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December 02, 2024 Project No. 240158

Brennain Lloyd
Northwatch
Box 282
North Bay, ON P1B 8H2

Dear Ms. Lloyd,

Re: **Technical Review of the Canadian Nuclear Safety Commission's "*Regulatory Oversight Report for Uranium Mines, Mills, Historic and Decommissioned Sites in Canada*" (2023) and Associated Information**

This letter presents comments and questions on several information sources related to and including the Canadian Nuclear Safety Commission's (CNSC) "Regulatory Oversight Report for Uranium Mines, Mills, Historic and Decommissioned Sites in Canada, 2023." The review was conducted for Northwatch and focussed on the following decommissioned uranium mine sites:

- Agnew Lake (Ministry of Mines), a receiving facility for tailings from the Beaucage Mine; and,
- Rio Algom and Denison Mine sites in the Elliot Lake Area.

Particular attention was given to radiological mine sites that had been identified as 'high-priority' in previous reviews conducted by Hutchinson Environmental (2018), including Agnew Lake and the Denison Mine sites. Conditions of the Pronto Mine (Rio Algom) site were not reviewed in detail due to project limitations, but information about the site from the last CNSC State of the Environment monitoring cycle (2015 to 2019) was considered to identify water quality trends.

Detailed review findings are provided by site and area in the attached review document. The detailed findings are important to consider for potential improvements in tailings management area monitoring, environmental effects monitoring, data analysis and data quality, findings presentation and follow-up actions. The project scope and limitations of the review are also discussed to provide context for the review comments. A summary at the end of the review highlights the key concerns identified, and recommendations for improvement.

We hope this review will provide constructive feedback on information collection, analysis and communication for the uranium mines in the Agnew Lake and Elliot Lake areas.

Sincerely,
Per. Hutchinson Environmental Sciences Ltd.

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1. Introduction

Hutchinson Environmental Sciences Ltd. (HESL) was retained by Northwatch to conduct a technical review of documents pertaining to the decommissioned uranium mine sites in the Serpent River basin and surrounding areas (near Elliot Lake, Ontario), including the Pronto Mine and Agnew Lake Mine. The technical review was conducted to evaluate environmental site conditions, identify shortcomings in reporting, and determine if site conditions were sufficiently represented in the Regulatory Oversight Report.

Historic and decommissioned mine sites are under license by the Canadian Nuclear Safety Commission (CNSC). The licensees prepare annual reports describing site conditions and environmental monitoring for individual mine sites, which are submitted to the CNSC. A summary Regulatory Oversight Report is prepared by CNSC every three years, providing CNSC staff's assessments of the safety performance of individual mine sites. Additional related reports are prepared by Minnow Environmental Inc. (State of the Environment Report) over a five-year cycle, and an annual report for the Serpent River Watershed Monitoring Program (SRWMP) is prepared by Rio Algom and Denison Mines Inc. for legacy sites within the Serpent River watershed.

2. Objectives and Scope of Review

The available information sources on the mine sites were provided by Northwatch and reviewed to evaluate:

- If the decommissioned mine sites were stable, deteriorating, or improving;
- If CNSC's Regulatory Oversight Report adequately and effectively reflected the information found in the site-specific documents prepared by licensees;
- If current site conditions are comparable to earlier predictions of how the site conditions would evolve to the approximate current point in time; and,
- If the available information is adequate for understanding the site conditions.

The technical review focused on decommissioned mine sites that were of particular interest to Northwatch in the Serpent River basin and surrounding area, in particular the Pronto Mine and Agnew Lake Mine, to evaluate whether site conditions were accurately represented in the Regulatory Oversight Report. Agnew Lake Mine was of particular concern due to the proposed transfer of low-level radioactive materials from the Beaucage Mine to it.

The information reviewed varied in purpose and technical depth. The following documents were reviewed:

- Canadian Nuclear Safety Commission (2023). Regulatory Oversight Report for Uranium Mines, Mills, Historic and Decommissioned Sites in Canada, 2023.
- Ministry of Mines (2024). 2023 Annual Report – Agnew Lake Tailings Management Area License Number WNSL-W5-3102.1/2025.
- Ministry of Mines (2024). Presentation: Agnew Lake Tailings Management Area – Niobium Rock Tailings Relocation Project. September 11, 2024.
- Denison Mines Inc. (2024). 2023 Operating Care & Maintenance Annual Report.

- Rio Algom Ltd. & Denison Mines Inc. (2024). 2023 Serpent River Watershed Monitoring Program Annual Water Quality Report – Year 4 of Cycle 5; Submitted to the Canadian Nuclear Safety Commission on behalf of Rio Algom Limited, and Denison Mines Inc.
- Minnow Environmental Inc. (2021). Serpent River Watershed Cycle 5 (2015 to 2019) State of the Environment Report.

There were no documents pertaining to the Beaucage Mine site; therefore, the nature of tailings being relocated to the Agnew Lake and/or Pronto Tailings Management Areas (TMA) could not be evaluated. Site-specific documents for Rio Algom sites (Quirke, Panel, Spanish-American, Stanleigh, Nordic, and Pronto Mine sites) were not provided for this review.

This review was conducted to assess actual and potential environmental concerns for human and ecological receptor health, and did not include a review of occupational health and safety, industrial processes, compliance audits, wildlife and human health assessments, or other non-environmental issues. This review provides comments and questions to clarify future regulatory oversight and associated reporting, to encourage improvements in monitoring, reporting, and responses to actual or potential concerns. HESL does not guarantee that all environmental concerns related to the sites identified by Northwatch were captured in this review.

3. Review Findings

3.1 2023 CNSC Regulatory Oversight Report

Canadian Nuclear Safety Commission (2023). Regulatory Oversight Report for Uranium Mines, Mills, Historic and Decommissioned Sites in Canada, 2023.

Review Comments

The report presented CNSC staff's assessment of licensee performance for operating historic and decommissioned uranium mines and mills regulated by CNSC, as well as providing information on the five uranium mines and mills licensed to operate in Canada (northern Saskatchewan). The report focussed on 3 of the 14 safety and control areas that CNSC evaluates, including radiation protection, environmental protection, and conventional health and safety.

This review found that the CNSC report provided a general overview of the role CNSC plays in regulating the licensees and rating safety and control area (SCA) performance. The information CNSC provided for each historic and decommissioned mine site was brief, and generally did not contain specific information from the monitoring period nor did it characterize the current mine site conditions. Site history details for each historic/decommissioned mine site were summarized, and a brief description of CNSC staff's evaluation of each mine's performance (in the SCAs of radiation protection, environmental protection, and conventional health and safety) as a result of inspections over the reporting period were provided in the report. A summary of key information for each site, such as 'state of the environment' updates specific to 2023, was not provided, and it was difficult to understand how CNSC staff evaluated each historic and decommissioned site.

CNSC's performance evaluation for the key SCAs was 'satisfactory' for all of the historic and decommissioned mine sites, but no information was provided detailing how the classification was determined, nor were any specific evidence-based updates provided (e.g., current water quality and radiation levels) that would reassure readers that conditions were indeed 'satisfactory' and increase confidence in CNSC's performance evaluations. Key areas of concern to Northwatch, including the Agnew Lake Mine and Pronto Mine, were not sufficiently described for the reviewer to evaluate whether CNSC's assessments of the sites were reasonable, or if environmental or human health concerns existed. CNSC's future expectations for the mine sites were also unclear.

Insufficient detail is an ongoing concern in CNSC's regulatory oversight reporting, as was stated in HESL's previous review of the 2017 CNSC Regulatory Report (HESL, 2018). It is therefore difficult to evaluate whether the regulatory report adequately reflects the information found in the site-specific documents, which was a key objective of this review.

Recommendations

Future CNSC reports should provide more robust technical information, including site-specific temporal data from the assessment period, to characterize current mine site conditions, document specific concerns and non-compliances (if any), and provide evidence to support CNSC staff assessments of each mine site. Detailed descriptions of data used by CNSC to determine that mine performance was satisfactory should be provided, for transparency and to provide a more fulsome understanding of the criteria used to evaluate each site. Specific references and links to the site-specific reporting documents should be provided in the evaluations, to improve document accessibility and ease of review for the public.

Evaluation Summary

The report's evaluation summary is provided in Table 1. Additional review findings and associated comments/information requests are presented in Table 2 (note that limited site-specific information pertaining to the Agnew Lake TMA and Elliot Lake mine sites was provided, and therefore more targeted comments/information requests could not be presented).

Table 1. Evaluation summary of CNSC (2024): Regulatory Oversight Report for Uranium Mines, Mills, Historic and Decommissioned Sites in Canada, 2023. Issued October 7, 2024.

Evaluation Question	Review Comment
Does the CNSC regulatory report adequately and effectively convey the information found in site-specific reporting documents?	The report provided information from CNSC pertaining to active, historic, and decommissioned uranium mine sites. A satisfactory general overview of the mine sites in Canada was provided, however, a significant lack of detailed information to support CNSC's evaluations and specific details pertaining to site conditions and inspections over the period of assessment were not provided. Sites of particular interest to Northwatch, including Agnew Lake TMA, Rio Algom, and Denison Mine sites, were not adequately characterized in the regulatory document (from an environmental perspective), and it was therefore difficult to evaluate

Evaluation Question	Review Comment
	whether information was consistent with the available site-specific reporting documents.
Is the available information adequate to the task of understanding site conditions?	Site-specific information over the reporting period provided by CNSC was limited, and it was difficult to evaluate CNSC's understanding of site conditions (i.e., any concerning CoPC trends, specific observations from site inspections, specific information from licensee documents) and whether appropriate follow-up oversight was conducted over the most recent assessment period. CNSC's SCA site evaluations classified as 'satisfactory' were not substantiated in the regulatory report.
Based on the available information, are site conditions changing or stable, and if they are changing, are they improving or deteriorating, from an environmental perspective?	The report did not contain sufficient information to determine if conditions at the mine sites were stable or changing, despite CNSC's assertions (unsubstantiated) that several sites (e.g., Denison and Stanrock sites) were stable.
How do current site conditions compare to earlier predictions of how the site conditions would evolve to this approximate point in time?	A comparison of predictions vs. observed conditions was not conducted in this report for the Agnew Lake TMA, and Rio Algom and Denison Mines Elliot Lake sites.

Table 2. Findings of CNSC (2024): Regulatory Oversight Report for Uranium Mines, Mills, Historic and Decommissioned Sites in Canada, 2023, and review comments and questions.

Report Finding	Comment/Question
Section 8.9, P. 95 In the performance assessments, CNSC stated that all Elliot Lake Rio Algom sites were in compliance with license limits (i.e., effluent water quality), that all sites were well-managed, and that infrastructure was in good operating condition. However, Minnow (2021) stated that there were documented slight increasing trends of radium-226 in surface waters at the principle discharge channel at the Pronto TMA (below SWRMP benchmark), increasing iron concentrations in primary discharges from Denison and Quirke TMAs, and increasing manganese at station D-3 of the Denison site (below SRWMP benchmarks), for example. Although concentrations remained below SWRMP benchmarks, current site conditions and trends that could indicate future concerns at the	CNSC should provide additional detail on the specific mine sites in the regulatory report, including updated water quality trends and a summary of increasing and decreasing trends (despite remaining below benchmarks). A brief summary of how the proponent is addressing any increasing trends (i.e., through modelling) should also be provided, to predict if an increasing trend in a contaminant of concern could be a concern during the next reporting period (2024-2026). In addition to the management considerations that may could be informed and implemented by the predictions, the proactive approach could reassure the public that concerning trends would not result in adverse effects.

Report Finding	Comment/Question
mine sites were not fully explained in the regulatory document; therefore, potential concerns that are of importance to the public were not identified by CNSC's 'satisfactory' performance evaluations.	
Section 8.9, P. 95. The CNSC Report mentioned that a fitness for service inspection was conducted in October 2023 to assess Water Treatment Plant (WTP) effectiveness at the Pronto Mine site, which resulted in two non-compliances, which were "*of low safety significance and corrected by the licensee*." (P. 95). More detail on the circumstances of these non-compliance events was not provided.	CNSC should provide additional information on the non-compliance events that occurred at the Pronto Mine site in October 2023 and how they were remedied, to demonstrate that the non-compliance events were of low safety significance and were corrected appropriately by the licensee.
Section 9.3, P. 99 The CNSC Report stated that "*licensees include program documentation for the environmental protection SCA as part of the overall management system documents; these form part of the licensing basis for these sites*." (P. 99). CNSC did not elaborate on what is specifically required of licensees for monitoring and documenting environmental protection.	CNSC should describe what is specifically required of licensees under the environmental protection SCA (i.e., the definition of a non-compliance; the extent of monitoring required at each site, etc.), to clearly document potential environmental concerns, and to increase public confidence in CNSC's regulatory role.
Section 8.10, P. 97 For the Denison and Stanrock sites, CNSC stated that "*the licenses cover the physical works such as dam structures, effluent treatment plants and fencing, associated with the decommissioned mine and mill sites and associated tailings management areas*" (P. 97). In the site-specific documents, downstream environmental concerns at the Denison Mine site were documented. It is unclear what CNSC's role is in regulating downstream environmental effects.	CNSC should provide additional information in the regulatory report on how environmental effects in the downstream environment are regulated.
Plain Language Summary, P.10; Section 6.1, P. 75	CNSC should describe the findings of all inspections of decommissioned mine and mill sites that occurred over the reporting period (2021-

Report Finding	Comment/Question
CNSC stated that *"from 2021 to 2023, CNSC staff performed a total of 11 inspections across the 12 historic and decommissioned sites and found 3 non-compliances"* (P. 10). The regulatory document also stated that a baseline compliance inspection of the Agnew Lake TMA was to be conducted in fall 2024 prior to the site receiving Beaucage Mine tailings (P. 91). However, the actual frequency and findings from CNSC inspections that should have occurred over the reporting period (2021 to 2023) were unclear in the document. Section 6.1 stated "*based on CNSC staff's baseline inspection plan, the 2 remediation projects and the decommissioned sites are required to have at least 1 inspection per 3 years*" (P. 75). Specific findings from inspections during the reporting period were not disclosed in the regulatory document.	2023). This is of particular concern for the Agnew Lake TMA, where several concerns were identified by previously by HESL (2018) and an inspection was to be conducted in fall 2024 in advance of receiving Beaucage Mine tailings, and current site conditions are unknown.
Section 8.6.1, P. 91 The report stated that "*repair to the cover of the TMA and the addition of the niobium bearing material, scheduled to begin during the summer of 2021, was delayed due to covid pandemic restrictions, and is now scheduled to take place in 2024*." (P. 91) No other information regarding the niobium relocation project (from Beaucage Mine) was provided.	CNSC should provide additional information on existing Agnew Lake site conditions over the reporting period, including details of additional environmental assessment work in advance of receiving the niobium tailings. Addition of niobium tailings may cause further environmental concerns, or alternatively, the tailings addition and assumed subsequent closure could improve conditions at Agnew Lake if completed properly.

3.2 Agnew Lake Tailings Management Area

The Agnew Lake TMA is a particular concern for Northwatch. HESL's previous review of CNSC regulatory reports in 2018 identified concerns with care and maintenance of the Agnew Lake tailings cover, potential environmental effects on surface water near the TMA, and unknown effects from the pending import of tailings from the Beaucage Mine. There were delays in receiving the regulatory reporting document from the Ministry of Northern Development Mines (the licensee); accessibility of important documents remains a key concern for the decommissioned uranium sites.

Ontario Ministry of Transportation and Ministry of Mines (2024). Agnew Lake Tailings Management Area – Niobium Rock Tailings Relocation Project. Presentation; September 11, 2024.

A 2024 presentation prepared by the Ministry of Transportation and Ministry of Mines regarding the Agnew Lake TMA and Niobium Rock Tailings Relocation Project (Beaucage Mine tailings) was reviewed to gain a general understanding of the current site conditions and the proposed niobium rock tailings disposal work (and associated environmental protective measures and concerns). The presentation stated that "*the targeted placement of niobium rock tailings will improve the overall site*" by providing additional radiation shielding in maintenance areas, as 12-15 cm of clean material and topsoil will be placed on the niobium rock tailings and revegetated. However, two specific areas of the TMA require maintenance, as public radiation dose limit exceedances (1.83 mSv/year) appear to have occurred in this area over the reporting period, posing a risk to casual site users, such as hunters.

Ministry of Mines (2024). 2023 Annual Report – Agnew Lake Tailings Management Area License Number WNSL-W5-3102.1/2025. Letter to CSNC; March 28, 2024.

The Agnew Lake TMA 2023 Annual Report was brief, but contained an analysis and discussion of surface water and groundwater sampling around the TMA in 2023. The report included results of 2023 maintenance work, inspections and sampling, and a summary of work to be completed in 2024, including a Gamma Radiation Survey (spring 2024), and work to be done in preparation for the Beaucage Mine Niobium Relocation Project. No radiation survey results were provided in the 2023 report, and it was unclear if radiation surveys had been conducted in the spring. Ongoing concerns existed with the care and maintenance of the TMA cover, as identified previously in HESL's 2018 review. Although more detailed site information was provided in the Annual Report than was provided by CNSC (2024), there were several data concerns with the 2023 monitoring, as well as CoPC exceedances in surface waters, soils, sediments, and groundwater around the TMA. Discussion of how the tailings relocation from Beaucage Mine could affect the TMA was not included, nor was any mention of how tailings placement could potentially improve Agnew Lake conditions, as was asserted by Ministry of Mines in the September 2024 presentation. An environmental monitoring program (to be implemented during the construction phase of the niobium relocation project) was to be developed by Ecometrix Inc. and was anticipated in April 2024.

The 2023 report's evaluation summary is provided in Table 3. Specific review findings for the report are presented in Table 4.

Table 3. Evaluation summary of Ministry of Mines (2024): Agnew Lake 2023 Annual Report.

Evaluation Question	Review Comment
Does the regulatory report adequately and effectively convey the available information to the CNSC about the nuclear facilities which the CNSC has licensed, and for which CNSC has ultimate responsibility in evaluating the adequacy of the license conditions?	The report generally provided a reasonable level of information from 2023 environmental monitoring for CSNC to evaluate, however, insufficient information regarding the licensee's response to exceedances across the site (i.e., uranium exceedances in soils, high arsenic concentrations in soils, etc.) were not provided. There were also several surface water and groundwater monitoring

Evaluation Question	Review Comment
	stations where not all parameters were analyzed. Insufficient information was provided on the potential effects of niobium tailings relocation to the site, which were stated to be provided in an April 2024 update report; the April report was not provided.
Is the available information adequate to the task of understanding site conditions?	See the comment above.
Based on the available information, are site conditions changing or stable, and if they are changing, are they improving or deteriorating, from an environmental perspective?	Based on the information presented, site conditions do not appear to be improving, and several parameters remain above environmental quality guidelines. The report indicated exceedances of: • Uranium in soils adjacent to the TMA and sediments to the west of the creek; • Arsenic in sediment around the TMA; • Uranium in groundwater upgradient of the middle dam in June 2023; • Cobalt and uranium in spring surface waters below the West Dam; • Uranium in fall surface waters below the West Dam; • Several metals in surface waters from the Middle Dam (suspected sampling error); • Iron in upstream and downstream surface waters in spring; • Cyanide in Middle Dam surface waters in the spring; and, • Radium in the West Dam surface waters in the fall. Despite these exceedances, the report stated that "*there were no reportable events taking place at the Agnew Lake TMA in the year 2023*." (P. 8)
How do current site conditions compare to earlier predictions of how the site conditions would evolve to this approximate point in time?	The report did not contain sufficient information to determine what conditions had been predicted, nor were comparisons provided of predicted values vs. observed values.

Table 4. Specific findings of Ministry of Mines (2024): Agnew Lake 2023 Annual Report.

Report Finding	Comment/Question
Section 2 – 2023 Maintenance Work, Inspections and Sampling. The report stated that "*between June 12 and 14, three wells were installed including a well located downgradient from the West Dam (MW 101), one located at the middle dam upgradient from the middle dam (MW103) and a well to monitor background groundwater levels that was installed upstream of the discharge point into the Ministic Creek...the reduced number and distance between each location of the installed monitoring wells provided a limited number of groundwater elevation data points, making it challenging to interpret shallow groundwater flow directions*" (P. 1-2). The report stated that well installation details are included in Appendix A of the report.	No information regarding well installation details or groundwater sampling protocols was provided in the body of the report. The report stated that Appendix A included well installation details, however, it Appendix A was attached to the report in the copy received by Northwatch and reviewed by HESL. The purpose of each monitoring well was not included in the report. • The licensee should provide well records (i.e., Appendix A attachment) and detailed installation and sampling protocols that were followed for monitoring well installation, borehole soil sampling, and groundwater well development and sampling. • The licensee should describe the purpose of each new monitoring well installed on the site (i.e., target soil lithology, shallow vs. deep monitoring).
Section 2 – 2023 Maintenance Work, Inspections and Sampling. Uranium concentrations from soil (borehole) samples collected adjacent to the TMA (BH01, BH02, BH03) were higher than provincial standards (MOE, 2011: Table 8: Generic Site Condition Standards for Use within 30 m of a Water Body in Potable Groundwater Condition), and was highest in the "worst case" sample collected from the orange precipitate-containing sediment in the creek west of the West Dam.	The high uranium concentrations in soils adjacent to the TMA and sediments in the west creek are concerning. It is unclear if the licensee took actions to investigate the cause of the concerning concentration. • Has the licensee taken steps to investigate and/or address the concerning uranium concentrations in soils and sediments near the TMA?
Section 2 – 2023 Maintenance Work, Inspections and Sampling. The report stated that "*a sediment sample taken from the area south of MW103 on June 13 contained 110 µg/g of arsenic. The standard for both Canada and Ontario is 6 µg/g.*" (P. 2).	The high arsenic concentration in sediments around the TMA is a concern. It is unclear if the licensee took actions to investigate or mitigate the cause of the concerning concentration. • Has the licensee taken steps to investigate and/or address the concerning arsenic concentrations in sediments near the TMA?

Report Finding	Comment/Question
Section 2b – Groundwater Sampling The report stated that in the June sampling event, uranium concentrations exceeded PWQO at station MW103 (upgradient from the middle dam). Additionally, the remaining wells (MW101 and MW104) were not sampled in the fall (September 2023), as the wells had insufficient water. Although the report stated that MW101 and MW104 were sampled in June 2023, no analytical results were recorded in Table 2 (P. 3).	• Has the licensee taken steps to investigate and/or address the high uranium concentrations in groundwater upgradient of the middle dam? • The licensee should explain why data collected from groundwater monitoring stations in June was not reported. • Groundwater is only analyzed for uranium; no other CoPCs are analyzed. What CoPCs does CNSC require the licensee to monitor in groundwater?
Section 2c – Surface Water Sampling The report stated that "*for the spring event, exceedances of cobalt and uranium* [in surface water] *were detected below the West Dam (AL101)….iron was two orders of magnitude higher in concentration below the West Dam* [37000 mg/L]." (P. 3) Iron exceedances also occurred at stations AL110 (Ministic Creek upstream) and AL111 (Ministic Creek downstream) during the spring surface water sampling event. In Tables 3 and 4 (P. 4), several parameters were not analyzed at several surface water monitoring stations (e.g., at AL108 and AL109, only aluminum, copper, and iron are analyzed). The reason why several parameters were not analyzed was not provided.	The exceedances detected in surface water below the West Dam are a potential concern. It is unclear if exceedances of cobalt and uranium have been consistently high in downstream surface waters, as the 2023 data was not compared to previous data. • Will the licensee provide comparisons of spring exceedances to previous monitoring data from the same period for the AL101 station? • Has the licensee conducted any additional monitoring or investigation into the cause of the cobalt and uranium exceedances in surface water? • Why are several CoPCs not analyzed at all surface water stations (e.g., stations AL101, AL108, AL109, AL111, AL110)? • What is Agnew Lake's action/response protocol when an exceedance occurs? What does CNSC require of the licensees when an exceedance occurs?

Report Finding	Comment/Question
	• The licensee should explain why there are several gaps in analysis at key surface water monitoring stations. Will the licensee commit to analyzing surface water samples for all CoPCs? • What CoPCs does CNSC require the licensee to monitor in surface water?
Section 2c – Surface Water Sampling The report stated that "*discrepancies between [surface water] samples taken from AL110 (Ministic Creek upstream) and the duplicate sample were also noted. As the results reported for AL110 are consistent with past sampling events, a possible contamination event during sampling likely occurred*." (P. 3).	The discrepancy between the Ministic Creek upstream and the only duplicate sample collected for surface water suggests that possible contamination of other surface water samples may have occurred. • The surface water sampling methodology used at the Agnew Lake site should be provided. Note: this may be included in Appendix A, which was not attached to the report). • How will the licensee prevent sample contamination from occurring in the future?
Section 2c – Surface Water Sampling During the fall sampling event, uranium exceeded PWQO below the West Dam. Ten metals sampled at station AL105 (Middle Dam) also exceeded PWQO in the fall (although several metal exceedances may have been due to a high amount of sediment in the samples) - The report stated that "*while it is normal for exceedances to increase in samples taken later in the year due to low water levels and flows, some of the exceedances reported for total metals may be explained in part by the amount of solid material in the samples. Low water and mucky conditions at AL101 and AL105 made it challenging to collect sediment-free water and as a result, total metal concentrations could have been exaggerated…dissolved uranium still exceeds the PWQO below the west Dam, but dissolved arsenic is below the PWQO, indicating that the total arsenic result likely reflected the sediment conditions in this area "* (P. 3).	Despite concerns with high sediment in AL101 and AL105 surface water samples which likely affected total metal concentrations in samples, the uranium exceedance at the West Dam is a concern. • Has the licensee taken steps to investigate and/or address the high uranium concentrations in surface water below the west dam?

Report Finding	Comment/Question
Section 2c – Surface Water Sampling An exceedance of free cyanide was detected in the spring at surface water station AL105 (Middle Dam), and in the fall, an exceedance of radium-226 at AL101 (West Dam). The report stated that "*both of these results have not been reported in previous sampling efforts. Continued sampling in 2024 and after will confirm if these results reflect new trends or an error in sampling*" (P 5).	Despite concerns with sediment impacts on the fall surface water sampling, the free cyanide concentration detected in the spring at the Middle Dam is a concern. The licensee has not proposed additional monitoring outside of the regular annual monitoring to confirm if the cyanide concentration is a concerning trend. • Is the licensee's response to the cyanide exceedance in accordance with CNSC's expectations?
Section 2d – Vegetation Removal In 2023, vegetation was removed from the West Dam spillway and East Barrier Dyke using an excavator, and efforts were made to minimize rutting/surface disruption on the TMA (although minor rutting still occurred). An area of erosion was identified along the East Barrier Dyke, and the report stated that this area was to be repaired once the niobium project was finished (P. 6).	HESL's 2018 review identified tailings cover maintenance as a key shortcoming at Agnew Lake. No additional information regarding care and maintenance of the TMA cover was provided in the 2023 Annual Report outside of the vegetation removal; erosional concerns at the East Barrier Dyke are outstanding and may be an ongoing concern. • Has the licensee implemented mitigative measures to prevent further erosion at the East Barrier Dyke? • What care and maintenance activities is the licensee required to perform on the TMA on an annual basis (if any)?
Section 3: Other Activities Undertaken; Section 6: Work Planned for 2024 Ecometrix Inc. was retained to prepare a Conceptual Site Model and Environmental Risk Assessment for the site, and the scope of work included developing an environmental monitoring program to be implemented during the construction phase of the niobium relocation project, including a 5-year monitoring program to assess the impacts of the niobium relocation project. This will "*assess and monitor any impacts resulting from an addition to the site's inventory*." (P. 7) Preliminary results were expected in late April 2024.	It is unclear why the preliminary results of the environmental monitoring program for the niobium relocation project were not disclosed in the 2023 Annual Report. • Has the licensee provided the preliminary results (including additional groundwater monitoring well installation details and any monitoring results) in a separate report in April? This data should have been provided in advance of niobium tailings relocation (hauling of niobium material was anticipated to start in July 2024 and may have been completed in October).

Report Finding	Comment/Question
The report also stated that the Conceptual Site Model/Risk Assessment anticipated in April 2024 would "*provide recommendations for changes in the project design, mitigation measures, and monitoring program including the installation of additional groundwater monitoring wells*" (P. 8).	• The April 2024 report by Ecometrix should be provided to Northwatch to review and understand the current risks associated with the site.

3.3 Elliot Lake Sites

Historic and decommissioned mine sites in the Elliot Lake area include Denison, Canmet, and Stanrock sites (operated by Dension Mines Inc.), and Quirke, Panel, Spanish-American, Stanleigh, Nordic, and Pronto sites (operated by Rio Algom). The annual report for sites managed by Denison Mines Inc. was available for this review. For the remainder of the Elliot Lake sites (owned by Rio Algom), no site-specific documents were sourced; Therefore, any site-specific environmental concerns were reviewed based on monitoring data reported in the 2023 SRWMP (Serpent River Watershed Monitoring Program Annual Water Quality Report), TOMP (Tailings Management Area Operational Monitoring Program), and the most recent SOE Report (Serpent River Watershed Cycle 5 State of the Environment Report), covering the 2015-2019 cycle.

Denison Mines Inc. (2024). 2023 Operating Care and Maintenance Annual Report, Denison Mines Inc. Submitted to CNSC, 2024.

The 2023 Operating Care and Maintenance Report included details on Denison organizational information, financial guarantees, license and monitoring program changes, health and safety, and water quality monitoring details at the Denison and Stanrock TMAs. The surface water and groundwater quality monitoring results were reviewed.

The report was generally thorough and informative, and provided a good overall summary of water quality monitoring (collected per the TOMP and SAMP requirements) conducted at the Denison and Stanrock sites from 2019 to 2023. Surface water and groundwater conditions in key areas of the site (TMA-1, TMA-2 – Denison; Stanrock ETP) were individually assessed, and a discussion of parameter concentrations and general trends was provided for each key area.

DMI provided a fairly thorough discussion of 2023 concentrations of CoPCs in surface water (influent, effluent, and downstream areas of the site), as well as groundwater downstream of Dam sites. However, an assessment of trends over the last 5 years of monitoring (and contextualizing the monitoring data by comparing water quality to historic trends) was overly brief. It was unclear which concentrations of CoPCs were exceeding SAMP and TOMP benchmarks, as exceedances were not explicitly stated, and rather parameters were described as being ‘elevated’, ‘stable’, or ‘declining’. DMI’s responses to potentially concerning trends, such as the elevated acidity, sulphate, and iron concentrations downstream of Dam 17 at the Denison site were unclear, and enhanced monitoring/modelling or mitigative actions in response to these ‘elevated’ concentrations (if any) were not described.

The DMI report’s evaluation summary is provided in Table 5. The findings of the report, and review comments and questions are provided in Table 6.

Table 5. Evaluation summary of Denison Mines Ltd. (2024): 2023 Operating Care and Maintenance Annual Report.

Evaluation Question	Review Comment
Does the regulatory report adequately and effectively convey the available information to the	See comment below.

Evaluation Question	Review Comment
CNSC about the nuclear facilities which the CNSC has licensed, and for which CNSC has ultimate responsibility in evaluating the adequacy of the license conditions?	
Is the available information adequate to the task of understanding site conditions?	The information provided in the report was generally sufficient to understand site conditions, including areas where high concentrations of contaminants of concern had been identified (each facility was discussed in a separate section), and a discussion of concentrations of CoPCs for each facility/discharge location were provided, with general evaluations of trends in the body of the text. An overall summary of increasing and decreasing trends and findings was not provided in the annual report. For ease of review, DMI should provide a table summarizing the locations, CoPCs, and trends of concern, and corresponding mitigative actions and follow-up monitoring that will be conducted to monitor any increasing trends, to ensure that increasing trends will not become a concern (i.e., exceeding SAMP and TOMP benchmarks) in the proceeding reporting cycle.
Based on the available information, are site conditions changing or stable, and if they are changing, are they improving or deteriorating, from an environmental perspective?	Site conditions at the Denison and Stanrock site were generally reported to be stable but elevated for many parameters. It appeared that CoPCs are generally remaining within (elevated) historical ranges for the site, but are not exceeding benchmarks, with the exception of uranium at station D-2. The report indicated: • TMA-1: Slightly increasing concentrations of uranium at influent station D-1 (below surface water quality benchmark). • TMA-1: Uranium concentrations were above benchmarks at effluent station D-2. • Lower Williams Lake: effluent was high in sulphates, but within historical ranges. • Downstream of Dam 17: Groundwater was high in acidity, sulphates, and iron (exceedance of benchmark unknown).

Evaluation Question	Review Comment
	• Stanrock: Holding pond (DS-2) was high in acidity, but met discharge limits. Groundwater from all dams was high in sulphate, acidity, and iron (but trending down in 2023).
How do current site conditions compare to earlier predictions of how the site conditions would evolve to this approximate point in time?	The report contained some general comparisons of 2023 levels to predicted concentrations from 1995 evaluations. Denison Inc. stated that for the D-1 location, "*sulphate concentrations have been declining as predicted in the 1995 Environmental Impact Statement (DML, 1995) with the values generally stable over the past 4 years*," and, "*Annual average radium-226 levels remained stable and elevated compared to the 50-year post-decommissioning predictions (i.e., predictions for the year 2050).*" (P. 18). Several similar predictions are made at other Denison and Stanrock stations. Some comparisons of Denison sites to 2050 post-decommissioning predictions were made in the report, generally indicating that concentrations of radium remained above the 2050 prediction (TMA-1), and sulphate was well below predictions in TMA-2 influent porewater However, no comparisons were made to predicted values for the current point in time, nor is it clear whether such predictions exist.

Table 6. Specific findings of Denison Mines Ltd. (2024): 2023 Operating Care and Maintenance Annual Report.

DMI (2024) Report Finding	Comment/Question
Section 5.2.1.1 – Denison TMA-1 Denison Mines Inc. stated that at the Denison TMA-1 facility, the ETP influent (D-1) station annual average concentration of uranium (from 2019-2023) was "*slightly higher than the past four years but remain below the surface water quality benchmark (0.0150 mg/L).*" (P. 18). Station D-1 (influent) also had stable (but elevated) annual average radium-226 concentrations, and declining sulphate concentrations. Uranium concentrations at D-2 (final discharge for the Stollery settling pond) were above SRWMP benchmarks, but other parameters remained stable. This uranium exceedance at D-2 has occurred every year since 2013, according to HESL's previous review (HESL, 2018). Denison TMA-1 was in compliance with the discharge limits established in the decommissioning license (P. 19).	Monitoring data was reported as annual averages throughout the DMI Annual Report. This practice masks seasonal variations of CoPC concentrations, and may underestimate the seasonal concentrations of uranium and radium-226 released. There may be trends in parameter concentrations that are important for CNSC and other stakeholders to understand, that are not clearly displayed in licensee reporting. This is an ongoing concern that was highlighted in HESL's 2018 review. • DMI's future reporting should consider important seasonal fluctuations in water quality, as has been previously requested in 2018. It was unclear what DMI is doing to address the increasing trend in uranium at the ETP influent station D-1, nor was it clear if the increasing trend may be a concern during the next reporting period. Analytical summary data tables were included in the report, but no data prior to 2019 was provided, and data from this reporting period was not compared to historic trends to determine if an increasing trend was occurring. • Will DMI provide comparisons to historical trends in future reporting, to evaluate concerning trends requiring additional assessment and mitigation? • DMI should provide figures showing water quality trends over each station's monitoring history, for clarity and ease of review. The uranium exceedance at the D-2 final outfall station is an ongoing concern at the Denison site, which was also discussed in HESL's 2018 review. 2018 comments regarding the potential environmental impact

DMI (2024) Report Finding	Comment/Question
	near the outfall that may not be captured by water quality monitoring stations further downstream remain unaddressed: • Is there a plan or requirement to mitigate the uranium releases or assess the environmental impacts near outfall in more detail? If not, CNSC should provide rationale for why. • What is the cause of the uranium exceedance, and is there a remedy to bring uranium concentrations to below guidelines (relevant benchmarks and PWQO)? Additionally, it was unclear why radium-226 concentrations were not reported/monitored in groundwater at the Denison and Stanrock sites, as well as at several surface water stations. • Why doesn't DMI report radium-226 concentrations for groundwater and for all surface water stations?
Section 5.2.1.2. Denison Lower Williams Lake (TMA-2) In final discharge areas of the Denison site, station D-22 (final discharge from Lower Williams Lake) had high sulphate concentrations, but were reported to be within historical ranges. The high downstream uranium concentration was attributed to a 1959 operational spill, which impacted Lower Williams Lake (P. 22). At the final discharge location (D-3), uranium concentrations were higher than its influent (D-22), but was in compliance with discharge limits.	As stated previously, water quality at TMA-2 was reported as annual averages, which masks seasonal variation and may underestimate seasonal concentrations of uranium and radium-226 released. • Will future annual reports consider important seasonal fluctuations in water quality? It is unclear how the high sulphate and uranium at the final discharge point (D-22) were planned to be investigated/addressed, how the uranium concentration was compared to historical trends, or if any additional monitoring had been conducted downstream to detect effects. Since the spill occurred in 1959, it is also unclear why concerns were not detected and reported previously. • Has DMI conducted additional monitoring to determine the extent of potential effects from the historic spill? DMI should provide

DMI (2024) Report Finding	Comment/Question
	additional context to determine if a concerning trend is occurring at this station.
Section 5.2.1.3 – Stanrock ETP At the Stanrock TMA holding pond (DS-2), which collected discharge, runoff, and seepage from the Stanrock TMA, high acid concentrations were detected, but final effluent quality met discharge limits. The final discharge station (DS-4) was reported to be stable. Additionally, uranium measured in April 2023 at the DS-2 holding pond site represented an 11-year high. Further information on why this high concentration occurred was not provided in the report.	Water quality at the Stanrock ETP is reported as annual averages, which masks seasonal variation and may underestimate seasonal concentrations of uranium and radium-226 released. • Will future annual reports consider important seasonal fluctuations in water quality? The reason for the high uranium concentration in April 2023 in the holding pond (DS-2), is unknown. It is unclear whether a general increasing trend in uranium is occurring at DS-2, or whether DMI has investigated the reason for the high concentration. • Does DMI have a response plan for investigating the cause of the 11-year high in uranium in April 2023 at the DS-2 site?
Section 5.2.1.3.1 – Unnamed Pond adjacent to Stanrock Mine Site Periodic surface water monitoring of an unnamed pond adjacent to the Stanrock site (first discovered in 2015) detected elevated metals (Al, Co, Fe) and low pH. It was determined that the pond is likely influenced by TMA-affected groundwater. The report stated that "*Denison is currently in discussions with regulators to determine a path forward for management of this pond and/or any discharges from this pond*." (P. 27).	The concerning conditions detected in this unnamed pond were not mentioned in the CNSC regulatory oversight report. • Does DMI have a timeline for implementing a management plan for this pond?
Section 5.2.2.1 – Denison TMA-1 Groundwater Results Further downstream of TMA-1, particularly downstream of Dam 17, groundwater had high acidity, iron, and sulphate, with acidity trending down over the past 5 years.	Trends in iron and sulphate concentrations in groundwater downstream of Dam 17 were unclear, and should be contextualized within the historical groundwater quality data, to determine if an increasing trend exists that could exceed benchmarks over the next reporting period.

DMI (2024) Report Finding	Comment/Question
	• Will DMI compare iron and sulphate concentrations in Dam 17 groundwater to historic ranges, to determine if a concerning increasing trend exists? • What criteria are groundwater (and porewater) quality compared to?
Section 5.2.2.3 – Stanrock Groundwater from Dam A was reported to be high in sulphate, acidity and iron, but that iron concentrations had been decreasing over the past 5 years. Dam B groundwater was also elevated in sulphate, acidity, and iron, but was reported to be stable, with a slight decrease in 2023. Groundwater downstream of Dam C was persistently high in acidity, sulphate and iron, but it was unknown from the report discussion whether high parameters exceeded benchmarks.	High concentrations of sulphate, acidity, and iron in Dam A, B, C groundwater were not contextualized within the monitoring history at these stations; overall increasing trends could not be understood by the reviewer. • Will DMI provide comparisons to historic groundwater monitoring data, to understand if there are concerning trends requiring additional monitoring and/or mitigative responses? • What criteria are groundwater (and porewater) quality compared to?

Rio Algom and Denison Mines Inc. (2024). 2023 Serpent River Watershed Monitoring Program Annual Water Quality Report; Year 4 of Cycle 5. Submitted to the CNSC. March 31, 2024.

The report described the results of the Serpent River Watershed Monitoring Program (SRWMP), which is integrated with three other monitoring programs (reported separately): The Tailings Management Area (TMA), the Operational Monitoring Program (TOMP), and the Source Area Monitoring Program (SAMP). The TMA, TOMP, and SAMP are discussed in the State of Environment Report by Minnow Environmental Inc. (2021).

The SRWMP conducted monitoring at 16 stations in the Serpent River watershed (5 reference locations, 8 near-field, and 3 far-field stations). Sampling is conducted 1-4 times per year. The objectives of the SRWMP are to evaluate cumulative effects of mine discharges on the Serpent River watershed, evaluate the effectiveness of mine decommissioning plans, and assess long-term trends in environmental quality in the watershed. The report was informative and contained site-specific water quality data for 2023 (an in-depth evaluation of water quality trends is produced every 5 years, with the last trend evaluation conducted in 2021), and 5-year trends in sulphate, uranium, and radium-226 for key outlets in the Serpent River watershed.

The report's evaluation summary is provided in Table 7. Review comments and questions are provided in Table 8.

Table 7. Evaluation summary of Rio Algom and Denison Mines Inc. (2024). 2023 Serpent River Watershed Monitoring Program Annual Water Quality Report.

Evaluation Question	Review Comment
Does the regulatory report adequately and effectively convey the available information to the CNSC about the nuclear facilities which the CNSC has licensed, and for which CNSC has ultimate responsibility in evaluating the adequacy of the license conditions?	The report provided a summary of water quality in the Serpent River watershed for 2023. As annual average concentrations were reported, which may mask seasonal variation in water quality and may not provide a fulsome understanding of site conditions, which would be needed to inform management of the site.
Is the available information adequate to the task of understanding site conditions?	The information provided in the report was difficult to assess in light of the decommissioned mine sites, as site-specific information was not included in the report. The information provided is not adequate to understand the characteristics of the watershed and inform regulatory oversight.
Based on the available information, are site conditions changing or stable, and if they are changing, are they improving or deteriorating, from an environmental perspective?	The report stated that conditions in the Serpent River watershed continued to meet and remain well below assessment criteria established for the protection of aquatic life. Water quality data and five-year trends for key parameters of concern were discussed to support their claims that

	watershed conditions have remained stable at all locations and well below assessment criterion.
How do current site conditions compare to earlier predictions of how the site conditions would evolve to this approximate point in time?	The report did not contain sufficient information to determine what conditions had been predicted, nor were comparisons provided of predicted values vs. observed values.

Table 8. Specific findings of Rio Algom and Denison Mines Inc. (2024). 2023 Serpent River Watershed Monitoring Program Annual Water Quality Report.

SRWMP (2024) Report Finding	Comment/Question
Section 3.2 – Annual Average Locations Results Summary SWRMP parameters are reported as annual averages for 2023 data. The results summary stated that "*annual average concentrations for all parameters in 2023 were less than the assessment criteria at all locations and pH was within the assessment range, apart from D-4 with a pH of 6.4, slightly below the assessment range for lakes*." (P. 14).	Monitoring data is reported as annual averages in the SRWMP report. This masks seasonal variability, and may not provide sufficient resolution to inform management actions to improve watershed water quality. • Will future annual reports consider important seasonal fluctuations in water quality?
Section 4.4 – Representative Public Radiation Dose Estimation The report stated that "*the CNSC requested that RAL and DMI provide annual reporting of the radiation dose to the public associated with the closed uranium mine sites in the Serpent River."* (P. 18). During mine operations, radiation dose was estimated to be less than 5% of annual public dose limit of 1 mSv/a. To determine a dosing estimate for Elliot Lake residents, a new monitoring program was developed in 2016, and it was determined in 2019 that the public radiation dose was 0.01 mSv/a. The public dose was to be reviewed (if required) in the Cycle 6 SOE.	The report suggested that CNSC 'requested' that the proponents provide annual radiation dose reporting. It is unclear if this was a requirement of the CNSC-issued licence. Additionally, the public radiation dose was estimated during mine operations, and subsequently in 2019. It was unclear if measurements of radon and gamma radiation are collected at the site annually to produce an annual public dosing estimation. Further, the report stated that "*all components of the design monitoring program were completed in 2019*" (P. 19), and was to be reviewed (if required) in the Cycle 6 SOE. • Does CNSC require the proponents to measure public radiation dosing annually? CNSC should provide more prescriptive language to enforce activities required of the licence. • Have the proponents conducted annual measurements of radon and gamma radiation to estimate public dosing, as requested by CNSC?

Minnow Environmental Inc. (2021). Serpent River Watershed Cycle 5 (2015 to 2019) State of the Environment Report. March 2021.

The Minnow report was the fifth installment of a 4-year cyclical study of the uranium mining impacts on the Serpent River watershed. The report included a detailed summary of each historic and decommissioned mine site, monitoring results of the SAMP (discharges and seepages) and TOMP (surface water, groundwater, and porewater) programs from the 2015 to 2019 period, a detailed discussion of effluent and water quality trends across the TMAs, and an assessment of watershed conditions for the study cycle.

This review focussed on the SAMP and TOMP results for the sites of concern to Northwatch (Rio Algom and Denison mine sites). Focus was given to water quality data and trends from mine sites that had not been reviewed in the site-specific licensee regulatory reporting, including the Rio Algom sites, for which the licensee's regulatory document was not available. However, the data included in the report pertained to 2015 to 2019, and did not reflect current site conditions or all of the CNSC reporting period that was the subject of this review.

The report's evaluation summary is provided in Table 9. Review comments and questions are provided in Table 10.

Table 9. Evaluation summary of Minnow (2021) Serpent River Watershed Cycle 5 (2015 to 2019) State of the Environment Report.

Evaluation Question	Review Comment
Does the regulatory report adequately and effectively convey the available information to the CNSC about the nuclear facilities which the CNSC has licensed, and for which CNSC has ultimate responsibility in evaluating the adequacy of the license conditions?	The report contains detailed and extensive water quality monitoring data collected under the SAMP and TOMP programs. However, seasonal variations in water quality were not considered, and several increasing trends (which could become potential concerns requiring further assessment), are not made clear to reviewers without careful review of material. It is unclear if key concerns, such as an increasing trend in radium at the Pronto site discharge, are known to CNSC, as these trends are not commented on in their regulatory oversight report.
Is the available information adequate to the task of understanding site conditions?	The report provided detailed information on each of the uranium mine sites, consistent with the SAMP and TOMP programs. However, it was difficult to evaluate concerning trends (if any) at each site, as monitoring data for each site was not summarized. The data included in the Minnow report pertained to Cycle 5 (2015-2019), and did not reflect current site conditions. The available information was valuable but does not allow understanding of present site conditions.

Evaluation Question	Review Comment
Based on the available information, are site conditions changing or stable, and if they are changing, are they improving or deteriorating, from an environmental perspective?	The report stated that the TMAs are "*performing well and reflecting improving conditions, with parameters meeting EIS predictions, effluents achieving discharge criteria, and low to no effects in acute and sublethal toxicity testing of effluents*." (P. 7). Uranium, radium-226, and sulphate concentrations were reported to be decreasing. Monitoring data provided in the report was sufficiently detailed to corroborate the conclusions.
How do current site conditions compare to earlier predictions of how the site conditions would evolve to this approximate point in time?	Comparisons of parameters of concern to 50-year post-operation predictions for water quality data from the TMAs. However, no comparisons are made to current predicted site conditions, nor is it apparent if any predictions were made for the current monitoring period.

Table 10. Specific findings of Minnow (2021). Serpent River Watershed Cycle 5 (2015 to 2019) State of the Environment Report.

Minnow (2021) Report Finding	Comment/Question
General The report presented water quality data for the 12 decommissioned uranium mining operations in the Elliot Lake area. Although general trends in parameters of concern were identified and discussed, it was difficult to determine in the discussion body of the reports which stations corresponded to which mine sites without careful review, which trends were concerning, and it was unclear if the proponents had responded to potentially concerning trends (e.g., additional monitoring). Water quality at the TMAs was reported as annual mean concentrations, which may have masked some important seasonal trends.	• In Cycle 6 reporting, a table summarizing key trends/findings, and resulting response to the trend should be provided, for ease of review for both the regulator (CNSC) and the public. Concerning trends should be made clear to reviewers for transparency and accuracy. Reporting water quality data as annual means masks seasonal variability. No mention of seasonal variability was provided in the report. • Will future (Cycle 6) reports consider important seasonal fluctuations in water quality? • When samples are collected, do they consider the effects of seasonality?
Section 10.2 TMA Discharges and Seepages (SAMP); Section 4.4.1 – Discharge Quality and Loads At the Stanrock and Denison TMAs, it was reported that barium and radium-226 had increased slightly since 2003. The report mentioned that iron, acidity, and sulphate concentrations in porewater at the Stanrock TMA have not improved. Barium and radium loadings in discharge from the Denison mine site were also Barium and radium loadings in discharge from the Denison mine site also appeared to be increasing over time (from 2005 to 2019). Slight decreasing trends in pH were also identified for the Stanrock, Stanleigh, Denison, and Quirke TMA principal discharge sites.	Several potentially increasing trends were identified at the Stanrock, Denison, Stanleigh, and Quirke mine sites from ~2005 to 2019. It is unclear to what extent trends at these sites were further investigated from 2020 to 2023. Although site-specific data has been reviewed for the Stanrock and Denison sites, which showed that barium and radium concentrations had increased slightly, an evaluation of the cause of any persistently increasing trends should be investigated, to determine if mitigative actions should be taken. • Have the trends identified in the 2021 SOE report been further evaluated?

Minnow (2021) Report Finding	Comment/Question
At the Panel TMA, iron concentrations in groundwater downgradient of Dam E (station P-31) was also reported to have increased over time (P. 154).	
Section 8.1 – Sediment Quality The report stated that *"mean concentrations of metals and radium-226 in most mine-exposed lakes exceeded the upper limit of background or LEL benchmarks in 2019 (i.e., barium in McCabe and Quirke Lakes, cobalt, nickel, radium-226 in all lakes, manganese in McCabe and Nordic Lakes, and uranium in all lakes except May Lake). In no instance did sediment concentrations exceed the SEL."* (P. 245).	Based on the comparatively higher concentrations of iron, manganese, and nickel in Quirke Lake in 2019 vs. 1999, it appears that there is an increasing trend in metal and radium-226 concentrations in Quirke Lake sediment over time – it is unclear from the report if increasing trends exist for other lakes (generally stable for May Lake and Nordic Lake), although it was stated that most lakes exceeded LELs. It is unclear from the report if any actions have been taken to address the LEL exceedances in sediment in most mine-exposed lakes, or the Quirke Lake increasing trends in sediment. • Has the proponent investigated and produced a response plan for the metal and radium LEL exceedances in sediment in most mine-exposed lakes? • Has the cause for the increasing trend in metal and radium in Quirke Lake sediments been investigated?
Section 11 – Recommendations At the Pronto TMA (station PR-01 – primary discharge), a slight increase in radium-226 was observed at station PR-01 since 2003, but remained below the SRWMP benchmark and the discharge criterion of 0.37 Bq/L. The report recommendations stated that "*if concentrations continue to rise, an investigation into the cause should be conducted*" (P. 280).	The slight increasing trend in radium-226 since 2003, despite remaining below the SRWMP, is a potential concern. Given that site-specific licensee documents for the Pronto Mine (managed by Rio Algom) were not obtained for this review, and the next SOE report will not be issued until 2025 (Cycle 6), it remains unknown whether a concerning increasing trend has persisted in the Pronto TMA discharge. • Is CNSC aware of a potential increasing trend in radium at the Pronto Mine primary discharge, and has any follow-up work been conducted to determine the cause of the increase, per the recommendations of the 2021 SOE report?

Minnow (2021) Report Finding	Comment/Question
Section 11 – Recommendations The public dose associated with closed Elliot Lake mine sites, as reported in the SRWMP, was estimated in 2019 to be 0.01 mSv/a (after removal of background). In the 2021 SOE report, it was recommended that the public dose estimation be reviewed and updated (if required) as part of the Cycle 6 (2020 to 2025) SOE report.	As stated in the SRWMP review, it is unclear if annual public dose estimation was a licensing requirement from CNSC. • Does CNSC require annual public radiation dose estimation updates? • Under what circumstances will an updated public dose estimation be required for the Elliot Lake mine sites as part of Cycle 6 reporting?
Appendix A – Water Quality Assessment and Response Plan (P. 376) The Water Quality Assessment and Response Plan in Appendix A (prepared by Rio Algom) provided guidance on developing and implementing mitigative measures "*to confirm water quality trends identified through the Performance Monitoring Programs*" (P. 376). The plan stated that monthly data is compiled, and emerging trends are identified before the environmental coordinator initiates a response. A trend confirmation is conducted by investigating if a trend is isolated to one parameter, if there are similar trends upstream vs. downstream, and if there are similar trends at non-related stations (for example). Confirmed trends are then evaluated to determine the significance of any potential impact from the trend, which may include remedial or mitigative measures.	It is unclear how this response plan has been actively implemented in the monitoring programs in the Serpent River watershed. Although the response plan appears to be well-founded and reasonable, no specific examples are provided of how this has been implemented for any trends identified in the SAMP and TOMP over the reporting period (2015 to 2019). • Have the proponents implemented the Water Quality Assessment and Response Plan into their monitoring programs? • How has Rio Algom evaluated/responded to concerning trends (if any) that have emerged during their mine site monitoring? • Does Denison Mines Inc. (and the other licensees) have a Water Quality Assessment and Response Plan?

4. Summary of Key Review Findings

The review found that the CNSC regulatory report was lacking detail and sufficient supporting information to communicate inspection results, the rationale for conclusions, potential environmental concerns and implications of these concerns, and the actions required or requested by licensees to remedy concerns. Most concerns identified in HESL's previous review of CNSC's regulatory reporting (HESL, 2018) did not appear to have been resolved, and many concerns have continued or perhaps worsened during the current reporting period, particularly at the Agnew Lake site. Although the annual reports prepared by the licensees were generally informative and provided a good summary of monitoring conducted, they were commonly unclear on the resulting environmental effects (potential impacts) and the commitments to resolving concerns and monitoring concerning trends into the future. These concerns were highlighted in 2018, and do not appear to have been addressed.

CNSC's regulatory role and responsibility were not well-defined. Identified concerns, particularly at the Agnew Lake site and Elliot Lake sites, did not appear to be known to CNSC based on their regulatory report, and no enforced compliance or mitigative/remediation action appeared to have been made. It was not understood how the licensees would be monitored by the regulators for addressing environmental concerns, if at all. This is of particular concern at Agnew Lake, where niobium tailings are being currently transported and stored, and a response plan did not appear to have been prepared (or was not publicly available at the time of this review).

Accessibility of documents remained a key concern identified in this review. The CNSC regulatory report did not contain specific references to important supporting documents, and site-specific licensee documents were difficult to access, requiring repeated requests to licensees. Difficulties accessing key environmental information (which should be publicly available) can increase public concerns regarding these mine sites. The accessibility of information and the level of communication seem to have declined since the previous reporting period, and previous comments on communication improvements (HESL, 2018) appear to have been largely ignored.

Increased clarity and transparency in communication from CNSC is key recommendation of this review. CNSC provided evaluations of 'satisfactory' for all sites (including Agnew Lake), and only two non-compliance events were reported in the area (for the Pronto Mine site), which were reported to be of low safety significance and were corrected by the licensee (implications unknown). CNSC's rationale and supporting evidence for site evaluations were not provided; specific references to publicly available information in the licensee documents were not provided to substantiate CNSC's findings, and more robust technical information was not provided from the 2023 assessment period. CNSC's ambiguous regulatory oversight role does not ease public concern, and is not sufficiently protective of the public.

Unresolved potential sources of contaminants at Agnew Lake and in the Elliot Lake area include:

- Surface water, groundwater, sediment, and soil CoPC exceedance concerns around the Agnew Lake TMA, as well as data quality concerns;
- Ongoing care and maintenance concerns of the Agnew Lake tailings cover (erosional concerns; lack of maintenance activities); unknown effects from the import of niobium rock from the Beaucage Mine; lack of environmental monitoring reported in advance of the niobium relocation project;

- Continuing exceedance of uranium in effluent (station D-2) at the Denison TMA-1 site;
- Rising concentrations of radium (below water quality benchmarks) at the Pronto TMA primary discharge;
- Metal, uranium, and radium LEL (lowest effect level) exceedances in sediments from several mine-exposed lakes in 2019 (Quirke, McCabe, Nordic, and May Lakes); and,
- Several increasing trends (below water quality benchmarks) at the Stanrock, Denison, Stanleigh, and Quirke sites from ~2005-2019.

In all cases, limited information was provided on the response to the potential contaminant sources, and the results of actions (if any) were not reported in the documents reviewed. It was unclear if CNSC was aware of these potential concerns, and any responses/actions required by the regulator (as well as any regulatory follow-up) to these concerns were unclear.

The review identified common areas of improvement in environmental effects monitoring and reporting (several of which were also recommended in HESL's 2018 review), including:

- Seasonal water quality monitoring and data interpretation could provide additional insight into periods of the year when contaminant presence in surface water is higher, and contribute to further improving water quality. Water quality is currently reported as annual averages, which can mask the effects of seasonality.
- All reports had an absence of comparisons for current measured conditions to predictions of site conditions at the approximate point in time. This was a key review question provided by Northwatch: "*How do earlier site conditions compare to earlier predictions of how the site conditions would evolve to this approximate point in time?"* As stated in the 2018 review, comparisons to predictions could inform adaptive management activities, however, it was unclear if predictions were a requirement of the CNSC regulatory process and thus an issue of non-compliance. Denison Mines Inc. provided comparisons to 50 years post-decommissioning (i.e., 2050), however, predictions of site conditions at the approximate point in time (i.e., ~25 year post-decommissioning) may not have been conducted for the site.
- Analysis of trends was generally not provided in the licensee reports. Although Denison Mines Inc. provided a discussion of general trends in recent history, data was generally not contextualized within the historical environmental data available for the sites, and it was difficult to determine when exceedances were of concern or were within historical ranges. And,
- Water quality criteria for surface water, groundwater and porewater should be clearly established and stated in the reports, and used to identify environmental concerns. Although Denison Mines Inc. commonly compared environmental data to benchmarks (per the SAMP and TOMP monitoring plans), it was unclear where environmental quality guideline/standard exceedances may have occurred.

CNSC requirements for environmental effects monitoring and reporting were unclear. Areas of improvement highlighted by HESL in 2018 have not been implemented into current reporting; no efforts have been made to improve data reporting to better inform the public of changes in the Elliot Lake environment. Clearly defining CNSC's regulatory requirements and rationale for site evaluations, and improving transparency by clearly stating environmental concerns and enforcing mitigative actions and monitoring follow-up, may reduce ambiguity in CNSC reports.

5. Closing

Thank you for the opportunity to conduct this technical review! If you have any questions or concerns, please contact Emily Ham or David Leeder.

6. References

Hutchinson Environmental Sciences Ltd. (2018). Technical review of the Canadian Nuclear Safety Commission's "Regulatory Oversight Report on Uranium Mines, Mills, Historic and Decommissioned Sites in Canada" (2017) and associated information. Letter for Northwatch: November 19, 2018.

Ministry of the Environment (2011). Soil, ground water and sediment standards for use under Part XV.1 of the Environmental Protection Act. April 15, 2011.