risk to wildlife that consume aquatic vegetation.
b) Please define what "adverse" effects represents.
c) How will NexGen monitor for potential changes in wildlife habitat availability and quality due to these predicted exceedances, particularly for woodland caribou.

D13	Topic: Wildlife Connectivity Impacts and Description of Habitat Distribution Too Simplistic
EIS Section(s)	Section 14.5 Residual Effects Analysis
Subsection, Page #	
Terms of Reference	

Rationale / Review Comments:

Habitat distribution is assessed qualitatively and discussed for each wildlife VC. Generally, some suitable habitat will be available within the RSA for wildlife VCs, and it is assumed that wildlife can and will access these other areas. However, no detailed assessment regarding movement or connectivity was completed which is important to understand how individuals and populations may adjust to a changing landscape. For example, the use of connectivity modelling that considers varying environmental conditions/factors that an individual may encounter when moving across a landscape (e.g., resistance) would provide insight into the accessibility of these other suitable habitats and the probability of wildlife actually accessing them. Or simpler metrics could be used to build more context on the discussion of habitat distribution such as distance between suitable patches and size of patches.

Furthermore, impacts to loss of suitable wildlife habitat within the LSA that causes wildlife to move away from the area will impact Indigenous hunting and harvesting. For example, IK indicated that moose populations are declining due to current exploration activities and the slow rate of vegetation regrowth following wildfires. Although input from land users was shared in the wildlife sections that indicate Indigenous members are already observing changes in wildlife, it is not clear how these changes were meaningfully incorporated into the significance determination to wildlife habitat distribution. As well as to how wildlife moving to other areas of the RSA might impact traditional use and Indigenous Peoples.

Information Requests:

a) In addition to the discussion of habitat distribution under the Application and RFD cases, please provide further details on size of the suitable habitat patches and distance between these habitat patches from the LSA for each wildlife VC.
b) Please provide connectivity analyses as part of the impact assessment. If not, provide ecologically supported rationale for not doing so.

D14	Topic: Wildlife Mortality from Wildlife Collisions Should Be Included in Assessment
EIS Section(s)	Section 14.4 Project Interactions and Mitigations
Subsection, Page #	Section 14.4.2 Secondary Pathways, pg 14-171
Terms of Reference	

Rationale / Review Comments:

Effects from vehicular collisions on wildlife were considered a secondary pathway and not carried forward in the assessment. Rationale and some support is provided that indicates the risk to larger mammals is reduced based on proposed mitigations. Although Golder indicates that it would be similar for avian species (as they can fly over vehicles), for ground-dwelling birds like spruce grouse, we feel that the concern remains given that often bird strikes are not reported or even known (e.g., grouse chicks vs large semi-trucks). Indigenous Knowledge indicated that spruce grouse are often observed on the side of the road (pg 14-171). Furthermore, amphibians would also remain at a higher risk of collisions with vehicles particularly during migratory or dispersal movements. Golder states that surveys would be

completed at possible breeding habitats near roads to identify potential high-risk areas where signs would be installed to remind drivers to reduce speed and watch for wildlife. As noted with smaller ground-dwelling birds, smaller wildlife maybe difficult to see from the larger vehicles often used in project construction and operation.

Information Requests:

a) Please discuss mortality risk for smaller wildlife VCs in the residual effects assessment.
b) How will mitigation effectiveness be assessed given that smaller species may be under reported or unknown at the time of collision?

D15	**Topic: Wildlife Connectivity Impacts**
EIS Section(s)	Section 14.2 Component Methods
Subsection, Page #	Section 14.2.1 Incorporation of Indigenous and Local Knowledge, pg 14-9
Terms of Reference	

Rationale / Review Comments:

Through engagement, members identified a wildlife movement route called the Narrows at the north arm of Patterson Lake that is used by caribou, moose, and black bear to cross the large lake. Based on the location of the Project this route will be impacted as wildlife will likely avoid crossing through the Project site to access the narrows. Furthermore, reviewing the maps of the Project footprint including a zone of influence (ZOI) around the existing gravel road and proposed project site, general east/west movement between the Patterson Lake and Forrest Lake would also likely be impacted. The predictions for the impact assessment suggest for many of the wildlife VCs that other intact suitable habitat is available within the RSA that wildlife could access. These predictions do not consider the impact the loss of these areas will have on Indigenous members, nor do they identify other existing wildlife movement areas in the RSA.

What feedback was shared from the Indigenous working groups regarding the removal of these areas and its impact to wildlife and member access/movement for traditional activities. Overall, it was not clear how Indigenous value or importance of these areas were considered in the impact assessment.

Information Requests:

a) What other movement corridors were identified in the RSA that would support wildlife movement due to the loss of the narrows, and the area between Patterson Lake and Forrest Lake? Please identify areas on a map.
b) What feedback was shared from the Indigenous working groups regarding the removal of these areas and its impact to wildlife and member access/movement for traditional activities.
c) How did the impact assessment consider Indigenous values and importance of the movement route in the impact significance determination?

D16	**Topic: Reclamation and lack of commit to monitor for wildlife use of reclaimed habitats.**
EIS Section(s)	Section 14.7 Monitoring, Follow up and Adaptive Management
Subsection, Page #	Pg 14-356
Terms of Reference	

Rationale / Review Comments:

The EIS states that monitoring would be used to "*establish a trajectory towards the successful regeneration and succession of vegetation ecosystems that are functionally similar to natural*

plant communities and wildlife habitat in the region." (pg 14-356). Often monitoring during reclamation efforts focuses on the establishment of vegetation and not necessarily whether wildlife is returning and using the habitat.
Information Requests: a) Please discuss how wildlife use of reclaimed habitat will be assessed in follow up programs.

D17	**Topic: Additional Clarify on Proposed Monitoring Efforts Needed**
EIS Section(s)	Section 14.7, Section 24, Appendix 23B
Subsection, Page #	
Terms of Reference	

Rationale / Review Comments:

Monitoring to test whether EIS predictions are accurate is inconsistent and vaguely discussed. It appears that "*surveillance monitoring*" would identify unanticipated negative effects but it is not clear what that monitoring will entail and whether this will include quantifiable data rather than wildlife incidental reporting. There is a vague statement that it may include a wildlife incident log, breeding bird follow-up studies and remote camera follow up studies (pg 24-16). Further in Appendix 23B, Table 23B-1 the monitoring objectives include:

- Evaluate the effectiveness of the environmental protection measures (e.g., construction monitoring, mitigation to avoid destruction of migratory bird nests and birds)
- Identify unanticipated negative effects, including possible accidents and malfunctions, and need for additional mitigation
- Assess the success of plant community establishment following reclamation.

To achieve these objectives, the description of the conceptual monitoring activities focuses largely on reducing human/wildlife interactions and a caribou offset plan. It is unclear how predictions regarding wildlife habitat changes will be tested.

Information Requests:

a) Provide an outline of what predicted impacts the monitoring program for wildlife will address and methods for studying those impacts.

D18	**Topic: Model Development -Moose**
EIS Section(s)	Appendix 14B
Subsection, Page #	Sections 14B2.1, 14B3.1, table 14B3-1
Terms of Reference	

Rationale / Review Comments:

In Section 14B2.1, NexGen provides information on the ecological land classification (ELC) used to understand landcover and vegetation types in the Regional and Local Study Areas (RSA and LSA, respectively). With respect to fire disturbance, NexGen assigned an ecosite modifier to indicate wildfire disturbance (BU) and another ecosite modifier to indicate early-stage (E) or late-stage (L) regeneration, as follows:

- Early-stage regeneration (6-20 years) – BU/E
- Late-stage regeneration (21-40 years) – BU/L

In Section 14B3.1, NexGen Indicates that "*functional habitat for moose is expected to become available 6 to 10 years after fire disturbance….and resulting optimal moose habitat occurs at 10 to 26 years post-fire*" (p. 7, Section 14B3.1.1).

Table 14B3-1 (Section 14B3.1.1), shows that both 'BU/E' and 'BU/L' ecosite modifiers are included for landcover types that end up with a high habitat suitability classification for moose. That is, some early-stage regeneration (6-20 years; BU/E) ends up getting classified at 'high suitability' even though optimal moose habitat only occurs at 10 – 25 years post-fire. The timelines for the presence of optimal moose habitat do not align with the timelines for the ecosite modifiers for burn and regeneration.

Later in Section 14B3.1.1, moose are noted as having a positive response to logged areas between 10 to 30 years of age, and also showing avoidance behaviour for linear features in the presence of wolves. Recent studies have noted that the interaction of roads and logged areas may be resulting in an ecological trap for moose. The forage provided by recent logging activity attracts foraging moose but also makes them susceptible to wolf predation due to the linked spatial arrangement of cut blocks and roads (Boucher et al. 2022). Likewise, it is also possible that any burned area that happens to occur near roads could also potentially function as an ecological trap for moose given the improved predator access.

Information Requests:

a) Can the classification of burns be modified to correspond with optimal moose habitat to make the moose HSI more accurate?
b) Is there any forestry activity in the area that needs to be considered in the HSI?
c) Can the HSI model be adjusted to reflect the ecological interaction of recently logged or burned areas (moose forage) with roads (predator access)?

Reference

Boucher, N.P., M. Anderson, A. Ladle, C. Procter, S. Marshall, G. Kuzyk, B.M. Starzomski and J.T. Fisher. 2022. Cumulative effects of widespread landscape change alter predator-prey dynamics. Scientific reports 12: 11692.

D19	**Topic: Model Validation**
EIS Section(s)	Appendix 14B
Subsection, Page #	Sections 14B2.4, 14B3.1.2
Terms of Reference	

Rationale / Review Comments:

In Sections 14B2.4, NexGen discusses the importance of model validation is assessing the reliability of habitat models. In Section 14B3.1.2, NexGen indicates that they were unable to validate the moose habitat model due to insufficient data from baseline track surveys, though they did solicit expert opinion on the adequacy of the moose model.

Campbell et al. (2018) report on the quantification of impacts of development within impact assessments using wildlife habitat models. They highlight that confidence in models depends on the degree to which they are validated. They found that impact assessments were "more likely to find a significant effect on wildlife if the habitat model was validated" (Campbell et al. 2020). As such, it is important that wildlife habitat models are validated quantitatively whenever possible. This will also improve the confidence that Indigenous communities and other stakeholders have in the impact assessment itself and in the likelihood of success of any associated mitigation measures.

While these comments and the questions below are made in association with validation of the moose model, they are applicable to all wildlife models that were not quantitatively validated (which is all of the wildlife Valued Components).

Information Requests:

a) Are pools of existing data and scientific consensus regarding moose populations available for the area?
b) Are other moose models available for a similar region that have been developed with validation?
c) Can additional pre-disturbance data be collected for the purpose of model validation?

Reference

Campbell, M.A., B. Kopach, P.E. Komers, and A.T. Ford. 2020. Quantifying the impacts of oil sands development on wildlife: perspectives from impact assessments. Environmental Reviews 28(2): https://doi.org/10.1139/er-2018-0118

D20	**Topic: Zones of Influence**
EIS Section(s)	Appendix 14B
Subsection, Page #	Section 14B2.3, Table 14B2-2, Table 14B2-3
Terms of Reference	

Rationale / Review Comments:

In Section 14B2.3, NexGen discussed wildlife avoidance of habitat adjacent to human development and activity (indirect impacts). Table 14B2.3 summarizes existing disturbance types and estimated zones of influence and Table 14B2-3 summarizes zones of influence applied to the Project and reasonably foreseeable developments.

In Table 14B2-2, there seems to be a lack of consistency in the application of ZOI. For instance, it is unclear why no ZOI has been applied for large mammals (moose, gray wolf, black bear) with respect to non-linear development by NexGen Energy Ltd, but a 500 m ZOI has been applied for moose with respect to historical oil and gas/mineral exploration. Likewise, no ZOI for large mammals has been applied with respect to rough roads, cutlines, seismic lines, and trails, yet a 500 m ZOI has been applied for moose with respect to the Rook 1 access road and Highway 955. In Table 14B2-3, a 500 m ZOI has been applied for moose with respect to the Rook 1 Project and Fission Patterson Lake South Property, but no ZOI is applied to the other large mammals. These are just a few comparisons. The section would benefit from the addition of a brief explanation for the application of ZOIs for all of the Valued Components.

Recent research has suggested that the availability of forage provided by recent logging activity attracts foraging moose, but also makes them susceptible to wolf predation due to the linked spatial arrangement of cut blocks and roads (Boucher et al. 2022). This ecological response of increased predator-prey encounters could also be applicable to burns that are closely associated with existing roads on the landscape. Anthropogenic disturbance appears to have an impact of wildlife behaviour that may need to be considered in the assessment of impacts on wildlife and wildlife habitat use.

Information Requests:

a) Please provide a brief justification / explanation for the application of the various ZOI distances for each Valued Component and disturbance type.

b) Can NexGen factor changes in predator-prey behaviour into the development and application of ZOI on wildlife habitat?

D21	**Topic: Wolves and Human Disturbance**
EIS Section(s)	Appendix 14B
Subsection, Page #	Section 14B3.2.1, Table 14B3-2, Table 14B3-3
Terms of Reference	

Rationale / Review Comments:

Tables 14B3-2 and 14B3-3 show habitat suitability of landcover types and ecosites for wolf during the snow-free period and winter period, respectively. Both tables identify cutlines, seismic line, and trails as high suitability habitat and identify access roads and rough roads as moderate suitability habitat.

Stewart and Komers (2017) evaluated wolf harvest density (which indexes with high wolf populations) across a gradient of landscape disturbance and suggested that intermediate linear densities (~0.75 km/km^2) are associated with peaks in wolf populations, with wolf populations decreasing on either side of this threshold. This could be interpreted to mean that wolf use of linear features is dependent on the overall amount of disturbance in each area.

Information Requests:

a) Please provide information on the overall level of linear disturbance in the RSA.
b) Consider that wolf use of linear features may change depending on the overall amount of linear disturbance in the landscape. Does this change any of the classifications of existing disturbance in the wolf habitat models?

Reference

Stewart, A. and P.E. Komers. 2017. Conservation of wildlife populations: factoring in incremental disturbance. Ecology and Evolution 2017: 1-9.

D22	**Topic: Assessing Biodiversity**
EIS Section(s)	Section 14.5.13 pg. 14-353
Subsection, Page #	
Terms of Reference	

Rationale / Review Comments:

Biodiversity was assessed via a qualitative discussion and review of landscape-level effects with respect to wildlife VCs. For example, wetlands are associated with high biodiversity but in the RFD case, there will be a loss of approximately 58 ha of wetland habitat. Golder predicts that these losses will be minor given that there are other wetlands available in the RSA. This does not give any insight into the range of diversity or richness that might change from the Project nor how current levels of biodiversity in the LSA compares to similar areas in the RSA.

Information Requests:

a) Please quantitatively assess changes in biodiversity including providing metrics on existing biodiversity in the study area compared to similar areas in the region.

Appendix D:

Internal review conducted by ACFN's Dene Lands and Resource Management (DLRM)

Indigenous content review of NexGen Rook 1 Uranium Mine Application

Appendix D: Internal review conducted by ACFN's Dene Lands and Resource Management (DLRM)

Indigenous content review of NexGen Rook 1 Uranium Mine Application

By: Dene Lands and Resource Management

Overarching Comments / General Concerns

As stated in the Statement of Concern, ACFN has not been classified as a Primary Indigenous Group. The rational that NexGen used to identify ACFN as an "Other Indigenous Group" is inaccurate and flawed, and the above implication that ACFN does not desire or require the same degree of consultation as was accorded Primary First Nations, (and even some in the "Other Indigenous Group" category) is equally incorrect.

ACFN maintains active use of in the area NexGen proposes to mine. NexGen has not undertaken to inform itself of impacts to ACFN from the proposed Project, as it has not provided capacity or opportunity to ACFN to provide this information to NexGen.

E1	Topic: Other Indigenous Groups
EIS Section(s)	Section 1.2.3, Indigenous and Community Setting
Subsection, Page #	Table 1.2-2, page 1-26
Terms of Reference	

Rationale / Review Comments:

Section 1.2.3 makes a distinction between Local, or Primary, Indigenous Groups, and Other Indigenous Groups. ACFN is identify as an "Other Indigenous Group". The Rationale for this is cited in Table 1.2-2 and includes the following statement/bullet point: "Potential overlap with traditional territory but no access link or known residency/land use."

This statement is factually incorrect, as ACFN maintains active use in the area.

Information Requests:

b) Please explain what information was used as the basis for the above statement, and provide references, if any to these sources of information.
c) Please describe what efforts were undertaken, if any, to confirm the above statement directly with ACFN.

E2	Topic: Assessment of Impacts on Indigenous Rights
EIS Section(s)	Section 1.3.2
Subsection, Page #	Page 1-43
Terms of Reference	

Rationale / Review Comments:

Section 1.3.2 states "NexGen's approach to the EA process has been focused on enabling dialogue with and seeking feedback from Indigenous Groups who could be potentially affected by the proposed Project".

On the basis of inaccurate information, NexGen categorized ACFN as an "Other Indigenous Group" and sought only to inform ACFN of the project. Through inclusion of ACFN as an "Other Indigenous Group", NexGen acknowledges that ACFN "could be potentially affected by the proposed Project". However, NexGen did not demonstrate effort or interest in enabling dialogue with ACFN, for the purpose of seeking ACFN's input."

Information Requests:

b) Please indicate whether any meetings were held, whether in person or virtual, with ACFN Leadership, Staff, or Community, to enable dialogue regarding the Project and how ACFN could be potentially affected by it.
c) Please describe what efforts were undertaken, if any, to confirm the above statement directly with ACFN prior to including it in the EIS.

E3	Topic: Assessment of Impacts on Indigenous Rights
EIS Section(s)	Section 2.4.1
Subsection, Page #	Table 2.4-2 Page 2-18
Terms of Reference	

Rationale / Review Comments:

Table 2.4-2 shows the consultation activity spectrum that NexGen used to determine whether ACFN would be considered a primary indigenous group. The table suggests a "weak claim" would mean no serious adverse effects and identified ACFN as an "Other Indigenous Group"

This section also states that "not all communities will desire or require the same degree of consultation".

The rational that NexGen used to identify ACFN as an "Other Indigenous Group" is inaccurate and flawed, and the above implication that ACFN does not desire or require the same degree of consultation as was accorded Primary First Nations, (and even some in the "Other Indigenous Group" category) is equally incorrect.
ACFN maintains an active presence and activity in the project-affected areas, and as such requires full engagement from NexGen.

Information Requests:

a) Please provide further rational for determining ACFN as a group who would not require the same level of consultation as a primary Indigenous group.
b) Please enter into a full Study Agreement with ACFN, which would commence with ACFN undertaking a TLU/IK study to further enhance NexGen's understanding of ACFN's use and ACFN's indigenous knowledge. This information, and subsequent studies as deemed relevant, must then be used to re-evaluate the EIS, including relevant impact predictions and proposed mitigations.

E4	**Topic: Assessment of Impacts on Indigenous Rights**
EIS Section(s)	Section 2.4.1
Subsection, Page #	Table 2.4-4 Page 2-20
Terms of Reference	

Rationale / Review Comments:

Table 2.4-4 shows the below:

Athabasca Chipewyan First Nation	Located in Alberta, approximately 130 km from the Project to the reserve boundary, or 620 km by road, including portion on a winter road; approximately 1,350 km by all-season road	▪ Treaty 8 signatory ▪ Previous engagement with the CNSC on the Cluff Lake Project ▪ Potential overlap with traditional territory but no access link or known residency/land use

NexGen identified ACFN as having "Weak Claim" on the basis of the statement that there is "no access link or known residency/land use", which is inaccurate and incorrect.
Even if this statement was accurate, NexGen has entered into study agreements with other communities who are classified as "Other" Indigenous Groups at an "inform" level.

Information Requests:

a) Same as E1(a)
b) Same as E3(b) Please enter into a study agreement with ACFN to provide TLU/IK Study, site visits, meetings with ACFN and ACFN leadership.

E5	**Topic: Indigenous Engagement Methods**
EIS Section(s)	Section 2.5.2
Subsection, Page #	Page 2-29
Terms of Reference	

Rationale / Review Comments:

The EIS states that "
Primary Indigenous Groups were invited to engage fully with NexGen, while other Indigenous Groups were initially informed of the Project by the CNSC and ENV and invited by NexGen to remain informed throughout the EA process (Section 2.4.1).

ACFN maintains active use of in the area NexGen proposes to mine. NexGen has not undertaken to inform itself of impacts to ACFN from the proposed Project, as it has not provided capacity or opportunity to ACFN to provide this information to NexGen.

Further, even if ACFN agreed that it should only be "informed" throughout the EA process, the amount and quality of information received to date regarding the Project, the EIS, and the information about ACFN in the EIS, has been woefully lacking.

Information Requests:

a) Same as E3(b)
b) Please include ACFN as a full participator in this process
c) Please enter into a study agreement with ACFN to provide TLU/IK Study, site visits, meetings with ACFN and ACFN leadership.

E6	**Topic: Indigenous Engagement Methods**
EIS Section(s)	Section 2.5.2
Subsection, Page #	Page 2-29
Terms of Reference	

Rationale / Review Comments:

The following is stated in the EIS as an example of collaboration and engagement: "NexGen continues to pursue opportunities and has successfully piloted a reclamation-related caribou research project that involved members of local Indigenous Groups who wished to participate."

Caribou migration does not take borders or human access into consideration and ACFN members rely on the caribou to practice their treaty rights. ACFN has a great concern for Woodland Caribou and has undertaken extensive studies and research that would have been available to the reclamation-related caribou research project, had ACFN been included in the project.

Information Requests:

a) Please provide information on the reclamation-related caribou research project
b) Please include ACFN in the research project.

E7	**Topic: Indigenous Engagement Methods**
EIS Section(s)	Section 2.5.2
Subsection, Page #	Page 2-29
Terms of Reference	

Rationale / Review Comments:

The following is stated in the EIS as an example of collaboration and engagement: "NexGen has maintained an open-door policy of informing as a minimum and continues to regularly provide groups with opportunities for enhanced engagement options that range from consult to collaborate participation levels, as appropriate."

The above statement is false as ACFN has requested funding for a study in 2019 and was denied funding.

Information Requests:

a) Same as E3(b)

b) Please include ACFN as a full participator in this process
c) Please enter into a study agreement with ACFN to provide TLU/IK Study, site visits, meetings with ACFN and ACFN leadership.

E8	**Topic: Incorporation of Indigenous and Local Knowledge**
EIS Section(s)	Section 2.5.5
Subsection, Page #	Page 2-37
Terms of Reference	

Rationale / Review Comments:
This section refers to the incorporation of indigenous and local knowledge:

> Indigenous Groups and members of communities within the LPA have shared Indigenous and Local Knowledge with NexGen through a variety of engagement activities and sources of information.

As ACFN was not included within the Local Priority Area, it was not accorded the opportunity to share Indigenous Knowledge with NexGen, through any kind of engagement activity at all. Further, Indigenous Groups who also fell outside what NexGen identified as the LPA were accorded the opportunity to share their knowledge with NexGen through engagement and Study Agreements.
ACFN views the EIS and application as deficient without ACFN's Use information and Indigenous Knowledge reflected in the impact predictions and proposed mitigations.

Information Requests:
a) Please explain what efforts NexGen will undertake to engage with ACFN, including providing ACFN with site visits, meetings and other project-information sharing activities, and meetings with ACFN Leadership.
b) Same as E3(b).

E9	**Topic: Incorporation of Indigenous and Local Knowledge**
EIS Section(s)	Section 2.5.5
Subsection, Page #	Page 2-37
Terms of Reference	

Rationale / Review Comments:
This section refers to the incorporation of indigenous and local knowledge and states:
"Indigenous and Local Knowledge for the Project was collected through the IKTLU Studies, JWGs, community information sessions, site tours with community members, other formal and informal meetings, and research conducted as part of environmental and socio-economic baseline data collection programs (Section 2.6)"

ACFN was not provided capacity or opportunity to engage with NexGen, nor gather and share its Use information and Indigenous Knowledge with NexGen. As such, this section, and the entire EIS, do not include ACFN's Use, Indigenous Knowledge, nor other relevant information. knowledge, or use.

Information Requests:
a) Please include ACFN within the local priority area
b) Please enter into a study agreement with ACFN to provide TLU/IK Study, site visits, meetings with ACFN and ACFN leadership.

E10	Topic: Indigenous Engagement
EIS Section(s)	Section 2.6.1.2.2
Subsection, Page #	Page 2-51
Terms of Reference	

Rationale / Review Comments:

This section highlights the below:
"To date, no issues or concerns have been identified by the ACFN or ERFN"

This statement is inaccurate and incorrect. Further, it has not been verified with ACFN for accuracy prior to inclusion in the EIS. Had NexGen provided adequate capacity and opportunity to ACFN, NexGen would be informed of the issues and concerns of ACFN, and further, ACFN and NexGen could have undertaken to include these in the EIS and develop mitigation and strategies to address such issues and concerns. To date, no such process with ACFN has occurred.

Information Requests:

a) Please include ACFN within the local priority area
b) Please enter into a study agreement with ACFN to provide TLU/IK Study, site visits, meetings with ACFN and ACFN leadership.

E11	Topic: Indigenous Engagement
EIS Section(s)	Section 2.7.1.1
Subsection, Page #	Page 2-64
Terms of Reference	

Rationale / Review Comments:

The following activities NexGen's planned engagement with ACFN:

- Joint Working Groups
- Joint Working Group Summaries
- Joint Working Group Breakout Sessions
- Indigenous Group Leadership and Staff
- Benefit Agreements

ACFN has not been included in any of the above engagement opportunities to date.

Information Requests:

a) Please provide an invitation to join the working groups
b) Please include ACFN on any indigenous collaboration efforts as a priority Indigenous Group

E12	Topic: Inclusion of Indigenous and Local Knowledge in the Environmental Assessment- General Context
EIS Section(s)	Section 3.1.1
Subsection, Page #	Page 3-4
Terms of Reference	

Rationale / Review Comments:

NexGen states:
"The inclusion of Indigenous and Local Knowledge in the EA aligns with the Government of Canada's commitment to advancing reconciliation through a renewed relationship based on the recognition of rights, respect, cooperation and partnership".

ACFN has not provided IK/TLU information to NexGen due to lack of capacity funding.

Information Requests:

a) Please include ACFN within the local priority area.
b) Please enter into a study agreement with ACFN to provide TLU/IK Study, site visits, meetings with ACFN and ACFN leadership.
c) Please provide instances in which NexGen illustrated reconciliation with ACFN when it comes to rights, respect, cooperation, and partnership.

E13	**Topic: Indigenous Groups**
EIS Section(s)	Section 3.2.1
Subsection, Page #	Page 3-5
Terms of Reference	

Rationale / Review Comments:

The section states:
"After submission of the Project Description, one of the formative means by which Indigenous Groups were initially identified for inclusion in the EA process was through letters of notification issued by the CNSC and the Saskatchewan Ministry of Environment inviting Indigenous Groups to participate. These letters established those groups who should be considered as primary groups for engagement based on likely Project effects, and those who should be considered as other groups for engagement."

ACFN is highly active in the project area and practices our treaty rights within the territory and will be affected by the proposed Project. Though the above-mentioned regulatory bodies (CNSC, Government of Saskatchewan) have not identified ACFN as a primary Indigenous group it still does not excuse the lack of adequate consultation.

Information Requests:

a) Please provide further references to the selection of priority Indigenous Groups

E14	**Topic: Indigenous Groups- Athabasca Chipewyan First Nation**
EIS Section(s)	Section 3.2.1.6
Subsection, Page #	Page 3-7
Terms of Reference	

Rationale / Review Comments:

The ACFN's homelands are mapped along the boundary of the Firebag River south of Lake Athabasca and west of the Project.

The map referenced is not part ACFN's consultation policy. The map referenced shows ACFN priority protection area's and protecting the Woodland Caribou, barren ground Caribou, and wood bison *within* the consultation map. The map referenced is not a comprehensive area of ACFN consultation zones.

Information Requests:

a) Please provide the rationale for determining ACFN territory without adequate consultation with ACFN

E15	**Topic: An Indigenous Knowledge and Traditional Land Use (IKTLU)**
EIS Section(s)	Section 6, 7, 8, 9,10, 11, 12, 13, 14, 15, 16, 17, 18, 19
Subsection, Page #	Incorporation of Indigenous and Local Knowledge
Terms of Reference	
Rationale / Review Comments: Incorporation of Indigenous Knowledge was used in the multiple sections listed above. ACFN was not included in this process.	
Information Requests: a) Same as E1(a) b) Same as E3(b) Please enter into a study agreement with ACFN to provide TLU/IK Study, site visits, meetings with ACFN and ACFN leadership.	