



**Written submission from the
English River First Nation**

**Mémoire de la Première Nation
d'English River**

**Regulatory Oversight Report for
Uranium Mines, Mills, Historic and
Decommissioned Sites in Canada: 2023**

**Rapport de surveillance réglementaire
des mines et usines de concentration
d'uranium et des sites historiques et
déclassés au Canada : 2023**

Commission Meeting

Réunion de la Commission

January 29, 2025

29 janvier 2025



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December 9, 2024

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“VIA EMAIL cnscc.interventions.ccsn@canada.ca”

**RE: ERFN Intervention- Regulatory Oversight Report for Uranium Mines,
Mills, Historic and Decommissioned Sites in Canada: 2023**

This submission is made on behalf of the English River First Nation (ERFN). This topic is of great importance to the people of the ERFN, because of the presence of the Uranium Mines and Mills located within English River First Nation Ancestral Territory. The people of ERFN have and continue to subsist on this land for generations- fishing, hunting, gathering, and thriving.

English River First Nation is comprised of 19 reserves located in Northern Saskatchewan. ERFN has a population of approximately 1,900 people. The on-reserve members of the First Nation reside at two small remote Northern Saskatchewan reserves called Wapatuanak and La Plonge. These reserves are located approximately 600 km north of Saskatoon.

On September 18, 2024, ERFN participated in the Canadian Nuclear Safety Commission (CNSC) annual Indigenous engagement session. This engagement session allowed ERFN to receive concise and clear information regarding the Uranium Mines and Mills. Further, ERFN was able to raise and discuss issues of common concern with other impacted Indigenous Nations in the Athabasca Basin. ERFN considers this engagement session invaluable and a good example of the open and effective Indigenous engagement we have grown to rely upon from the CNSC.

In addition to attending the CNSC Engagement Session, ERFN has engaged Robin Kusch to assist the Nation in reviewing and understanding the technical and scientific aspects of the Regulatory Oversight Report for Uranium Mines, Mills, Historic and

Decommissioned Sites in Canada (RoR) for the 2023 year. Mrs. Kusch has once again provided the people of ERFN a thorough and informative critical review of the RoR. Mrs. Kusch has outlined questions that have arisen from her review. These questions have been posed to Cameco, and we look forward to receiving their response in due course.

ERFN concludes that there is no reason to object to the CNSC's conclusions in the 2023 RoR. Further, ERFN does not take issue with the finding that the operations and historical and decommissioned sites are being managed effectively in terms of the SCAs. The RoR concludes that adequate protections are in place to protect the environment and humans during operation and closure/decommissioning activities.

Sincerely,

A handwritten signature in blue ink that reads "Cheyenna Hunt". The signature is written in a cursive style with a large initial 'C' and 'H'.

Cheyenna Hunt BA, LL.B.
English River First Nation
Director, Lands & Consultation

Technical Memorandum

Review of the Regulatory Oversight Report for Uranium Mines, Mills, Historic and Decommissioned Sites in Canada: 2023

December 5, 2024

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Background Information

This technical memorandum has been prepared for the English River First Nation (ERFN) and provides a summary and review of the Regulatory Oversight Report for Uranium Mines, Mills, Historic and Decommissioned Stie in Canada: 2023 (CMD 24-M4; 2023 RoR) with the intent to inform the ERFN's Intervener Submission. The Commission Member Document (CMD) was 146 pages (electronic document), the review effort included summarizing relevant information relating to concerns expressed by ERFN. Concerns expressed pertain in general to environmental protection of their Ancestral lands (Nuhtsiye-kwi Benéne in Dene), safeguarding their traditional, current and foreseeable way of life and reclaiming their identity and heritage (culture). Specifically, concerns were related to the preservation of their people's ability to hunt, fish and gather country food and advocate for their devotional connections with the lands of Nuhtsiye-kwi Benéne.

Introduction

English River First Nation

ERFN is a Dene and Cree First Nation located in Northern Saskatchewan. ERFN's Nhutsiye-kwi Benéne encompasses a large section of the boreal forest in central-northern Saskatchewan, stretching from the Churchill River in the south to Wapata Lake in the north. ERFN has seven historical settlements located at Sucker Creek, Cree Lake, Elak Dase, Knee Lake, Dipper Rapids, Wapachewunak and La Plonge. Since 1992, an additional twelve reserve parcels have been added to their land base through the Treaty Land Entitlement process, which aims to resolve outstanding Treaty land obligations. ERFN's two largest reserves are La Plonge Reserve and Wapachewunak, located approximately 600 km north of Saskatoon, Saskatchewan. ERFN's main settlement area is located along the Churchill River, about 500 km north of Saskatoon at the Wapatuanak Reserve, Saskatchewan. The ERFN is a signatory to Treaty 10 (1906) and is comprised of nineteen different reserves:

- La Plonge 192,
- Elak Dase 192A,
- Knee Lake 192B,
- Dipper Rapids 192C,
- Wapachewunak 192D,
- Ile a la Crosse 192 E,
- Primeau Lake 192F,
- Cree Lake 192G,
- Grasswoods 192J,
- Leaf Rapids 192P,
- English River (Porter Lake) 192H,
- English River FN Barkwell Bay No. 192I,
- English River FN Haultain Lake No. 192K,
- English River FN Flatstone Lake No. 192L,
- English River FN Cable Bay No. 192M,
- English River First Nation Cable Bay Cree Lake 192N,
- English River FN Beauval Forks No. 192O,
- Slush Lake Reserve No. 192Q, and
- Mawdsley Lake Reserve No. 192R.

The ERFN's total membership is 1,900, with approximately 855 members living on reserve lands (Cheyenna Hunt, personal communication, December 4, 2024). Comprised of both Cree and Dene people, the “people of the river” are known for their bold and collaborative spirit and trusting and humble nature (CanNorth 2017).

The ERFN name originates from the English River area, which was inhabited by the Poplar House people for periods during the year. Most of the families that now live at the Wapachewunak Reserve and La Plonge reserve, traditionally lived along the Churchill River system at Primeau Lake, Knee Lake, Dipper Lake and/or Cree Lake to the north. Summers were spent primarily fishing along the river system. For the rest of the year, family units would spread out through the northern forests for trapping and subsistence hunting. Commonly used winter trapping areas included Haultain Lake, Costigan Lake, Foster Lake and the area between Cree Lake and the Churchill River (Jarvenpa 1980, CanNorth 2017, SVS 2022).

The community is shaped by its respected Elders who are widely consulted for decisions, wisdom and strength. ERFN is dedicated to stewardship of the land and the education of future generations through land based learning youth camps and other opportunities to share knowledge on the land (Cameco 2021). ERFN is rising to the challenge of ensuring sustainable development in the vicinity of their communities and within their Nhutsiye-kwi Benéne and recognizes the unique and important role they have to play in the protection of Northern Saskatchewan. While remaining true to traditional values as “keepers of the land,” members also pursue opportunities to participate in the development of ERFN's resources (e.g., forestry, industry and workforce).

ERFN established Des Nedhe Group of Companies in 1991 to create sustainable employment and business opportunities for English River members. Since its inception, Des Nedhe Group has invested in established companies that are leaders in Saskatchewan's mining and construction industry and expanded its portfolio into the areas of retail and real estate development and management. The company takes pride in its strong focus on growth through investment, experienced management team and history of delivering solid financial results. Looking forward, Des Nedhe Group is exploring new opportunities across the Country, in multiple sectors, and is positioned to play an important role in Canada's economic future.

Saskatchewan Uranium Industry

The Athabasca Basin of northern Saskatchewan has been the site of several major uranium discoveries and Saskatchewan is recognized as a world leader in uranium production. The uranium is exclusively used for electricity generation at nuclear power plants, which is a non-carbon emitting energy source and provides about 15% of Canada's electricity needs. The uranium industry is a significant economic driver in northern Saskatchewan. Within ERFN's Nhutsiye-kwi Benéne three uranium operations are currently operating or in a state of care and maintenance (Key Lake Mill [1983; halted mining in 1997 and milling halted from 2018 to 2021], McArthur River Mine [1999; halted mining from 2018 to 2021], and Cigar Lake Mine [2015; halted mining from March 2020 to September 2020]), and there are two additional operations just northeast of ERFN Traditional Lands near Wollaston Lake (McCLean Lake Mine and Mill [1999] and Rabbit Lake Mine and Mill [1975; mining and milling halted in 2016 and operations transitioned to care and maintenance]).

Collaboration Agreement

All of the uranium mines, mills, and historical and decommissioned sites in northern Saskatchewan are considered of interest to the communities of ERFN. In northern Saskatchewan, the industry leaders Orano Canada Inc (Orano) and Cameco Corporation (Cameco) have entered into formal agreements with Indigenous communities, including ERFN (referred to as collaboration agreement (CAs) or impact benefit agreements (IBAs). These agreements provide Indigenous communities with workforce and business development programs, dedicated community engagement programs, community investment monies and mechanisms to collaborate around environmental stewardship. These industry leaders have also entered into several trapper compensation agreements with individual land users who are affected by their activities.

After three years of thoughtful negotiation and an opportunity for all members to weigh in through a ratification vote, ERFN and Denison Mines signed a Shared Prosperity Agreement on September 26, 2023 in connection with the proposed development of the Denison Wheeler River Project in Northern Saskatchewan. The agreement acknowledges that the proposed project is located within ERFN's ancestral Lands and provides consent from ERFN to advance development of the uranium mine.

These agreements are part of the effort undertaken in recent history to engage and respect local communities, First Nations, Metis Nations and local land users during the planning and execution of industrial developments. Execution of these agreements ensures that engagement occurs with the intent to minimize the potential and perceived negative impacts from a development, as well as optimize potential positive impacts. Signing of these agreements conveys a general trust in the industry's performance and is recognition of a positive working relationship with the industry leaders.

Consultation

Consultation is recognized by the Canadian Nuclear Safety Commission (CNSC) as an important part of the process to develop the details of its regulatory framework. In recent years, specifically since 2018, ERFN has witnessed an evolution in the consultation process that they view as positive. ERFN has signed long term formal Terms of Reference for Engagement with the CNSC. This advancement is one of the ways in which the CNSC has responded to the feedback that ERFN has provided to them since 2018; ERFN applauds this advancement in reconciliation. Now there is more readily available and approachable ways to have direct dialogue between the CNSC and First Nations, which ERFN sees as invaluable to the process of building and maintaining trust in Canada's Nuclear Industry. The outcome of feeling like you have no power in a situation is a state of forced apathy, the direct engagement with ERFN has resulted in a sense of relevance and with the consultation process a sense of consequence. As well, there is a seriousness conveyed about their concerns when during hearings CNSC members reiterate or even directly represent the views the First Nations have conveyed to them directly. Previously, ERFN felt as though their views were filtered through the proponents of projects and/or operating companies to the CNSC and as such could see their perspectives being softened, deemphasized, devalued, or even lost. ERFN looks forward to continued advancement in their relationship with the CNSC and the manner in which they are engaged.

Leadership Role

In addition to the recent empowerment discussed above, members of ERFN gained a heightened awareness of the external factors that can affect the mining industry and that life-of-mine estimates based on resource delineation are just projections, in other words there are no guarantees regarding the persistence of the economic benefits to the local economy. In response, the communities shifted their engagement focus from operational performance and economic benefits to the long-term environmental effects of closure and understanding associated reclamation uncertainties. More recently in 2023 with the rebound of uranium prices and projected revival of the nuclear energy industry, members of ERFN are allocating more resources to identifying and pursuing opportunities for their communities to confirm they are optimizing the social and economic benefits presented by having such an industry in northern Saskatchewan.

Key concerns of the ERFN communities continue to include:

- Operation and ultimate closure of the Key Lake Operations, due to the long-term (1000s of year) management of tailings and linkages to Wheeler River system that is an area of heightened value; and
- Operation and ultimate closure of McArthur River Operation and Key Lake Operations, due to potential for cumulative effects on the Wheeler River system.

Key concerns of the ERFN communities now include:

- Development of the proposed Denison Wheeler River Project; specifically, concerns regarding cooperation among existing and proposed operations to confirm adverse environmental and social impacts minimized and cumulative effects assessed sufficiently.

The Wheeler River region is recognized as an important cultural, ecological, and sustainability resources (i.e., drinking water, food and air) area for the communities of ERFN. The prevalence of the importance of the resources (clean air, water, soil, and country foods) in this area is considered likely to increase in value to local land users following closure of local operations.

However, in general, ERFN is dedicated to stewardship of the land for future generations and doesn't take this responsibility lightly. Often in relation to First Nation consultation and engagement the focus is on the spatial extent of their traditional and current land use, and it is conveyed that their concerns should be limited to these areas. However, it is recognized that the climate and environments around the world are changing, and there is no way to know in the future where the traditional resources that could be necessary to support future generations will be located within northern Saskatchewan or even Canada. As such, ERFN has interest in uranium operations and sites from two perspectives: (1) protection of all lands in northern Saskatchewan and (2) gaining an increased understanding of operational and long-term tailings management methods / technologies.

Summary of Regulatory Oversight Report

The report provides information on the 5 uranium mines and mill licensed to operate in northern Saskatchewan 2023:

- Uranium Mine – Cameco’s Cigar Lake and McArthur River Operations
- Uranium Mine and Mill – Cameco’s Rabbit Lake Operation
- Uranium Mill – Cameco’s Key Lake and Orano’s McClean Lake Operations

and historic and decommissioned sites in Canada:

- Gunnar Legacy Uranium Mine (Saskatchewan) - Historic
- Madawaska Closed Uranium Mine (Ontario) - Historic
- Former Lorado Mill Site (Saskatchewan) - Decommissioned
- Beaverlodge Mine Site (Saskatchewan) - Decommissioned
- Cluff Lake Uranium Mine and Mill (Saskatchewan) – Decommissioned
- Rayrock Closed Mine (Northwest Territories) – Decommissioned
- Agnew Lake Tailings Management Facility (Ontario) – Decommissioned
- Bicroft Tailing Storage Facility (Ontario) – Decommissioned
- Dyno Closed Mine (Ontario) – Decommissioned
- Elliot Lake Historic Site (Ontario) – Decommissioned
- Denison and Stanrock Closed Mines (Ontario) - Decommissioned
- Port Radium Closed Mine (Northwest Territories) - Decommissioned

As indicated in the RoR, the uranium mine and mill facilities discussed in the report are located on Treaty 10 territory and the home of the Dene, Cree and the Métis peoples. This review focuses on the operations and activities within and in the vicinity of the ERFN Traditional Lands.

Financial Guarantees and Institutional Control Program

Financial guarantees ensure that sufficient financial resources are available to fund all necessary decommissioning and waste management activities should the licensee not be able to fulfill its obligations. The financial guarantees for Cigar Lake and McArthur River are lower relative to the other facilities because of the absence of tailings management facilities at those sites. The 2023 RoR provides the financial guarantees for each of the five operations (Appendix B-F; page 105, 109, 113, 117, and 121 /194). Complied in [Table 1 provided in Appendix A](#) are the financial guarantees reported from 2017 to 2018 and 2020 to 2024 (values were not provided in the 2019 RoR).

All The values are updated to reflect any progressive reclamation (e.g., a mined-out pit and its associated supporting infrastructure is decommissioned and reclaimed), as well as any expansion of the operation’s liability (e.g., a new water treatment plant is established).

Percent change from 2022 to 2023 for each operation is provided here: Cigar Lake Operation +0.002%, McArthur River Operation 0%, Rabbit Lake Operation -79.2%, Key Lake Operation 4.3%, and McClean Lake Operation 0%. In 2023 there was a significantly decrease in the Rabbit Lake Operation financial

guarantee; RoR doesn't specifically list activities completed to reflect this change; it is stated that 2 of the 3 mined-out pits have been reclaimed, but still consists of a in-pit tailings management facility and mill.

All historic or decommissioned sites within Saskatchewan are identified as the responsibility of the provincial government.

Gunnar Legacy Uranium Mine is being remediated by the Saskatchewan Research Council (SRC), which is currently in Phase 2 of characterizing and monitoring the onsite waste and develop remediation plans. Phase 3 will involve long-term monitoring and maintenance to verify that the site remains stable and safe.

Lorado Mill Site is being remediated by the SRC, appears from the RoR that currently continuing long-term monitoring and maintenance program.

In 2005, Saskatchewan began development of an institutional control framework for the long-term management of decommissioned mines and mill sites on provincial Crown lands ([Institutional Control Program | Mineral Exploration and Mining | Government of Saskatchewan](#)). The framework established a formal regulatory process for the long-term monitoring and maintenance of industrial sites when mining or milling activities have ended, remediation has been completed, and the sites are ready to be transferred to provincial responsibility.

Beaverlodge Mine Site the site consisted of 70 individual properties. Cameco has been conducting remedial activities. Five properties were transferred to the Institutional Control Program in 2009, 20 more properties in 2019, and during this RoR review period (2021-2023) 18 additional properties.

Cluff Lake Uranium Mine and Mill major decommissioning activities were completed by Orano within 5 years of closure and the Claude Pit was completely filled in and the DJ/DJX and D Pits were flooded and remain isolated from adjacent natural water bodies. In February 2020, Orano submitted an application to transfer responsibility of the property to the province of Saskatchewan, in May 2023 the CNSC revoked the mine and mill operating license ([Decommissioning](#)), and the property was accepted into the Institutional Control Program.

I reviewed the [Institutional Control Registry](#); however, I could only find the 2022 registry online; as such, missing 18 Beaverlodge properties and Cluff Lake encompassed under the program in 2023.

- Beaverlodge Mine Site (Saskatchewan): 2009 - (1) K260 Zone, EMAR 16 Claim; (2) 11 Zone, EMAR 19 Claim; (3) 46 Zone, EMAR 21 Claim; (4) 32 & 42 Zone & EAGLE shaft, EAGLE 4 & 7 Claims; (5) 02 Zone, EAGLE Claim; 2020 – (1) HAB 2A; (2) HAB 3; (3) HAB 6; (4) EAGLE 1; (5) BOLGER 2; (6) RA 6; (7) RA 9; (8) ATO 26; (9) EXC ATO 26; (10) URA MC; (11) EXC ACE 1; (12) ACE 2; (13) ACE 5; (14) ACE 10; (15) EXC ACE 3; (16) URA 3; (17) URA 5; (18) EXC URA 5; (19) JO-NES; (2) CLEANS Project – Mikey Lake (2022)

Inspections & Non-compliances

In 2022 and 2023, CNSC completed 25 and 22 inspections across the 5 operations, respectively. There were 79 and 93 non-compliance issues in 2022 and 2023, respectively as opposed to 18 in 2021. [Table 2 provided in Appendix A](#) summarize inspections and findings.

- Cigar Lake Operation there were 18 non-compliances through 6 CNSC inspections,
- McArthur River Operation there were 19 non-compliances through 7 CNSC inspections,
- Rabbit Lake Operation there were 20 non-compliances through 3 CNSC inspections,
- Key Lake Operation there were 14 non-compliances through 3 CNSC inspections, and
- McClean Lake Operation there were 22 non-compliances through 3 CNSC inspections.

All non-compliances were of low safety significance and all were deemed by CNSC staff to have been addressed appropriately and closed. As well, one order was issued to Cameco's Cigar Lake Operation in 2022 for exceeding the amount of potentially acid generating waste rock on Stockpile C ([Order issued to Cameco Corporation, Cigar Lake](#)) and one was issued to Cameco's Rabbit Lake Operation in 2023 ([Order by an inspector under subsection 35\(1\) of the nuclear safety and control act](#)). In October 2023, CNSC inspector found that most of the personal protection equipment for the Emergency Response Team (ERT) was expired and an Inspector's Order was issued prohibiting all work that had an increased risk of causing a fire and required immediate submission of a plan for sourcing sufficient PPE and identifying ERT capabilities in the meantime. Cameco was able to procure sufficient PPE within days of receiving the Order. In 2022, there were two exceptions the Management System and Radiation Protection SCAs at Cameco's Cigar Lake Operation were rated below expectations (BE).

Safety and Control Areas

As in 2017 to 2021, in 2023 all safety and control area (SCAs) were rated satisfactory for all mines, mills and historic (Gunnar Legacy Uranium Mine) and decommissioned sites (Former Lorado Mill and Beaverlodge Mine Site) in Saskatchewan (Table 2.1.1: Uranium mines and mills, SCA performance ratings, 2023).

- SCAs = Management Systems, Human Performance Management, Operating Performance, Safety Analysis, Physical Design, Fitness for Service, Radiation Protection, Conventional Health & Safety, Environmental Protections, Emergency Management and Fire Protection, Waste Management, Security, Safeguards and Non-proliferation, and Packaging and Transport

Radiation Average and Maximum Individual Dose Limit

Optically simulated luminescence dosimeters (OSLD) measure external gamma radiation exposure and personal alpha dosimeters (PADs) measure internal alpha radiation exposure from radon progeny and long-lived radioactive dust (LLRD). As with 2021, no workers exceeded their regulatory radiation dose limit of 50 mSv annually in 2022. The maximum individual radiation dose to a worker from 2014 to 2022 have been complied in the [Table 3 in Appendix A](#). In 2022, the maximum individual radiation exposure was 7.14 mSv to a worker at McArthur River, which is 14.3% of the annual regulatory limit (50 mSv). In 2023, the maximum individual radiation exposure was 18.92 mSv, which is 37.8% of the annual regulatory limit. The dose occurred to worker at Cigar Lake Operation. The majority of the worker's

effective dose (15.8 mSv) was attributed to an unplanned exposure event when conducting testing inside wash receiver tanks in the ore loading building under a radiation work permit while using respiratory protection. A root cause investigation was completed by Cameco and did not identify a loss of control of the Radiation Protection Program; however, improper ventilation of the tank and Job Hazard Analysis process. CNSC staff were provided information on corrective measures addressing improvements to radiation work planning and radiological hazard recognition and controls. The corrective actions were accepted by CNSC staff and follow-up inspections completed.

Radiological action level exceedances reported to CNSC in 2023 summarized below:

- Cigar Lake Operation reported 3 radiological action level exceedances (1 mSv weekly action limit) – (1) Dosimeter detached from worker and fell on floor next to recycle water sump and laid there for significant portion of the day (4.1 mSv replaced by conservative external whole-body dose of 0.034 mSv). (2) Worker testing inside receiver tanks with improper ventilation and identified hazard (15.8 mSv). (3) Dosimeter detached from worker in high radiation area between 12 and 24 hours (4.68 mSv replaced by conservative external whole-body dose of 0.041 mSv).
- McArthur River Operation no radiological action level exceedances.
- Rabbit Lake Operation no radiological action level exceedances.
- Key Lake Operation reported 6 radiological action level exceedances (1 mSv weekly action and quarterly effective dose action level 5 mSv) – (1) Two workers scraping caulking from within a continuous stir tank without respiratory protection (6.02 and 5.31 mSv). (2) Five workers in leaching circulate when a pinhole leak developed between continuous stir tanks exposing workers to leaching process material mist (2.20 mSv). (3) Maintenance work on Primary Thickener in the Counter Current Decant mill circuit (7.83 mSv) (4) Maintenance work on the Primary Thickener in the Counter Current Decantation mill circuit (3.35 mSv mSv). (5) Worker exposed to leaching process material while performing clean-up activities in the Leaching and Counter Current Decant mill areas (2.6 mSv).

The average individual effective dose by operation is provided in [Table 4a in Appendix A](#) and maximum individual dose in [Table 4b in Appendix A](#).

Lost-time Injuries

A lost-time injury is a workplace injury that results in the worker being unable to return to work for a period of time. The lost-time injuries per year for each operation is provided in the [Table 5 in Appendix A](#). Summary provided below for each lost-time incident, including of interest corrective actions taken.

Cigar Lake Operation

- March 25, 2023, a worker slipped and fell on an icy patch.
- November 19, 2023, a worker slipped and fell following freezing rain.

McArthur River Operation

- December 11, 2023, scoop remote operator tripped and bang knee.

Rabbit Lake Operation

- There were no loss-time injuries in 2023.

Key Lake

- April 15, 2023, worker struck by phone booth unit that tipped over.
- July 8, 2023, worker injured elbow when lifting 20 lbs fifth wheel tooling apparatus out of the parts washer.
- November 11, 2023, worker strained inner elbow when using a 24" pipe wrench.
- November 13, 2023, worker strained back when opening slurry power unit hood.

McClellan Lake

- January 7, 2023, rotary valve turning caught the worker's glove pulling their hand into the rotary vane and severing the tips of their right index and right middle fingers. The rotary valve had not been deenergized and locked out at the start of work, because workers had inadvertently selected an older lockout procedure than the most current version. Orano implemented corrective actions, including deletion of duplicate lockout sheets.
- March 3, 2023, worker strained arm when lifting angle iron and HDPE pipe.
- October 26, 2023, worker twisted ankle when stepped on a rock.

Releases to the Environment

Soil and vegetation may be affected by atmospheric deposition of particulate containing absorbed metals and radionuclides associated with onsite activities or the release of mine-contact water. Licensees monitoring contaminant concentrations in water, air, soil and terrestrial vegetation to verify that operational impacts are below regulatory limits. Air and vegetation sampling around the operations were compliant with environmental programs and provincial standards.

As would be expected, air monitoring for radon gas near tailings management facilities and waste rock piles shows results higher than the regional background level of 25 Bq/m³. However, concentrations fall to background levels within a short distance of the facility boundary (i.e., less than 2 km).

- From 2017 to 2023 the average concentration of molybdenum in effluent for all five operations were well below the most stringent Action Level¹ of 1 mg/L. [Table 6 in Appendix A](#) summarizes the data from 2014 to 2023. The maximum average molybdenum concentration between 2017 and 2023 was 0.213 mg/L, which was report at Rabbit Lake in 2021, and this concentration is 21.3% of the 1 mg/L Action Level. In 2022, the maximum average concentration was 0.162, which was also reported for Rabbit Lake Operations. In 2023, the maximum average concentration was 0.114 mg/L, which was reported for both McArthur River and Rabbit Lake operations.
- From 2017 to 2023 the average selenium concentration in effluent for all five operations was below the licensed maximum monthly mean effluent Discharge Limit of 0.6. [Table 7 in Appendix A](#) summarizes the data from 2014 to 2023. The maximum average selenium concentration between 2017 and 2023 was 0.042 mg/L reported at McClean Lake Operation in 2020, which is 7% of the guideline. In 2022 and 2023, the maximum average concentrations were 0.0139 mg/L and 0.0161 mg/L at McClean Lake Operation, respectively.
- From 2017 to 2023 the average uranium concentrations in effluent for all five operations was below the licensed maximum monthly mean effluent Discharge Limit of 2.5 mg/L and the CNSN Interim Objective of 0.1 mg/L. [Table 8 in Appendix A](#) summarizes the data from 2014 to 2023. In 2017, the maximum average uranium concentration was 0.07 mg/L reported at Rabbit Lake, which is 2.8% and 70% of the Discharge Limit and Interim Objective, respectively. In 2022, the maximum average concentrations was 0.0221 mg/L at Key Lake Operation. In 2023, the maximum average concentrations was 0.017 mg/L at Rabbit Lake Operation.
- From 2017 to 2023 the average concentration of radium-226 in effluent for all five operations were well below the license-authorized Effluent Discharge Limit of 0.37 Bq/L. [Table 9 in Appendix A](#) summarizes the data from 2014 to 2023. The maximum average concentration was 0.09 Bq/L reported at Key Lake in 2019, which is 24.3% of the Effluent Discharge Limit. In 2022 and 2023, the maximum average concentrations were 0.025 mg/L and 0.051 mg/L at McArthur Lake Operation, respectively.

¹ Administrative Level represents the upper range of design specifications for a specific parameter and reaching an administrative level will trigger an internal review by the operation. Exceeding an Action Level indicates a potential loss of control of the environmental protection program and it triggers notification to the CNSC, an immediate investigation, subsequent corrective action and preventative measure in order to restore the effectiveness of the environmental protection program.

Environmental Action Level and Regulatory Limit Exceedances

In 2021 and 2022 all authorized discharged water met the federal or provincial discharge limits ensuring the safety of people and the environment near the operations. In 2023, there were no environmental action level and/or regulatory limit exceedances reported over the 2023 calendar year for Cigar Lake, McArthur River, Rabbit Lake and Key Lake Operations.

At McClean Lake Operation there was 3 related incidents:

- (1) July 6, 2023 JEB Water Treatment Plant (WTP) gland water line rupture and acidic solution was pumped to sump and ultimately routed into the effluent discharge pipeline. Approximately 1599 m³ of effluent released with a pH of 3.76 and TSS of 16 mg/L; exceeding the Metal and Diamond Mining Effluent Regulations (MDMER) lower limit for pH (6.0 to 9.5) and the Environmental Code of Practice (ECOP) Action Level for total suspended solids (TSS) (> 15 mg/L).
 - (2) July 8, 2023, in JEB WTP an elevated amount of lime was added to the radium polishing circuit and pH continued to increase in the pond that also caused elevated unionized ammonia. Approximately, 535 m³ of effluent was released with a pH of 8.52 and unionized ammonia of 0.69 mg/L; exceeding the ECOP Action Level for pH (< 6.5 or > 8.5) an unionized ammonia (> 0.45 mg/L).
 - (3) July 8, 2023, in JEB WTP after discovering the acidic effluent routed to Monitoring Pond C on July 6, 2023 effluent was recycled back to the TMF. Some low pH water remained in Monitoring Pond C that was discharged to the Sink Reservoir. Approximately 121 m³ of effluent with a pH of 4.51 was released; exceeding the MDMER lower limit.
- July 10, 2023, an acute lethality sample was collected from the Sink Reservoir sampling location (WQ09) as per the Environmental Monitoring Program and Operating Approval.

Orano implemented the following corrective actions: (a) The discharge to the Sink Reservoir was stopped immediately upon discovery. (b) The defective 3-way valve was removed, and a new connector was installed on the pipeline. (c) Orano issued a standing order to recycle radium polishing discharge to the hydroxide tank when the WTP plant is in upset conditions. (d) The upset conditions that caused the pH spike were rectified in JEB WTP. The effluent remaining in the monitoring pond was recycled back to the TMF. (e) The standpipe was removed from the monitoring pond and remaining treated effluent with low pH was recycles back to the TMF. (f) The piping from the ferric sulphate tank was repaired so the sulphate production circuit could be returned to its original configuration to prevent inadvertent routing of acidic solution into the JEB WTF circuits.

Unauthorized Releases / Reportable Releases to the Environment

In 2023, 13 unauthorized releases were reported; 7 releases at Cigar Lake Operation, 1 release at McArthur River Operation, 3 released at Key Lake Operation, and 2 McClean Lake Operation. The amounts were within the normal range of releases for uranium mines and mills. All releases were remediated by the licenses and no lasting impacts to the environment resulted from these releases. The number of reportable environmental spills per year for each operation is summarized in [Table 10 in Appendix A](#). The spill details are summarized in [Table 11 of Appendix A](#).

Environmental Protection Reviews

Environmental Protection Reviews (EPRs) were completed in 2023 as required and Executive Summaries were published online: Cigar Lake (2021; [LINK](#)), Rabbit Lake (2023; [LINK](#)), Key Lake (2023; [LINK](#)), and McArthur Operations (2023; [LINK](#)) and Cluff Lake Project (2022; [LINK](#)). At links for Executive Summaries additional links provided that direct reader to additional information. EPRs have been published online starting in 2021 ([LINK](#)). For all three reviews completed in 2023 the conclusion was the same:

Based on their assessment and evaluation of Cameco's documentation and data, CNSC staff have found that the potential risks from the Operations' radiological and hazardous release to the atmospheric, terrestrial, aquatic and human environments are low to negligible, and that these releases are at levels similar to natural background. Furthermore, human health is not impacted by operations and the health outcomes are indistinguishable from health outcomes found in similar northern Saskatchewan communities.

In Section 3.1.3.1 Selenium and molybdenum in effluent of the EPRs it is stated that both selenium and molybdenum have been the focus of increasing regulatory oversight by the CNSC. This is because ERAs completed in the mid-2000s indicate that releases of selenium and molybdenum have the potential to cause adverse environmental effects. As a result of this finding an upon request by the Commission, licensees added administrative controls and upgrades to their effluent treatment systems and improved engineering controls and treatment technologies to reduce effluent releases. These actions have been successful to date for the uranium mining sector, where molybdenum and selenium releases have substantially decreased since the mid-2000s and continue to be effectively controlled and closely monitored. **Rabbit Lake Operation** – In this latter context and in response to the increase in selenium and molybdenum, Cameco implemented process optimization techniques in the mine water treatment plant to more effectively control selenium and molybdenum in effluent. This resulted in a decrease in loadings to the environment. Recent effluent data shows that loadings of selenium and molybdenum to the environment are stable. **Key Lake Operation** – In this latter context and in response to the increase in selenium and molybdenum, Cameco implemented process optimization techniques in the mill treatment plant at the Key Lake Operation to more effectively control selenium and molybdenum in effluent. This resulted in more stable loadings to the environment. **McArthur River Operation** – In this latter context and in response to the increase in selenium and molybdenum, Cameco implemented process optimization techniques in the mine water treatment plant at the McArthur River Operation to more effectively control selenium and molybdenum in effluent. This resulted in more stable loadings to the environment.

In Section 3.2.3.1 Surface water quality ERA predictions: **Rabbit Lake Operation** – Probabilistic modelling was used to confirm that the surface water quality can be expected to remain below surface water quality guidelines for most COPCs in the expected scenario, with exceedances for uranium, selenium and fluoride in Horseshoe Pond through the decommissioning period. Shorter-term exceedances are predicted for uranium, selenium and fluoride in Horseshoe Creek. Once the treated effluent release ends, concentrations are expected to quickly decline to levels below the applicable Saskatchewan Quality Guidelines (SEQG). There are no predicted exceedances of surface water quality in Hidden Bay on Wollaston Lake. **Key Lake Operation** – The 2020 ERA identified that there is the potential that aquatic biota may be influenced from continued operation and long-term post-decommissioning loads at Key Lake Operation. Potential influences on the aquatic community, such as

changes to density and diversity of benthic invertebrates and changes to condition of fish species. These changes are limited to the near-field exposure zone of Wolf Lake, Fox Lake, and Unknown Lake and the aquatic community in the Wheeler River drainage is expected to remain protected and not adversely influenced by Key Lake Operation. **McArthur River Operations** – The 2020 ERA indicated no predicted exceedances under the expected scenario.

The ERP contains Section 3.2.5 Human Environment, findings for all three operations were that (1) radiological releases pose a negligible risk to human health (that is, potential risk to humans is similar to health outcomes in similar northern Saskatchewan communities). (2) Hazard releases pose a negligible risk to human health (that is, potential risk to humans is similar to health outcomes in similar northern Saskatchewan communities). People living and working near the facility remain protected.

ERPs also provide an update regarding end-state planning: **Rabbit Lake Operation** – Cameco submitted a revised update of the preliminary decommissioning plan (PDP) in June (following an initial submission in May 2018). The revised PDP was reviewed and accepted by the CNSC in November 2020. An updated revised PDP was submitted in December 2022 and is currently under review by CNSC staff. **Key Lake Operation** – Cameco submitted an update of the PDP in October 2019 after addressing regulatory review comments from CNSC and Saskatchewan Ministry of Environment on the initial August 2018 submission. The revised PDP was reviewed and accepted by the CNSC, and the revised financial guarantee was accepted by the Commission on July 29, 2020. An updated revised PDP was submitted in December 2022 and is currently under review by CNSC Staff. **McArthur River Operation** – Cameco submitted an update of the preliminary decommissioning plan in January 2018. The revised PDP was reviewed and accepted by CNSC staff in May 2019. An updated revised PDP was submitted in December 2022 and is currently under review by CNSC staff.

Independent Environmental Monitoring Program

CNSC staff continued to carry out the Independent Environmental Monitoring Program (IEMP) at planned sites in 2023 at Beaverlodge, Gunnar and Lorado ([LINK](#)). CNSC concluded that the 2023 IEMP results are consistent with the results submitted by Cameco and SRC, supporting that conclusion that people and the environment in the vicinity of **Beaverlodge, Gunnar and Lorado** sites are protected and that there are no anticipated health impacts from the sites, provided the Saskatchewan Healthy Fish Consumption Guideline is followed regarding fish and water consumption.

For radiological contaminants in fish, Labrador tea, berries, moose and spruce grouse, the monitoring results were compared to CNSC screening levels to ensure that human health is protected. Measured radioactivity levels were below the CNSC screening levels for radionuclides, except for polonium-210 in fish. The measured radioactivity levels of polonium-210 in fish at both exposure and reference stations were within the regional background range of 0.02 to 16 Bq/kg fresh weight and were consistent with the results from the Eastern Athabasca Regional Monitoring Program (EARMP). Levels in fish in exposure areas were not the result of Beaverlodge, Gunnar and Lorado since they were similar to the levels detected at the reference station.

With the exception of selenium and arsenic in fish, and copper, molybdenum, selenium and zinc in moose, the concentration of contaminants in fish, berries, labrador tea, moose and spruce grouse were below CNSC screening levels. No health effects are expected from the consumption of fish due to selenium or arsenic because the highest concentration was well below the Health Canada's tolerable

daily intake (TDI), and the concentrations in all other samples (water, labrador tea, berries) were well below the screening level. Contaminants in moose sampled were compared against from the EARMP, the levels in the IEMP were within or close to the EARMP range. This means that the moose in the vicinity of Beaverlodge, Gunnar and Lorado are safe to eat.

In the 2023 IEMP, there is a **focus on health** section in which it is concluded that People living near the Beaverlodge, Gunnar and Lorado sites had statistically higher age-standardized death rates from all cases and injuries, with all other causes having similar rates as the province. Leading causes of death in northern Saskatchewan are cancer (23%), injury (20%), circulatory disease (18%) and respiratory disease (8%) (Quinn & Irvine 2023). For the reported period of 2010 – 2014, compared to the provincial average, northern Saskatchewan had significantly higher age-standardized cancer incident rates for female lung and colorectal cancer, and higher rates of male lung and kidney cancer. About 40% of cancer cases are preventable by reducing tobacco use and second-hand smoke exposure. The impact of tobacco use on cancer may be even greater for people living near the sites than for the province as a whole since the smoking rate in northern Saskatchewan First Nations communities is as high as 79% (Quinn & Irvine 2019).

The relationship between workplace radiation exposure and health among uranium mine and mill workers employed at the Beaverlodge site was examined. Overall, Beaverlodge workers were as healthy as the general Canadian population, except in the case of lung cancer. Lung cancer death and cancer incidence rates were higher among uranium works compared to the general Canadian population, and the likelihood of lung cancer increased with increased radon exposure (Lane et. al. 2010; Lane et al. 2019).

The findings of studies of uranium workers around the world (UNSCEAR 2020) resulted in strict radiation protection regulations to keep workers safe. Workers' doses are monitored to ensure that they are as low as reasonably achievable and are far below occupational dose limits.

In 2017, a study of 90,000 Canadian uranium workers was initiated. This project will provide insight into the long-term health of workers and the relationship between workplace radiation and cancer incidence and mortality, especially at the low radiation exposures of today's workers. More information about the Canadian Uranium Workers Study (CANUWS) is available online ([LINK](#)). The final study report is expected in 2026.

Thus, based on environmental exposure data, the health data of people living near the Beaverlodge, Gunnar and Lorado sites, and the monitoring of current uranium workers, we have not observed and do not expect to observe any adverse health outcomes relating to the Beaverlodge, Gunnar and Lorado sites.

For more information, access the CNSC Health Studies page ([LINK](#)).

<https://www.nitha.com/>

<https://www.saskhealthauthority.ca/>

<http://www.saskcancer.ca/research-article/cancer-surveillance>

Eastern Athabasca Regional Monitoring Program

The Eastern Athabasca Regional Monitoring Program (EARMP; 2023/2024 Community Report available at [LINK](#)). Community members collected and submitted 60 fish, 7 moose meat, 8 moose organ, 6 barren-ground caribou meat, and 6 water samples for testing in late 2023. The EARMP illustrates country foods chemical profiles are similar to previous monitoring years and natural background levels. As such, the water and country foods continue to be safe for consumption.

Findings from Report Review

I have reviewed the CMD 25-M4 / 2023 RoR identifying questions and comments community members would likely have, taking into consideration my engagement with ERFN and the knowledge and understanding I have of the uranium industry and regulatory requirements. The review was completed in this manner to critically review the 2023 RoR in a concise and culturally aware manner.

Indented text indicates context reiterated from the 2022 RoR from previously identified concerns and ongoing uncertainty.

Cigar Lake Operation - Arsenic in Seru Bay Declined from 2016 to 2021 in 2022 and 2023 Again Elevated Above ERA Predictions

As described in 2022 RoR Review:

In 2016, the Cigar Lake Operation Environmental Performance Report (EPR) indicated an increasing arsenic trend in effluent released to Seru Bay. While below regulatory limits, arsenic concentrations were above environmental assessment predictions and above concentrations previously measured prior to achieving full ore production. Stated in the 2020 RoR (CMD 21-M34), the CNSC has verified that arsenic loadings to the environment have decreased steadily since 2016 and stated in the 2021 RoR (CMD 22-M36) CNSC staff have concluded adequate measures have been taken to protect the environment (pg 49 = pg 56/160). In 2022, however, arsenic levels in effluent are elevated compared to previous years and exceeded the expected and upper-bound benchmarks in the ERA. In 2022 arsenic loadings and mean concentrations were 42.2 kg and 0.108 mg/L as compared to 23.4 kg and 0.065 mg/L and 22.2 kg and 0.063 mg/L in 2021 and 2020, respectively. [Table 12 of Appendix A](#) summarizes arsenic annual average effluent concentration. Note: the concentration in 2022 is higher than it was in 2016.

Although above ERA predictions, concentrations in the receiving environment (i.e., Seru Bay) remain below Surface Water Quality Objective of 5 µg/L (0.05 mg/L). Cameco continue to implement operational changes to lower arsenic loadings to the environment. CNSC staff are satisfied that Cameco continues to monitor and take appropriate action to lower arsenic concentration in the effluent, and that the environment remains protected.

Consistent with this conclusion, the 2020 IEMP results for the Cigar Lake Operation ([LINK](#)), fish sample from Waterbury Lake near Seru Bay the arsenic concentration (0.01 mg/kg) was below the guideline/reference level (0.06 mg/kg). As described in the EARMP, Health Canada measures concentrations in grocery store food items; they report arsenic in freshwater fish is typically 0.4 ug/g (0.4 mg/kg) wet weight (ranging from 0.12 to 1.1 ug/g [0.12 to 1.1 mg/kg]). Although, no

specific data provided, nor direct text speaking to arsenic levels, the writeup suggests that surface water samples from Seru Bay and within Waterbury Lake had measured levels of arsenic below guidelines.

Arsenic loadings are not discussed in the 2023 RoR, however, as you can see in [Table 12 of Appendix A](#) the arsenic concentration in Cigar Lake Operation effluent in 2023 (0.0921 mg/L) was lower than that in 2022 (0.108 mg/L), but comparable to that in 2016 (0.0919 mg/L). Concentration does not equate to loadings; however, the 2022 RoR stated arsenic levels in effluent are elevated and exceeded the expected and upper-bound benchmarks in the ERA.

McArthur River Operation – Molybdenum in Effluent Addressed In 2018 Care and Maintenance from 2018 to March 2022

As described in 2022 RoR Review:

Cameco implemented process changes prior to 2018 during active mining which reduced molybdenum concentrations in treated effluent. Since 2018, concentrations of molybdenum were further reduced by approximately 90% as a result of placing the facility into a state of care and maintenance. The operation in 2022 transitioned back into operation. CNSC staff reviewed the effluent treatment concentrations and confirmed that the McArthur River Operation continued to meet the discharge limits. The CNSC will continue to review effluent quality results to verify that effluent treatment performance remains effective.

In the 2023 the reported annual average molybdenum concentration in effluent released to the environment in Table 4.2.2 (pg 54/146) was 0.1136 and this is the same as are provided in Appendix C McArthur River Operation Dashboards of the 2023 RoR. As illustrated in [Table 6 Table of Appendix A](#), the effluent concentration is elevated as compared to range from 2018 to 2022 (0.0084 to 0.0192 mg/L) and comparable to concentrations in reported for 2014 to 2017 (0.146 to 0.2121 mg/L).

Northern Saskatchewan Community Cancer Rate Concern

There is a new Section of the IEMP (at least not in the 2022 reports) called Indigenous Nations and communities' participation, which includes the subsection Focus on health. This subsection speaks directly to concerns identified in the 2022 RoR Review Report submitted to ERFN that community members perceive their communities are being exposed to carcinogens due to uranium industry in northern Saskatchewan. The section confirms what community members speculated during engagement in 2022 that there are significantly higher cancer incidence rates in northern Saskatchewan communities as compared to the provincial average (23%). (1) female lung cancer, (2) female colorectal cancer, (3) male lung cancer, and (4) male kidney cancer. This confirmation could help the communities focus on identifying and implementing the ways they can protect themselves, such as that identified in the IEMP that 40% of cancer cases are preventable by reducing tobacco use and second-hand smoke exposure. As well, it is acknowledged that lung cancer rates increase with increased radon exposure. The 2023 IEMP speak directly to the Beaverlodge, Gunnar and Lorado sites (not active mines), and concludes that monitoring of current uranium workers and in the vicinity of the sites demonstrates that no adverse health outcomes are expected to the people living near these sites nor those working at the sites. The section also referenced the Canadian Uranium Worker Study (CANUWS), the report for which is anticipated to be published in 2026.

As indicated in Section 4.2 of the 2023 RoR, Air Emissions Released to the Environment, Licensees measure airborne particulate levels and concentrations of regulated contaminants and contaminants of potential concern (COPC), as well as the concentration of radon gas in ambient air. As described above and in the Releases to the Environment section of the RoR, radon gas monitoring near tailings management facilities and waste rock piles shows results higher than the regional background level of 25 Bq/m³ (equivalent to 1 mSv/year) but fall to background levels within background levels within a short distance (less than 2 km from operations). Data is not provided in the application in relation to the historical and decommissioned sites. It is stated in the 2023 RoR, CNSC staff reviewed air emission monitoring results for radon annual averages from 2021 to 2023 for all relevant facilities and were satisfied with the results at all historic and decommissioned facilities and will continue to monitor the program's effectiveness.

Data is provided for the active mines; refer to [Table 13 of Appendix A](#). I cannot confirm where the monitoring stations are, but all levels are below the 25 Bq/m³ with the exception of the measured level for Rabbit Lake Operation in 2023. In the 2023 EPRs, figures are provided showing air monitoring locations and results.

Added Information / Clarifications / Recommendations / Minor Editorial Items

Recommendation #1

I couldn't find the Saskatchewan Healthy Fish Consumption Guideline that was referenced in the IEMP. As this document is referenced in relation to people being able to protect themselves from exposure, easy access should be confirmed.

Clarification #1 / Added Information #1

The information provided in the IEMP in the subsection Focus on health helpful (described above in section Northern Saskatchewan Community Cancer Concern). The information led me to ask the following questions (1) Are smoking rates higher in northern Saskatchewan communities as compared to other areas? (2) Are radon levels higher in northern Saskatchewan communities as compared to other areas? Not to prove causation but to inform people on possible effective ways to protect themselves and their families.

(1) I couldn't find any publications that satisfactorily spoke to smoking rate in northern Saskatchewan, where it was identified cancer incidence rates are higher. However, I believe northern community members themselves would be best to judge this. For comparison ([LINK](#)), in 2022 it was reported that 12% of Canadians aged 15 and older currently smoke, 14% of males and 10% females, and 11% of the males and 8% of the females smoke daily.

(2) SRC 2017 blog [Radon: Is It in Your Home?](#) provides insight.

(a) Saskatchewan has some of the highest levels in the country; the Canadian average is 7% of homes measured above the protective Health Canada Guideline of 200 Bq/m³. Radon concentrations are usually higher where there is high concentration of uranium in underlying rock and soil. As illustrated in the figure provided as part of the SRK blog, the average in Mamawetan Churchill River area is 14% (1 in 7 homes), which is twice as high as the Canadian average but lower than the average for Heartland (20%; 1 in 5

homes), Sunrise (25%; 1 in 4 homes), Cypress (26%), Regina Qu'Appelle (26%), and Sun Country areas (15%) all southern Saskatchewan communities.

(b) Radon test devices can be purchased from retailers, health organizations or certified professional ([LINK](#)).

(c) Confirms support that radon is the second-leading cause of lung cancer after smoking. Health Canada links 16% of lung cancer cases among Canadian to radon exposure: Life time smoker + high level of radon exposure = risk 1 in 3 of lung cancer and Non-smoker + high level of radon exposure = risk 1 in 20 of lung cancer.

I also quickly reviewed online reference from the Mayo Clinic and Public Health Agency of Canada that speak to **Risk Factors** related to lung ([LINK](#) and [LINK](#)), colorectal ([LINK](#) and [LINK](#)) and kidney cancer ([LINK](#) and [LINK](#)). To inform people as to how to protect themselves the best they can.

I also quickly looked at **Screening Recommendations** for these three types of cancer, currently there is no screening protocol in Canada for kidney cancer but a list of symptoms to watch for a are provided by Canadian Cancer Society (Lung – [LINK](#); Colorectal – [LINK](#); Kidney - [LINK](#)).

Question #1 for the CNSC

In the IEMP, it is stated (1) They examined the relationship between workplace radiation exposure and health among uranium mine and mill workers employed at the Beaverlodge site. (2) Beaverlodge workers were as healthy as the general Canadian population, except in the case of lung cancer. It is not clear but the past tense implies that the data referenced was characterizing a previous stage of the operation; it would be helpful to understand the time period the monitoring was from.

What timeframe / phase of the operation was the radiation exposure and health characterization data collected during?

Further, there is no current data in the IEMP or 2023 RoR to characterize the workplace radiation exposure at Beaverlodge to provide context in comparison to monitoring data provided for the active mines and mill in northern Saskatchewan.

Clarification #2

I couldn't find the following references cited in the IEMP: Quinn & Irvine 2023, Quinn & Irvine 2019, Lane et. al. 2010 and Lane et al. 2019.

Clarification #3

Page 37/146 of RoR in Section 3.4.2 it is stated that in 2023, Cameco reported 6 radiological action level exceedances to the CNSC. However, I could only find 5 exceedances described.

Clarification #4

In the IEMP 2023 Results section there appears to be contradictory statements but I think this is just typo.

First statement: With the exception of selenium and arsenic in fish, and copper, molybdenum, selenium and zinc in moose (discussed below), the concentration of hazardous substances in fish, berries, Labrador tea, moose and spruce grouse were below CNSC screening for hazardous substances.

Second statement: This is because the highest concentration of selenium in fish was less than half of the conservative CNSC screening level, and the selenium concentrations in all other samples analyzed (water, Labrador tea, berries) were well below the screening levels.

I think the second statement was meant to read “This is because the highest concentration of selenium in fish was less than half the TDI, and the selenium concentrations in all other samples analyzed (water, Labrador tea, berries) were well below the screening levels.”

Question #2 to Cameco / CNSC

In relation to arsenic concentration in the Cigar Lake Operation effluent, would Cameco / CNSC still conclude action to lower arsenic concentration in the effluent has been effective as anticipated.

Question #3 to Cameco / CNSC

In relation to the molybdenum in the McArthur River Operation effluent, would Cameco / CNSC still conclude effluent treatment performance remains effective.

Minor Edit #1

I think there was a typo in the Appendix B: Cigar Lake Operation Dashboard Annual Average Effluent Release 5 Year Trend (pg 107/146) as radium-226 appears to have increases 10 fold in 2023 but I checked the previous data. As such, I think the values should be 2019 – 0.008, 2020 – 0.007, 2021 – 0.007, and 2022 – 0.008.

Reviewing Information Outside RoR

Clarification #5

While searching for updated ERFN population information, I found the link provided for ERFN website on INAC website ([First Nation Profiles](#)) takes you to [Homepage - Aurora Renewables](#). Notifying ERFN if this is not correct and they want to rectify.

Conclusion

From my review of the information provided there is no reason to object to the CNSC's conclusions in the 2023 RoR that the operations are being managed effectively in terms of the SCAs. The RoR concludes that adequate protections are in place to protect the environment and humans.

Sincerely,

A handwritten signature in blue ink, appearing to read "Robin Kusch", is placed over a light gray rectangular background.

Robin Kusch, M.Sc.
Environmental Scientist
108 Brookside Drive,
Warman, Saskatchewan
S0K 0A1

Appendix A: Summary Tables

Table 1: Financial Guarantees for the Five Operations from 2014 to 2023

Facility	2014	2015	2016	2017	2018	2020	2021	2022	2023
Cigar Lake	49,200,000	49,200,000	49,200,000	49,200,000	49,200,000	61,790,000	61,790,000	61,790,000	\$61,791,233
McArthur River	48,400,000	48,400,000	48,400,000	48,400,000	48,400,000	42,100,000	42,100,000	42,100,000	42,100,000
Rabbit Lake	202,700,000	202,700,000	202,700,000	202,700,000	202,700,000	202,700,000	202,700,000	202,700,000	42,100,000
Key Lake	225,100,000	225,100,000	218,300,000	218,300,000	218,300,000	222,500,000	222,500,000	213,400,000	222,500,000
McClellan Lake	43,074,800	43,074,800	107,241,000	107,241,000	107,241,000	107,241,000	107,241,000	102,098,000	102,098,000

Table 2: Inspections at Uranium Mines from 2018 to 2023

	2018	2019	2020	2021	2022	2023
Number of Inspections	26	20	17	18	25	22
Instances of non-compliance	31	23	11	19	79	93
Orders	-	-	-	-	1	1

Table 3: Maximum Individual Radiation Dose per Year from 2014 to 2023

Facility	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Maximum Individual Radiation Dose (mSv)	Rabbit Lake 8.64	Rabbit Lake 9.15	McArthur River 7.02	McArthur River 5.73	Cigar Lake 7.28	McClellan Lake 4.7	McClellan Lake 4.28	Cigar Lake 6.03	McArthur River 7.14	Cigar Lake 18.92*
% Annual Regulatory Limit	17	18	14	12	14	9	9	12	14	37.8

* A value that is 37.8% of the annual effective dose limited of 50 mSv for nuclear energy workers.

Table 4a: Annual Average Individual Radiation Dose for the Five Operations from 2014 to 2023

Year	Cigar Lake	McArthur River	Rabbit Lake	Key Lake	McClellan Lake
	mSv				
2014	0.16	1.03	1.35	0.63	0.37
2015	0.45	1.00	1.36	0.55	0.89
2016	0.39	0.85	0.85	0.62	1.04
2017	0.34	0.79	0.4	0.66	0.91
2018	0.47	0.15	0.46	0.19	0.9
2019	0.57	0.33	0.75	0.27	0.93
2020	0.38	0.27	0.7	0.35	0.67
2021	0.32	0.25	0.57	0.52	0.79
2022	0.46	0.59	0.70	0.74	0.81
2023	0.42	0.87	0.71	0.91	0.87

Table 4b: Maximum Individual Radiation Dose for the Five Operations from 2014 to 2023

Year	Cigar Lake	McArthur River	Rabbit Lake	Key Lake	McClellan Lake
	mSv				
2019	3.7	2.82	2.73	1.84	4.7
2020	2.82	2.94	2.93	2.11	4.28
2021	6.03	3.06	2.47	3.13	4.89
2022	5	7.14	2.86	6.46	6.86
2023	18.92	8.87	2.80	10.44	8.37

Table 5: Annual Lost-time Injuries for the Five Operations from 2014 to 2023

Year	Cigar Lake	McArthur River	Rabbit Lake	Key Lake	McClellan Lake
	Lost-time Injuries				
2014	1	1	1	0	3
2015	4	0	2	0	3
2016	1	1	1	2	3
2017	0	1	0	0	0
2018	0	0	0	0	1
2019	0	0	1	0	3
2020	0	0	0	0	2
2021	2	0	0	0	3
2022	0	0	1	1	3
2023	2	1	0	4	3

Table 6: Annual Average Molybdenum Concentration (mg/L) in Effluent from 2014 to 2023 (Discharge Limit = 1 mg/L)

Year	Cigar Lake	McArthur River	Rabbit Lake	Key Lake	McClellan Lake
2014	0.0303	0.2121	0.2820	0.16	0.0024
2015	0.0763	0.146	0.268	0.1	0.0024
2016	0.0369	0.1851	0.273	0.08	0.002
2017	0.064	0.146	0.139	0.12	0.004
2018	0.103	0.0192	0.18	0.063	0.003
2019	0.1069	0.0084	0.159	0.049	0.002
2020	0.0756	0.0094	0.184	0.056	0.002
2021	0.0515	0.0089	0.213	0.038	0.003
2022	0.0506	0.0142	0.163	0.013	0.006
2023	0.0399	0.1136	0.114	0.0543	0.014

Table 7: Annual Average Selenium Concentration (mg/L) in Effluent from 2014 to 2023 (Discharge Limit 0.6 mg/L)

Year	Cigar Lake	McArthur River	Rabbit Lake	Key Lake	McClellan Lake
2014	0.0009	0.0017	0.0042	0.018	0.0007
2015	0.0041	0.0025	0.0042	0.018	0.0092
2016	0.0062	0.0037	0.0035	0.017	0.021
2017	0.0042	0.0036	0.0024	0.015	0.011
2018	0.0044	0.0023	0.0026	0.01	0.021
2019	0.0041	0.0024	0.0023	0.01	0.037
2020	0.0034	0.0003	0.0026	0.011	0.042
2021	0.002	0.0003	0.0025	0.01	0.0211
2022	0.0037	0.0004	0.0024	0.009	0.0139
2023	0.0021	0.0048	0.0023	0.016	0.0161

Table 8: Annual Average Uranium Concentration (mg/L) in Effluent from 2014 to 2023 (Discharge Limit 2.5 mg/L)

Year	Cigar Lake	McArthur River	Rabbit Lake	Key Lake	McClellan Lake
2014	0.0193	0.0097	0.046	0.006	0.0018
2015	0.131	0.0089	0.052	0.008	0.0042
2016	0.0063	0.0055	0.073	0.006	0.004
2017	0.0018	0.0056	0.07	0.011	0.004
2018	0.0005	0.0071	0.032	0.013	0.007
2019	0.0004	0.0086	0.027	0.0243	0.005
2020	0.0002	0.0084	0.021	0.0259	0.005
2021	0.0001	0.0082	0.018	0.0239	0.0098
2022	0.0002	0.0103	0.019	0.0221	0.005
2023	0.00019	0.0076	0.017	0.00359	0.0052

Table 9: Annual Average Radium-226 Concentration (Bq/L) in Effluent from 2014 to 2023

Year	Cigar Lake	McArthur River	Rabbit Lake	Key Lake	McClellan Lake
2014	0.008	0.04	0.01	0.05	0.007
2015	0.01	0.065	0.007	0.07	0.006
2016	0.007	0.082	0.007	0.05	0.006
2017	0.007	0.061	0.007	0.07	0.006
2018	0.006	0.079	0.006	0.07	0.006
2019	0.008	0.051	0.006	0.09	0.006
2020	0.007	0.049	0.006	0.036	0.01
2021	0.007	0.029	0.006	0.017	0.01
2022	0.008	0.025	0.006	0.02	0.014
2023	0.008	0.051	0.005	0.01	0.01

Table 10: Annual Reportable Environmental Spills for Five Operations from 2014 to 2023

Year	Cigar Lake	McArthur River	Rabbit Lake	Key Lake	McClellan Lake
2014	3	1	4	1	2
2015	10	0	2	1	6
2016	5	1	2	1	8
2017	5	2	1	3	3
2018	5	2	1	5	4
2019	3	4	1	8	0
2020	0	0	0	2	4
2021	4	0	4	4	5
2022	2	0	0	5	2
2023	7	1	0	3	2

Table 11: Summary of Reportable Environmental Spills in 2023

No.	Operation	Spill Description
1	Cigar Lake	April 11, 2023, erosion on Stockpile C estimated to have resulted in 10,000 L of snow melt that had contacted Potentially Acid Generating (PAG) aggregate reported to ground.
2	Cigar Lake	April 11, 2023, during creating containment of ditch of Stockpile C the HDPE liner was punctured that resulted in approximately 1,000 – 2,000 L of snow melt water than contacted PAG reported to ground.
3	Cigar Lake	June 21, 2023, second tear in liner of Stockpile C identified resulted in approximately 2,000 L of water which had contacted PAG reported to ground.
4	Cigar Lake	August 5, 2023, malfunction on the solenoid valve resulted in an ammonia leak. Approximately 5 – 10 lbs of liquid ammonia leaked into the atmosphere inside the building causing the ammonia detector to alarm.
5	Cigar Lake	August 30, 2023, nitrogen blanket system on the process water cooling loop glycol expansion tank was venting nitrogen past the pressure regulator. Approximately 13,000 L was released before the leak was detected.
6	Cigar Lake	September 15, 2023, 3 totes of radiologically contaminated sand/rock from Ore Load Out building were placed near the hydrocarbon landfarm in an unlined area. One tote was broken; all three totes and contaminated soil were relocated to Stockpile B.
7	Cigar Lake	September 23, 2023, calcium chloride leak was identified and stopped. Approximately 6,000 L of brine was leaked to ground.
1	McArthur River	June 20, 2023, the contaminated plates for the Shriver filter press were misaligned which allowed contaminated water to spray out. Approximately 150 L of contaminated liquid was released to the ground outside the secondary water treatment plant.
1	Key Lake	August 16, 2023, alarm notification of an ore slurry leak within the feed utilidor. The majority of the slurry was released to the secondary containment, but an estimated 200 kg was released to the ground outside the utilidor. The slurry was removed via vacuum truck and deposited on an ore pad.
2	Key Lake	September 3, 2023, damaged industrial water line resulted from water wagon rolling back before line was detached. Approximately 1200 m3 of industrial water was released within utilidor reporting to secondary containment, while 12 m3 was released to the soil near the crusher sump. The impacted soil was removed and placed on an ore pad.
1	McClellan Lake	April 23, 2023, a “Y” connection failed along the treated effluent pipeline running from the JEB WTP to the Sink Reservoir. Approximately 126 m3 of treated effluent was released.
2	McClellan Lake	September 19, 2023, during offloading a truck approximately 0.04 m3 of sulphuric acid was discharged to ground. The driver did not have the compressed air line attached to the top of the truck as required. The truck trailer filled and eventually spilled over.

Table 12: Annual Average Arsenic Concentration (mg/L) in Effluent from 2014 to 2023

Year	Cigar Lake	McArthur River	Rabbit Lake	Key Lake	McClellan Lake
2014	0.003	0.0013	0.0056	0.007	0.0005
2015	0.0439	0.0029	0.004	0.006	0.0034
2016	0.0919	0.0011	0.0025	0.007	0.016
2017	0.075	0.0012	0.001	0.008	0.026
2018	0.0603	0.0009	0.0009	0.008	0.03
2019	0.0952	0.0009	0.0009	0.0075	0.058
2020	0.0627	0.0001	0.0090	0.0113	0.036
2021	0.0649	0.0001	0.0012	0.0109	0.044
2022	0.108	0.0001	0.00009	0.0019	0.0521
2023	0.0921	0.0002	0.0003	0.0034	0.0457

Table 13: Ambient Radon in Air (Bq/m³) from 2019 to 2023

Year	Cigar Lake	McArthur River	Rabbit Lake	Key Lake	McClellan Lake
2019	8.6	10.4	6	10.5	17.4
2020	9.8	9.5	14.6	12.2	9.5
2021	11.2	20.5	20.8	14.8	18.1
2022	10.9	10.8	19.3	6.9	17.9
2023	10.7	15.4	27.9	17.1	17.5