CMD 25-M4 - CNSC Staff Submission

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

Level of security	UNPROTECTED
Status	ORIGINAL
CMD	25-M4
Date signed	07 October 2024
Type of report	Regulatory Oversight Report
Public meeting date	29 January, 2025
Word e-DOC	7200159 – ENG 7324234 – FR
PDF e-DOC	7289425 – ENG 7357194 - FR
Summary	This CMD presents the Regulatory Oversight Report for Uranium Mines, Mills, Historic and Decommissioned Sites in Canada: 2023. - Purpose of document - Key events - Key findings
Actions required	There are no actions requested of the Commission. This CMD is for information only.

CMD 25-M4

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

Signed by:

X

Sigouin, Luc
C=CA, O=GC, OU=CNSC-CCSN, CN="Sigouin, Luc"

2024.10.07 10:25:10 -04'00'

Luc Sigouin

Director General, Directorate of Nuclear Cycle and Facilities Regulation

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

Canadian Nuclear Safety Commission

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

Cat. No. CC171-30E-PDF
ISBN 2560-8452

Également publié en français sous le titre : **Rapport de surveillance réglementaire des mines et usines de concentration d'uranium et des sites historiques et déclassés du Canada : 2023**

Document availability

This document can be viewed on the CNSC website. To request a copy of the document in English or French, please contact:

Canadian Nuclear Safety Commission
280 Slater Street
P.O. Box 1046, Station B
Ottawa, ON K1P 5S9
Canada

Tel.: 613-995-5894 or 1-800-668-5284 (in Canada only)
Fax: 613-995-5086

Email: cnsc.info.ccsn@cnsc-ccsn.gc.ca
Website: nuclearsafety.gc.ca
Facebook: facebook.com/CanadianNuclearSafetyCommission
YouTube: youtube.com/cnscccsn
Twitter: @CNSC_CCSN
LinkedIn: linkedin.com/company/cnsc-ccsn

Publishing history

TBD

Table of contents

Changes since last review

Change	Rationale
Created SCA section apart from facilities	Reduces duplication of information.
Created dashboards for data graphs and tables	Allows for readers to see relevant data at a glance while focusing on a given facility relevant to the reviewer.
Removed comparisons to non-uranium mining facilities for environmental protection and conventional health and safety sections	Information presented in comparing non-uranium mines and mills cannot be as current due to CNSC staff not having immediate access to the information. The comparison has shown that uranium mines and mills have performed as safely and effectively as other mining facilities across Canada. CNSC staff continue to obtain and review information and will report to the Commission should the situation change.

Plain Language Summary

The Regulatory Oversight Report for Uranium Mines, Mills, Historic and Decommissioned Sites in Canada: 2023 provides information about the work carried out by the Canadian Nuclear Safety Commission (CNSC) to verify the safety of people and the environment around all operating and all historic and decommissioned uranium mines and mills in Canada. The 5 operating mines and mills, all located in northern Saskatchewan, continued to operate safely in 2023. Monitoring continues to show that the country foods and water surrounding the mines and mills remain safe to eat and drink. There were no releases that could have harmed human health or the environment.

This report provides information on the 5 uranium mines and mills licensed to operate in 2023:

- Cameco's Cigar Lake – uranium mine
- Cameco's McArthur River – uranium mine
- Cameco's Rabbit Lake – uranium mine and mill (in care and maintenance since 2016)
- Cameco's Key Lake – uranium mill
- Orano's McClean Lake – uranium mine and mill

CNSC staff would like to acknowledge that the uranium mine and mill facilities discussed in the report are located on Treaty 10 territory, the Homeland of the Métis, and are within the traditional territories of the Dene, Cree, and the Métis peoples.

This report also provides information on the following historic and decommissioned sites in Canada for the 2021 to 2023 reporting period:

Historic

- Gunnar legacy uranium mine (Saskatchewan)
- Madawaska closed uranium mine (Ontario)

Decommissioned

- Former Lorado mill site (Saskatchewan)
- Beaverlodge mine site (Saskatchewan)
- Cluff Lake uranium mine and mill (Saskatchewan)
- Rayrock closed mine (Northwest Territories)
- Port Radium closed mine (Northwest Territories)
- Agnew Lake tailings management facility (Ontario)
- Bicroft tailings storage facility (Ontario)
- Dyno closed mine (Ontario)
- Elliot Lake historic site (Ontario)
- Denison and Stanrock closed mines (Ontario)

Each year, CNSC inspectors conduct inspections at uranium mines and mills. The number and focus of inspections depend on the performance and operating status of the mine or mill.

In 2023, CNSC staff performed a total of 22 inspections across the 5 operating mines and mills and found 93 non-compliances. From 2021 to 2023, CNSC staff performed a total of 11 inspections across the 12 historic and decommissioned sites and found 3 non-compliances . The CNSC issued 1 order to Cameco's Rabbit Lake Operation, and 1 order was issued to Dyno and to Madawaska. The operators are required to fix these non-compliances and are addressing all the concerns raised during the inspections.

Although the CNSC evaluates operating nuclear facilities across all 14 safety and control areas, this report focuses on the following 3 areas:

- Radiation protection: In 2023, the maximum individual radiation dose to a worker at any of the 5 uranium mine and mill facilities was 38% of the annual regulatory limit. Worker doses were kept below the CNSC regulatory dose limits.
- Environmental protection: All water used by mine and mill facilities must be treated before being discharged back into the environment. In 2023, all discharged water met the discharge requirements, ensuring that people and the environment near the facilities are safe. Licensees also conduct air sampling and vegetation sampling around their sites. All results for 2023 were well below the limits set by the environmental quality guidelines. In addition, CNSC licensees are required to report any unauthorized releases of hazardous substances or nuclear substances to the environment, such as spills. In 2023, 13 unauthorized releases were reported. These amounts were within the normal range of releases for uranium mines and mills. All releases were remediated by the licensees and no lasting impacts to the environment resulted from these releases.
- Conventional health and safety: Licensees of all mining and milling operations must report any lost-time, workplace-related injuries to the CNSC and provincial agencies. In 2023, 9 injuries required reporting. This is consistent with previous years.

As an agent of His Majesty the King in Right of Canada, the CNSC recognizes and understands the importance of building relationships with Indigenous peoples. In 2023, CNSC staff continued to work in support of the organization's ongoing commitment to Indigenous consultation and engagement with Indigenous peoples with interests in Canada's uranium mines and mills. CNSC staff continued to meet with Indigenous Nations and communities to provide information on and seek opportunities for improvement of the regulatory oversight report.

In summary, for the 2023 calendar year for operating sites and from 2021 to 2023 for historic and decommissioned sites, CNSC staff confirm that:

- workers at each facility were safe and were properly protected from radiation hazards and from conventional health and safety hazards
- there were no releases to air or to water that could harm the environment or the health and safety of people
- country foods continued to be safe to eat

1 Introduction

1.1 Background

Each year, the Canadian Nuclear Safety Commission (CNSC) publishes regulatory oversight reports, which offer information on the safety performance of CNSC licensees who are authorized to use nuclear substances. The reports evaluate licensees based on their compliance with regulatory requirements. Key issues and emerging changes in regulation are also highlighted.

Learn more about regulatory oversight reports

1.2 Scope of Report

This report describes the regulatory oversight and safety performance of operating, historic and decommissioned mines and mills in Canada. Information on operating mines and mills, reported in part I, covers the 2023 calendar year, while historic and decommissioned mines, reported in part II, covers the 2021-2023 calendar years.

Part I : Operating Uranium Mines and Mills in Canada: 2023

2 Overview

This section focuses on the regulatory performance of the 5 operating uranium mines and mills in Canada in 2023. These facilities are located within the Athabasca Basin of northern Saskatchewan and are shown in figure 2.1.

- Cigar Lake Operation (mine)
- McArthur River Operation (mine)
- Rabbit Lake Operation (mine and mill)
- Key Lake Operation (mill)
- McClean Lake Operation (mine and mill)

Figure 2.1: Location of uranium mines and mills in operation in Saskatchewan

The Cigar Lake, McArthur River, Key Lake and Rabbit Lake facilities are operated by Cameco, while the McClean Lake facility is operated by Orano.

In 2016, Cameco entered the Rabbit Lake mine and mill into a state of care and maintenance and that facility has remained so since that time. CNSC staff continue to verify the safety of that site during this care and maintenance phase. In 2023, CNSC inspectors continue to verify the safe restart of mining and milling at the McArthur River Operation and the Key Lake Operation which began in late 2022. Cameco performed all expected functions during this period of transition from care and maintenance.

In 2023, CNSC staff continued routine compliance verification inspections at all facilities to determine whether each licensee continued to meet regulatory requirements. The 2023 uranium production data for uranium mine and mill facilities are shown in table 2.1. CNSC staff concluded that all facilities operated within their authorized annual production limits in 2023.

Table 2.1: Uranium mines and mills, mining and milling production data, 2023

Production data	Cigar Lake	McArthur River	Rabbit Lake[1]	Key Lake[2]	McClean Lake[3]
Mining – ore tonnage (Mkg/year)	48.78	79.8	0	N/A	N/A
Mining – average ore grade mined (%U_3O_8)	14.1	8.4	N/A	N/A	N/A
Mining – U mined (Mkg U/year)	5.8	5.68	N/A	N/A	N/A
Milling – mill ore feed (Mkg/year)	N/A	N/A	0	119.86	49.6
Milling – average mill feed grade (%U)	N/A	N/A	N/A	5.17	11.85
Milling – mill recovery (%U_3O_8)	N/A	N/A	N/A	99.22	98.88
Milling – U produced (Mkg U/year)	N/A	N/A	0	5.2	5.81
Authorized annual production (Mkg U/year)	9.25	9.6	4.25	9.60	10.9

[1] Rabbit Lake was in a state of care and maintenance throughout 2023.
[2] Key Lake mill processing ore from McArthur River and various waste streams
[3] McClean Lake mill processing ore from Cigar Lake.
N/A = Not applicable.
Mkg = 1,000,000 kg

Licensees are required to develop and update preliminary decommissioning plans throughout the entire lifecycle of a facility and are required to provide associated financial guarantees. 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 obligation. Financial guarantee values for the mine and mill facilities range from approximately C$42 million at the McArthur River Operation to C$223 million at the Key Lake Operation. The values of the financial guarantees for each uranium mine and mill are listed in appendices B-F. Financial guarantees cover all costs necessary to fully decommission and remediate a uranium mine and/or mill to ensure the protection of people and the environment. 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.

Learn about CNSC requirements for Financial Guarantees

2.1 Performance

CNSC staff use expert professional judgement to rate safety and control area (SCA) performance at uranium mine and mill facilities. Ratings are based on the review of key performance indicators (e.g., accident/event occurrences, responses to accidents/events, desktop review of reports, dose information, environmental monitoring results) and the results of compliance activities, such as inspections and technical assessments.

The performance ratings are compared across the 5 operating uranium mines and mills and to the rating definitions in appendix G to ensure that consistent ratings are assigned. The 2023 SCA performance ratings for the mine and mill facilities are presented in table 2.1.1; the SCA ratings for each facility from 2019 to 2023 are also reported in appendix B, C, D, E and F.

Table 2.1.1: Uranium mines and mills, SCA performance ratings, 2023

Safety and Control Area	Cigar Lake	McArthur River	Rabbit Lake	Key Lake	McClean Lake
Management system	SA	SA	SA	SA	SA
Human performance management	SA	SA	SA	SA	SA
Operating performance	SA	SA	SA	SA	SA
Safety analysis	SA	SA	SA	SA	SA
Physical design	SA	SA	SA	SA	SA
Fitness for service	SA	SA	SA	SA	SA
Radiation protection	SA	SA	SA	SA	SA
Conventional health and safety	SA	SA	SA	SA	SA
Environmental protection	SA	SA	SA	SA	SA
Emergency management and fire protection	SA	SA	SA	SA	SA
Waste management	SA	SA	SA	SA	SA
Security	SA	SA	SA	SA	SA
Safeguards and non-proliferation	SA	SA	SA	SA	SA
Packaging and transport	SA	SA	SA	SA	SA

SA = satisfactory

This report provides detailed information about 3 SCAs that cover many of the key performance indicators for these facilities. These SCAs are radiation protection, environmental protection, and conventional health and safety. Additional SCAs are covered following these 3 highlighted SCAs.

Licensees are required to develop and maintain management systems that include integrated links to all 14 SCAs. Management systems are the framework that establish the processes and programs required to determine that an organization achieves its safety objectives, continuously monitors performance, identifies inadequacies, fosters a healthy safety culture and continually improves that culture. Throughout 2023, CNSC staff reviewed and assessed program performance and key performance indicators through regular compliance verification activities.

For 2023, CNSC staff concluded that the overall performance of the operating uranium mines and mills was satisfactory.

2.2 Public Information and Indigenous Consultation and Engagement

This year, data is being presented in the form of infographics to provide information to potentially impacted communities in a way that is easily digestible. These infographics are provided to communities and are made available when CNSC staff attend outreach sessions. Direct links to these infographics can be found in each facilities' section of this report.

All uranium mines and mills are required to maintain and implement public information and disclosure programs (PIDPs), in accordance with CNSC's REGDOC-3.2.1*, Public Information and Disclosure*, which sets out the requirements for public information and disclosure by licensees. The primary goal of the program is to ensure that information related to the health, safety and security of persons and the environment, and other issues associated with the lifecycle of nuclear facilities is shared with the public in a format relevant to the audience. A PIDP must include a commitment and protocol for ongoing, timely dissemination of information related to the licensed facility.

As the operating mine and mill sites are located in northern Saskatchewan, an area with a predominantly Indigenous population, this dissemination of information frequently includes and is accompanied by Indigenous engagement activities.

The CNSC has a mandate to disseminate scientific and regulatory information. CNSC staff fulfill this mandate in a variety of ways, including the publishing of RORs and through project specific outreach sessions. CNSC staff also seek out other opportunities to engage with the public and Indigenous Nations and communities, often participating in meetings or events in communities with interest in nuclear sites. These events allow CNSC staff to listen to and discuss concerns

raised by community members, and to answer any questions about the CNSC's mandate and work in regulating the nuclear industry. CNSC staff always attempt to meaningfully address and close out specific requests, concerns and comments raised by Indigenous Nations or communities and key intervenors. See appendix P for more details. In 2023, CNSC staff worked with the public within northern Saskatchewan to identify opportunities for formalized and regular engagement throughout the lifecycle of these sites, including meetings and facilitated workshops. Some of these engagements included:

- participation in the Northern Saskatchewan Environmental Quality Committee (EQC) meeting that took place in June 2023 in La Ronge
- attending the Saskatchewan Mining Association (SMA) Minerals and Products (MAP) event located in Beauval; this allowed CNSC staff members to engage with middle school students regarding the safety of uranium mines and mills located in northern Saskatchewan
- organizing an Indigenous information and discussion session in Saskatoon in September 2023

As an agent of His Majesty the King in Right of Canada, the CNSC recognizes and understands the importance of consulting and building relationships with Indigenous peoples in Canada. By pursuing informative and collaborative ongoing interactions, the CNSC's goal is to build partnerships and trust.

The CNSC's Indigenous engagement practices are consistent with the principles of upholding the honour of the Crown and reconciliation. These practices include information sharing and funding support through the CNSC Participant Funding Program (CNSC PFP) to assist Indigenous peoples to meaningfully participate in Commission proceedings and ongoing regulatory activities.

A list of Indigenous Nations and communities whose traditional and/or treaty territories are in proximity to operating uranium mine and mill sites are available in appendix J.

2.2.1 Public Information and Disclosure Program

All uranium mines and mills (UMM) have PIDPs which have been accepted by CNSC staff. CNSC staff monitor licensee implementation of the PIDPs to verify that communication with target audiences is regular and is intended to be meaningful for that audience. CNSC staff also review yearly program updates to verify licensees are taking public feedback into consideration and making program adjustments accordingly.

Upon review, CNSC staff determined that the PIDPs implemented by Cameco Corporation (Cameco) and Orano Canada Inc. (Orano) complied with REGDOC-3.2.1, and that they provided regular information and engagement opportunities on the status of their facilities to key audiences by adapting to a virtual environment. In 2023, licensees held in-person engagement, and maintained or expanded digital communication tools to reach their audience via multiple methods. These included:

- website and social media updates
- conventional media, newsletters, magazines, newspapers
- social media presence and updates to communities on information that they are interested in or need
- annual progress reports
- responding to public inquiries, meetings with community leadership and members
- site tours on request from committees and educational institutions, and incorporating visual aids with videos and tours (virtual or in person)
- in-person and virtual/hybrid events and sponsorship

2.2.2 Indigenous Consultation and Engagement

The CNSC is committed to building long-term relationships and conducting ongoing engagement and consultation with Indigenous Nations and communities who have an interest in CNSC-regulated facilities within their traditional and/or treaty territories. The CNSC's ongoing Indigenous engagement and consultation practices include:

- sharing information and discussing topics of interest with Indigenous Nations and communities
- seeking feedback and input on CNSC processes and regulations
- responding to issues and concerns
- creating and maintaining the conditions for collaboration and 2-way dialogue on an ongoing basis
- collaborating on drafting relevant sections of CNSC reports, including this ROR
- providing opportunities to participate in environmental monitoring through the CNSC Independent Environmental Monitoring Program (IEMP)
- supporting participation in Commission proceedings and ongoing regulatory activities via funding opportunities through the CNSC PFP
- participating in community engagements and outreach events upon request, including community tours, workshops, and ceremonies

The operating uranium mines and mills in Canada fall within the traditional and treaty territories of many Indigenous Nations and communities, as listed in appendix J. In 2023, CNSC staff worked with Indigenous Nations and communities in northern Saskatchewan with an interest in uranium mines and mills to identify opportunities for formalized and regular engagement throughout the lifecycle of the Saskatchewan Uranium Mine and Mill sites, including meetings and facilitated workshops.

CNSC staff continue to hold an annual ROR-focused engagement meeting with Indigenous Nations and communities in northern Saskatchewan. This meeting is held in September before the public consultation period for the ROR, to provide updated information on, and seek opportunities for improvement of, the ROR such as the plain language summary that is now included. Indigenous Nations and communities with an interest in Canada's uranium mines and mills are also provided a copy of the ROR for review each year. The meeting is held in Saskatoon and participant funding is offered to ensure that Indigenous Nations and communities are able to take part.

CNSC Engagement Efforts – Saskatchewan

In 2023, CNSC staff efforts in relation to UMM sites had a significant focus on consultation activities linked to ongoing environmental assessments (EAs) under the *Canadian Environmental Assessment Act, 2012* (CEAA 2012) and licensing processes for the proposed NexGen Energy Ltd.'s (NexGen) Rook I Project and the Denison Mine's (Denison) Wheeler River Project. While these projects are outside the scope of this ROR, the activities nonetheless advanced the CNSC's relationships with many Indigenous Nations and communities, and also provided for discussions on files that are included in this ROR, such as the operating uranium mine and mill sites in Saskatchewan.

In September of 2023, CNSC staff hosted an in-person ROR engagement meeting with Indigenous Nations and communities with interests in the uranium mine and mill sites in northern Saskatchewan to discuss topics such as: Beaverlodge Project (Cameco), McArthur River Operation (Cameco), Cigar Lake Operation (Cameco), Rabbit Lake Operation (Cameco), Key Lake Operation (Cameco), Cluff Lake Project (Orano), McClean Lake Operation (Orano) as well as the Gunnar legacy uranium mine (SRC) and the former Lorado mill site (SRC). CNSC staff also provided updates on proposed uranium mines and mill sites including: NexGen Rook I, Denison Wheeler River and Fission Patterson Lake South Projects.

In addition, in 2023 CNSC staff also carried out a number of engagement activities with Indigenous Nations and communities in northern Saskatchewan and Alberta, which included:

- Holding meetings directly with a number of Indigenous Nations and communities on Cameco's McArthur River Operation, Key Lake Operation and Rabbit Lake Operation licence renewal prior to the hearing in June 2023. This included an in-person meeting in La Ronge, Saskatchewan in April 2023 with Métis Nation – Saskatchewan (MN-S) Northern Region I (NR-1).
- Providing updates on the 2022 Rabbit Lake IEMP results to verify that the public, Indigenous Nations and communities, and the environment around nuclear facilities are safe. In 2023, CNSC staff worked directly with Ya'thi Nene Lands and Resources (YNLR) to communicate the results to their respective leadership and community members, including collaboration on easy-to-read results cards that were shared with YNLR community members.
    - This also included a joint presentation between CNSC and YNLR that was presented at the 2023 September ROR engagement meeting in Saskatoon to discuss the results and the IEMP process.
- Engaging with Indigenous Nations and communities and collaborating directly with the YNLR regarding the 2023 IEMP at the Gunnar, Lorado and Beaverlodge sites to ensure that IEMP sampling reflects Indigenous Knowledge, land use, and values. A community land technician from the YNLR joined CNSC staff for a weeklong sampling program in Uranium City and area.
- Continuing engagement and consultation activities with several Indigenous Nations and communities on NexGen's Rook I Project EA, ongoing in northwestern Saskatchewan. This included a weeklong community tour taking place in northwestern Saskatchewan which included discussions with Clearwater River First Nation, Birch Narrows Dene Nation, Buffalo River Dene Nation and the Métis Nation-Saskatchewan.
- Continuing engagement and consultation activities on Denison's Wheeler River Project including CNSC participation in the Kineepik Métis Elders (KML) Gathering in June 2023 and a separate weeklong-tour to northern Saskatchewan in November of 2023.
- Attending the Saskatchewan Research Council (SRC) CLEANS Tour in January 2023 to give updates on the Gunnar and Lorado sites to the Athabasca Basin communities.
- Attending a Decommissioned Beaverlodge Properties Workshop in June 2023, where feedback was sought on long term monitoring for the site and downstream environment. The intent of the workshop was to listen to any feedback provided by Indigenous Nations, communities and organizations and use this to develop the long-term monitoring program. In September of 2023 CNSC staff also attended community meetings and site tour in Uranium City on the Beaverlodge Properties. Providing updates to Indigenous Nations and communities on the Canadian Uranium Workers Study (CANUS) and informed communities of how they may become involved in the study, if interested.

- Continued to conduct regular meetings with the YNLR, the MN-S, ERFN, and KML that focused on the operating uranium mines and mills in northern Saskatchewan.
- Signing a Terms of Reference (ToR) for long-term relationship with YNLR in June 2022 and continued to hold quarterly meetings with the YNLR working group throughout 2023.
- Working towards establishing and finalizing a long-term relationship ToR and work plan with ERFN, KML and the Athabasca Chipewyan First Nation (ACFN) in 2023.
- Providing updates and held meetings directly with Indigenous Nations and communities on CNSC's new Indigenous and Stakeholder Capacity Fund that was officially launched in May 2023. CNSC was able to provide capacity support to MN-S, YNLR, ACFN, ERFN, KML, and Clearwater River Dene Nation (CRDN) through the Stream 1 funding to hire a staff member for 2 years.
- Attending MN-S Back to Batoche Days in July 2023 to participate in the Métis cultural events and share information on the CNSC with Métis citizens.
- Collaborating with KML on a panel at the International Conference on Radiation Research discussing radiation outreach and path forward for Indigenous inclusion.
- Attending the Northern Saskatchewan Environmental Quality Committee (NSEQC) in November 2023 in La Ronge, Saskatchewan, where staff provided an update on existing licensees, proposed projects, recent CNSC staff work on the Canadian Uranium Workers Study (CANUWS) project and on a comparative analysis of contaminants in wild northern Saskatchewan blueberries vs. blueberries from other sources. CNSC staff also responded to questions from the NSEQC on these topics.

Tracking of ROR Issues, Concerns and Recommendations

In order to effectively track and respond to requests and recommendations made by Indigenous Nations and communities on past RORs and other Commission proceedings, CNSC staff have established a process to capture the requests, concerns and comments included in interventions from Indigenous Nations and communities. The tracking tables also include CNSC staff's responses and proposed actions as appropriate.

Therefore, in response to the Commission's request, CNSC staff continue to include information on issues and concerns tracking, from interventions received specifically in relation to the RORs in appendix P. The appendix provides key information about the number of issues, concerns and recommendations submitted by each Indigenous Nation and community in relation to the 2022 UMM ROR. In addition, the appendix presents the number of issues and concerns that the CNSC has responded to in an effort to meaningfully address and close out specific requests, concerns and comments, where possible.

CNSC staff have reached out to all Indigenous Nations and communities who intervened in the 2022 ROR, offering to meet and discuss the requests, concerns, and comments from their interventions. For Indigenous Nations and communities that have a ToR for long-term engagement with the CNSC, requests, concerns and comments raised in the ROR are and will be further discussed in agreed-upon regular meetings, and engagement work plans. CNSC staff will continue to work with the Indigenous Nation or community to share and verify the data in their respective issues tracking table and work collaboratively to identify solutions or actions to help address their issues, concerns and recommendations.

Overall, the interventions in relation to the 2022 ROR were categorized into 12 different themes including consultation and engagement, improvements to ROR process and ROR content, and CNSC oversight activities.

CNSC Communications with Indigenous Nations and Communities

In addition to the outreach and engagement sessions, CNSC staff ensure that all interested Indigenous Nations and communities are made aware of the opportunities to review the ROR and submit interventions to the Commission, including the opportunity to intervene orally, as well as opportunities to receive funding through the CNSC PFP to support their participation in the process. In 2023, CNSC staff followed up with each Indigenous Nation and community who intervened with regards to the 2022 UMM ROR and offered to have specific meetings and discussions to address the concerns, comments and recommendations that they made.

Finally, under the ToR between YNLR and CNSC staff, CNSC staff collaboratively drafted engagement updates in this ROR with YNLR. More information on the ToR engagement summary with YNLR, is found in appendix O.

CNSC has also been working to establish a final ToR for long-term engagement with both ACFN and ERFN. An engagement summary of that process will also be included in appendix O.

2.2.3 Licensee Engagement Activities

In 2023, CNSC staff continued to monitor the engagement work conducted by licensees to ensure active engagement and communication with Indigenous Nations and communities interested in their UMM facilities, and also activities in relation to relevant licensing and Commission hearing processes that occurred in 2023.

CNSC staff confirmed that licensees continued to meet, engage, and share information with interested Indigenous Nations and communities throughout 2023. Licensee staff members also participated in cultural awareness activities, provided capacity funding to support engagement activities, and invited Indigenous community members to in-person events.

Many of licensee engagement activities in 2023 focused on licence applications related to the Beaverlodge, Cluff Lake, McArthur River, Key Lake, and Rabbit Lake Operations. However, discussions and activities have also addressed concerns about and interest in Cigar Lake, McClean Lake, Elliot Lake and Agnew Lake.

CNSC staff encourage licensees to continue to develop relationships and engage with Indigenous Nations and communities who have expressed an interest in their operations and activities.

2.3 CNSC Regulatory Efforts

2.3.1 Licensing

The CNSC regulates each operating uranium mine and mill under a separate licence. A licence granted by the Commission defines the licence period, licensed activities, and licence conditions. Each uranium mine and/or mill licence issued by the Commission is accompanied by a licence conditions handbook (LCH) which contains compliance verification criteria (CVC) used by CNSC staff to determine compliance with the conditions set out in the licence. All information related to the licences are also provided in appendices B- F.

In 2023, the Commission granted McArthur River Operation and Key Lake Operation a 20-year licence renewal, and Rabbit Lake Operation a 15-year licence renewal. Since the Rabbit Lake Operation has been in care and maintenance since 2016, hold points were added to the licence conditions to ensure the conditions for effective regulatory oversight, should Cameco elect to return the site to active operation.

2.3.2 Regulatory Developments

CNSC staff continue to modernize the regulatory framework with the CNSC's series of regulatory documents. CNSC staff have an effective process in place to implement new regulatory documents once they are approved by the Commission. Licensees are required to remain in compliance with the regulatory documents or applicable standards identified in their LCHs during the process to implement new regulatory documents or standards. For CNSC regulatory documents which have not yet been implemented, uranium mine and mill licensees are on track for meeting all agreed implementation deadlines, with the exception of CSA N393-13, which is treated separately below. CNSC staff continue to monitor progress through regular licensing meetings.

Table 2.3.2 lists updates made to the CNSC regulatory documents since 2021 including the implementation status up to the date of this ROR, that apply to the uranium mine and mill licensees.

Of note, CSA N393-13, *Fire Protection for Facilities that Process, Handle, or Store Nuclear Substances* was due for implementation by Cameco UMM facilities by December 31, 2023. Cameco has indicated to CNSC staff that the initial deadline was missed due to the unexpected complexity of CSA N393-13 implementation at their UMM sites. CNSC staff are monitoring Cameco's progress on CSA N393-13 implementation.

Table 2.3.2 - Regulatory documents and standards applicable to operating uranium mine and mill facilities

Regulatory Document	Cigar Lake	McArthur River	Rabbit Lake	Key Lake	McClean Lake
REGDOC-2.11.1, *Waste Management, Volume I: Management of Radioactive Waste* **January 2021**	Implemented	Implemented	Implemented	Implemented	Implemented
REGDOC-2.11.2, *Decommissioning* **January 2021**	Implemented	Implemented	Implemented	Implemented	Implemented
REGDOC-3.3.1, *Financial Guarantees for Decommissioning of Nuclear Facilities and Termination of Licensed Activities* **January 2021**	Implemented	Implemented	Implemented	Implemented	Implemented
CSA N294:19, *Decommissioning of facilities containing nuclear substances* **2019**	Implemented	Implemented	Implemented	Implemented	Implemented
CSA N393-13, *Fire Protection for Facilities that Process, Handle, or Store Nuclear Substances*	Progress overseen by CNSC staff	Progress overseen by CNSC staff	Progress overseen by CNSC staff	Progress overseen by CNSC staff	Implemented

2.3.3 Compliance Effort

The CNSC determines whether licensees are in compliance with requirements through verification, enforcement and reporting activities. CNSC staff develop compliance plans for each facility commensurate with their associated risk and implement these plans by conducting regulatory activities which include onsite and remote inspections, and technical assessments of licensee programs, processes, and reports. Adjustments to compliance plans are made as needed in response to operational status, events, facility modifications and changes in licensee performance.

Table 2.3.3 presents data on CNSC staff inspections conducted at operating uranium mines and mills between 2019-2023. Instances of non-compliance noted during the inspections were provided to the licensees in detailed inspection reports and recorded in the CNSC Regulatory Information Bank to ensure that corrective actions were tracked to completion. Examples of non-compliances can be found in section 4 of this report.

Table 2.3.3: 5-year inspection information

	2019	2020	2021	2022	2023
Number of inspections	20	17	18	25	22
Instances of non-compliance	23	11	19	79 + 1 order	93 + 1 order

Inspection details can be found in the facility section relevant to each site.

The number of inspections and instances of non-compliance change each year. The number of inspections is determined by CNSC staff's 10-year plan, taking into consideration the risk levels for each facility and the planned actions for each facility. It is important to remember that the number of notices of non-compliance (NNCs) issued does not provide a direct indicator of the licensee performance. CNSC staff did not identify any concerning trends between 2023 and previous years. The number of NNCs issued can vary depending on the inspection criteria selected for the inspection and type of inspection (general compliance inspection versus focused inspection, which focusses on a particular SCA) as well as what is observed during the walk down of the site (housekeeping issues, radiation protection signage and contamination control).

Other regulatory bodies that conduct inspections at uranium mine and mill facilities include the Saskatchewan Ministry of Environment, the Saskatchewan Ministry of Labour Relations and Workplace Safety, and Environment and Climate Change Canada (ECCC).

These regulatory bodies focus primarily on the areas of conventional health and safety and environmental protection. CNSC staff consider the findings from these regulatory bodies when assessing licensees' performance. When logistically reasonable, joint inspections are conducted with other federal or provincial regulatory agencies. One joint inspection occurred at the Cigar Lake Operation in 2023 with the Saskatchewan Ministry of Environment.

To modernize the way CNSC staff work with the Saskatchewan Ministry of Environment, an updated memorandum of understanding (MoU) was signed in May 2024 for the collaboration on the implementation, application and administration of regulations and requirements related to the decommissioning and reclamation, including the provision of financial assurances, for uranium mining and milling facilities in Saskatchewan. This updated MoU replaces the 1996 version. CNSC staff and the Saskatchewan Ministry of Environment will continue to work together to review, revise and add to our existing agreements.

2.3.4 Environmental Protection Review Reports

CNSC staff conduct environmental protection reviews (EPRs) for all licence applications for facilities with potential environmental interactions, in accordance with the CNSC's mandate under the NSCA and associated regulations. An EPR is a science-based environmental technical assessment conducted by CNSC staff.

Starting in 2021, the CNSC began a new approach for publishing EPR reports online and separate from a specific Commission proceeding, to allow interested Indigenous Nations and communities and members of the public additional time to review information related to environmental protection and engage with CNSC staff on any areas of interest or concern. All available EPR reports can be found on the CNSC website. EPR reports are typically conducted to align with the facility's Environmental Risk Assessment (ERA) cycle, discussed further in Section 4.2, which is approximately every 5 years or whenever there is a major change to the facility. CNSC staff have posted the following 5 EPR reports for UMMs:

- EPR report: Cigar Lake (2021)
- EPR report: Cluff Lake Project (2022)
- EPR report: Rabbit Lake Operation (2023)
- EPR report: Key Lake Operation (2023)
- EPR report: McArthur River Operation (2023)

The information in EPR reports support CNSC staff's recommendations to the Commission for related licensing and regulatory decisions on whether a proposal provides adequate protection of the environment and the health and safety of people.

3 Operating Facilities

3.1 Cigar Lake Operation

Figure 3.1.1: Cigar Lake Operation – aerial view looking north

Source: Shaw Global

Cameco is the licence holder and operator of the Cigar Lake Operation, which is located approximately 660 kilometers north of Saskatoon, Saskatchewan.

The Cigar Lake Operation consists of an underground uranium mine with surface facilities for loading ore slurry into trucks, waste management facilities, a water treatment plant (WTP), surface freeze plants, administration offices and warehouses.

In June 2021, following a public hearing held virtually, the Commission issued a 10-year licence to Cameco for the Cigar Lake Operation. Cameco's licence expires on June 30, 2031.

3.1.1 Performance

Appendix B details the regulatory performance of the Cigar Lake Operation, as well as detailed information for the protection of people, and protection of the environment, including 5-year data trends. As noted in the 2022 ROR, in 2022 the Cigar Lake Operation was rated as below expectation for the management system and radiation protection SCAs, with the rest rated as satisfactory by CNSC staff. In addition, in 2022 an Order was issued to the operation for exceeding the amount of potentially acid generating waste rock on Stockpile C specified in the operation's waste management program. Exceeding this limit was the primary contributing factors to the management system rating, in addition to findings from inspections conducted in 2022. Cameco has responded to all of the requirements specified in the Order in accordance with a CNSC staff accepted schedule, committed to draw down the stockpile volume to below 400,000 m^3 by August 2024. Cameco provided written confirmation that the volume of the pile was draw down to below 400,000 m^3 on June 22, 2024. CNSC staff inspected the pile in July 2024 as part of a compliance inspection and accept that the pile volume is below the limit. Cameo has also responded to all inspection findings from 2022 and 2023 related to their management system and the corrective actions/preventive measures were implemented to the satisfaction of CNSC staff. A management system focussed inspection was conducted in July 2024.

The primary contributing factor for the below expectation rating for the radiation protection SCA in 2022 was due to findings identified during a radiation protection focussed inspection in July 2022. The radiation protection focussed inspection resulted in 16 notices of non-compliance. In 2023, Cameco has addressed these notices of non-compliances, with the exception of 1 that requires a longer implementation timeline, to the satisfaction of CNSC staff, which represents a significant improvement in Cameco's radiation protection program implementation at the Cigar Lake Operation. A reactive radiation protection inspection was conducted in February 2024 to verify the implementation and effectiveness of Cameco's corrective actions/preventative measures in response to the findings identified in 2022. There were no notices of non-compliance identified during the inspection, further demonstrating improvements in the radiation protection SCA.

Although these 2 SCAs were related as satisfactory in 2023, CNSC staff will continue to monitor the Cigar Lake Operation with increased regulatory scrutiny for the management systems and radiation protection SCAs to ensure that performance remains satisfactory.

There were 18 non-compliances identified through 6 CNSC inspections at the Cigar Lake Operation in 2023. The non-compliances were of low safety significance and related to the following SCAs:

- radiation protection
- conventional health and safety
- emergency management and fire protection
- waste management

Section 4 of this report provides more information on the non-compliances by the safety and control area.

3.1.2 Events

The Cigar Lake Operation is required to report on events such as action level exceedances, regulatory exceedances and unplanned releases to the environment (spills). CNSC staff reviewed the reports, investigations and corrective actions for each event reported in 2023 and determined that the Cigar Lake Operation acted appropriately, and CNSC staff are satisfied with the corrective actions taken.

Radiological Action Level Exceedances

In 2023, Cameco reported 3 radiological action level exceedances to the CNSC, as follows.

On August 26, 2023, upon receipt of the second quarter external dosimetry results, Cameco reported a potential action level exceedance. It was discovered by Cameco that a worker's external whole-body dose for the quarter was 4.1 mSv, which indicates that the weekly action level of 1 mSv was exceeded for at least 1 week. Cameco's investigation concluded that while

the worker was installing scaffolding above a recycle water sump during the second quarter, the worker's external dosimeter became detached from their coveralls and fell to the floor adjacent to the sump, remaining there for a significant portion of the day until it was found by the worker while looking for it later in the afternoon. Cameco submitted a dose information change request, requesting that the erroneous result be replaced by a conservative external whole-body dose estimate of 0.34 mSv. CNSC staff approved the dose information change request and concurred that this action level exceedance is not from a personal exposure.

On September 11, 2023, a worker was involved in conducting testing inside wash receiver tanks in the ore loadout building under a radiation work permit while using respiratory protection. Upon follow-up urine bioassay sampling, the results indicated an intake of long-lived radioactive dust (LLRD), resulting in a committed effective dose assigned to the worker of 15.8 mSv. A root cause investigation was completed by Cameco and did not identify a loss of control of the RP program. Cameco's investigation did identify that there were programmatic non-conformances related to improper ventilation of the tank and the Job Hazard Analysis process. The tank was also not sufficiently clean, and the grinding operation conducted by the worker generated elevated LLRD levels. There was also no method or procedure established for the worker to follow regarding proper decontamination prior to removal of PPE, including respiratory protection, such that the likelihood of an intake is minimized. CNSC staff were provided information on the corrective measures established by Cameco, addressing improvements to radiation work planning and radiological hazard recognition and controls. The corrective actions were accepted by CNSC staff, and the verification of these actions will be completed during follow-up inspections.

On November 14, 2023, upon receipt of external dosimetry results for the third quarter, a worker's whole-body dose for the quarter was 4.68 mSv, which indicates that the weekly action level of 1 mSv was exceeded for at least 1 week. Similar to the action level exceedance discovered in August 2023, Cameco's investigation concluded that the external dosimeter was lost in a high radiation area between 12-24 hours. Cameco submitted a dose information change request to CNSC staff which was accepted. The erroneous result has been replaced by a conservative external whole-body dose estimate of 0.42 mSv. CNSC staff concur that this action level exceedance is not from a personal exposure.

Reportable Releases to the Environment

In 2023, Cameco reported 7 releases to the environment to the CNSC, as follows.

On April 11, 2023, erosion gullies on the southeast berm of Stockpile C were identified during routine environmental inspections. It is estimated that approximately 10,000 litres of snow melt water that contacted Potentially Acid Generating (PAG) aggregate from Stockpile C overtopped the containment ditch and reported to ground. Cameco staff used material from Stockpile A to reinforce the southeast berm to stop the erosion and ensure the meltwater stayed within the Stockpile C containment ditch.

On April 11, 2023, while conducting erosion repairs on the southeast berm and creating a channel in the containment ditch of Stockpile C to direct the flow pathway of the water and prevent further overtopping, the HDPE liner was punctured in the area where the old section and the new section of Stockpile C meet. It is estimated that approximately 1,000-2,000 L of snow melt water that contacted PAG aggregate from Stockpile C reported to ground. A berm was created within the Stockpile C containment ditch and water was pumped around the damaged liner section to mitigate PAG contact meltwater entering the environment. The liner was then repaired.

On June 21, 2023, during an environmental inspection of Stockpile C, a tear in the liner was identified. It is believed this tear occurred during the erosion gully repair work on the southeast berm which took place on April 11, 2023. It was estimated that approximately 2,000 L of water which had contacted PAG aggregate from Stockpile C reported through the liner during the April 11, 2023, erosion event. This tear was not previously identified during routine environmental inspections because there was a layer of sediment covering the tear. With recent rains, it exposed a part of the ripped liner which was identified during the environmental inspection. The corrective actions, including the removal of sediments within the containment ditch and repairing the tear, were accepted by CNSC staff.

On August 5, 2023, an ammonia leak was discovered. A malfunction on the solenoid valve occurred causing the water bubbler vessel to become filled with 5-10 lbs of liquid ammonia. This vessel is designed to hold water and catch ammonia gases from the ammonia system. Due to the solenoid valve failing, liquid ammonia collected in the vessel and leaked into the atmosphere inside the building, causing an ammonia detector to alarm. The auto purger was shut down and isolated from the system. Equipment age and installation characteristics caused constant vibration to the unit and contributed to the event. Work to repair the auto purger was completed. The corrective actions/preventative measures were accepted by CNSC staff.

On August 30, 2023, during operator care rounds, it was noticed that the nitrogen blanket system on the process water cooling loop glycol expansion tank was venting nitrogen past the pressure regulator. It is estimated that 1 full bottle (13,000 L) of nitrogen was released before the leak was detected. The cooling loop was shut down and the nitrogen shut off. The corrective action was to disassemble and replace internal parts for the regulator and this was accepted by CNSC staff.

On September 15, 2023, Cameco reported that 3 totes of radiologically contaminated sand/rock from Ore Load Out building were placed near the hydrocarbon landfarm (for petroleum hydrocarbon impacted soil) in an unlined area. One tote was broken, and all 3 totes had solids spilled around them. The totes and contaminated soil were relocated to Stockpile B, which is suitable for storing radiological materials. Cameco proposed corrective actions to clean up the area and dispose the solids onto Stockpile B, which were accepted by CNSC staff.

Additional corrective actions regarding the cleanup of hydrocarbon impacted soil in the area and the proper management of hydrocarbon impacted soil were also required by Saskatchewan Ministry of Environment. A gamma radiation grid scan and soil samples were used to confirm the area was cleaned.

On September 23, 2023, an operator noticed that the calcium chloride level was low in their distribution system and a leak was found and was stopped. As reported by Cigar Lake Operation, 6,000 L of calcium chloride brine leaked to ground. The spilled material was collected and disposed of at slimes Pond #4. The corrective actions proposed by Cameco to prevent a re-occurrence were accepted by CNSC staff.

Environmental Action Level and Regulatory Limit Exceedances

There were no environmental action level and/or regulatory limit exceedances reported over the 2023 calendar year.

Lost-Time Injuries

In 2023, Cameco reported 2 loss-time injuries to the CNSC, as follows.

On March 25, 2023, an individual slipped and fell on an icy patch on the road between the maintenance building and #1 headframe injuring low back/posterior hip. The worker was following Cameco's winter footwear policy and had installed studs in their footwear; however, this was not sufficient to prevent the slip. The worker was assessed by the occupational health nurse, then returned to full duties the next day and the remainder of their shift. Starting April 12, 2023, the worker was put on restricted work activities and in September, following further medical assessment, it was determined that the worker would require treatment for the injury sustained and miss work, resulting in a lost time injury. Cameco proposed corrective actions which were accepted by CNSC staff.

On November 19, 2023, Cameco's emergency response team was activated for an individual that experienced a slip and fall event when exiting from the southeast door of the old construction management office building. Earlier that day, the site experienced freezing rain. The metal grating of the stairs and landing of that building entrance remained slippery enough to allow the individual to slip. It was determined that the worker required treatment and would miss work and therefore was classified as a lost time injury. Cameco proposed corrective actions which were accepted by CNSC staff.

3.2 McArthur River Operation

Figure 3.2.1: McArthur Operation – aerial view

Source: Cameco

Cameco is the licence holder and operator of the McArthur River mine, which is located approximately 620 kilometers north of Saskatoon, Saskatchewan.

The McArthur River Operation consists of an underground uranium mine, primary ore processing, ore slurry loading, waste management facilities, a water treatment plant, effluent storage ponds, surface freeze plants, administration offices and warehouses.

In June 2023, following a public hearing in Saskatoon, Saskatchewan, the Commission issued a 20-year licence to Cameco for the McArthur River Operation. Cameco's licence expires on October 31, 2043.

3.2.1 Performance

Appendix C details the regulatory performance of the McArthur River Operation, as well as detailed information for the protection of people, and protection of the environment, including 5-year data trends.

There were 19 non-compliances identified through 7 CNSC inspections at the McArthur River Operation in 2023. The non-compliances were of low safety significance and related to the following SCAs:

- radiation protection
- conventional health and safety
- operating performance
- safety analysis
- physical design
- waste management
- security

Section 4 of this report provides more information on the non-compliances. The dashboards in appendix C provide information on licensing and compliance for the McArthur River Operation in 2023.

3.2.2 Events

The McArthur River Operation is required to report on events such as action level exceedances, regulatory exceedances, and releases to the environment (spills). CNSC staff reviewed the reports, investigations and corrective actions for each event reported in 2023 and determined that the McArthur River Operation acted appropriately, and CNSC staff are satisfied with the remedial actions taken.

In the context of the Inspector's Order to Rabbit Lake (discussed in section 3.3.1 below), McArthur River performed a self-assessment of Emergency Response Team's personal protective equipment (PPE) and found that some expired PPE was in use. Non-expired PPE was already present on site and so expired PPE was able to be quickly withdrawn.

Radiological Action Level Exceedances

There were no reportable radiological action level exceedances in the reported year.

Reportable Releases to the Environment

In 2023, Cameco reported 1 release to the environment to the CNSC, as follows.

On June 20, 2023, approximately 150 L of contaminated liquid from the Shriver filter press was released to the ground outside the secondary water treatment plant. The containment plates for the Shriver filter press were misaligned which allowed the contaminated water to spray out and approximate 150 litres reported to the ground outside an open overhead door. The affected area was cleaned, and a radiation scan of the area was performed to confirm the area was at background levels. The corrective actions, which included the alignment of the Shriver press plate, were corrected and the filter cloths were changed. In addition, curtains were installed around the perimeter of the Shriver press plate to contain any spray within the area. Cameco's corrective actions were accepted by CNSC staff.

Environmental Action Level and Regulatory Limit Exceedances

There were no environmental action level and/or regulatory limit exceedances in the reported year.

Lost-Time Injuries

In 2023, Cameco reported 1 loss-time injury to the CNSC, as follows.

On December 11, 2023, a worker was remotely mucking a waste pass at the 640 level of the mine. As the scoop was backing up with a loaded bucket, a run of muck occurred due to a release of material hung up in the waste pass. The flowing muck pushed the scoop past the operator, who had turned to move farther into the crosscut. The operator tripped and banged their knee. This was initially rated a first aid accident; however, it was later escalated to a lost-time injury due to an occupational psychological injury related to the run of muck event. As an immediate corrective action, Cameco issued a safety flash to the mining and process department to review the hazards and controls for handling wet muck. Cameco's proposed long-term corrective actions were reviewed and accepted by CNSC staff.

3.3 Rabbit Lake Operation

Figure 3.3.1: Rabbit Lake Operation – mill aerial view

Source: Cameco

Cameco is the licence holder and operator of the Rabbit Lake Operation, which is located 750 kilometers north of Saskatoon, Saskatchewan. Operated by Cameco, the facility stretches across approximately 20 kilometers. It consists of an underground mine; 3 mined-out pits, of which 2 are reclaimed; a further mined-out pit which has been converted into an in-pit tailings management facility (TMF), a mill and supporting infrastructure.

In June 2023, following a public hearing in Saskatoon, Saskatchewan, the Commission issued a 15-year licence to Cameco for the Rabbit Lake Operation. Cameco's licence expires on October 31, 2038. Hold points were added to the licence conditions to ensure the conditions for effective regulatory oversight, should Cameco elect to return the site to active operation.

3.3.1 Performance

Appendix D details the regulatory performance of the Rabbit Lake Operation, as well as detailed information for the protection of people, and protection of the environment, including 5-year data trends.

There were 20 non-compliances identified through 3 CNSC inspections at the Rabbit Lake Operation in 2023. The non-compliances were of low risk and related to the following SCAs:

- radiation protection
- human performance management
- fitness for service
- emergency management and fire protection
- waste management

Section 4 of this report provides more information on the non-compliances. The dashboards in appendix D provide information on licensing and compliance for the Rabbit Lake Operation in 2023.

Inspector's Order

In October of 2023, CNSC staff conducted an inspection at the Rabbit Lake Operation, centered on an emergency drill being held at the site. During the inspection, CNSC inspectors found that

most of the personal protective equipment (PPE) for the Emergency Response Team (ERT) was expired. Following this, the inspectors determined that there was an insufficient amount of non-expired PPE to equip the Rabbit Lake ERT to respond to a fire.

On October 26, 2023, prior to the inspection team leaving the site, an Inspector's Order (prohibited all work that had an increased risk of causing a fire) was issued to the Rabbit Lake Operation which, required the immediate submission of a plan for sourcing sufficient PPE to equip the Rabbit Lake ERT and required Cameco to outline the Rabbit Lake Operation's ERT's response capabilities in the absence of PPE.

The order also required longer-term actions to ensure that PPE is routinely examined and replaced before expiry. CNSC staff have informed the Saskatchewan Ministry of Labour Relations and Workplace Safety and the Saskatchewan Ministry of Environment, and nearby Indigenous Nations and communities of this order. In November, CNSC staff subsequently requested that all other fuel cycle facilities which have on-site ERTs advise CNSC staff of the status of their ERT PPE, a request which licensees complied with, and which did not identify any other concerns.

Cameco was able to source sufficient PPE to allow resumption of normal operation of the Rabbit Lake ERT within days of the order being issued. On August 2, 2024, CNSC staff determined that all conditions of the order were met and lifted the order. CNSC staff will continue to monitor the Rabbit Lake Operation to ensure the facility remains in compliance.

3.3.2 Events

The Rabbit Lake Operation is required to report on events such as action level exceedances, regulatory exceedances and releases to the environment (spills). CNSC staff reviewed the reports, investigations and corrective actions for each event reported in 2023 and determined that the Rabbit Lake Operation acted appropriately, and CNSC staff are satisfied with the remedial actions taken.

Radiological Action Level Exceedances

There were no reportable radiological action level exceedances in the reported year.

Reportable Releases to the Environment

There were no reportable releases to the environment in the reported year.

Environmental Action Level and Regulatory Limit Exceedances

There were no environmental action level and/or regulatory limit exceedances in the reported year.

Lost-Time Injuries

There were no loss-time injuries in the reported year.

3.4 Key Lake Operation

Figure 3.4.1: Key Lake Operation – aerial view

Source: Cameco

Cameco is the licence holder and operator of the Key Lake Operation which is located approximately 570 kilometers north of Saskatoon. The operation began with 2 open-pit mines and a mill complex. The Gaertner open pit was mined from 1983 to 1987, followed by the Deilmann open pit until 1997. Uranium mining is no longer carried out at Key Lake.

In June 2023, following a public hearing in Saskatoon, Saskatchewan, the Commission issued a 20-year licence to Cameco for the McArthur River Operation. Cameco's licence expires on October 31, 2043.

Milling of the stockpiled Deilmann ore continued until 1999. In 2000 the mill started processing ore from the McArthur River Operation. The Key Lake Operation continues today as a mill operation that is licensed to process McArthur River ore and residual special waste from previous mining at the Key Lake Operation.

After open pit mining in the eastern pit of the Deilmann ore body was completed in 1995, the pit was converted to the engineered Deilmann tailings management facility (DTMF), while mining continued in other parts of the pit area. Mill tailings continue to be deposited in this facility today.

Figure 3.4.2: Deilmann tailings management facility

Source: CNSC

3.4.1 Performance

Appendix E details the regulatory performance of the Key Lake Operation, as well as detailed information for the protection of people, and protection of the environment, including 5-year data trends.

There were 14 non-compliances identified through 3 CNSC inspections at the Key Lake Operation in 2023. The non-compliances were of low safety significance and related to the following SCAs:

- radiation protection
- conventional health and safety
- physical design
- emergency management and fire safety
- security

Section 4 of this report provides more information on the non-compliances. The dashboards in appendix E provide information on licensing and compliance for the Key Lake Operation in 2023.

3.4.2 Events

The Key Lake Operation is required to report on events such as action level exceedances, regulatory exceedances, and releases to the environment (spills). CNSC staff reviewed the reports, investigations and corrective actions for each event reported in 2023 and determined that the Key Lake Operation acted appropriately, and CNSC staff are satisfied with the remedial actions taken.

Radiological Action Level Exceedances

In 2023, Cameco reported 6 radiological action level exceedances to the CNSC. In accordance with Cameco's corrective action process, investigations were performed for the events that resulted in the exceedances. The causal factors for all 2023 action level exceedances were reviewed, and Cameco concluded that there was no indication of a loss of control of the Radiation Protection (RP) Program, which was verified by CNSC staff. The investigations did identify RP program nonconformances related to communication between front line workers and RP support workers, work planning processes, hazard identification, preventative maintenance plans, and doffing personal protective equipment such as respiratory protection. Corrective actions were created, with some remaining actions to be completed in 2024. CNSC staff will continue to monitor implementation of corrective actions, with verification of effectiveness to occur during future compliance activities. Cameco also conducted RP stand downs at the Key Lake Operation in September 2023, which were observed by CNSC staff. The stand downs were effective in providing workers with a clear overview of recent events (leading to RP action level exceedances) at site, clear messaging around effective RP controls, and reemphasis of RP support that is available to them.

In January 2023, 2 workers were scraping caulking from within a continuous stir tank, without respiratory protection. Post work urine samples indicated that the workers had intakes of uranium ore. The final dose assessments determined committed effective doses for the workers of 6.02 mSv and 5.31 mSv, which exceed both the weekly effective dose action level of 1 mSv and the quarterly effective dose action level of 5 mSv. Each of these exceedances are considered their own event.

In April 2023, 5 workers were working in the Leaching circuit when a pinhole leak developed on a line between 2 continuous stir tanks, exposing the workers to the leaching process material mist. Once final dose assessments were completed for all workers, the committed effective dose for 1 worker was determined to be 2.20 mSv, which exceeds the weekly effective dose action level of 1 mSv.

In September 2023, the post work urine sample collected for a worker indicated an intake of uranium ore after they performed maintenance work on the Primary Thickener in the Counter Current Decantation (CCD) mill circuit. The final dose assessment determined a committed effective dose for the worker of 7.83 mSv, which exceeds both the weekly effective dose action level of 1 mSv and the quarterly effective dose action level of 5 mSv.

In September 2023, another worker was exposed to uranium ore after performing maintenance work on the Primary Thickener in the CCD mill circuit. The final dose assessment determined a committed effective dose for the worker of 3.35 mSv, which exceeds the weekly effective dose action level of 1 mSv.

Finally, in November 2023, a worker was exposed to leaching process material (uranium slurry) while performing clean-up activities in the Leaching and CCD mill areas. The final dose assessment determined a committed effective dose for the worker of 2.60 mSv, which exceeds the weekly effective dose action level of 1 mSv.

Reportable Releases to the Environment

In 2023, Cameco reported 3 reportable spills to the CNSC, as follows.

On August 16, 2023, operations responded to a leak detection alarm. Upon investigation, the operator discovered an ore slurry leak within the feed utilidor. The majority of slurry was released to the secondary containment inside the utilidor, but an estimated amount of 200 kg was released to the ground outside of the utilidor. Slurry released to both the ground and secondary containment was removed with the use of a vacuum truck and deposited on an ore pad. Corrective actions included sealing the utility lid and communication to the supervisory group that any work within utilidors will require a breach of containment permit.

On September 3, 2023, an operator was filling the water wagon at the industrial water fill station near the Mine Shop. The operator removed the wheel chocks and started the engine to the water wagon prior to disconnecting the fill hose. The water wagon rolled back slightly which resulted in damage to the industrial water line.

The industrial water (treated RO effluent) line is located within the feed utilidor. Approximately 1200 m^3 of industrial water was released within the utilidor which flowed towards Crushing and Grinding, reporting to secondary containment. An additional 12 m^3 was released to the soil near the crusher sump. The impacted soil was removed and placed on an ore pad. Corrective actions included reviewing work instructions with all workers that operate the water wagon to ensure all are aware of the proper use of wheel chocks and locking of brakes to mitigate this from re-occurring.

On October 6, 2023, Acid Plant Operators witnessed an increase in demand for the Cooling Tower water at a rate of 12.6 m^3/hr. Reasoning for the increased water demand was not apparent until October 8, 2023, at 08:00 AM where water was found seeping from a crack in the pavement within the Packaging Coverall. Acid Plant Operators completed tests which confirmed the presence of chlorine and Trasar in the water coming from the cracks in the pavement. Trasar and chlorine are additives in the treated industrial water used for the cooling tower. The Mill Operations were shutdown to allow for a safe isolation of the cooling tower water line at 17:25, October 8, 2023. There was 636 m^3 of treated industrial water released to the ground. Released water that reported to the electrical manhole was transferred by submersible sump pump into the nearby sewage lift station for treatment within the water treatment plant. The impacted sand removed during the excavation was disposed of at the AGTMF. During excavation of the area an additional 226 m^3 of the liquid reported back into the excavation area. This liquid was removed by a vacuum truck and disposed of at the AGTMF. Cameco is currently assessing 2 options for preventing a reoccurrence of the cooling water line break.

2018 Uranium in Groundwater Event

In 2018, Cameco required the completion of investigation and development of corrective action plans after the discovery of uranium contamination in groundwater under the mill terrace. A site assessment and Corrective Action Plan (CAP) was developed and accepted by CNSC staff. As with the past RORs since 2018, CNSC staff have provided an update on Cameco's progress on groundwater capture and remediation in this ROR. The remediation involves the installation and operation of 2 uranium recovery wells to pump out and treat the contaminated groundwater. These wells became operational in March 2023 and operated for the remainder of 2023.

As part of the site assessment of the uranium in groundwater event, Cameco installed and sampled several new wells. Water quality results from 2 of these newly installed wells showed elevated contaminant levels including ammonia and sulphate. These wells are also located on the mill terrace. This is not associated with the 2018 uranium in groundwater event but is thought to be from a separate discharge which occurred sometime before the facility went into care and maintenance in 2018. Cameco developed a CAP which was submitted to CNSC staff in July 2023.

Six existing ammonia recovery wells, and the newly installed uranium recovery wells are expected to capture the groundwater. CNSC staff have accepted the CAP and will review the Adaptive Management Strategy to be submitted in 2024 to address the CNSC comments about operation targets of the recovery well system and recovery well performance assessment.

The environment remains protected while the remediation of the elevated uranium and ammonia and sulphate in groundwater is conducted.

Environmental Action Level and Regulatory Limit Exceedances

There were no environmental action level and/or regulatory limit exceedances in the reported year.

Lost-Time Injuries

In 2023, Cameco reported 4 lost-time injuries to the CNSC, as follows.

On April 15, 2023, 2 workers were erecting scaffolding near the discharge end of the ball mill deck in the Crushing and Grinding building. As 1 of the workers on the deck was passing scaffold tubing to the other worker, a nearby phone booth unit, used to create a quiet space for workers to have phone or radio calls, tipped over and struck the worker. This event resulted in 1 day of lost time for the injured worker.

On July 8, 2023, a worker was lifting a fifth wheel tooling apparatus out of the parts washer when they felt pain in the elbow. The tool weighed approximately 20 lbs. The worker reported the injury to the supervisor and was then assessed at the site Health Centre. The injury was initially classified as a restricted work event; with additional off-site medical assessment, in consultation with Cameco’s Nursing Services, the event was reclassified as a lost-time injury as of June 10, 2024.

On November 11, 2023, a worker was loosening a 1 1/2" steel pipe with a 24" pipe wrench while working on the victory boilers in the acid plant. During the task the worker felt a strain in the left inner elbow. The worker immediately stopped the task and reported to the Health Center for assessment.

On November 13, 2023, a worker was conducting routine Operator Care Round and attempted to open the hood from the side of the slurry power unit. The worker felt a muscle strain in the right side of their back. The worker did not report the injury immediately as required and continued to drive mobile equipment throughout the rest of the work shift. The pain in their back progressively worsened, so the worker reported the injury to their supervisor and was assessed at the site Health Center.

3.5 McClean Lake Operation

Figure 3.5.1: McClean Lake Operation – aerial view

Source: Orano

Orano is the licence holder and operator of the McClean Lake Operation. The McClean Lake Operation is a uranium mine and mill facility located approximately 750 kilometers north of Saskatoon in the Athabasca Basin of northern Saskatchewan. The McClean Lake Operation includes the John Everett Bates (JEB) milling area, Sue mining area, JEB tailings management facility (TMF) and the undeveloped McClean, Midwest and Caribou ore deposits.

Cigar Lake Mine ore slurry was the only ore processed at the McClean Lake Mill in 2023. In 2023, there was no mining occurring at the McClean Lake Operation. The Surface Access Borehole Resource Extraction (SABRE) Project Site remained in a state of care and maintenance in 2023.

Figure 3.5.2: SABRE Project Site – aerial view

Source: Orano

3.5.1 Performance

Appendix F details the regulatory performance of the McClean Lake Operation, as well as detailed information for the protection of people, and protection of the environment, including 5-year data trends.

There were 22 non-compliances identified through 3 CNSC inspections at the McClean Lake Operation in 2023. The non-compliances were related to the following SCAs:

- radiation protection
- environmental protection
- conventional health and safety
- operating performance
- emergency management and fire protection

Section 4 of this report provides more information on the non-compliances. These non-compliances were considered low risk and do not pose an immediate concern regarding the protection of the environment or the health and safety of the workers or the public.

CNSC staff reviewed and confirmed that Orano addressed the non-compliances in a satisfactory manner and have taken appropriate corrective actions, and therefore all 22 notices of non-compliance were closed.

The dashboards in appendix F provide information on licensing and compliance for the McClean Lake Operation in 2023.

3.5.2 Events

The McClean Lake Operation is required to report on events such as action level exceedances, regulatory exceedances, releases to the environment (spills) and lost time injuries (LTIs). CNSC staff reviewed event notifications, 21-day follow up investigation reports, preventive and corrective actions identified for each event reported in 2023, and determined that the McClean Lake Operation acted appropriately. CNSC staff are satisfied with the remedial and corrective actions taken.

Radiological Action Level Exceedances

Orano reported an administrative level exceedance of a worker's elevated uranium in urine concentration on September 20, 2023. After investigation and through dosimetry modelling, Orano determined that there were 2 exceedances of the effective dose action level of 1 mSv/week and 1 exceedance of the effective dose action level of 5 mSv/quarter. These exceedances were due to calcined yellowcake exposures during non-routine work performed in the calciner enclosure.

In September 2023, workers were performing cleaning activities in the calciner hearths. Workers are required to don special personal protective equipment (PPE) when entering the calciner enclosure as well as the calciner hearths, including a powered air purifying respirator (PAPR) equipped with dust/chemical filter. Six workers performing the cleaning activities experienced difficulties with their PPE while in the calciner hearths, including PPE getting caught while manoeuvring in the hearths, which resulted in their PPE shifting, breaking the seal between their PAPR and their face. One worker also knocked the filter off their PAPR. The PPE difficulties resulted in either the workers inhaling or ingesting calcined yellowcake. The workers' doses were calculated using dosimetry modelling and 3 workers were assigned committed effective doses of 2.19 mSv, 4.84 mSv and 5.42 mSv, which exceed the weekly and/or quarterly effective dose action levels of 1 mSv and 5 mSv respectively. Orano investigated the exceedances and established corrective actions addressing improvements to conducting future calciner hearth cleaning activities. The corrective actions were accepted by CNSC staff, and the verification of the effectiveness of these actions will be performed during a future RP focused compliance inspection.

Reportable Releases to the Environment

On April 23, 2023, approximately 126 m^3 of treated effluent was released to the environment due to a “Y” connection failure where the 10" pipeline connects to the 18" pipeline, along the treated effluent pipeline running from the JEB water treatment plant (WTP) to the Sink Reservoir. The treated effluent is contained within an existing ditch which reports to the site runoff pond (SRO). This area typically contains a small volume of runoff water which will run to the SRO. Orano implemented the following corrective actions:

- The discharge to the Sink Reservoir was stopped immediately upon discovery.
- The defective connector was removed, and a new connector was installed on the pipeline.

CNSC staff reviewed Orano’s 21-day follow up report and are satisfied with corrective actions implemented.

On September 19, 2023, approximately 0.04 m^3 of sulphuric acid was discharged to the ground when a truck driver was offloading the acid into a storage tank. The driver did not have the compressed air line attached to the top of the truck as required. When the transfer process started, the head pressure in the Mill storage tank was higher than the head pressure in the truck trailer, therefore gravity fed the sulphuric acid back into the truck trailer. The truck trailer filled with acid, and eventually spilled out of the top of the truck trailer. Orano implemented the following corrective actions:

- the transfer of acid was stopped, and area was flagged off with Danger tape
- contaminated material was cleaned up and disposed of at the designated Sue C contaminated landfill
- the sulphuric acid off-loading procedure and checklist was reviewed with both Northern Resource Trucking (NRT) and Orano’s personnel
- installation of a check valve on the sulphuric acid tank fill line to prevent backflow

CNSC staff reviewed Orano’s 21-day follow up report and are satisfied with corrective actions implemented.

Environmental Action Level and Regulatory Limit Exceedances

The 3 incidents reported below are related to one another leading to a chain of events. Orano’s corrective actions are presented after all 3 events described.

On July 6, 2023, JEB WTP treated effluent exceeded the *Metal and Diamond Mining Effluent Regulations* (MDMER) lower limit for pH (6.0 to 9.5) and the *Environmental Code of Practic*e (ECOP) Action Level for total suspended solids (TSS) (>15 mg/L). Approximately 1599 m^3 of effluent was released from Monitoring Pond B to the environment with a pH of 3.76 and TSS of 16 mg/L. In the water treatment plant, the gland water line used for ferric sulphate pumps ruptured causing acidic solution to leak from a pump seal and into the sump in the ferric

sulphate plant. The acidic solution was inadvertently pumped to the sump in the radium polishing circuit and eventually resulted in acidic effluent being routed towards a monitoring pond. The 3-way valve meant to isolate pond fill from pond discharge was bypassed, resulting in acidic effluent being routed into the effluent discharge pipeline. The elevated TSS was a result of gypsum scaling that built up in the monitoring ponds that had dislodged and entered the effluent discharge intake.

On July 8, 2023, JEB WTP treated effluent exceeded the Environmental Code of Practice (ECOP) Action Level for pH (<6.5 or >8.5) and unionized ammonia (>0.45 mg/L). Approximately 535 m^3 of effluent was released from monitoring Pond B to the environment with a pH of 8.52 and unionized ammonia of 0.69 mg/L. An elevated amount of lime was added to the radium polishing circuit as a follow up to the July 6, 2023, incident where low pH effluent was discharged. Excess, unreacted lime carried into the monitoring pond and the pH continued to increase in the pond beyond the pH that was observed in the pond fill composite sample. The elevated pH also caused elevated unionized ammonia.

On July 8, 2023, JEB WTP treated effluent exceeded the MDMER lower limit for pH (6.0 to 9.5). Approximately 121 m^3 of effluent was released from Monitoring Pond C to the environment with a pH of 4.51. After discovering on July 6, 2023, that acidic effluent had been routed to Monitoring Pond C; Monitoring Pond C was recycled back to the TMF. Some low pH water remained in the pond after recycling as a standpipe installed in the bottom of the pond retained some water. When Pond C was re-filled with treated effluent, it was mixed with the residual low pH effluent, impacting the pH value of the treated effluent discharged to the Sink Reservoir.

Orano implemented the following corrective actions:

- The discharge to the Sink Reservoir was stopped immediately upon discovery.
- The defective 3-way valve was removed, and a new connector was installed on the pipeline.
- Orano issued a standing order to recycle radium polishing discharge to the hydroxide tank when the WTP plant is in upset conditions.
- 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.
- The standpipe was removed from the monitoring pond and remaining treated effluent with low pH was recycled back to the TMF.
- 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 WTP circuits.

In accordance with MDMER, an acute lethality sample was collected on July 10, 2023, from the Sink Reservoir sampling location (WQ09) as per the Environmental Monitoring Program and Operating Approval. The sample results indicate that the effluent was not acutely lethal.

CNSC staff reviewed Orano's 21-day follow up report and are satisfied with corrective actions implemented.

Lost-Time Injuries

On January 7, 2023, a worker was performing maintenance work (welding and grinding) in the fluid bed dryer vessel. The worker had to remove the grinder handle due to restricted access in the vessel. The handle fell through a gate opening towards a downstream rotary valve. Upon completion of the job, the worker exited the vessel and was in the process of cleaning up the area. The worker attempted to retrieve the handle from a clean out port on the back side of the vessel above the rotary valve. The rotary valve was turning and caught the worker's glove, pulling their hand into the rotary vane and consequently severing the tips of their right index and right middle finger. The rotary valve was powered separately and had not been deenergized and locked out at the start of work, because workers had inadvertently selected an older lockout procedure rather than the most current version. Orano implemented the following corrective actions:

- An audit of the saved lockout procedures in the lockout library was completed.
- Duplicate lockout sheets were deleted, and a section was added to the lockout sheet to indicate that the pre-populated lockouts are to be treated as a guide only (organizational factor).
- An incident follow up was created and presented during weekly safety huddles.
- The human and organizational factors involved were analyzed to better understand the incident.
    - Human Factors - retrieval of the handle involved stepping beyond the boundaries of the original work; end of a long challenging day of working in a confined space. Orano advocates situational awareness through their Stop, Think, Act program was likely compromised by some fatigue and a desire to complete the task and finish an extended day.
    - Organizational Factors – duplicate lockout sheets; document control standards to the lockout guides; not storing them in a SharePoint database that prevents employees from making unapproved changes to the guides and ensures only a single approved document exists.

CNSC staff reviewed Orano's 21-day follow up report and are satisfied with corrective actions implemented.

On March 3, 2023, a worker was lifting angle iron and HDPE pipe to be mounted to a support beam via u-bolt hanger. The worker felt a slight strain in their arm but did not feel any pain immediately. The worker continued regular duties to the end of the day. Later that evening, the worker felt tightness and pain in the right bicep and an abnormal bulge had developed on their arm. The worker visited the site Health Centre for treatment and received an offsite medical assessment. Since the March 3, 2023, incident, the worker was placed on modified work duty while awaiting surgery. The worker left site on August 16, 2023, and had surgery on August 20, 2023, and has not returned to work as they are recovering from the surgery. On September 13, 2023, the incident was classified as a LTI. Orano implemented the following corrective actions:

- Orano emphasized the need to focus on strain prevention during annual safety days at McClean Lake in June 2023.
- These types of injuries can be mitigated by performing a warmup before work activity, stretching after work activity, asking for assistance (2-person task) and avoiding sudden, intense strength exertions.

CNSC staff reviewed Orano's 21-day follow up report and are satisfied with corrective actions implemented.

On October 26, 2023, a worker was completing routine duties near the incinerator building when they stepped on a rock causing their right ankle to turn to the left. Orano implemented the following corrective actions:

- Senior management shared a site wide communication emphasizing situational awareness, hazard identification, slips, trips, and falls.
- A Safety Bulletin was developed and shared by supervisors at morning rollout meetings.
- Workers are advised to check their walking path and work areas for obstructions and hazards.

CNSC staff reviewed Orano's 21-day follow up report and are satisfied with corrective actions implemented.

4 Safety And Control Area (Operating Facilities)

CNSC staff use safety and control areas (SCAs) as a way to organize regulatory oversight activities. In 2023, all operating facilities received "Satisfactory" ratings for each of the 14 SCAs, including improvements to Cigar Lake Operation's management systems and radiation protection SCAs. For definitions of each SCA, see REGDOC-3.6, *Glossary of CNSC Terminology*. Methodology on the CNSC's SCA ratings can be found in appendix G.

4.1 Radiation Protection

Uranium mine and mill licensees in Canada are required to implement and maintain radiation protection (RP) programs in accordance with the *Radiation Protection Regulations*. Each program must ensure that contamination levels and radiation doses received by individuals are monitored, controlled, maintained below regulatory limits and are kept consistent with the as low as reasonably achievable (ALARA) principle, considering economic and social factors.

CNSC staff rated the 2023 performance of the uranium mine and mill licensees for the radiation protection SCA as satisfactory. It is noted that the Cigar Lake Operation's performance was rated as below expectations in 2022. Actions taken by the licensee resulted in an improvement in performance in this SCA in 2023, and further information on the Cigar Lake Operation's performance rating can be found in section 3.1.1.

Table 4.1.1: Uranium mines and mills radiation protection ratings, 2023

Cigar Lake	McArthur River	Rabbit Lake	Key Lake	McClean Lake
Satisfactory	Satisfactory	Satisfactory	Satisfactory	Satisfactory

Radiological hazard control

Sources of radiation exposure at uranium mines and mills include:

- gamma radiation
- long-lived radioactive dust (LLRD)
- radon progeny (RnP)
- radon gas (RnG)

CNSC staff's compliance activities confirmed these hazards were sufficiently controlled by the licensees' RP programs, including practices such as the effective use of time, distance and shielding, source control, ventilation, contamination control, and personal protective equipment.

Radiation Protection Program Performance

During 2023, CNSC staff conducted regulatory oversight activities for the radiation protection SCA for all 5 uranium mine and mill facilities. These activities were carried out to verify that licensees were complying with regulatory requirements for the implementation of RP programs.

A focused CNSC compliance inspection of the radiation protection SCA was conducted at the Key Lake Operation, and general inspections at all other facilities included aspects of RP. A total of 36 notices of non-compliance (NNCs) for the radiation protection SCA were identified at the following facilities:

- 8 at the Cigar Lake Operation
- 11 at the McArthur River Operation
- 6 at the Rabbit Lake Operation
- 7 at the Key Lake Operation
- 4 at the McClean Lake Operation

Findings forming the basis of the NNCs included the following areas:

- tracking calibrations and locations of radiation instrumentation
- posting of radiation warning signage and labelling of drums containing uranium ore
- implementing contamination control between zones
- providing risk information to nuclear energy workers (NEWs)
- completing radiation work permits with all required information
- providing adequate zone control measures

The NNCs were classified as low safety significance, and the licensees have established and implemented corrective actions to the satisfaction of CNSC staff.

Licensee's RP programs include codes of practice that outline administrative levels and action levels for exposures and doses of radiation. Action levels and administrative levels are identified for all radiological hazard types, applied to normal operating conditions, and are followed to ensure optimal conditions for workers. Licensees are responsible for identifying the parameters for their programs that represent timely indicators of potential losses of control. For this reason, action and administrative levels are licensee-specific and may change over time, depending on operational and radiological conditions. If an action level is reached, it may indicate the loss of control of part of a licensees' RP program. The licensee is then required to establish the cause, notify the CNSC and if applicable, restore the effectiveness of the radiation protection program.

Administrative levels include a list of specific actions to be taken by the licensee based on radiological monitoring in the workplace. Exceedances of administrative levels are not reportable to the CNSC, unless required by each licensee's Radiation Code of Practice.

The radiation protection programs include actions to be taken under specific conditions, for example:

- continue to work while monitoring or investigating a parameter
- leave the area and initiate an investigation
- report to regulatory authority

The 5 uranium mines and mill licensees have the same effective dose action levels of 1 millisievert (mSv) per week and 5 mSv per quarter for NEWs. In 2023, licensees reported to the CNSC a total of 12 instances where an action level was reached at the following uranium mine and mill facilities:

- 3 at the Cigar Lake Operation
- 6 at the Key Lake Operation
- 3 at the McClean Lake Operation

Upon investigation into the action level exceedances, 2 occurring at the Cigar Lake Operation were determined to not be attributed to personal exposures. For all exceedances, the licensees investigated and implemented corrective actions addressing causal factors leading to the exceedances, to CNSC staff's satisfaction. Additional discussions on the action level exceedances are found in sections 3.1.2, 3.4.2, and 3.5.2 and the safety rating definitions are found in appendix H1.

Application of ALARA

RP programs implemented by uranium mine and mill licensees include responsibilities and processes for ensuring that exposures to workers are consistent with the ALARA principle.

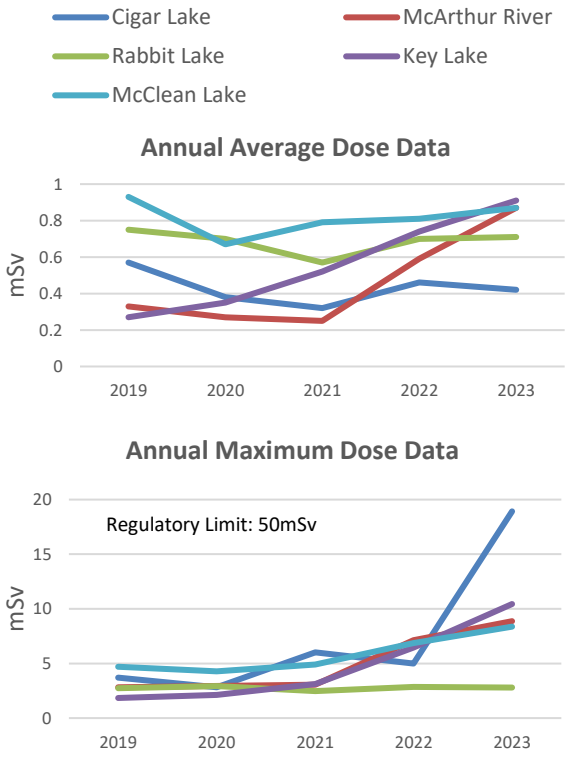
Through compliance verification activities and desktop reviews, CNSC staff verified that key elements of these ALARA programs (e.g., management control over work practices, personnel qualification and training, control of occupational and public exposure to radiation planning for unusual situations) were effectively implemented by the licensees in 2023.

This report includes the reporting of annual collective dose values for NEWs for each licensee (see appendix B.2, C.2, D.2, E.2 and F.2). The collective dose value is the sum of the effective doses received by all NEWs at a given site over a calendar year. Collective dose is a RP performance indicator that provides the total exposures associated with each operation. It supplements other performance statistics, like average dose, which have been affected by factors including changes in the number of workers or workers who receive radiation exposures over very short periods of time.

Worker Dose Control

In accordance with the *Radiation Protection Regulations*, uranium mine and mill licensees' RP programs include processes and criteria to provide assurance that all individuals identified as NEWs under section 2 of the NSCA are appropriately designated and trained. This includes licensees' employees and contractors. Radiation exposures are ascertained through approved dosimetry methods and workers are notified of the results.

Figure 4.1.1: Uranium mines and mills, average and maximum individual effective dose for nuclear energy workers, 2019-2023



At all operating uranium mine and mill facilities, NEWs are issued optically stimulated luminescence dosimeters (OSLD) that measure external gamma radiation exposure. Where required, workers also wear personal alpha dosimeters (PADs) to measure internal alpha radiation exposure from radon progeny and LLRD. OSLD and PAD readings are measured by CNSC-licensed dosimetry service providers. Where direct monitoring through dosimeters is not warranted or practical, dose estimation methods authorized under the *Radiation Protection Regulations* (such as area/group monitoring and timecards) are used in keeping with CNSC regulatory guidance. CNSC staff confirmed that all licensees met the regulatory requirements for the use of licensed dosimetry during the reporting period.

Figure 4.1.1 shows the average individual NEW effective dose and maximum individual NEW effective dose during the 5-year period from 2019 to 2023 for the 5 uranium mine and mill facilities. In 2023, no NEW at any facility exceeded the individual effective dose limit of 50 mSv in 1 year, or 100 mSv in a 5-year dosimetry period. CNSC staff note that maximum effective doses show increasing trends in 2023 from the previous year at all uranium mines and mills, with the exception of Rabbit Lake which is comparable to the previous year. The licensees attribute this in part to the unplanned exposure events (leading to action level exceedances), increased production and/or high level of turnover in the workforce.

The highest maximum individual effective dose to a NEW at a uranium mine or mill in 2023 occurred at the Cigar Lake Operation. The NEW was assigned an effective dose of 18.92 mSv; a value that is 37.8% of the annual effective dose limit of 50 mSv for NEWs. The majority of this NEW's effective dose was attributed to an unplanned exposure event where the NEW received

a committed effective dose of 15.8 mSv. Additional information regarding the event is detailed in section 3.1.2 of this report. CNSC staff note that the next highest maximum effective dose for a NEW at the Cigar Lake Operation is 4.55 mSv, which is lower than the maximum effective doses observed since 2021.

Appendix B2, C2, D2, E2 and F2 display the number of NEWs with the corresponding average individual effective dose and maximum individual effective dose for each uranium mine and mill facility from 2019 to 2023.

In 2023, CNSC staff concluded that the overall performance of the radiation protection SCA at the uranium mine and mill facilities was satisfactory. CNSC staff will continue to monitor performance across all facilities in the radiation protection SCA.

4.2 Environmental Protection

The environmental protection SCA covers programs that identify, control and monitor all releases of radioactive and hazardous substances and effects on the environment from facilities or as the result of licensed activities.

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 facilities.

Further to this, the CNSC requires that each nuclear facility licensee develops, implements, and maintains an environmental monitoring program to demonstrate that persons and the environment are protected from any releases to the environment related to the facility's licensed activities. CNSC staff evaluate and assess the results of these monitoring programs to determine compliance with the applicable requirements and limits, as set out in the regulations that govern Canada's nuclear industry.

Based on regulatory oversight activities, CNSC staff rated the 2023 performance of all 5 operating uranium mine and mill facilities for the environmental protection SCA as satisfactory. CNSC staff concluded the licensees' environmental protection programs were effectively implemented and are protective of the environment and people.

Table 4.2.1: Environmental protection ratings

Cigar Lake	McArthur River	Rabbit Lake	Key Lake	McClean Lake
Satisfactory	Satisfactory	Satisfactory	Satisfactory	Satisfactory

In 2023, CNSC staff performed an inspection focused on environmental protection at the McArthur River Operation, also, each operation had elements reviewed and inspected as part of the general inspections. One notice of non-compliance (NNC) was identified at the following facility:

- 1 at the McClean Lake Operation

The NNC identified at this site included weaknesses identified with:

- notifying CNSC when corrective action implementation dates related to environmental reportable events are extended

This NNC was of low safety significance and has since been closed by CNSC staff.

CNSC staff concluded that the overall performance of the environmental protection SCA at the operating facilities was satisfactory.

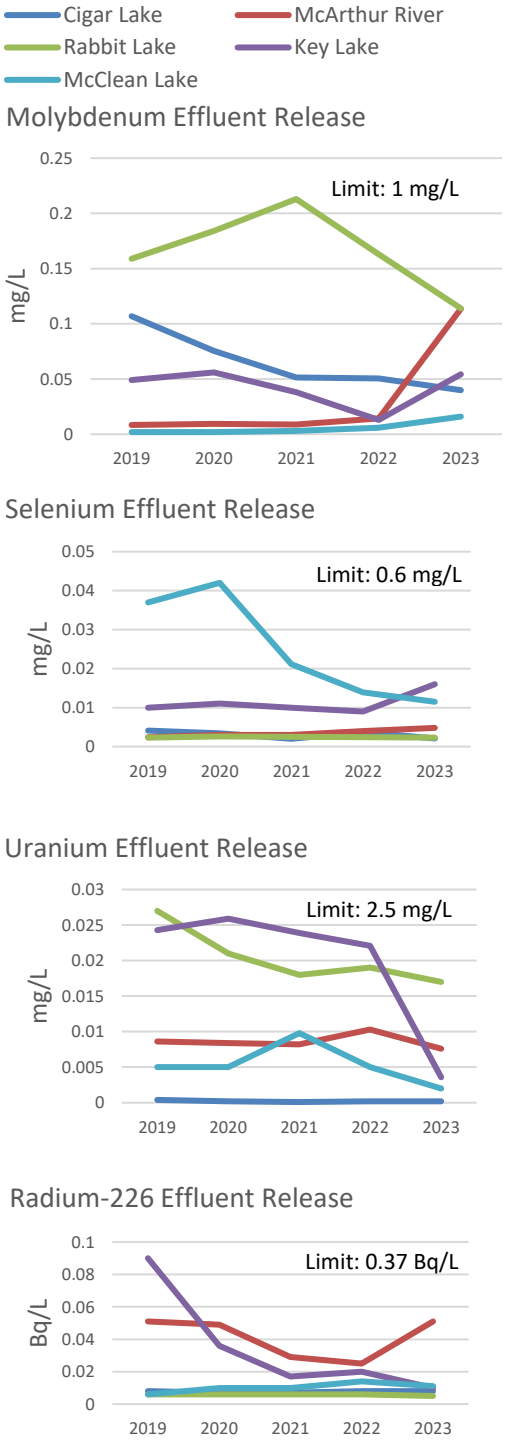
Environmental Management System

As part of an effective environmental protection program, the CNSC requires licensees to develop and maintain environmental management systems that provide a framework for integrated activities related to environmental protection at their operation. Environmental management systems include activities such as establishing annual environmental objectives, goals and targets. The licensees conduct internal audits of their programs as identified in their CNSC-accepted management system program. CNSC staff confirmed the licensees' objectives, goals and targets through regular compliance verification activities. Facility-specific details are provided in appendices B.3, C.3, D.3, E.3 and F.3 of this report.

Effluent and Emissions Control

Effluent and emissions control programs are associated with an environmental code of practice that sets out administrative levels and action levels for select contaminants of potential concern (COPC) with the potential for adverse environmental effects. An administrative level represents the upper range of design specifications for a specific parameter. Reaching an administrative level is not reportable to the CNSC but triggers an internal review of the controls in place by the licensee. Exceedance of an action level indicates a potential loss of control of the environmental protection program, which is based on the approved facility design envelope. Such an exceedance triggers notification to the CNSC, an immediate investigation by the licensee, and subsequent corrective actions and preventive measures taken to restore the effectiveness of the environmental protection program. It is important to recognize that an exceedance of an action level does not imply a potential risk to the environment but is an early warning signal that identifies that the operating parameter may be outside the facility design envelope. Facility action levels are determined using actual operating data and by following the methodology described in Canadian Standards Association (CSA) Group standard CSA N288.8-17, *Establishing and Implementing Action Levels for Releases to the Environment from Nuclear Facilities*.

Figure 4.2.1: Annual average concentrations for molybdenum, selenium, uranium and radium-226



Treated Effluent Released to the Environment

Environmental risk assessments (ERAs) identified releases of molybdenum, selenium, and uranium as having the potential for adverse environmental effects at uranium mines and mills. As a result, improved engineering controls and treatment technologies to reduce effluent releases of these contaminants were implemented where required. In 2023, the treatment technologies implemented continued to keep these contaminant concentrations stable at levels below regulatory limits. Figure 4.2.1 and appendices B3, C3, D3, E3 and F3 show the 2023 average annual effluent concentrations for molybdenum, selenium and uranium at the 5 mine and mill facilities. In the absence of federal or provincial effluent discharge limits for molybdenum, the CNSC required licensees to develop facility-specific effluent controls within the codes of practice of their environmental protection programs. The 2019 to 2023 average concentrations of molybdenum in effluent for the 5 facilities were each below the most stringent action level used across the 5 operating facilities. This level (1mg/L) is shown in the graphs found in appendix B, C, D, E and F for reference only.

The CNSC identified an interim objective for uranium of 0.1 mg/L. This was derived from the treatment technologies in place at the uranium mines and mills and based on what would be both protective of the environment, and achievable by the uranium metal mining sector. The interim objective was applied to all uranium mine and mill facilities and has been consistently met during the reporting period.

The interim objective for uranium in effluent will be re-evaluated once CNSC's REGDOC-2.9.2,

Controlling Releases to the Environment, is implemented by licensees. CNSC'S REGDOC-2.9.2 contains requirements and guidance for establishing and implementing licensed release limits. CNSC staff will follow the standard REGDOC implementation process for this REGDOC at uranium mines and mills.

Appendix B3, C3, D3, E3 and F3 include information on the total annual release of relevant radionuclides to the environment from these facilities from 2019 to 2023.

To increase public access to data on releases of radionuclides to the environment from nuclear facilities, the CNSC provides this information in the appendices of this ROR along with maintaining and annually updating downloadable databases on the CNSC Open Government Portal.

In addition to the above COPCs with the potential for adverse environmental effects, a graph showing concentrations of radium-226 is also provided in figure 4.2.1. From 2019 to 2023, the annual average effluent concentrations of radium-226 for the 5 facilities were well below the CNSC's licence-authorized monthly mean effluent discharge limit of 0.37 Bq/L.

Uranium mine and mill facilities also analyze treated effluent for concentrations of other regulated contaminants and COPCs such as arsenic, copper, lead, nickel, zinc, total suspended solids (TSS), un-ionized ammonia and pH. Table 4.2.2 shows the annual average parameter concentration values in effluent for these substances released in 2023, as well as the discharge limits described in the *Metal and Diamond Mining Effluent Regulations* (MDMER) made under the *Fisheries Act*. All metal and diamond mines and mills in Canada are subject to the MDMER. The CNSC cites the effluent limit requirements of the MDMER in uranium mine and mill LCHs. In 2023, all treated effluent released to the environment from licensed mining and milling activities for the above substances met the effluent discharge limits.

Table 4.2.2: Annual average parameter concentration values in effluent released to the environment, 2023

Parameter	Discharge Limit	Cigar Lake	McArthur River	Rabbit Lake	Key Lake	McClean Lake
Arsenic (mg/L)	**0.3***	0.0921	0.0002	0.0009	0.0034	0.0457
Copper (mg/L)	**0.3***	0.00031	0.0005	0.0003	0.005	0.003
Lead (mg/L)	**0.2***	0.0001	0.0001	0.0001	0.0001	0.0005
Nickel (mg/L)	**0.5***	0.00093	0.0014	0.0011	0.063	0.0202
Zinc (mg/L)	**0.5***	0.029	0.0028	0.001	0.0028	0.003

Parameter	Discharge Limit	Cigar Lake	McArthur River	Rabbit Lake	Key Lake	McClean Lake
Molybdenum (mg/L)	**1****	0.0399	0.1136	0.114	0.0543	0.014
Selenium (mg/L)	**0.6*****	0.0021	0.0048	0.0023	0.016	0.0161
Uranium (mg/L)	**2.5*****	0.00019	0.0076	0.017	0.00359	0.0052
TSS (mg/L)	**15***	1	1	1	3	3
Un-ionized ammonia – N (mg/L)	**0.5***	0.01	0.01	0.01	0.04	0.06
pH annual mean value	**6.0–9.5***	6.89	6.9	6.9	6.8	7.15

*MDMER discharge limit
**Key Lake action level, the most stringent across the 5 facilities
***Saskatchewan provincial limit

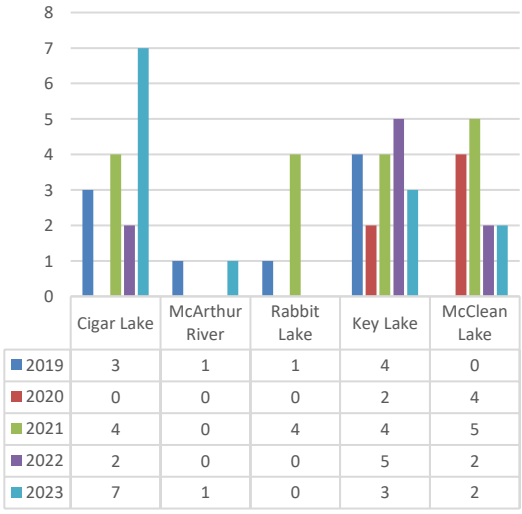
CNSC staff will continue to review effluent quality results to verify that effluent treatment performance remains effective.

Uncontrolled Releases

Licensees are required to report to regulatory authorities, including the CNSC, any uncontrolled releases (spills) of hazardous or radioactive substances to the environment.

Figure 4.2.2 shows the number of reportable spills for uranium mine and mill facilities during the 2019 to 2023 reporting period. In each case, CNSC staff reviewed and evaluated the licensee's actions to verify effective remediation and prevention and were satisfied with actions taken by the licensee. CNSC staff rated all 2023 spills as low safety significance resulting in no residual impact on the environment.

Figure 4.2.2: Uranium mines and mills reportable environmental spills, 2019–23

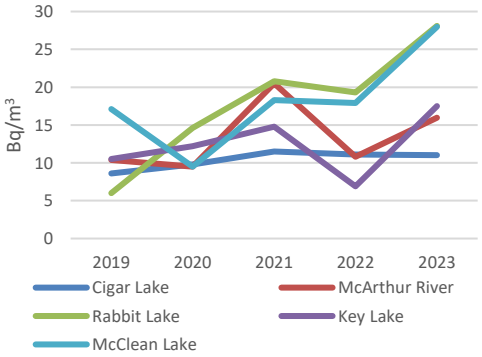


The facility-specific sections 3.1.2, 3.2.2, 3.3.2, 3.4.2 and 3.5.2 describe each reportable spill and the licensee's corrective actions response. The CNSC's spill rating definitions are also found in appendix H2.

Air Emissions Released to the Environment

Environmental protection programs at uranium mines and mills include monitoring the effects of operations on the surrounding air and soil. Licensees measure airborne particulate levels and concentrations of regulated contaminants and COPC, as well as the concentration of radon gas in ambient air. Soil and vegetation may be affected by atmospheric deposition of particulate containing adsorbed metals and radionuclides associated with onsite activities. Licensees monitor contaminant concentrations in soil and terrestrial vegetation to verify that operational impacts are below regulatory limits.

Figure 4.2.3: Average concentration of radon in ambient air, 2019–23



Facilities with milling operations monitor atmospheric emissions from acid plants, yellowcake dryers, calciner operations, packaging, grinding and ammonium sulphate operations. Other measured parameters (e.g., ambient radon and stack testing for sulphur dioxide, uranium and heavy metals) verify facility design and evaluate the operation's performance against predictions made in ERAs.

CNSC staff verified that the uranium mines and mills demonstrated satisfactory performance in monitoring and mitigating the effects of their operations on the surrounding air and soil. Figure 4.2.3 provides data for the average concentration of radon in ambient air, with values well below the concentrations which would lead to incremental dose of 1 mSv/year (53 Bq/m^3). Soil monitoring results around the facilities indicated that all measured parameters are within background levels. 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, the concentrations fall to background levels within a short distance of the facility boundary – less than 2 kms from the facility. The monitoring results indicate negligible impacts to the environment from atmospheric releases and confirm that all uranium mines and mills are in compliance with their environmental programs and provincial standards.

Assessment and Monitoring

In accordance with the *Uranium Mines and Mills Regulations* each uranium mine and mill licensee has an environmental monitoring program that monitors concentrations of nuclear and hazardous substances in the environment and characterizes and monitors effects to the environment associated with the licensed facility. Nuclear and hazardous substances associated with monitoring programs are selected based on COPCs identified through the licensee's ERA. COPCs identified through the ERA that have the potential for adverse environmental effects are managed through increased monitoring, inclusion in the environmental code of practice and further study or implementation of additional controls by licensees. CNSC staff review and evaluate environmental monitoring programs as criteria for assessing environmental performance.

The results of the licensee's environmental monitoring programs relative to the ERA predictions are provided in a licensee's environmental performance report. These are typically completed every 5 years and provides environmental data collected over the previous 5-year period. CNSC staff and the Saskatchewan Ministry of Environment staff review these performance reports once the reports are released.

Environmental Risk Assessment

An Environmental Risk Assessment (ERA) of nuclear facilities is a systematic process used by licensees to identify, quantify, and characterize the risk posed by releases of radiological and hazardous substances and physical stressors on representative human and non-human biota receptors, including the magnitude and extent of the potential effects associated with a facility. The ERA serves as the basis for the development of site-specific environmental protection measures, including the Environmental Monitoring Program (EMP). The results of these programs, in turn, inform and refine future revisions of the ERA.

REGDOC 2.9.1, *Environmental Protection: Environmental Principles, Assessments and Protection Measures* includes a requirement for an ERA in accordance with CSA N288.6, *Environmental Risk Assessments at Class I Nuclear Facilities and Uranium Mines and Mills*. The ERA document must detail the facility's interactions with the environment along with any potential impacts. Facility ERAs are to be reviewed on a 5-year cycle, or more frequently if major facility changes are proposed that would trigger a predictive assessment.

Table 4.2.3 shows the year of the most recent ERA submitted for each uranium mine and mill and the year the next ERA updates will be submitted to the CNSC for review. CNSC staff review ERAs to assess the potential risks to human health and the environment and to verify that mitigation measures are adequate.

Table 4.2.3: ERAs – current and upcoming submissions

ERA	Cigar Lake	McArthur River	Rabbit Lake	Key Lake	McClean Lake
Current ERA	2021	2020	2020	2020	2016
Upcoming ERA	2026	2025	2026	2025	2025 *

*Deferred to align environmental monitoring and reporting frequencies, subject to annual adequacy reviews, as approved by the CNSC on August 12, 2020.

In December 2020, updated ERAs were submitted to the CNSC and the Saskatchewan Ministry of Environment for the Key Lake Operation, McArthur River Operation, and Rabbit Lake Operation. In addition, environmental performance reports for the period from 2015 to 2019 were submitted to the CNSC for the Key Lake Operation, Rabbit Lake Operation and McArthur River Operation. CNSC staff reviewed the environmental monitoring results for air, soil, vegetation, surface water, groundwater and sediment, as well as the health indicators for fish and their prey inhabiting sediment and confirmed the results to date were within those predicted in the ERAs for each of the operations.

After reviewing the ERAs and environmental performance report, CNSC staff concluded that adequate measures have been taken at the McArthur River, Rabbit Lake and Key Lake operations to protect human health and the environment.

The Cigar Lake environmental performance report and updated ERA for the period from 2016 to 2020 were submitted to the CNSC in late 2021. CNSC staff reviewed the environmental monitoring results for air, soil, vegetation, surface water, groundwater, sediment, and aquatic health indicators and confirmed that the results were within those predicted in the ERA.

After reviewing the environmental performance report and ERA, CNSC staff concluded that adequate measures have been taken at the Cigar Lake Operation to protect human health and the environment.

In October 2022, an Environmental Performance Technical Information Document (EP TID vol. 1) was submitted to the CNSC for the McClean Lake Operation covering the period from 2016 to 2021. The EP TID comprised validation of the previous 2016 ERA and a 2018 risk assessment completed for selenium. CNSC staff reviewed the environmental monitoring results for air, soil, vegetation, surface water, groundwater, and sediment, as well as the health indicators for fish and their prey inhabiting sediment and confirmed that the results were within those predicted in the ERA.

After reviewing the 2022 EP TID, and Orano’s ongoing activities, CNSC staff concluded that adequate measures have been taken at the McClean Lake Operation to protect human health and the environment.

Protection of People

Each licensee must demonstrate that persons are protected from exposures to radiological and hazardous substances released from an operation. Protection of people is assessed in the human health risk assessment (HHRA). The HHRA assesses hazardous and radiological releases from facilities, and it models the resultant concentrations of contaminants in air, water, soil and traditional foods (such as fish, waterfowl and moose). The concentrations of contaminants consumed by a typical land user are assessed against human health benchmarks in the HHRA. For all facilities, the HHRAs confirmed that the concentrations of contaminants for a typical local resident are well below concentrations that could cause health effects. Therefore, it has been determined that the health of persons in areas surrounding the facilities is protected.

Doses to persons are calculated based on an individual expected to have the highest possible exposure using conservative assumptions. Calculated dose values are determined for both camp workers (e.g., cook) and persons that are expected to be in close vicinity to the licensed site (such as traditional land users). To be conservative, the dose calculations assume that local Indigenous residents (including adult, child, and toddler) obtain their dietary components throughout the year from the local area.

CNSC staff reviewed the HHRAs submitted by the uranium mines and mills and concluded that the estimated doses to persons as a result of licensed operations are a small fraction of the regulatory public dose limit of 1 mSv/year.

In 2023, CNSC staff were satisfied that uranium mine and mill licensees' controlled radiation doses to persons at levels well below the regulatory limits and are ALARA. This conclusion was based on the outcome of inspections, as well as reviews of licensees' environmental protection programs.

Eastern Athabasca Regional Monitoring Program

The Eastern Athabasca Regional Monitoring Program (EARMP) is a well-recognized environmental monitoring program designed to gather data on long-range environmental information and potential cumulative impacts downstream from uranium mining and milling operations. The program was initiated in 2011 with funding from the Saskatchewan government and the uranium mining industry (Cameco and Orano) as a sub-element of the Province of Saskatchewan's Boreal Watershed Initiative, which ended in 2017. The CNSC became a funding partner in 2017 to support the publication of an EARMP final report (2011 to 2017) with a 5-year long-term funding agreement (2018–2019 to 2022–2023) signed in 2018 between the Saskatchewan Government, the CNSC and industry, and extended in 2023 for 3 additional years ending 2025/2026. The community program monitors the safety of traditionally harvested country foods by analyzing water, fish, berries and wild meat (e.g., grouse, rabbit, caribou and moose) from representative northern Saskatchewan communities.

The program contractor is an Indigenous-owned business in northern Saskatchewan. Samples are collected from areas identified by community members, with members either assisting in sample collection or providing samples from their own harvesting activities.

Harvesting and consuming traditional country foods are an important part of the culture in northern Saskatchewan. The intent of EARMP is to provide confidence and transparent communication with community members that traditional country foods remain safe to eat today and for future generations. The program has demonstrated that concentrations of COPC have been relatively consistent over time and are within the regional reference range, which indicates no evidence of long-range transport of contaminants associated with uranium mining.

Evaluation of country food data from previous years confirms uranium mines and mills are not affecting the safety of country foods at nearby communities. The results indicated that radiological and non-radiological exposures to residents consuming country foods were similar to exposures of the general Canadian population. The EARMP has proven to be a productive means of involving the community in monitoring the health of their local environment and provides them with confidence in the safety of their traditional foods. The conclusion of the EARMP is that water and country foods are considered safe for consumption.

The annual reports and data are available at the EARMP website. The CNSC continues to support the EARMP and CNSC staff are working to further collaborate on this valuable program.

Learn more about the Eastern Athabasca Regional Monitoring Program

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. Each site has its own dedicated IEMP results page linked below:

Beaverlodge, Gunnar and Lorado 2023 Results

Learn more about the IEMP

4.3 Conventional Health and Safety

The conventional health and safety SCA covers the implementation of a program to manage workplace safety hazards and to protect workers.

Licensees are required to include program documentation for the conventional health and safety SCA as part of the overall management system documents; these form part of the licensing basis for these facilities.

For 2023, CNSC staff rated the conventional health and safety SCA at uranium mine and mill facilities as satisfactory, following acceptable performance in health and safety practices, awareness and performance.

Table 4.3.1 Conventional health and safety ratings

Cigar Lake	McArthur River	Rabbit Lake	Key Lake	McClean Lake
Satisfactory	Satisfactory	Satisfactory	Satisfactory	Satisfactory

In 2023, CNSC staff performed 1 inspection focused on conventional health and safety at the Cigar Lake Operation, however, each operation had elements reviewed and inspected as part of general inspections. Sixteen notices of non-compliance (NNCs) were identified at the following facilities:

- 9 at the Cigar Lake Operation
- 2 at the McArthur River Operation
- 1 at the Key Lake Operation
- 4 at the McClean Lake Operation

The NNCs identified at these sites included weaknesses identified with:

- housekeeping standards being kept
- identifying hazards and mitigating risks associated with them
- safe egress through and around stairs, platforms and ladders

These NNCs were of low safety significance and have since been closed by CNSC staff.

CNSC staff concluded that the overall performance of the conventional health and safety SCA at the operating facilities was satisfactory.

Practices

The CNSC requires licensees to identify potential safety hazards, assess associated risks, and introduce the necessary materials, equipment, programs, and procedures to effectively manage, control and minimize these risks. CNSC staff work in collaboration with the Saskatchewan Ministry of Labour Relations and Workplace Safety to provide regulatory oversight of conventional health and safety in uranium mines and mills. CNSC staff's compliance verification activities include inspections and reviews of compliance reports and health and safety events. Most CNSC inspections include some level of verification of conventional health and safety performance.

CNSC staff confirmed that licensees at uranium mines and mills implemented effective conventional health and safety practices in their activities. In addition to CNSC staff's regulatory oversight, the Saskatchewan Government conducts regular inspections of occupational health and safety, mine safety and fire protection through an agreement with the Government of Canada.

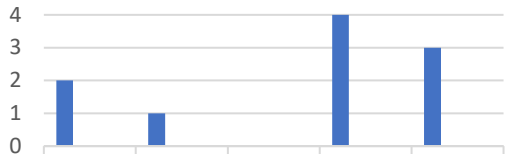
Awareness

CNSC staff observed how the implementation of conventional health and safety programs continued to provide workers with education, training, tools, and support. Each facility licensee promotes the idea that safety is the responsibility of all individuals; this message is reinforced by the licensees' management, supervisors and workers. The licensees' management stress the importance of conventional health and safety through regular communication, management oversight and the continual improvement of safety systems. Through inspections, CNSC staff have identified an acceptable level of communication and awareness in the area of conventional health and safety. CNSC staff concluded that in 2023, licensees of uranium mines and mills were committed to accident prevention and safety awareness and focused on safety culture.

Performance

Key performance measurement criteria for conventional health and safety are the number of LTIs and the total recordable incident rate (TRIR) that occur at each facility. An LTI is a workplace injury that results in the worker being unable to return to work for a period of time. In reviewing each LTI, CNSC staff consider injury severity and frequency rates. The TRIR is the incident frequency rate, where incidents include fatalities, LTIs and other injuries requiring medical treatment. Figure 4.3.1 shows the number of LTIs at the uranium mines and mills, along with severity, frequency and TRIRs.

Figure 4.3.1: Lost-Time Injury Statistics in 2023



	Cigar Lake	McArthur River	Rabbit Lake	Key Lake	McClean Lake
Lost-Time Injuries	2	1	0	4	3
Severity Rate	6.29	0.75	0	7.25	64.8
Frequency Rate	0.29	0.19	0	0.66	0.7
TRIR	2.78	1.88	1.12	4.84	2.7

Lost-time injuries = An injury that takes place at work and results in the worker being unable to return to work for a period of time. A measure of the total number of days lost to injury for every 200,000 person-hours worked at the facility.

Severity rate = [(# of days lost in last 12 months) / (# of hours worked in last 12 months)] x 200,000. A measure of the number of LTIs for every 200,000 person-hours worked at the facility.

Frequency rate = [(# of injuries in last 12 months) / (# of hours worked in last 12 months)] x 200,000. A measure of the number of fatalities, lost-time injuries, and other injuries requiring medical treatment for every 200,000 person-hours worked at the facility.

Total recordable incident rate = [(#incidents in last 12 months) / # hours worked in last 12 months)] x 200,000.

Sections 3.1.2, 3.2.2, 3.4.2 and 3.5.2 provide additional details on LTIs that occurred at the uranium mine and mill operations in 2023, and appendices B2, C2, D2, E2 and F2 provide LTI data per facility over the past 5 years. CNSC staff and the Saskatchewan Ministry of Labour Relations and Workplace Safety monitor and review each reportable injury to verify that the cause is identified, and the corrective actions taken are satisfactory. When applicable, injury information is shared by licensees amongst the facilities for lessons learned to improve safety and prevent reoccurrences.

CNSC staff concluded through their compliance verification activities that the health and safety programs at all uranium mines and mills were satisfactory in 2023.

4.4 Management Systems

The management system SCA covers the framework that establishes the processes and programs required to ensure that an organization achieves its safety objectives, continuously monitors its performance against these objectives, and fosters a healthy safety culture.

CNSC staff assess performance in the management system SCA by verifying the compliance of licensee documents and programs through desktop reviews and through compliance verification inspections that are planned or reactive. The specific areas assessed within the management system include organization; planning and controlling business activities; resource management; communication; safety culture; change management; information management; work management; problem identification and resolution; performance assessment, improvement, and management review.

Licensees included program documentation for the management system SCA as part of their overall management system documents; these constitute part of the licensing basis for their facility.

CNSC staff rated the 2023 performance of the uranium mine and mill licensees for the management systems SCA as satisfactory. It is noted that the Cigar Lake Operation's performance was rated as below expectations in 2022. Actions taken by the licensee resulted in an improvement in performance in this SCA sufficient to warrant a satisfactory rating in 2023. Further information on the Cigar Lake Operation's performance rating can be found in section 3.1.1.

Table 4.4.1: Management systems ratings

Cigar Lake	McArthur River	Rabbit Lake	Key Lake	McClean Lake
Satisfactory	Satisfactory	Satisfactory	Satisfactory	Satisfactory

In 2023, CNSC staff did not perform any inspections with the sole focus of management systems, however, each operation had elements reviewed and inspected as part of the general inspections. No notices of non-compliance (NNCs) were identified at any facility in 2023.

CNSC staff concluded that the overall performance of the management system SCA at the operating facilities was satisfactory.

4.5 Human Performance Management

The human performance management SCA covers activities that enable effective human performance through the development and implementation of processes that ensure a sufficient number of licensee personnel are in all relevant job areas and have the necessary knowledge, skills, procedures and tools in place to safely carry out their duties.

Licensees include program documentation for the human performance management SCA as part of the overall management system documents; these form part of the licensing basis for these facilities.

Table 4.5.1: Human performance management ratings

Cigar Lake	McArthur River	Rabbit Lake	Key Lake	McClean Lake
Satisfactory	Satisfactory	Satisfactory	Satisfactory	Satisfactory

In 2023, CNSC staff performed inspections with the sole focus of human performance management (personnel training) at the Rabbit Lake Operation, also, each operation had elements reviewed and inspected as part of the general inspections. Five notices of non-compliance (NNCs) were identified at the following facility:

- 5 at the Rabbit Lake Operation

The NNCs identified at this site included inconsistencies with the:

- training governance documents and their implementation
- implementation of the training change management process and documentation of its outputs
- maintenance of workers training records

To address these NNCs, the licensee submitted corrective action plans that were reviewed and accepted by CNSC staff. These NNCs were of low safety significance and have since been closed by CNSC staff.

CNSC staff concluded that the overall performance of the human performance management SCA at the operating facilities was satisfactory.

4.6 Operating Performance

The operating performance SCA includes an overall review of the conduct of the licensed activities and the activities that enable effective performance.

Licensees include program documentation for the operating performance SCA as part of the overall management system documents; these form part of the licensing basis for these facility in their LCH's.

Table 4.6.1: Operating performance ratings

Cigar Lake	McArthur River	Rabbit Lake	Key Lake	McClean Lake
Satisfactory	Satisfactory	Satisfactory	Satisfactory	Satisfactory

In 2023, CNSC staff performed inspections focused on operating performance at the McArthur River and McClean Lake operations, also, each operation had elements reviewed and inspected as part of the general inspections. Ten notices of non-compliance (NNCs) were identified at the following facilities:

- 1 at the McArthur River Operation
- 9 at the McClean Lake Operation

The NNCs identified at these sites included weaknesses identified with:

- maintaining calibration processes for required equipment
- posting the CNSC licence
- evaluating risk reviews in change control

These NNCs were of low safety significance and have since been closed by CNSC staff.

CNSC staff concluded that the overall performance of the operating performance SCA at the operating facilities was satisfactory.

4.7 Safety Analysis

The safety analysis SCA covers maintenance of the safety analysis that supports the overall safety case for the facility. Safety analysis is a systematic evaluation of the potential hazards associated with the conduct of a proposed activity or facility and considers the effectiveness of preventative measures and strategies in reducing the effects of such hazards.

Licensees include program documentation for the safety analysis SCA as part of the overall management system documents; these form part of the licensing basis for these facilities.

Table 4.7.1: Safety analysis ratings

Cigar Lake	McArthur River	Rabbit Lake	Key Lake	McClean Lake
Satisfactory	Satisfactory	Satisfactory	Satisfactory	Satisfactory

In 2023, CNSC staff did not perform any inspections focused on safety analysis however, each operation had elements reviewed and inspected as part of general inspections. One notice of non-compliance (NNC) was identified at the following facility:

- 1 at the McArthur River Operation

The NNC identified at this site included weaknesses identified with:

- proper rationale for lowering risk rankings of possible hazards and events

This NNC was of low safety significance and has since been closed by CNSC staff.

CNSC staff concluded that the overall performance of the safety analysis SCA at the operating facilities was satisfactory.

4.8 Physical Design

The physical design SCA relates to activities that impact the ability of structures, systems and components to meet and maintain their design basis given new information arising over time and taking changes in the external environment into account.

Licensees include program documentation for the physical design SCA as part of the overall management system documents; these form part of the licensing basis for these facilities.

Table 4.8.1: Physical design ratings

Cigar Lake	McArthur River	Rabbit Lake	Key Lake	McClean Lake
Satisfactory	Satisfactory	Satisfactory	Satisfactory	Satisfactory

In 2023, CNSC staff performed an inspection focused on physical design at the Cigar Lake Operation, also, each operation had elements reviewed and inspected as part of the general inspections. Two notices of non-compliance (NNCs) were identified at the following facilities:

- 1 at the McArthur River Operation
- 1 at the Key Lake Operation

The NNCs identified at these sites included weaknesses identified with:

- proper warning signals in case of main fan malfunction
- temporary changes being tracked to respect time limits

These NNCs were of low safety significance and have since been closed by CNSC staff.

CNSC staff concluded that the overall performance of the physical design SCA at the operating facilities was satisfactory.

4.9 Fitness for Service

The fitness for service SCA covers activities that impact the physical condition of structures, systems and components to ensure that they remain effective over time. This area includes programs that ensure all equipment is available to perform its intended design function when called upon to do so.

Licensees include program documentation for the fitness for service SCA as part of the overall management system documents; these form part of the licensing basis for these facilities.

Table 4.9.1: Fitness for service ratings

Cigar Lake	McArthur River	Rabbit Lake	Key Lake	McClean Lake
Satisfactory	Satisfactory	Satisfactory	Satisfactory	Satisfactory

In 2023, CNSC staff performed an inspection focused on fitness for service at the McArthur River Operation, also, each operation had elements reviewed and inspected as part of the general inspections. Three notices of non-compliance (NNCs) were identified at the following facility:

- 3 at the Rabbit Lake Operation

The NNCs identified at this site included weaknesses identified with:

- maintaining boot wash stations to ensure zone control
- ensuring radiation instrumentation being fit for service

These NNCs were of low safety significance and have since been closed by CNSC staff.

CNSC staff concluded that the overall performance of the fitness for service SCA at the operating facilities was satisfactory.

4.10 Emergency Management and Fire Protection

The emergency management and fire protection SCA covers emergency plans and emergency preparedness programs that exist for emergencies and for non-routine conditions. This area also includes any results of participation in exercises.

Licensees include program documentation for the emergency management and fire protection SCA as part of the overall management system documents; these form part of the licensing basis for these facilities.

Table 4.10.1: Emergency management and fire protection ratings

Cigar Lake	McArthur River	Rabbit Lake	Key Lake	McClean Lake
Satisfactory	Satisfactory	Satisfactory	Satisfactory	Satisfactory

In 2023, CNSC staff performed an inspection focused on emergency management and fire protection at the Rabbit Lake Operation however, each operation had elements reviewed and inspected as part of the general inspections. Twelve notices of non-compliance (NNCs) were identified at the following facilities:

- 2 at the Cigar Lake Operation
- 3 at the Rabbit Lake Operation
- 3 at the Key Lake Operation
- 4 at the McClean Lake Operation

The NNCs identified at these sites included deficiencies identified with:

- ensuring fire extinguishers are checked monthly
- ensuring fire cabinets contain items appropriate for the cabinets
- training requirements for emergency response team members
- ensuring fire doors have self-closing mechanisms

These NNCs were of low safety significance and have since been closed by CNSC staff.

CNSC staff concluded that the overall performance of the emergency management and fire protection SCA at the operating facilities was satisfactory.

During an inspection at the Rabbit Lake Operation, an Inspector's Order was issued after the inspection team found expired personal protective equipment (PPE) for the emergency response team (ERT) to be expired. The PPE ranged in expiry between 3 and 10 years, and apart from a small subsect of the ERT members' equipment, all equipment that was in service was expired. The Inspector's Order was issued on October 26, 2023, and ordered the Rabbit Lake Operation to immediately suspend non-essential activities that may have posed an increased fire risk, obtain non-expired ERT PPE, and perform an investigation into why the impaired state of readiness for the ERT PPE was not reported to the CNSC. CNSC staff also requested that Cameco and Orano verify the presence of a sufficient quantity of ERT PPE at other UMM sites. Cameco indicated that McArthur River had also been using some expired PPE, which was quickly replaced out of stocks already on site.

4.11 Waste Management

The waste management SCA covers internal waste-related programs that form part of the facility's operations up to the point where the waste is removed from the facility to a separate waste management facility. This area also covers the planning for decommissioning.

Licensees include program documentation for the waste management SCA as part of the overall management system documents; these form part of the licensing basis for these facilities.

Table 4.11.1: Waste management ratings

Cigar Lake	McArthur River	Rabbit Lake	Key Lake	McClean Lake
Satisfactory	Satisfactory	Satisfactory	Satisfactory	Satisfactory

In 2023, CNSC staff did not perform any inspections focused on waste management however, each operation had elements reviewed and inspected as part of the general inspections. Four notices of non-compliance (NNCs) were identified at the following facilities:

- 1 at the Cigar Lake Operation
- 2 at the McArthur River Operation
- 1 at the Rabbit Lake Operation

The NNCs identified at these sites included weaknesses identified with:

- ensuring wastes are separated and disposed of in the appropriate waste receptacles
- ensuring vegetation growth does not impact the stability of waste pad ditches

These NNCs were of low safety significance and have since been closed by CNSC staff.

CNSC staff concluded that the overall performance of the waste management SCA at the operating facilities was satisfactory.

4.12 Security

The security SCA covers the programs required to implement and support the security requirements stipulated in the regulations, the licence, orders, or expectations for the facility of activity.

Licensees include program documentation for the security SCA as part of the overall management system documents; these form part of the licensing basis for these.

Table 4.12.1: Security ratings

Cigar Lake	McArthur River	Rabbit Lake	Key Lake	McClean Lake
Satisfactory	Satisfactory	Satisfactory	Satisfactory	Satisfactory

In 2023, CNSC staff did not perform any inspections focused on security however, each operation had elements reviewed and inspected as part of the general inspections. Two notices of non-compliance (NNCs) were identified at the following facilities:

- 1 at the McArthur River Operation
- 1 at the Key Lake Operation

A breakdown of NNCs is not provided for the security SCA, given the potentially sensitive information associated with the SCA.

All NNCs were of low safety significance and have since been closed by CNSC staff.

CNSC staff concluded that the overall performance of the security SCA at the operating facilities was deemed satisfactory.

4.13 Safeguards and Non-Proliferation

The safeguards and non-proliferation SCA covers the programs and activities required for the successful implementation of the obligations arising from the Canada/International Atomic Energy Agency (IAEA) safeguards agreements, as well as all other measures arising from the Treaty on the Non-Proliferation of Nuclear Weapons.

Licensees include program documentation for the safeguards and non-proliferation SCA as part of the overall management system documents; these form part of the licensing basis for these facilities in their LCH's.

Table 4.13.1: Safeguards and non-proliferation ratings

Cigar Lake	McArthur River	Rabbit Lake	Key Lake	McClean Lake
Satisfactory	Satisfactory	Satisfactory	Satisfactory	Satisfactory

In 2023, there were no CNSC inspections related to the Safeguards and Non-Proliferation SCA. No notices of non-compliance (NNCs) were identified at any facility and there are no events reported in 2023.

In addition, the IAEA conducts independent verification activities with coordination and support through the CNSC regulatory framework. During the reporting period, the IAEA conducted a Complementary Access (CA) at the Key Lake Operation from October 2 to 4, 2023. The IAEA concluded that they were able to carry out all planned activities during the CA.

CNSC staff concluded that the overall performance of the Safeguards and Non-Proliferation SCA at the operating facilities was satisfactory.

4.14 Packaging and Transport

The packaging and transport SCA covers programs for the safe packaging and transport of nuclear substances to and from the licensed facility.

Licensees include program documentation for the packaging and transport SCA as part of the overall management system documents; these form part of the licensing basis for these facilities.

Table 4.14.1: Packaging and transport ratings

Cigar Lake	McArthur River	Rabbit Lake	Key Lake	McClean Lake
Satisfactory	Satisfactory	Satisfactory	Satisfactory	Satisfactory

In 2023, CNSC staff did not perform any inspections focused on packaging and transport however, each operation had elements reviewed and inspected as part of the general inspections. No notices of non-compliance (NNCs) were identified at any facility in 2023.

CNSC staff concluded that the overall performance of the packaging and transport SCA at the operating facilities was satisfactory.

5 Conclusions

CNSC staff concluded that, in 2023, operating uranium mines and mills in Canada operated safely. This assessment was based on CNSC staff's verification of licensee activities, including inspections, reviews of reports submitted by licensees, and reviews of events supported by follow-up and general communication with the licensees.

For 2023, the performance safety ratings for all operating uranium mines and mills in all 14 SCAs were rated as "satisfactory".

Section II : Historic and Decommissioned Sites in Canada: 2021-2023

6 Overview

Section II of this report provides information on 2 historic sites that are being actively remediated, 10 decommissioned uranium mine and mill sites in long-term monitoring and maintenance, and 1 site that has been fully released from licensing during the period covered by this report (see figure 6.1 for site locations).

The objective of active remediation projects is to establish long-term, stable conditions that ensure the safe use of each site by current and future generations. Wherever possible, the remediation plans aim to return historic uranium mine and mill sites to previously existing environmental conditions or to land uses that will be sustainable in the long term. Active remediation projects consist of ongoing cleanup activities involving full-time staff and contractors, as well as frequent monitoring and reporting.

The decommissioned sites discussed in this report are in the long-term maintenance and monitoring phase. These sites have a very low potential of radiation exposures because of limited onsite work, the outdoor setting, and low radiation levels following completed remediation activities. Some still carry out active water treatment, while others produce no effluent and so do not require treatment.

Figure 6.1: Locations of historic and decommissioned sites in Canada

The following 2 historic mine sites are undergoing active remediation:

- Gunnar legacy uranium mine
- Madawaska closed uranium mine

The following 10 sites have been decommissioned for several years and are currently in the long-term monitoring and maintenance phase:

- Lorado former mill site
- Beaverlodge mine and mill
- Rayrock closed mine
- Port Radium closed mine
- Agnew Lake tailings management area
- Bicroft tailings storage facility
- Dyno closed mine
- Elliot Lake historic sites
- Denison and Stanrock closed mines

The following site was released from CNSC licensing in 2023:

- Cluff Lake uranium mine and mill

6.1 Regulatory Efforts

CNSC staff provide risk-informed regulatory oversight of licensed activities at the active remediation projects and decommissioned sites. 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.

The CNSC requires licensees to develop decommissioning plans for each of their sites. Each plan, reviewed and approved by CNSC staff, is accompanied by a financial guarantee that provides the funding necessary to complete all decommissioning work. For sites that have been decommissioned, financial guarantees are still required to support the monitoring and maintenance of the site.

The values of the financial guarantees for the historic and decommissioned sites are listed in appendix I.

6.1.1 Effects of COVID-19 on Regulatory Efforts

On March 15, 2020, the CNSC activated the Business Continuity Plan (BCP) in response to the COVID-19 pandemic and effective March 16, 2020, all CNSC staff were directed to work from home as described in past regulatory oversight reports.

Compliance activities of uranium mine and mill facilities continued remotely into 2022, when onsite verification activities resumed on a risk-informed basis in observance of relevant COVID-19 health protocols. In 2023, inspections at historic and decommissioned sites returned to pre-COVID norms.

6.2 Performance

The CNSC requires all licensees, as per their CNSC licences, to submit annual compliance reports with information pertaining to their performance in the applicable SCAs. CNSC staff review these reports to verify if licensees are complying with regulatory requirements and are operating safely. These reports are available on licensees' websites, as applicable (see appendix M of this report for the links).

CNSC staff reviewed licensee compliance reports, revisions to licensee programs, licensee responses to events and incidents, and results of their inspections to compile the performance ratings for the active remediation projects and decommissioned sites. As per their licences, not every SCA will be applicable to each of the sites in this section.

Ratings for the applicable SCAs for each historic and decommissioned sites for 2021-2023 are presented in sections 7 and 8. For the review period of 2021-2023, CNSC staff rated all applicable SCAs as "satisfactory" for all historic and decommissioned sites, with the exception of Port Radium for their operating performance SCA, which is discussed in section 8.5.

This report focuses on the 3 SCAs that cover many of the key performance indicators for historic and decommissioned sites: radiation protection, environmental protection and conventional health and safety. These are detailed in section 9.

6.3 Indigenous Consultation and Engagement

CNSC Engagement Efforts –Ontario

Since 2020, CNSC staff have continued to provide updates to potentially interested Indigenous Nations and communities regarding the Madawaska, Bicroft and Dyno decommissioned uranium sites, where appropriate. Since 2020, there has been no major changes in the status of, or related activities for these sites. The majority of activities are related to ongoing monitoring, maintenance and oversight to ensure compliance and safety. The communications and engagement with Indigenous Nations and communities in relation to these sites involved providing information and status updates with key Indigenous Nations and communities whose traditional and/or traditional territory intersect with the location of these historic and decommissioned uranium mining sites including the Williams Treaties First Nations (WTFN) and the Metis Nation of Ontario. The CNSC has signed a Long-Term Engagement ToRs with WTFN members Curve Lake First Nation, Hiawatha First Nation, and the Mississaugas of Scugog Island First Nation, as well as with the Métis Nation of Ontario, outlining regular meetings and discussions on CNSC regulated sites and facilities of interest, including these historic and decommissioned uranium mining sites.

For the sites located in the Elliot Lake, Ontario region, including the Agnew Lake, Elliot Lake and Denison and Stanrock sites, CNSC staff engaged with and provided updates to key Indigenous Nations and communities whose traditional and/or traditional territories intersect with the location of these historic and decommissioned uranium mining sites including Mississauga First Nation (MFN), Sagamok Anishnawbek Nation (SAN) and Serpent River First Nation (SRFN).

CNSC Engagement Efforts – Northwest Territories

Since 2020, CNSC staff have participated in outreach and engagement meetings with the Tlicho Government to answer questions and provide updates regarding the Rayrock and Port Radium sites. In 2021, CNSC staff participated in the Wek'èezhìi Land and Water Board Proceedings for Rayrock where the Tlicho Government asked CNSC staff a number of questions about our licensing procedures and regulatory oversight. In 2022, CNSC staff participated in 3 separate meetings with the Tlicho Government regarding the Rayrock Remediation Project where program documents were discussed. In 2023, CNSC staff participated in 2 separate events with the Tlicho Government where discussions centered around the remediation project and radiation awareness.

7 Historic (Remediating) Uranium Mines and Mills

7.1 Gunnar

The Gunnar legacy uranium mine site is located approximately 600 kilometres north of Saskatoon, on the north shore of Lake Athabasca in northwest Saskatchewan.

Gunnar was a commercial uranium mine that operated from 1955 to 1963. The site closed in 1964, with little decommissioning performed at the time. The former uranium mine and mill is being remediated by the Saskatchewan Research Council (SRC). Following a November 2014 public hearing, the Commission issued the SRC a waste nuclear substance licence for the Gunnar Remediation Project. SRC's licence is valid until November 30, 2024.

Figure 7.1.1: Gunnar – Radiation warning sign located at Gunnar Main, 2023

Source: CNSC

The remediation project consists of the cleanup of mine tailings, waste rock piles, an open pit, a mine shaft, and demolition debris. The remediation work is being carried out in 3 phases. Phase 1, which has been completed, involved characterizing and monitoring the onsite waste and developing remediation plans. Phase 2, currently ongoing, consists of implementing the remediation plans. Phase 3 will involve long-term monitoring and maintenance to verify that the site remains stable and safe.

During the 2021 to 2023 review period, work conducted at the Gunnar site consisted of the following:

- central cover systems were completed at 2 out of 3 tailings management facilities in 2022 and revegetation is growing in well
- all mine openings on site have been remediated (i.e. capping of vent raises)
- work was completed on Catchment 3, the Dam exclusion zone and the Beaver Pond, as-built reports were provided to CNSC staff for review
- preparatory work for Langley Bay remediation has begun
- completion of legacy waste sweeps and consolidation, all material moved into the appropriate landfills

7.1.1 Performance

For the review period of 2021 to 2023, CNSC staff were satisfied with SRC's performance at the Gunnar site in the SCAs of radiation protection, environmental protection, and conventional health and safety.

The CNSC's baseline inspection plan for 2021 to 2023 required CNSC staff to conduct 1 site inspection during the 3-year period at the Gunnar site. Due to the pandemic and restrictions on travel, CNSC staff did not perform an inspection in 2021. In June of 2022 and August of 2023, CNSC staff performed annual baseline inspections of the Gunnar site. The inspectors found that, overall, SRC was in compliance with its licence conditions, with the exception of requirements for labelling radioactive material in 2022. As a result of this instance of non-compliance, which was of low safety significance, a notice of non-compliance was issued to SRC. SRC took immediate corrective actions, which were verified and approved by CNSC staff. These enforcement actions are now closed.

For the review period of 2021 to 2023, CNSC staff rated the radiation protection, conventional health and safety, and environmental protection SCAs as "satisfactory".

Gunnar – safety and control area ratings

Safety and Control Area	2021	2022	2023
Radiation Protection	Satisfactory	Satisfactory	Satisfactory
Conventional Health and Safety	Satisfactory	Satisfactory	Satisfactory
Environmental Protection	Satisfactory	Satisfactory	Satisfactory

7.2 Madawaska

Madawaska, a legacy uranium mine located near Bancroft, Ontario, operated from 1957 to 1982 and was decommissioned in the 1980s. Ovintiv Canada UVP (Ovintiv) is the licensee of the Madawaska mine. EWL Canada Ltd was the licensee until 2022. For the foreseeable future, the site will remain under long-term monitoring and maintenance.

The site includes the footprint of the mining operation, 2 tailings management areas (TMAs) (figure 7.2.1), a number of capped and sealed openings, underground workings and 4 tailings dams.

Figure 7.2.1: Madawaska – vegetative cover on TMA 2

Source: CNSC

In 2021 and 2023, Ovintiv continued rehabilitation/maintenance work on the 2 TMAs. In 2021 and 2022, Ovintiv completed improvements to the physical conditions of the site with the implementation of the following work:

- completion of the upgrades to TMA-1 cover and improvements to the physical stability of the TMA-1 spillway
- completion of upgrade of remaining raises and shaft covers to meet regulatory requirements
- site clean-up post-rehabilitation work including the removal of the temporary construction structures and reclamation of disturbed areas

7.2.1 Performance

For the reporting period of 2021 to 2023, CNSC staff were satisfied with Ovintiv's performance at the Madawaska site for the SCAs of radiation protection, environmental protection, and conventional health and safety. Ovintiv's performance over the reporting period has been stable and met the requirements of the *Nuclear Safety and Control Act* [1] and its associated regulations.

In 2022 EnCana – the parent company of EWL Canada Ltd. – became Ovintiv Canada ULC. As part of this reorganization, in February 2022 Ovintiv dissolved EWL Canada Ltd. CNSC staff were informed of these changes in March. This left the Madawaska site (and the nearby Dyno site, discussed in section 8.8) without a licensee, as EWL's licences were not transferred to Ovintiv prior to EWL's dissolution. In light of those events, in May of 2022 CNSC staff carried out a reactive inspection of the Dyno and Madawaska sites. This inspection found that the sites were in a safe state, and resulted in an Inspector's Order requiring Ovintiv to comply with the conditions of EWL's former licence to ensure continued safe operations.

Ovintiv subsequently applied for a new licence and provided an updated financial guarantee. A new licence was issued by a designated officer in August of 2023, valid until 2033, and the order was closed by CNSC staff in October 2023 after an inspection verified the safe state of the site. At the time of the inspection, Ovintiv's rehabilitation and maintenance works were nearing completion.

During inspections conducted in November 2021, May 2022 and October 2023, CNSC staff found that the Madawaska site was well maintained. There were satisfactory environmental protection measures and procedures in place.

Madawaska – safety and control area ratings

Safety and Control Area	2021	2022	2023
Management System	Satisfactory	Below Expectation	Satisfactory
Radiation Protection	Satisfactory	Satisfactory	Satisfactory
Conventional Health and Safety	Satisfactory	Satisfactory	Satisfactory
Environmental Protection	Satisfactory	Satisfactory	Satisfactory

8 Decommissioned Uranium Mines and Mills

8.1 Lorado

The Lorado former mill site is located 8 kilometres south of Uranium City, Saskatchewan.

Figure 8.1.1: Lorado – soil and vegetative cover on tailings area

Source: CNSC

The Lorado uranium mill operated from 1957 to 1960 and was abandoned in the 1960s without any decommissioning or remedial work. The Province of Saskatchewan now has ownership of the site under the Saskatchewan Ministry of Energy and Resources. The ministry has subsequently appointed the Saskatchewan Research Council (SRC) as the project manager to oversee the ongoing management and remediation of the Lorado site. The SRC has a long-term objective to transfer the remediated site into the Saskatchewan Institutional Control Program (ICP) after demonstrating that it is safe and stable for a period of 10 to 15 years.

In 2022 the SRC applied to renew the licence for a period of 10 years to continue their long-term monitoring and maintenance program and allow the SRC to continue to possess, manage and store nuclear substances that are associated with the Lorado site. CNSC staff reviewed the application and on April 17, 2023, a designated officer made the decision to grant the licence on behalf of the Commission.

8.1.1 Performance

As a result of the findings from desktop reviews and general compliance inspections, CNSC staff were satisfied with SRC's performance from 2021 to 2023 at the Lorado site, for the SCAs of radiation protection, environmental protection and conventional health and safety.

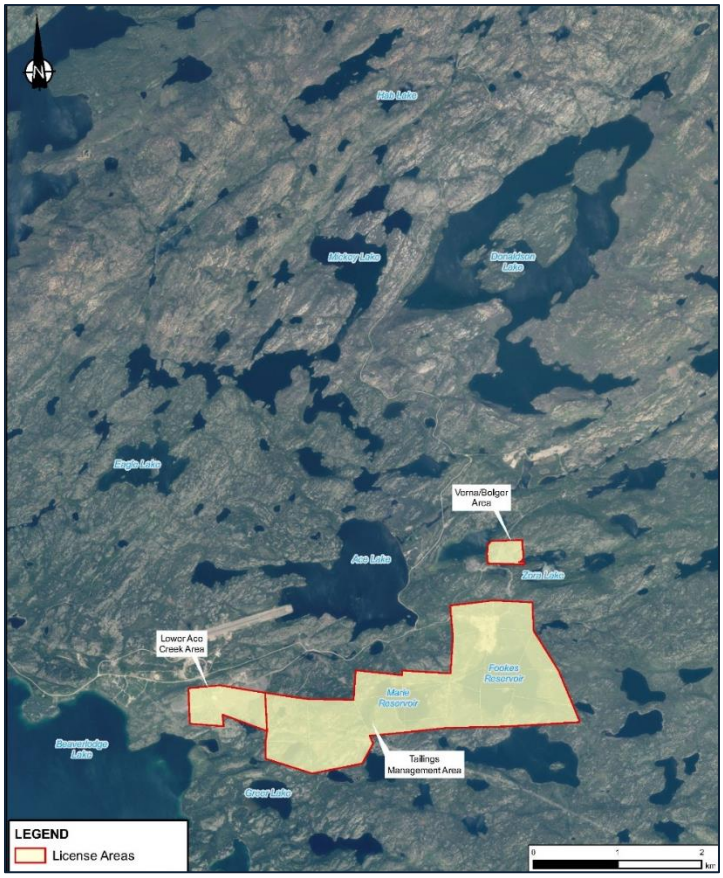
CNSC staff conducted an inspection of the Lorado site in 2022 which verified that SRC was in compliance with its licence.

Lorado – safety and control area ratings

Safety and Control Area	2021	2022	2023
Radiation Protection	Satisfactory	Satisfactory	Satisfactory
Conventional Health and Safety	Satisfactory	Satisfactory	Satisfactory
Environmental Protection	Satisfactory	Satisfactory	Satisfactory

8.2 Beaverlodge

Figure 8.2.1: Beaverlodge Project – site



The decommissioned Beaverlodge uranium mine and mill site is located east of Uranium City in northwest Saskatchewan and the site layout is shown in figure 8.2.1.

Mining and milling activities began at the Beaverlodge site in 1952, and the mine closed in 1982. The Beaverlodge site consisted of a central mill, underground mines, open pit mines and a tailings management area (TMA).

Decommissioning commenced shortly after operations ended and was completed to the standards in place at the time of decommissioning (1985). Beaverlodge was the first uranium mining site in Canada to submit a formal decommissioning plan and to be decommissioned under an Atomic Energy Control Board licence. On behalf of the federal government, Cameco Corporation (Cameco) is the licensee and manages the site conducting routine environmental monitoring, environmental investigations and maintenance work, to verify that the site remains safe and secure.

The site consisted of 70 individual properties. Cameco has been conducting remedial activities and preparing supporting documentation to demonstrate that the properties can be released from CNSC licensing and transferred to the ICP for provincial management. Five properties were released from CNSC licensing in 2009 and transferred to the ICP. On December 19, 2019, the Commission authorized the release of an additional 20 properties.

During the current ROR review period (2021-2023) Cameco requested the release of an additional 18 properties from the CNSC licence. The Commission released the 18 properties from the CNSC issued licence on September 7, 2022, and all of these properties were transferred to the ICP. There has been ongoing Indigenous Nations and public engagement for the Beaverlodge Project in recent years as part of Cameco's plan to have all properties released from licensing and the entire site transferred to the ICP.

Figure 8.2.2 shows a public tour of the site conducted in June 2022. As of December 31, 2023, there are 27 properties remaining within the CNSC licence.

On May 27, 2013, the Commission issued a 10-year licence for the Beaverlodge site. As part of its application, Cameco provided a plan for the implementation of additional remediation to support natural recovery of the site, and a timetable for final decommissioning of the site's various licensed areas. Since issuance of that licence, Cameco completed studies and additional remediation work to support an application to release additional portions of the Beaverlodge site into the ICP.

Figure 8.2.2: public tour, June 2022

Source: CNSC

Cameco had expressed its intent to have the remaining properties released from the CNSC licence as soon as feasible. This was not achievable prior to the licence renewal in 2023 and therefore a 2-year licence renewal was requested by Cameco. On May 10, 2023 the Commission renewed the Beaverlodge licence which is valid until May 31, 2025.

In November 2023 Cameco submitted a Closure Report to demonstrate how the performance indicators and regulatory acceptance criteria have been met along with a long-term monitoring program to be implemented should the site be accepted into the ICP.

8.2.1 Performance

In 2021 to 2023, CNSC staff rated the Beaverlodge site performance as "satisfactory" for all applicable SCAs. The following sections contain additional information on the performance ratings for the SCAs of radiation protection, environmental protection, and conventional health and safety.

Beaverlodge – safety and control area ratings

Safety and Control Area	2021	2022	2023
Radiation Protection	Satisfactory	Satisfactory	Satisfactory
Conventional Health and Safety	Satisfactory	Satisfactory	Satisfactory
Environmental Protection	Satisfactory	Satisfactory	Satisfactory

8.3 Cluff Lake

Figure 8.3.1: Cluff Lake Project – pre-decommissioning view, 2009

Source: Orano

The decommissioned Cluff Lake uranium mine and mill is located in northern Saskatchewan, approximately 75 kilometres south of Lake Athabasca and 30 kilometres east of the provincial border with Alberta. Owned and operated by Orano Canada Inc. (Orano), the Cluff Lake Project operated from 1981 to 2002. Following closure, the major decommissioning activities commenced and were largely completed within 5 years. In September 2013, the Cluff Lake Project reached a major milestone when Orano decommissioned the remaining camp residence and airstrip. Site occupancy was ceased, and access to the site is no longer controlled.

The former Cluff Lake Operation consisted of a central mill, above ground tailings management area (TMA), 3 open pits, 2 underground mines, associated waste rock piles, and site infrastructure including an airstrip and camp (figure 8.3.1).

As part of decommissioning activities, the Claude pit was completely filled in. The DJ/DJX and D pits were flooded and remain isolated from adjacent natural water bodies. Potentially problematic portions of the surface waste rock piles were placed into the pits, while the remainder of the surface waste rock was contoured, covered and revegetated. The portals and vents to the underground mines were closed and the TMA was contoured, covered and revegetated. All structures were dismantled and disposed of.

In February 2020, Orano submitted an application to transfer responsibility for the Cluff Lake property to the province of Saskatchewan. In May 2023, the Commission, pursuant to subsection 24(2) of the *Nuclear Safety and Control Act*, revoked the CNSC licence issued to Orano Canada Inc. for its Cluff Lake Project, and the site has since been transferred to the province of Saskatchewan's Institutional Control Program. Due to no CNSC licence being in place, Cluff Lake will no longer be reported on in future CNSC RORs.

8.3.1 Performance

For the review period between 2021 to 2023, CNSC staff were satisfied with Orano's performance in all relevant SCAs.

Cluff Lake – safety and control area ratings

Safety and Control Area	2021	2022	2023*
Radiation Protection	Satisfactory	Satisfactory	Satisfactory
Conventional Health and Safety	Satisfactory	Satisfactory	Satisfactory
Environmental Protection	Satisfactory	Satisfactory	Satisfactory

*Note that the 2023 rating covers the period until the Commission revoked the CNSC licence issued to Orano.

8.4 Rayrock

The Rayrock idle mine site was formerly a uranium mine and mill. It is located in the Northwest Territories, 74 kilometres northwest from the community of Behchoko (formerly the community of Rae) and 156 kilometres northwest of Yellowknife. Figure 8.4.1 presents an aerial view of the Rayrock idle mine site.

Figure 8.4.1: Rayrock – aerial view

Source: CNSC

The uranium mine and mill operated from 1957 until 1959, when the site was abandoned. The site was then decommissioned and rehabilitated in 1996 by Indigenous and Northern Affairs Canada (INAC) now Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC). A CNSC Designated Officer issued a renewal of CIRNAC's CNSC licence on June 30, 2017, for a period of 10 years (until June 30, 2027). Subsequently, CNSC staff issued a licence conditions handbook (LCH) to provide guidance on the compliance strategy for the Rayrock mine site. In September 2020, CIRNAC submitted an application to amend their current licence in order to perform remediation work. CNSC staff reviewed the application and requested additional information from the licensee and have accepted their plan. CNSC staff are in the process of finalizing a licence amendment package for the Rayrock site in order for remedial work to begin during the Summer of 2024.

8.4.1 Performance

For the review period of 2021 to 2023, CNSC staff were satisfied with CIRNAC's performance in the SCAs of environmental protection, radiation protection and conventional health and safety. CIRNAC's performance over the reporting period has been stable and has met the requirements of the *Nuclear Safety and Control Act* [1] and its associated regulations.

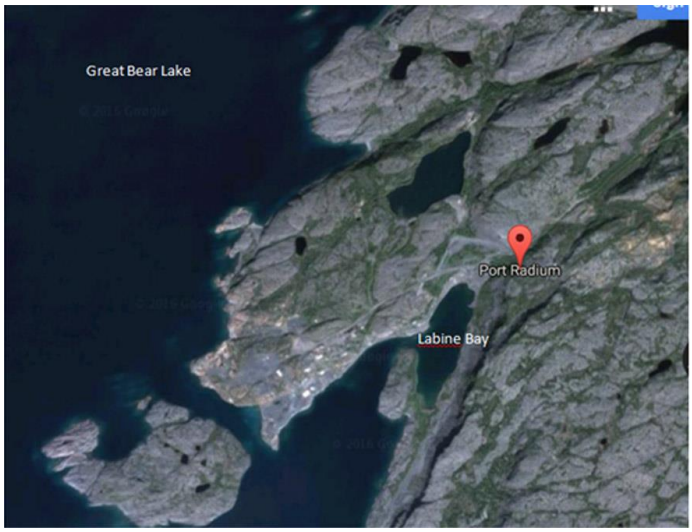
According to the CNSC's risk-informed baseline inspection plan, Rayrock is subject to a minimum of 1 compliance inspection every 3 years. CNSC staff conducted an inspection in 2019. In 2020, CNSC staff reviewed CIRNAC's response to the findings from this inspection and are satisfied with CIRNAC's corrective actions. The next inspection is scheduled to take place in the summer of 2024, in conjuncture with CIRNAC's proposed remedial works.

Rayrock – safety and control area ratings

Safety and Control Area	2021	2022	2023
Radiation Protection	Satisfactory	Satisfactory	Satisfactory
Conventional Health and Safety	Satisfactory	Satisfactory	Satisfactory
Environmental Protection	Satisfactory	Satisfactory	Satisfactory

8.5 Port Radium

Figure 8.5.1: Port Radium – idle mine site



Source: Google Earth

The Port Radium idle mine site is located in the Northwest Territories at Echo Bay on the eastern shores of Great Bear Lake, about 265 kilometres east of the Dene community of Deline at the edge of the Arctic Circle (figure 8.5.1).

The mine was in operation for 50 years, from 1932 to 1982. The site covers approximately 12 hectares and is estimated to contain 1.7 million tonnes of uranium and silver tailings. The site was partially decommissioned in 1984, according to the standards at that time. In 2006, the Government of Canada reached an agreement with the local community and completed the remediation of the site in 2007 under a CNSC licence granted to Indigenous and Northern Affairs Canada (INAC) now Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC). On December 31, 2016, a CNSC Designated Officer issued a licence renewal to CIRNAC for a period of 10 years (until December 31, 2026), in order to allow continued long-term maintenance and monitoring of the Port Radium site. In 2017, CNSC staff issued a licence conditions handbook to provide guidance on the compliance strategy for the Port Radium site.

8.5.1 Performance

From 2021 to 2023, CNSC staff rated CIRNAC's performance in the radiation protection, environmental protection, and conventional health and safety SCAs as satisfactory and in the operating performance SCA as below expectations.

CIRNAC's performance in the operating performance SCA was rated as "below expectations" due to insufficient annual reporting of licensed activities – for certain years, CIRNAC did not submit annual compliance monitoring reports as required by their licence. As a result of this, CNSC staff issued CIRNAC with a written notice to take corrective actions to provide CNSC staff written reports of activities performed under WNSL-W5-3207.0/2026 during the 2021, 2022 and 2023 calendar years. CIRNAC has indicated that site activity in these years where reporting was not submitted was extremely minimal, and is currently working to implement corrective actions to submit the requested reporting by May 31, 2024.

According to CNSC's risk-informed baseline inspection plan, Port Radium is subject to a minimum of 1 compliance inspection every 3 years. CNSC staff conducted a baseline compliance inspection during the summer of 2022. The next baseline compliance inspection is planned for the summer of 2025.

Port Radium – safety and control area ratings

Safety and Control Area	2021	2022	2023
Radiation Protection	Satisfactory	Satisfactory	Satisfactory
Conventional Health and Safety	Satisfactory	Satisfactory	Satisfactory
Environmental Protection	Satisfactory	Satisfactory	Satisfactory
Operating Performance	Below Expectations	Below Expectations	Below Expectations

8.6 Agnew Lake

Figure 8.6.1: Agnew Lake – idle mine site

Source: CNSC

The Agnew Lake Tailings Management Area (ALTMA) is located about 25 kilometres northwest of Nairn Centre, Ontario. The uranium mine site was decommissioned and monitored by Kerr Addison Mines from 1983 until 1988. The site was then turned over to the Province of Ontario in the early 1990s. In November 2018, the Ontario Ministry of Energy, Northern Development and Mines (ENDM), now the Ontario Ministry of Mines (MINES), submitted an application to renew the current CNSC licence for a period of 5 years as well as amend their radioactive waste inventory to add approximately 20,000 m^3 of niobium bearing material classified as naturally occurring radioactive material (NORM) from the former Beaucage Mine near North Bay. The additional niobium bearing material as well as a layer of clean soil will be used to make repairs to the cover of the existing ALTMA site to better cover these. On July 29, 2020, the CNSC Designated Officer issued ENDM (now MINES) an amended waste nuclear substance licence for ALTMA and the current licence is valid until July 31, 2025. For the foreseeable future, the site is expected to remain under long-term monitoring and maintenance.

8.6.1 Performance

For the review period of 2021 to 2023, CNSC staff were satisfied with MINES' performance in the SCAs of radiation protection, environmental protection and conventional health and safety. MINES' performance over the reporting period has been stable and met the requirements of the *Nuclear Safety and Control Act* [1] and its associated regulations.

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. A baseline compliance inspection of ALTMA is scheduled for the fall of 2024.

Agnew Lake – safety and control area ratings

Safety and Control Area	2021	2022	2023
Radiation Protection	Satisfactory	Satisfactory	Satisfactory
Conventional Health and Safety	Satisfactory	Satisfactory	Satisfactory
Environmental Protection	Satisfactory	Satisfactory	Satisfactory

8.7 Bicroft

The Bicroft tailings management facility, owned and operated by Barrick Gold Corporation (Barrick Gold), is located on the south side of Highway 118, approximately 2 kilometres west of Cardiff, Ontario. The current licence was issued by a CNSC Designated Officer to Barrick Gold on February 24, 2021, and is valid until February 29, 2036. For the foreseeable future, the site is expected to remain under long term monitoring and maintenance (see figure 8.7.1).

Figure 8.7.1: Bicroft – spillway of Pond A at the tailings management facility, 2017

Source: CNSC

The Bicroft facility was constructed to contain tailings from mining operations that were carried out at the nearby Bicroft mine, which operated from 1956 to 1962. The uranium tailings stored in the Bicroft tailings storage site resulted from the processing of low-grade uranium ore from the Bicroft mine. Remediation work included upgrading of dams in 2022 and 2023.

8.7.1 Performance

For the period of 2021 to 2023, CNSC staff were satisfied with Barrick Gold's performance in the SCAs of radiation protection, environmental protection and conventional health and safety at the Bicroft site. The licensee's performance over the reporting period has been stable and met the requirements of the *Nuclear Safety and Control Act* [1] and its associated regulations.

According to CNSC's risk-informed baseline inspection plan, Bicroft is subject to a minimum of 1 compliance inspection every 3 years. The last geotechnical/baseline inspection took place in November 2021. CNSC staff found that the site was well managed and maintained, and that satisfactory environmental protection measures and procedures were in place. As an example, the licensee continued maintenance improvements by removing vegetation on certain dams and beaver cuttings to protect the overall integrity of the dams, as well as performing maintenance work to Dam H which included additional material being placed on the toe berm.

Bicroft – safety and control area ratings

Safety and Control Area	2021	2022	2023
Radiation Protection	Satisfactory	Satisfactory	Satisfactory
Conventional Health and Safety	Satisfactory	Satisfactory	Satisfactory
Environmental Protection	Satisfactory	Satisfactory	Satisfactory

8.8 Dyno

The Dyno closed mine property, a legacy uranium mine located near Farrel Lake, about 30 km southwest of Bancroft, Ontario. The site was operated from 1958 to 1960 and was decommissioned in the 1980s. Ovintiv Canada ULC (Ovintiv) is the licensee of the Dyno site. EWL Canada Ltd. was the licensee until 2022. For the foreseeable future, the site will remain under long-term monitoring and maintenance.

Figure 8.8.1: Dyno – dam and toe berm

Source: EWL Management

The property consists of an abandoned sealed underground uranium mine; a mill, which has been demolished; capped openings; a tailings area; 1 dam with a toe berm; and various roadways.

8.8.1 Performance

For the years from 2021 to 2023, CNSC staff were satisfied with Ovintiv's performance in the SCAs of radiation protection, environmental protection and conventional health and safety. Performance over the reporting period at the Dyno site was stable and met the requirements of the *Nuclear Safety and Control Act* and its associated regulations.

In 2022 EnCana – the parent company of EWL Canada Ltd. – became Ovintiv Canada ULC. As part of this reorganization, in February 2022 Ovintiv dissolved EWL Canada Ltd. CNSC staff were informed of these changes in March. This left the Dyno site (and the nearby Madawaska site, discussed in section 7.2) without a licensee, as EWL's licences were not transferred to Ovintiv prior to EWL's dissolution. In light of those events, in May of 2022 CNSC staff carried out a reactive inspection of the Dyno and Madawaska sites. This inspection found that the sites were in a safe state, and resulted in an Inspector's Order requiring Ovintiv to comply with the conditions of EWL's former licence to ensure continued safe operations.

Ovintiv subsequently applied for a new licence and provided an updated financial guarantee. A new licence was issued by a designated officer in August of 2023, valid until 2034, and the order was closed by CNSC staff in October 2023 after an inspection verified the safe state of the site.

During inspections conducted in November 2021, May 2022 and October 2023, CNSC staff found that the Dyno site was well maintained. There were satisfactory environmental protection measures and procedures in place.

Dyno – safety and control area ratings

Safety and Control Area	2021	2022	2023
Management System	Satisfactory	Below Expectation	Satisfactory
Radiation Protection	Satisfactory	Satisfactory	Satisfactory
Conventional Health and Safety	Satisfactory	Satisfactory	Satisfactory
Environmental Protection	Satisfactory	Satisfactory	Satisfactory

8.9 Elliot Lake – Rio Algom Sites

Figure 8.9.1: Elliot Lake – spillway at the Quirke mine site

Source: CNSC

Rio Algom Limited (RAL) is the owner and licensee of 9 decommissioned uranium mines in the Elliot Lake area of northeastern Ontario: Stanleigh, Quirke, Panel, Spanish, American, Milliken, Lacnor, Nordic, Buckles and Pronto, as well as some peripheral areas. The Panel mine was the last to operate and ceased operation in 1990. Decommissioning for the entire Elliot Lake area concluded in 2001 with the completion of the vegetative cover at the Pronto site. Figure 8.9.1 shows the spillway inlet of Quirke Dam M at the Quirke decommissioned mine site.

The mine sites and associated tailings management areas (TMAs) are managed under a single CNSC licence, which is of an indefinite term. The sites have all been decommissioned and the TMAs are in the long-term care and maintenance phase. RAL conducts site-specific and regional environmental monitoring programs, operates the effluent treatment plants, inspects and maintains the sites in the Elliot Lake area. The long-term plan for these sites is to reach a state where water treatment is no longer required and reliance on physical works can be reduced.

8.9.1 Performance

For the review period of 2021 to 2023, CNSC staff were satisfied with RAL's performance in the SCAs of radiation protection, environmental protection and conventional health and safety.

In October of 2021 CNSC staff inspected all of the Elliot Lake area sites, including each of the sites licensed to Rio Algom. CNSC staff found that all sites were well managed and had no compliance issues. CNSC staff confirmed the dams and associated structures were in good operating condition and appeared well maintained. Effluent water quality at all discharge locations was in compliance with licence limits.

In October of 2023, CNSC staff performed a fitness for service inspection at the decommissioned Pronto site to assess the effectiveness of the water treatment plant's during on-going construction activities and to observe the construction activities. This inspection resulted in 2 notices on non-compliance which were of low safety significance and corrected by the licensee.

Elliot Lake – safety and control area ratings

Safety and Control Area	2021	2022	2023
Radiation Protection	Satisfactory	Satisfactory	Satisfactory
Conventional Health and Safety	Satisfactory	Satisfactory	Satisfactory
Environmental Protection	Satisfactory	Satisfactory	Satisfactory

8.10 Elliot Lake – Denison and Stanrock

Denison Mines Inc. is the licensee for the 2 closed uranium mines of Denison and Stanrock in the Elliot Lake area of northeastern Ontario. The Denison and Stanrock sites are licensed individually under separate licences with indefinite licence periods.

Figure 8.10.1: Denison – Dam 16

Source:

The licences 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. The licensee conducts onsite inspection programs and verifies that local and area-wide environmental monitoring programs are in place. Figure 8.10.1 provides a view of Dam 16 at the Denison mine site area.

The Denison and Stanrock mine sites were decommissioned in 1997 and 1999 respectively, and there are no mining or milling structures remaining. The tailings management areas (TMAs) are in the long-term care and maintenance phase, which includes water treatment, source and watershed monitoring. The Denison mine site contains 2 TMAs that are covered by water and contain a total of 63 million tonnes of uranium mine tailings. The Stanrock site is a dry TMA with a head pond upstream of Dam A and contains 6 million tonnes of uranium mine tailings.

8.10.1 Performance

For the review period of 2021 to 2023, CNSC staff were satisfied with the licensee's performance in the SCAs of radiation protection, environmental protection, and conventional health and safety. The licensee's performance at the Denison and Stanrock sites has been stable and met requirements of the *Nuclear Safety and Control Act* [1] and its associated regulations.

In October of 2021, CNSC staff inspected all of the Elliot Lake area sites, including Denison and Stanrock. CNSC staff found that all sites were well managed and had no compliance issues. CNSC staff confirmed the dams and associated structures were in good operating condition and appeared well maintained. Effluent water quality at all discharge locations were tested by Denison and Stanrock and the results were in compliance with licence limits.

Denison and Stanrock – safety and control area ratings

Safety and Control Area	2021	2022	2023
Radiation Protection	Satisfactory	Satisfactory	Satisfactory
Conventional Health and Safety	Satisfactory	Satisfactory	Satisfactory
Environmental Protection	Satisfactory	Satisfactory	Satisfactory

9 Safety And Control Area (Historic and Decommissioned Facilities) and Performance

9.1 Radiation Protection

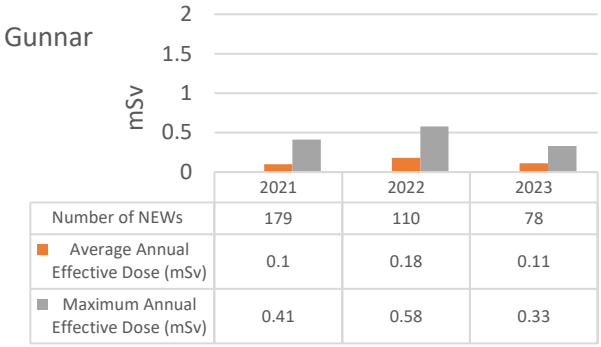
The radiation protection SCA covers the implementation of a radiation protection program in accordance with the *Radiation Protection Regulations*. The program must ensure that contamination levels and radiation doses received by individuals are monitored, controlled and maintained as low as reasonably achievable (ALARA).

Licensees include program documentation for the radiation protection SCA as part of the overall management system documents; these form part of the licensing basis for these facility in their LCH's.

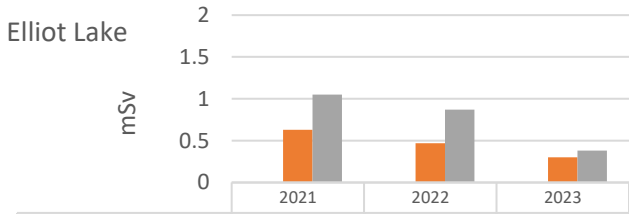
Gamma doses are monitored at Elliot Lake, Denison and Stanrock, and Gunnar due to ongoing work on site. For the review period of 2021 to 2023, figure 9.1 shows the number of NEWs, average annual effective dose, and maximum annual effective dose.

From 2021 to 2023, CNSC staff verified that there were no gamma doses above the detection threshold recorded for nuclear energy workers at any of the historic and decommissioned mine and mill facilities and will continue to monitor the program's effectiveness.

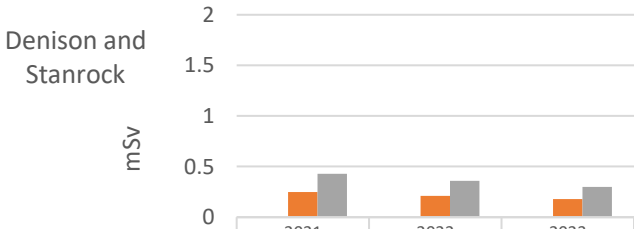
Figure 9.1: Radiation Protection Data - 2021-2023



	2021	2022	2023
Number of NEWs	179	110	78
Average Annual Effective Dose (mSv)	0.1	0.18	0.11
Maximum Annual Effective Dose (mSv)	0.41	0.58	0.33



	2021	2022	2023
Number of NEWs	9	10	5
Average Annual Effective Dose (mSv)	0.63	0.47	0.3
Maximum Annual Effective Dose (mSv)	1.05	0.87	0.38



	2021	2022	2023
Number of NEWs	12	12	11
Average Annual Effective Dose (mSv)	0.25	0.21	0.18
Maximum Annual Effective Dose (mSv)	0.43	0.36	0.3

9.2 Conventional Health and Safety

The conventional health and safety SCA covers the implementation of a program to manage workplace safety hazards and to protect workers.

Licensees include program documentation for the conventional health and safety SCA as part of the overall management system documents; these form part of the licensing basis for these sites.

For the review period of 2021 to 2023, CNSC staff were satisfied with the conventional health and safety programs at all historic and decommissioned uranium mine and mill facilities and will continue to monitor the program's effectiveness.

9.3 Environmental Protection

The environmental protection SCA covers programs that identify, control and monitor all releases of radioactive and hazardous substances and effects on the environment from facilities or as the result of licensed activities.

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.

CNSC staff reviewed air emissions 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.

CNSC staff verified that the effluent water quality for constituents of potential concern consistently met discharge criteria at all TMAs.

For the review period of 2021 to 2023, CNSC staff were satisfied that adequate measures were in place to protect the public and the environment at all historic and decommissioned uranium mine and mill facilities.

10 Conclusions

CNSC staff concluded that, between 2021 and 2023, historic and decommissioned uranium mines and mills in Canada operated safely. This assessment was based on CNSC staff's verification of licensee activities, including inspections, reviews of reports submitted by licensees, and reviews of events supported by follow-up and general communication with the licensees.

For 2021 to 2023, the performance safety ratings for all 14 SCAs were rated as "satisfactory" with the exception of Port Radium for their operating performance SCA.

11 Glossary

For definitions of terms used in this document, see REGDOC-3.6, *Glossary of CNSC Terminology*, which includes terms and definitions used in the *Nuclear Safety and Control Act* and the Regulations made under it, and in CNSC regulatory documents and other publications.

Appendix A: List of Inspections

The following table present CNSC's inspections by facility and safety control area (SCA) for the facilities discussed in this report.

Table A-1: Operating Uranium Mines and Mills - Inspections by facility and SCA

Facility	Method	Safety and control area	Notices of non-compliance	Inspection report issued
Cigar Lake Operation	On Site	Management System Fitness for Service Conventional Health and Safety Environmental Protection Waste Management	2	April 17, 2023
	On Site	Conventional Health and Safety Radiation Protection	7	June 30, 2023
	On Site	Fitness For Service Radiation Protection Security	1	August 14, 2023
	On Site	Human Performance Management Environmental Protection Conventional Health and Safety Packaging and Transport	2	August 30, 2023
	On Site	Physical Design Environmental Protection	0	December 5, 2023
	On Site	Waste Management Conventional Health and Safety Emergency Management & Fire Protection Radiation Protection	6	February 15, 2024

Facility	Method	Safety and control area	Notices of non-compliance	Inspection report issued
McArthur River Operation	On Site	Management System Human Performance Management Operating Performance Radiation Protection Conventional Health and Safety Waste Management	4	April 11, 2023
	On Site	Fitness for Service	0	May 11, 2023
	On Site	Fitness for Service Radiation Protection Conventional Health and Safety Environmental Protection Emergency Management and Fire Protection Packaging and Transport	1	May 23, 2023
	On Site	Environmental Protection	3	December 5, 2023
	On Site	Safety Analysis Physical Design Radiation Protection Conventional Health and Safety Waste Management	5	October 16, 2023
	On Site	Operating Performance Radiation Protection Conventional Health and Safety Emergency Management and Fire Protection	2	December 15, 2023
	On Site	Radiation Protection Conventional Health and Safety Waste Management Security	4	January 24, 2024

Facility	Method	Safety and control area	Notices of non-compliance	Inspection report issued
Rabbit Lake Operation	On Site	Human Performance Management Fitness for Service Radiation Protection Emergency Management and Fire Protection	10	July 14, 2023
	On Site	Human Performance Management Fitness for Service Radiation Protection Conventional Health and Safety	8	November 3, 2023
	On Site	Radiation Protection Emergency Management and Fire Protection	2	December 15, 2023
Key Lake Operation	On Site	Safety Analysis Physical Design Radiation Protection Security Packaging and Transport	5	November 1, 2023
	On Site	Operating Performance Fitness for Service Radiation Protection Conventional Health and Safety Environmental Protection Security	2	July 5, 2023
	On Site	Operating Performance Radiation Protection Conventional Health and Safety Environmental Protection Emergency Management and Fire Protection	7	November 22, 2023
McClean Lake Operation	On Site	Human Performance Management Conventional Health and Safety Environmental Protection Emergency Management and Fire Protection	11	July 6, 2023
	On Site	Operating Performance	8	September 6, 2023
	On Site	Radiation Protection Conventional Health and Safety Environmental Protection	3	November 27, 2023

Appendix B: Cigar Lake Operation Dashboards

The following dashboards show the overall performance of the Cigar Lake Operation for the reported year, and was provided to Indigenous Nations and Communities, the public, and any interested party who requested information on the performance of the Cigar Lake Operation.

Data described in the dashboards can be obtained in machine readable format through the Open Government Portal, or by sending a request to the CNSC.

B.1 Licensing and Compliance

Licence Term	Financial Guarantee	Licence:
July 1, 2017 to June 30, 2031	$ 61,791,233.00	UML-MINE-CIGAR.00/2031

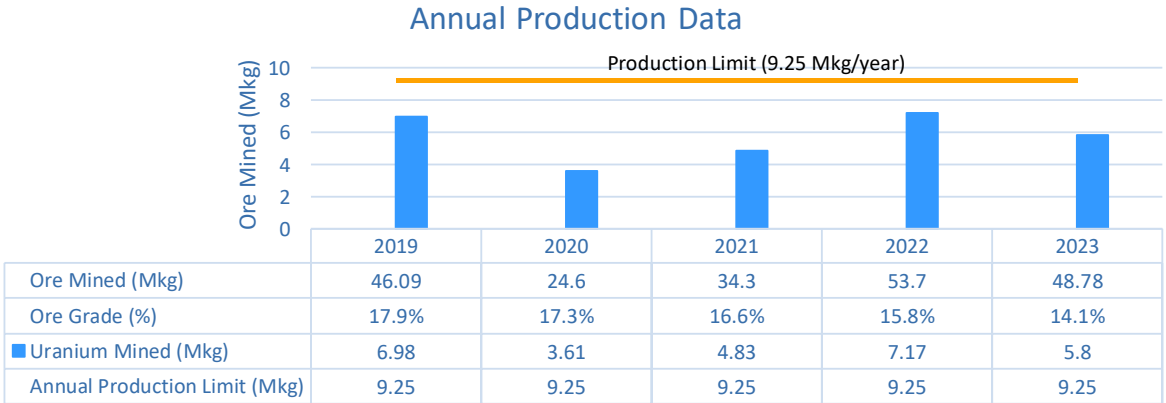
Figure 3.1: Cigar Lake Operation - aerial view looking north

Cigar Lake Operation Facilities that CNSC Staff Inspects:
Underground mine
Slurry load-out building
Waste management facilities
Water treatment plant
Surface freeze plants
Ancillary buildings
Warehouses

Safety and Control Area Rating	
Safety and Control Area	**Rating**
Management Systems	Satisfactory
Human Performance	Satisfactory
Operating Performance	Satisfactory
Safety Analysis	Satisfactory
Physical Design	Satisfactory
Fitness for Service	Satisfactory
Radiation Protection	Satisfactory
Conventional Health and Safety	Satisfactory
Environmental Protection	Satisfactory
Emergency Management and Fire Protection	Satisfactory
Waste Management	Satisfactory
Security	Satisfactory
Safetguards and Non-Proliferation	Satisfactory
Packaging and Transport	Satisfactory

Cigar Lake Operation is situated within historic Treaty 10 (1906) and Homeland of the Métis and is within the traditional territories of the Dene, Cree, and Métis peoples.

Inspection Data	
Number of Inspections:	6
Number of NNCs:	18
Safety Significance	
Low:	18
Medium:	0
High:	0

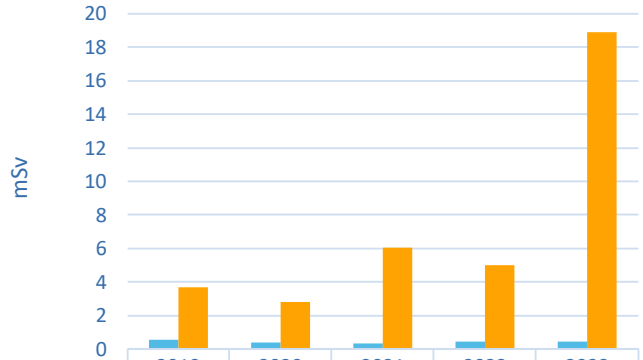


	2019	2020	2021	2022	2023
Ore Mined (Mkg)	46.09	24.6	34.3	53.7	48.78
Ore Grade (%)	17.9%	17.3%	16.6%	15.8%	14.1%
Uranium Mined (Mkg)	6.98	3.61	4.83	7.17	5.8
Annual Production Limit (Mkg)	9.25	9.25	9.25	9.25	9.25

B.2 Protection of People

The CNSC has the mandate for the protection of people, both nuclear energy workers (NEWs) as well as the public. This dashboard provides information on Cigar Lake Operation's efforts on radiation protection and conventional health and safety.

Effective Dose Data Trends



	2019	2020	2021	2022	2023
Average Effective Dose	0.57	0.38	0.32	0.46	0.42
Maximum Individual Dose	3.7	2.82	6.03	5	18.92

Maximum Annual Dose

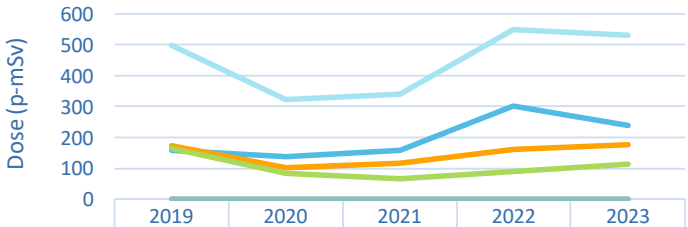
18.92 mSv

(maximum 50 mSv/year)

Total Number of NEWs:

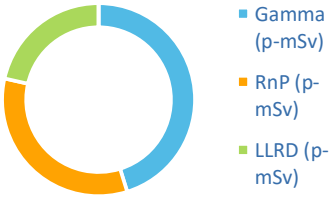
1252

5-Year Annual Collective Dose

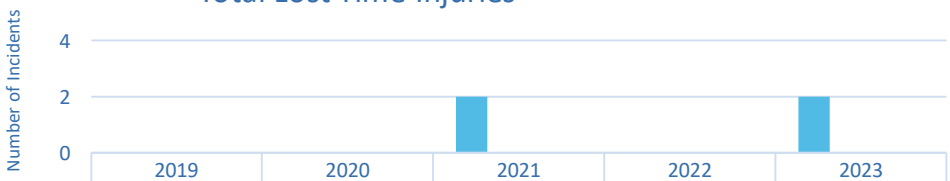


	2019	2020	2021	2022	2023
Gamma (p-mSv)	158	138	157	301	240
RnP (p-mSv)	173	103	117	160	177
LLRD (p-mSv)	166	83	67	89	114
RnG (p-mSv)	0	0	0	0	0
Total (p-mSv)	497	324	341	550	531

Collective Dose for Report Year



Total Lost Time Injuries



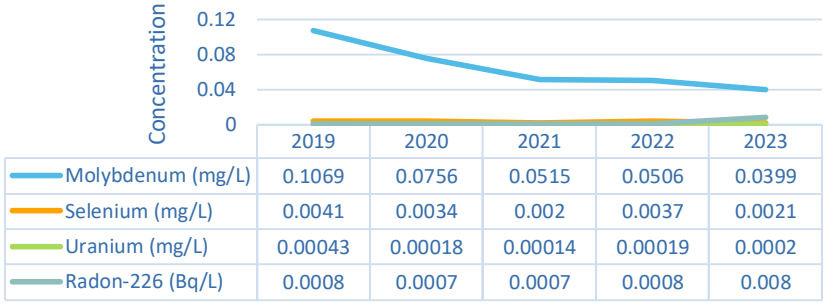
	2019	2020	2021	2022	2023
Loss Time Injuries	0	0	2	0	2
Severity Rate	0	0	3.31	4.18	6.29
Frequency Rate	0	0	0.37	0	0.29
Total Recordable Incident Rate	1.67	2.08	2.6	2.69	2.78

The data along with compliance activities give CNSC staff confidence that people are protected.

B.3 Protection of Environment

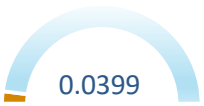
The CNSC has the mandate for the protection of the environment, and CNSC staff ensure that all licensees maintain effective environmental protection programs. This dashboard provides information on Cigar Lake Operation's efforts on environmental protection.

Annual Average Effluent Releases 5 Year Trend



	2019	2020	2021	2022	2023
Molybdenum (mg/L)	0.1069	0.0756	0.0515	0.0506	0.0399
Selenium (mg/L)	0.0041	0.0034	0.002	0.0037	0.0021
Uranium (mg/L)	0.00043	0.00018	0.00014	0.00019	0.0002
Radon-226 (Bq/L)	0.0008	0.0007	0.0007	0.0008	0.008

Molybdenum Effluent Release

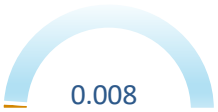


mg/L
(maximum 1 mg/L)

Radium-226 Effluent Release

Bq/L
(maximum 0.37 Bq/L)

Uranium Effluent Release

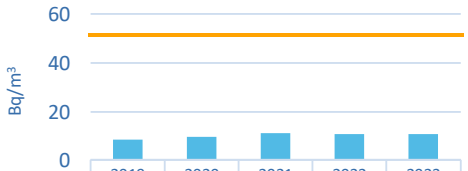


mg/L
(maximum 2.5 mg/L)

Selenium Effluent Release

mg/L
(maximum 0.6 mg/L)

Ambient Radon in Air

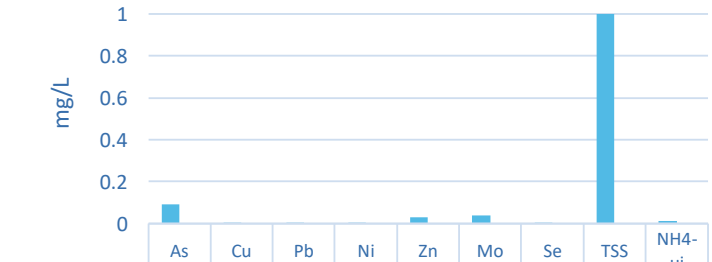


	2019	2020	2021	2022	2023
Radon	8.6	9.8	11.2	10.9	10.7

Spills

	2019	2020	2021	2022	2023
Spills	3	0	4	2	7

Annual Average Parameter Concentration Values in Effluent Released to the Environment



	As	Cu	Pb	Ni	Zn	Mo	Se	TSS	NH4-ui
Concentration	0.0921	0.0003	0.0001	0.0009	0.029	0.0399	0.0021	1	0.01
Limit	0.3	0.3	0.2	0.5	0.5	1	0.6	15	0.5

Metal and Radionuclides in Air			
Analyte	**Unit**	**Limit**	**Measured**
TSP	µg/m3	60	16.8
As	µg/m3	0.06	0.0011
Cu	µg/m3	9.6	0.0029
Mo	µg/m3	23	0.0004
Ni	µg/m3	0.04	0.001
Pb	µg/m3	0.1	0.0007
Se	µg/m3	1.9	0.00004
Zn	µg/m3	23	0.014
Pb-210	Bq/m3	0.021	0.000435
Po-210	Bq/m3	0.028	0.000155
Ra-226	Bq/m3	0.013	0.000037
Th-230	Bq/m3	0.0085	0.000019
U	µg/m3	0.06	0.0017

The data along with compliance activities give CNSC staff confidence that the environment is protected.

Appendix C: McArthur River Operation Dashboards

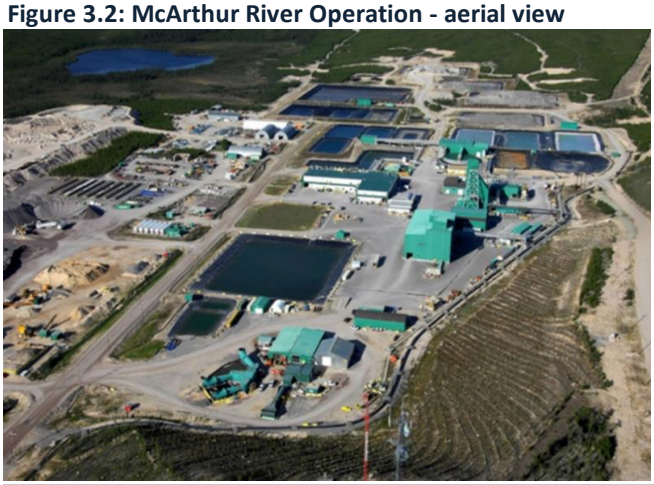
The following dashboards show the overall performance of the McArthur River Operation for the reported year, and was provided to Indigenous Nations and Communities, the public, and any interested party who requested information on the performance of the McArthur River Operation.

Data described in the dashboards can be obtained in machine readable format through the Open Government Portal, or by sending a request to the CNSC.

C.1 Licensing and Compliance

Licence Term	Financial Guarantee	Licence:
November 1, 2023 to October 31, 2043	$ 42,100,000.00	UML-MINE-McARTHUR.01/2043

Figure 3.2: McArthur River Operation - aerial view



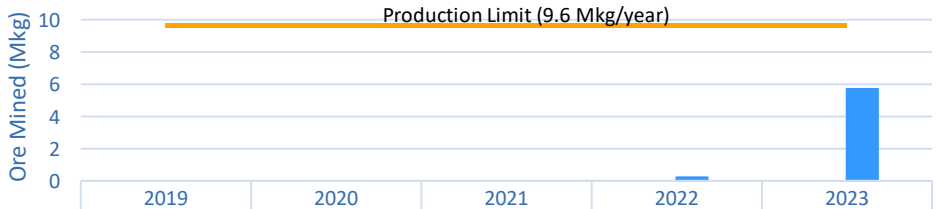
McArthur River Operation Facilities that CNSC Staff Inspects:
Underground mine
Primary ore processing
Ore slurry loading
Waste management facilities
Water treatment plant
Effluent storage ponds
Surface freeze plants
Ancillary buildings
Warehouses

Safety and Control Area Rating	
Safety and Control Area	**Rating**
Management Systems	Satisfactory
Human Performance	Satisfactory
Operating Performance	Satisfactory
Safety Analysis	Satisfactory
Physical Design	Satisfactory
Fitness for Service	Satisfactory
Radiation Protection	Satisfactory
Conventional Health and Safety	Satisfactory
Environmental Protection	Satisfactory
Emergency Management and Fire Protection	Satisfactory
Waste Management	Satisfactory
Security	Satisfactory
Safetguards and Non-Proliferation	Satisfactory
Packaging and Transport	Satisfactory

McArthur River Operation is situated within historic Treaty 10 (1906) and Homeland of the Métis and is within the traditional territories of the Dene, Cree, and Métis peoples.

Inspection Data	
Number of Inspections:	7
Number of NNCs:	19
Safety Significance	
Low:	19
Medium:	0
High:	0

Annual Production Data

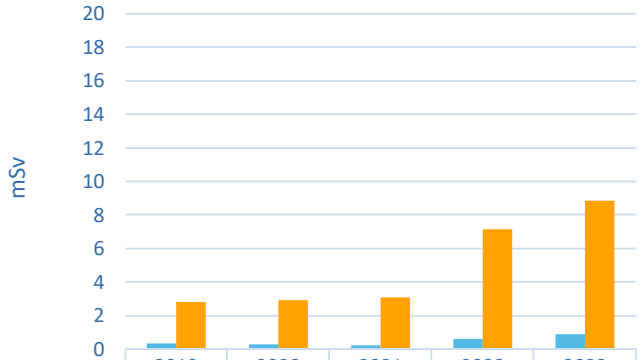


	2019	2020	2021	2022	2023
Ore Mined (Mkg)	0	0	0	3.53	67.7
Ore Grade (%)	0.0%	0.0%	0.0%	8.3%	8.4%
Uranium Mined (Mkg)	0	0	0	0.25	5.68
Annual Production Limit (Mkg)	9.6	9.6	9.6	9.6	9.6

C.2 Protection of People

The CNSC has the mandate for the protection of people, both nuclear energy workers (NEWs) as well as the public. This dashboard provides information on McArthur River Operation's efforts on radiation protection and conventional health and safety.

Effective Dose Data Trends



	2019	2020	2021	2022	2023
Average Effective Dose	0.33	0.27	0.25	0.59	0.87
Maximum Individual Dose	2.82	2.94	3.06	7.14	8.87

Maximum Annual Dose

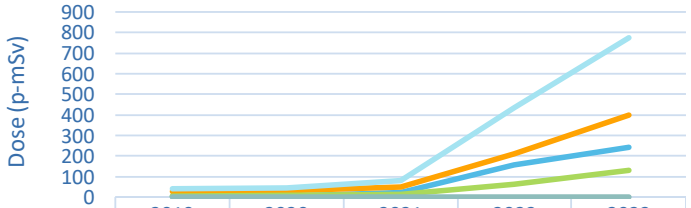
mSv

(maximum 50 mSv/year)

Total Number of NEWs:

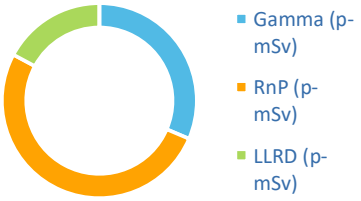
899

5-Year Annual Collective Dose



	2019	2020	2021	2022	2023
Gamma (p-mSv)	7	5	21	158	243
RnP (p-mSv)	30	34	49	213	398
LLRD (p-mSv)	6	8	12	62	133
RnG (p-mSv)	0	0	0	0	0
Total (p-mSv)	43	47	82	433	774

Collective Dose for Report Year



Total Lost Time Injuries

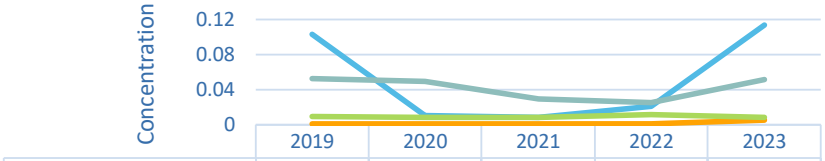
	2019	2020	2021	2022	2023
Loss Time Injuries	0	0	0	0	1
Severity Rate	0	0	0	0	0.75
Frequency Rate	0	0	0	0	0.19
Total Recordable Incident Rate	0.7	1.97	2.12	5.02	1.88

The data along with compliance activities give CNSC staff confidence that people are protected.

C.3 Protection of Environment

The CNSC has the mandate for the protection of the environment, and CNSC staff ensure that all licensees maintain effective environmental protection programs. This dashboard provides information on McArthur River Operation's efforts on environmental protection.

Annual Average Effluent Releases 5 Year Trend



	2019	2020	2021	2022	2023
Molybdenum (mg/L)	0.103	0.0096	0.0084	0.0204	0.1136
Selenium (mg/L)	0.0003	0.0003	0.0003	0.0002	0.0048
Uranium (mg/L)	0.0085	0.0084	0.0079	0.0108	0.0076
Radium-226 (Bq/L)	0.052	0.049	0.029	0.025	0.051

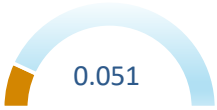
Molybdenum Effluent Release

mg/L
(maximum 1 mg/L)

Uranium Effluent Release

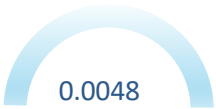
mg/L
(maximum 2.5 mg/L)

Radium-226 Effluent Release



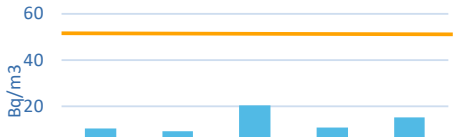
Bq/L
(maximum 0.37 Bq/L)

Selenium Effluent Release



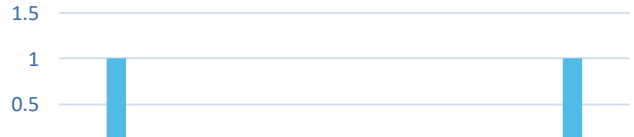
mg/L
(maximum 0.6 mg/L)

Ambient Radon in Air



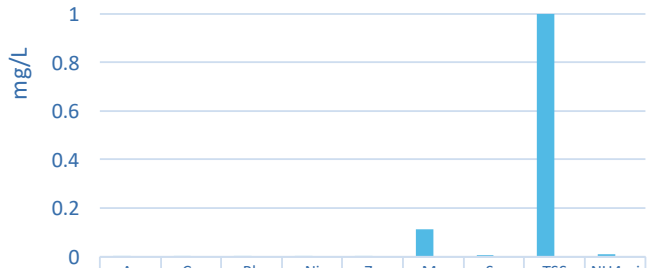
	2019	2020	2021	2022	2023
Radon	10.4	9.5	20.5	10.8	15.4

Spills



	2019	2020	2021	2022	2023
Spills	1	0	0	0	1

Annual Average Parameter Concentration Values in Effluent Released to the Environment



	As	Cu	Pb	Ni	Zn	Mo	Se	TSS	NH4-ui
Concentration	0.0002	0.0005	0.0001	0.0014	0.0028	0.1136	0.0048	1	0.01
Limit	0.3	0.3	0.2	0.5	0.5	1	0.6	15	0.5

Metal and Radionuclides in Air			
Analyte	**Unit**	**Limit**	**Measured**
TSP	µg/m3	60	7.2
As	µg/m3	0.06	0.0000888
Cu	µg/m3	9.6	0.0229
Ni	µg/m3	0.04	0.000503
Pb	µg/m3	0.1	0.00112
Se	µg/m3	1.9	0.0000475
Zn	µg/m3	23	0.00728
Pb-210	Bq/m3	0.021	0.000479
Po-210	Bq/m3	0.028	0.000193
Ra-226	Bq/m3	0.013	0.00000588
Th-230	Bq/m3	0.0085	0.00000725
U	µg/m3	0.06	0.000371

The data along with compliance activities give CNSC staff confidence that the environment is protected.

Appendix D: Rabbit Lake Operation Dashboards

The following dashboards show the overall performance of the Rabbit Lake Operation for the reported year, and was provided to Indigenous Nations and Communities, the public, and any interested party who requested information on the performance of the Rabbit Lake Operation.

Data described in the dashboards can be obtained in machine readable format through the Open Government Portal, or by sending a request to the CNSC.

D.1 Licensing and Compliance

Licence Term	Financial Guarantee	Licence:
November 1, 2023 to October 31, 2043	$ 42,100,000.00	UML-MINEMILL-RABBIT.00/2038

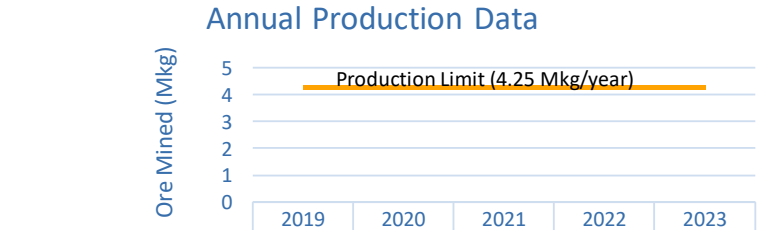
Figure 3.3: Rabbit Lake Operation - aerial view of Mill

Rabbit Lake Operation Facilities that CNSC Staff Inspects:
Underground mine
3 mined-out pits
In-pit tailings management facility
Mill
Water treatment plant
Supporting infrastructure
Ancillary buildings

Safety and Control Area Rating	
Safety and Control Area	**Rating**
Management Systems	Satisfactory
Human Performance	Satisfactory
Operating Performance	Satisfactory
Safety Analysis	Satisfactory
Physical Design	Satisfactory
Fitness for Service	Satisfactory
Radiation Protection	Satisfactory
Conventional Health and Safety	Satisfactory
Environmental Protection	Satisfactory
Emergency Management and Fire Protection	Satisfactory
Waste Management	Satisfactory
Security	Satisfactory
Safetguards and Non-Proliferation	Satisfactory
Packaging and Transport	Satisfactory

Rabbit Lake Operation is situated within historic Treaty 10 (1906) and Homeland of the Métis and is within the traditional territories of the Dene, Cree, and Métis peoples.

Inspection Data	
Number of Inspections:	3
Number of NNCs:	20
Safety Significance	
Low:	20
Medium:	0
High:	0



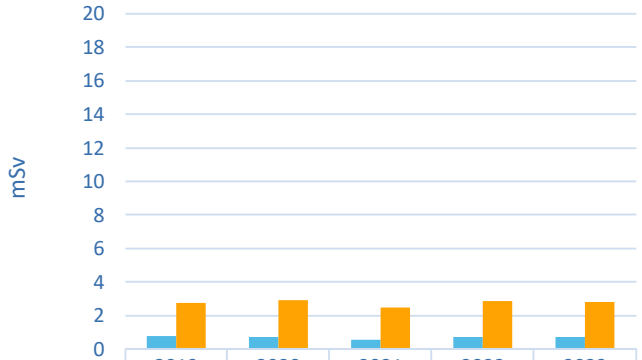
	2019	2020	2021	2022	2023
Ore Mined (Mkg)	0	0	0	0	0
Ore Grade (%)	0.0%	0.0%	0.0%	0.0%	0.0%
Uranium Mined (Mkg)	0	0	0	0	0
Annual Production Limit (Mkg)	4.25	4.25	4.25	4.25	4.25

An order was issued to the Rabbit Lake Operation in 2023 related to personal protective equipment for fire response. Rabbit Lake Operation acted in accordance with the Order and is now in compliance.

D.2 Protection of People

The CNSC has the mandate for the protection of people, both nuclear energy workers (NEWs) as well as the public. This dashboard provides information on Rabbit Lake Operation's efforts on radiation protection and conventional health and safety.

Effective Dose Data Trends



	2019	2020	2021	2022	2023
Average Effective Dose	0.75	0.7	0.57	0.7	0.71
Maximum Individual Dose	2.73	2.93	2.47	2.86	2.80

Maximum Annual Dose

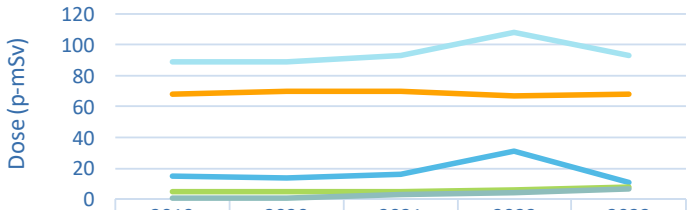
2.80 mSv

(maximum 50 mSv/year)

Total Number of NEWs:

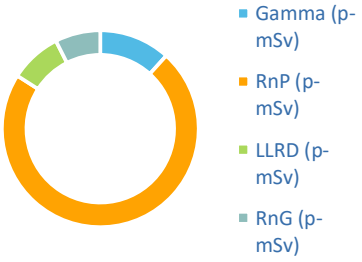
131

5-Year Annual Collective Dose



	2019	2020	2021	2022	2023
Gamma (p-mSv)	15	14	16	31	11
RnP (p-mSv)	68	70	70	67	68
LLRD (p-mSv)	5	5	5	6	8
RnG (p-mSv)	1	1	3	4	7
Total (p-mSv)	89	89	93	108	93

Collective Dose for Report Year



Total Lost Time Injuries

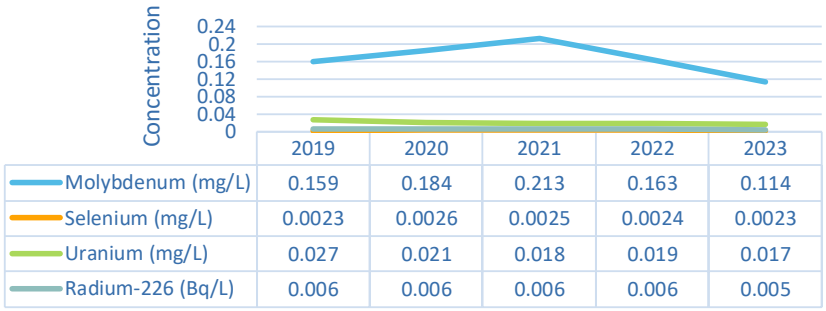
	2019	2020	2021	2022	2023
Loss Time Injuries	1	0	0	1	0
Severity Rate	104.79	40.86	0	0	0
Frequency Rate	1.05	0	0	0	0
Total Recordable Incident Rate	2.1	1.13	1.04	3.47	1.12

The data along with compliance activities give CNSC staff confidence that people are protected.

D.3 Protection of Environment

The CNSC has the mandate for the protection of the environment, and CNSC staff ensure that all licensees maintain effective environmental protection programs. This dashboard provides information on Rabbit Lake Operation's efforts on environmental protection.

Annual Average Effluent Releases 5 Year Trend



	2019	2020	2021	2022	2023
Molybdenum (mg/L)	0.159	0.184	0.213	0.163	0.114
Selenium (mg/L)	0.0023	0.0026	0.0025	0.0024	0.0023
Uranium (mg/L)	0.027	0.021	0.018	0.019	0.017
Radium-226 (Bq/L)	0.006	0.006	0.006	0.006	0.005

2023 Molybdenum Effluent Release

mg/L
(maximum 1 mg/L)

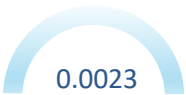
2023 Uranium Effluent Release

mg/L
(maximum 2.5 mg/L)

2023 Radium-226 Effluent Release

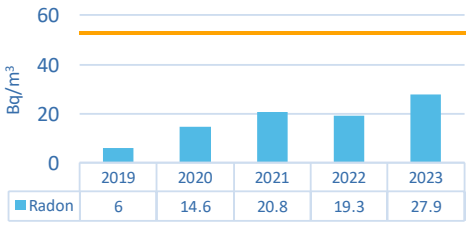
Bq/L
(maximum 0.37 Bq/L)

2023 Selenium Effluent Release



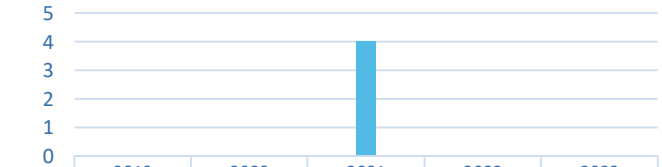
mg/L
(maximum 0.6 mg/L)

Ambient Radon in Air



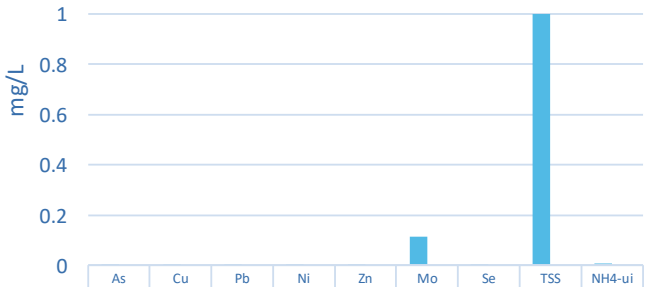
	2019	2020	2021	2022	2023
Radon	6	14.6	20.8	19.3	27.9

Spills



	2019	2020	2021	2022	2023
Spills	0	0	4	0	0

Annual Average Parameter Concentration Values in Effluent Released to the Environment



	As	Cu	Pb	Ni	Zn	Mo	Se	TSS	NH4-ui
Concentration	0.0009	0.0003	0.0001	0.0011	0.001	0.114	0.0023	1	0.01
Limit	0.3	0.3	0.2	0.5	0.5	1	0.6	15	0.5

Metal and Radionuclides in Air			
Analyte	**Unit**	**Limit**	**Measured**
TSP	µg/m3	60	6.0
As	µg/m3	0.06	0.00048
Ni	µg/m3	0.04	0.0004
Pb-210	Bq/m3	0.021	0.00000945
Ra-226	Bq/m3	0.013	0
Th-230	Bq/m3	0.0085	0
U	µg/m3	0.06	0.00012

The data along with compliance activities give CNSC staff confidence that the environment is protected.

Appendix E: Key Lake Operation Dashboards

The following dashboards show the overall performance of the Key Lake Operation for the reported year, and was provided to Indigenous Nations and Communities, the public, and any interested party who requested information on the performance of the Key Lake Operation.

Data described in the dashboards can be obtained in machine readable format through the Open Government Portal, or by sending a request to the CNSC.

E.1 Licensing and Compliance

Licence Term	Financial Guarantee	Licence:
November 1, 2023 to October 31, 2043	$ 222,500,000.00	UML-MILL-KEY.00/2043

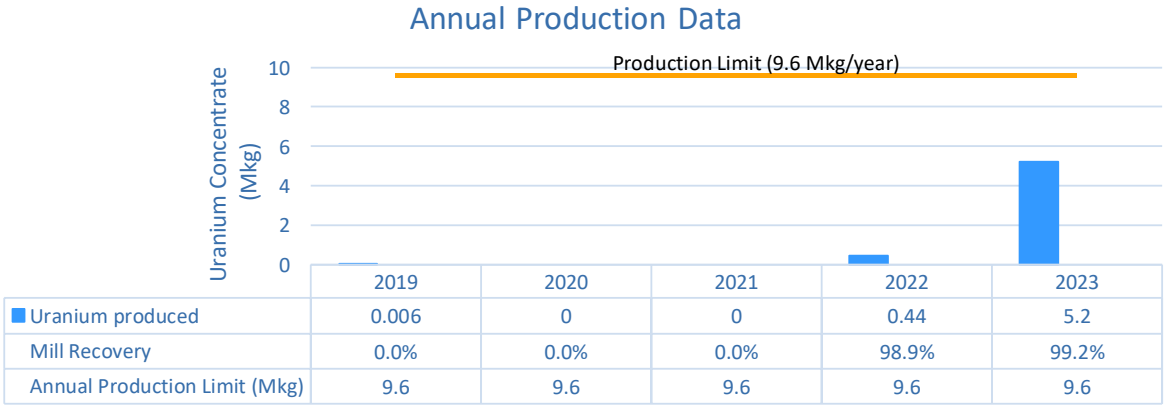
Figure 3.4 Key Lake Operation - aerial view

Key Lake Operation Facilities that CNSC Staff Inspects:
Mill facility
Deilmann tailings facility
Gaertner tailings facility
Waste management facilities
Water treatment plant
Effluent storage ponds
Warehouses
Ancillary buildings

Safety and Control Area Rating	
Safety and Control Area	**Rating**
Management Systems	Satisfactory
Human Performance Management	Satisfactory
Operating Performance	Satisfactory
Safety Analysis	Satisfactory
Physical Design	Satisfactory
Fitness for Service	Satisfactory
Radiation Protection	Satisfactory
Conventional Health and Safety	Satisfactory
Environmental Protection	Satisfactory
Emergency Management and Fire Protection	Satisfactory
Waste Management	Satisfactory
Security	Satisfactory
Safetguards and Non-Proliferation	Satisfactory
Packaging and Transport	Satisfactory

Key Lake Operation is situated within historic Treaty 10 (1906) and Homeland of the Métis and is within the traditional territories of the Dene, Cree, and Métis peoples.

Inspection Data	
Number of Inspections:	3
Number of NNCs:	14
Safety Significance	
Low:	14
Medium:	0
High:	0

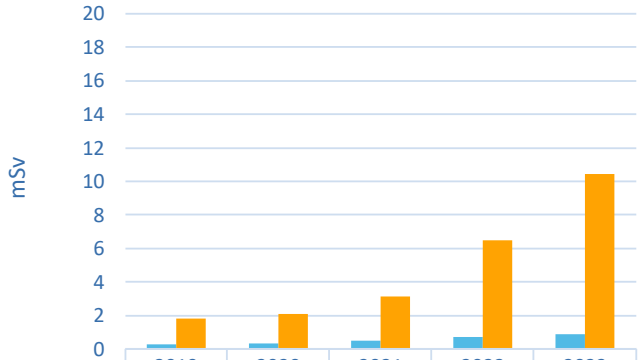


	2019	2020	2021	2022	2023
Uranium produced	0.006	0	0	0.44	5.2
Mill Recovery	0.0%	0.0%	0.0%	98.9%	99.2%
Annual Production Limit (Mkg)	9.6	9.6	9.6	9.6	9.6

E.2 Protection of People

The CNSC has the mandate for the protection of people, both nuclear energy workers (NEWs) as well as the public. This dashboard provides information on Key Lake Operation's efforts on radiation protection and conventional health and safety.

Effective Dose Data Trends



	2019	2020	2021	2022	2023
Average Effective Dose	0.27	0.35	0.52	0.74	0.91
Maximum Individual Dose	1.84	2.11	3.13	6.46	10.44

Maximum Annual Dose

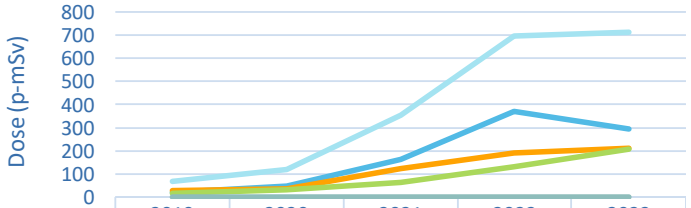
mSv

(maximum 50 mSv/year)

Total Number of NEWs:

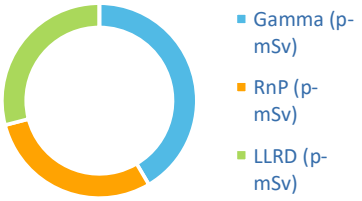
785

5-Year Annual Collective Dose



	2019	2020	2021	2022	2023
Gamma (p-mSv)	21	47	165	371	296
RnP (p-mSv)	30	38	123	193	210
LLRD (p-mSv)	18	33	65	133	207
RnG (p-mSv)	0	0	0	0	0
Total (p-mSv)	69	118	353	697	713

Collective Dose for Report Year



Total Lost Time Injuries

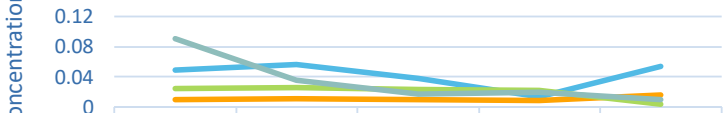
	2019	2020	2021	2022	2023
Loss Time Injuries	0	0	0	1	4
Severity Rate	0	0	0	0	7.25
Frequency Rate	0	0	0	0.2	0.66
Total Recordable Incident Rate	2.22	2.04	1.99	1.76	4.84

The data along with compliance activities give CNSC staff confidence that people are protected.

E.3 Protection of Environment

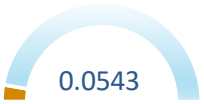
The CNSC has the mandate for the protection of the environment, and CNSC staff ensure that all licensees maintain effective environmental protection programs. This dashboard provides information on Key Lake Operation's efforts on environmental protection.

Annual Average Effluent Releases 5 Year Trend



	2019	2020	2021	2022	2023
Molybdenum (mg/L)	0.049	0.056	0.038	0.013	0.0543
Selenium (mg/L)	0.01	0.011	0.01	0.009	0.016
Uranium (mg/L)	0.0243	0.0259	0.0239	0.0221	0.00359
Radon-226 (Bq/L)	0.09	0.036	0.017	0.02	0.01

Molybdenum Effluent Release

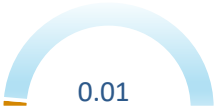


mg/L
(maximum 1 mg/L)

Uranium Effluent Release

mg/L
(maximum 2.5 mg/L)

Radium-226 Effluent Release

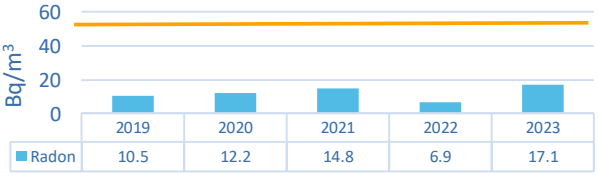


Bq/L
(maximum 0.37 Bq/L)

Selenium Effluent Release

mg/L
(maximum 0.6 mg/L)

Ambient Radon in Air

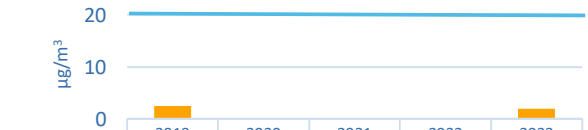


	2019	2020	2021	2022	2023
Radon	10.5	12.2	14.8	6.9	17.1

Spills

	2019	2020	2021	2022	2023
Spills	4	2	4	5	3

Sulfur Dioxide



	2019	2020	2021	2022	2023
Sulfur Dioxide	2.6	0	0	0	2

Annual Average Parameter Concentration Values in Effluent Released to the Environment

	As	Cu	Pb	Ni	Zn	Mo	Se	TSS	NH4-ui
Concentration	0.0034	0.005	0.0001	0.063	0.0028	0.0543	0.016	3	0.04
Limit	0.3	0.3	0.2	0.5	0.5	1	0.6	15	0.5

Metal and Radionuclides in Air			
Analyte	**Unit**	**Limit**	**Measured**
TSP	µg/m3	60	6.2
As	µg/m3	0.06	0.0006
Ni	µg/m3	0.04	0.00048
Pb-210	Bq/m3	0.021	0.00014
Ra-226	Bq/m3	0.013	0.0001
Th-230	Bq/m3	0.0085	0.0001
U	µg/m3	0.06	0.00166

The data along with compliance activities give CNSC staff confidence that the environment is protected.

Appendix F: McClean Lake Operation Dashboards

The following dashboards show the overall performance of the McClean Lake Operation for the reported year, and was provided to Indigenous Nations and Communities, the public, and any interested party who requested information on the performance of the McClean Lake Operation.

Data described in the dashboards can be obtained in machine readable format through the Open Government Portal, or by sending a request to the CNSC.

F.1 Licensing and Compliance

Licence Term	Financial Guarantee	Licence:
July 1, 2017 to June 20, 2027	$ 102,098,000.00	UML-MINEMILL-McCLEAN.02/2027

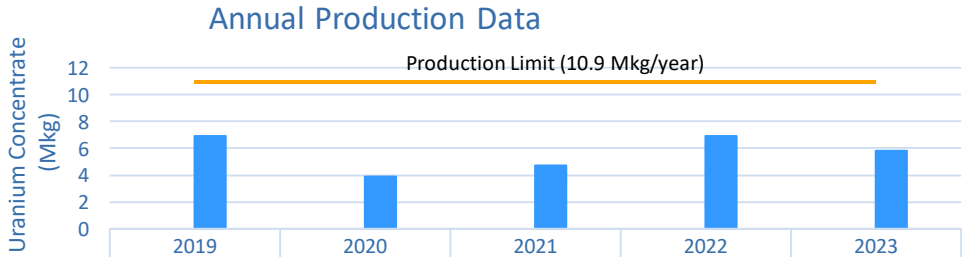
Figure 3.5 McClean Lake Operation - aerial view

McClean Lake Operation Facilities that CNSC Staff Inspects:
John Everett Bates milling area
Sue mining area
JEB tailings management facility
Undeveloped ore deposits
Water treatment plant
Effluent storage ponds
Warehouses
Ancillary buildings

Safety and Control Area Rating	
Safety and Control Area	**Rating**
Management Systems	Satisfactory
Human Performance Management	Satisfactory
Operating Performance	Satisfactory
Safety Analysis	Satisfactory
Physical Design	Satisfactory
Fitness for Service	Satisfactory
Radiation Protection	Satisfactory
Conventional Health and Safety	Satisfactory
Environmental Protection	Satisfactory
Emergency Management and Fire Protection	Satisfactory
Waste Management	Satisfactory
Security	Satisfactory
Safetguards and Non-Proliferation	Satisfactory
Packaging and Transport	Satisfactory

McClean Lake Operation is situated within historic Treaty 10 (1906) and Homeland of the Métis and is within the traditional territories of the Dene, Cree, and Métis peoples.

Inspection Data	
Number of Inspections:	3
Number of NNCs:	22
Safety Significance	
Low:	22
Medium:	0
High:	0

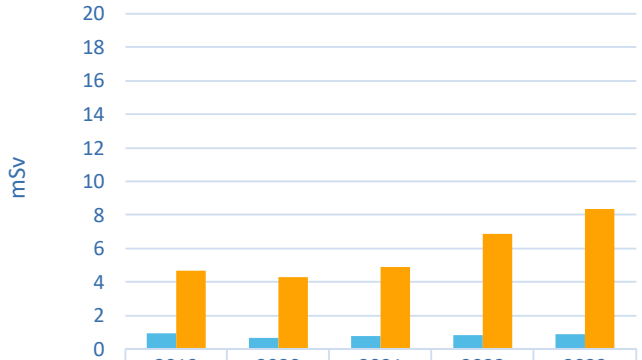


	2019	2020	2021	2022	2023
Ore Mined (Mkg)	0	0	1.21	0	0
Mill Recovery	98.9%	98.8%	98.7%	98.9%	98.9%
Uranium produced	6.94	3.88	4.75	6.94	5.81
Annual Production Limit (Mkg)	10.9	10.9	10.9	10.9	10.9

F.2 Protection of People

The CNSC has the mandate for the protection of people, both nuclear energy workers (NEWs) as well as the public. This dashboard provides information on McClean Lake Operation's efforts on radiation protection and conventional health and safety.

Effective Dose Data Trends



	2019	2020	2021	2022	2023
Average Effective Dose	0.93	0.67	0.79	0.81	0.87
Maximum Individual Dose	4.7	4.28	4.89	6.86	8.37

Maximum Annual Dose

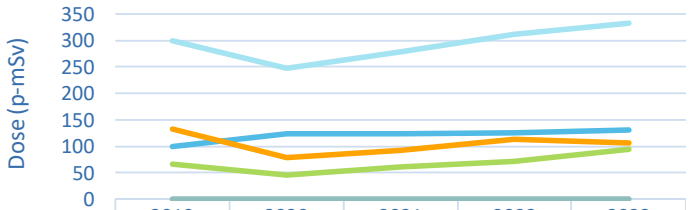
mSv

(maximum 50 mSv/year)

Total Number of NEWs:

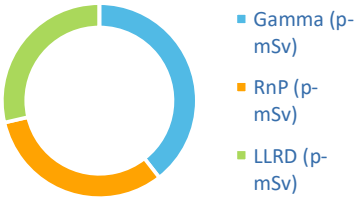
381

5-Year Annual Collective Dose

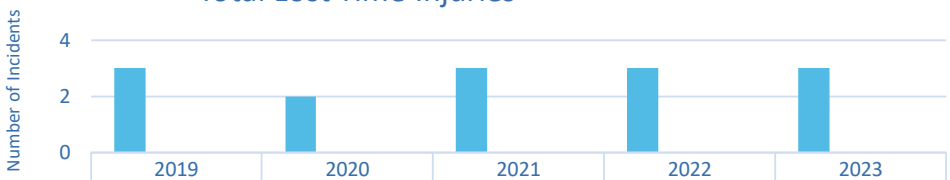


	2019	2020	2021	2022	2023
Gamma (p-mSv)	100	124	124	126	131
RnP (p-mSv)	133	78	93	114	106
LLRD (p-mSv)	67	45	61	71	95
RnG (p-mSv)	0	0	0	0	0
Total (p-mSv)	300	247	278	311	332

Collective Dose for Report Year



Total Lost Time Injuries



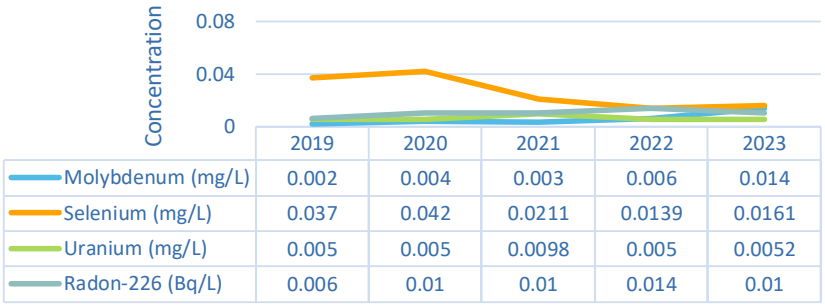
	2019	2020	2021	2022	2023
Loss Time Injuries	3	2	3	3	3
Severity Rate	48	42.8	49.8	28.6	64.8
Frequency Rate	0.9	0.7	0.9	0.8	0.7
Total Recordable Incident Rate	3.15	2.7	5.6	2.9	2.7

The data along with compliance activities give CNSC staff confidence that people are protected.

F.3 Protection of Environment

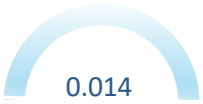
The CNSC has the mandate for the protection of the environment, and CNSC staff ensure that all licensees maintain effective environmental protection programs. This dashboard provides information on McClean Lake Operation's efforts on environmental protection.

Anual Average Effluent Releases 5 Year Trend



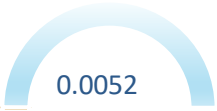
	2019	2020	2021	2022	2023
Molybdenum (mg/L)	0.002	0.004	0.003	0.006	0.014
Selenium (mg/L)	0.037	0.042	0.0211	0.0139	0.0161
Uranium (mg/L)	0.005	0.005	0.0098	0.005	0.0052
Radon-226 (Bq/L)	0.006	0.01	0.01	0.014	0.01

Molybdenum Effluent Release



mg/L
(maximum 1 mg/L)

Uranium Effluent Release



mg/L
(maximum 2.5 mg/L)

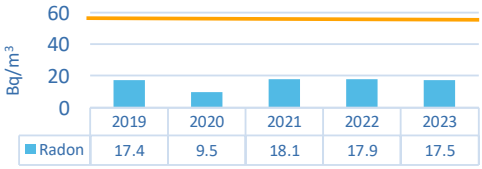
Radium-226 Effluent Release

Bq/L
(maximum 0.37 Bq/L)

Selenium Effluent Release

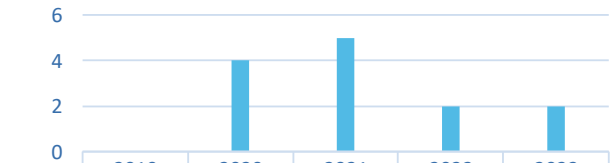
mg/L
(maximum 0.6 mg/L)

Ambient Radon in Air



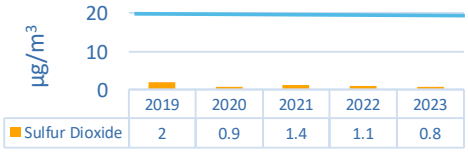
	2019	2020	2021	2022	2023
Radon	17.4	9.5	18.1	17.9	17.5

Spills



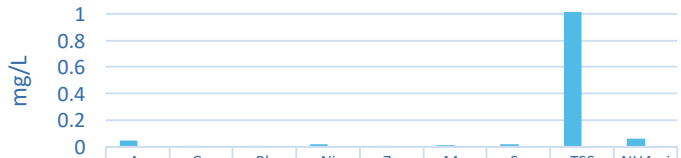
	2019	2020	2021	2022	2023
Spills	0	4	5	2	2

Sulfur Dioxide



	2019	2020	2021	2022	2023
Sulfur Dioxide	2	0.9	1.4	1.1	0.8

Annual Average Parameter Concentration Values in Effluent Released to the Environment



	As	Cu	Pb	Ni	Zn	Mo	Se	TSS	NH4-ui
Concentration	0.0457	0.003	0.0005	0.0202	0.002	0.014	0.0161	3	0.06
Limit	0.3	0.3	0.2	0.5	0.5	1	0.6	15	0.5

Metal and Radionuclides in Air			
Analyte	**Unit**	**Limit**	**Measured**
TSP	µg/m3	60	16.2
As	µg/m3	0.06	0.00030
Cu	µg/m3	9.6	0.061475
Mo	µg/m3	23	0.00298
Ni	µg/m3	0.04	0.000193
Pb	µg/m3	0.1	0.000227
Zn	µg/m3	23	0.00411
Pb-210	Bq/m3	0.021	0.000329
Po-210	Bq/m3	0.028	0.000115
Ra-226	Bq/m3	0.013	0.0000160
Th-230	Bq/m3	0.0085	0.000009
U	µg/m3	0.06	0.00200

The data along with compliance activities give CNSC staff confidence that the environment is protected.

Appendix G: Safety and Control Area Rating Methodology

Performance ratings used in this report are defined as follows:

Satisfactory (SA)

The licensee meets all of the following criteria:

• Performance meets CNSC staff expectations.

• Licensee non-compliances or performance issues, if any, are not risk-significant.

• Any non-compliances or performance issues have been, or are being, adequately corrected.

Below expectations (BE)

One or more of the following criteria apply:

• Performance does not meet CNSC staff expectations.

• The licensee has risk-significant non-compliance(s) or performance issue(s).

• Non-compliances or performance issues are not being adequately corrected.

Unacceptable (UA)

One or both of the following criteria apply:

• The risk associated with a non-compliance or performance issue is unreasonable.

• At least one significant non-compliance or performance issue exists with no associated corrective action.

The following rating is no longer used by the CNSC. It is defined below for informational purposes only. This rating may appear in historic data.

Fully satisfactory (FS)

Safety and control measures implemented by the licensee are highly effective. In addition, compliance with regulatory requirements is fully satisfactory (FS), and compliance within the SCA or specific area exceeds requirements and CNSC expectations. Overall, compliance is stable or improving, and any problems or issues that arise are promptly addressed.

The following rating definitions are no longer used by the CNSC. They are defined below for informational purposes only. These definitions may appear in historic data.

Satisfactory (SA)

Safety and control measures implemented by the licensee are sufficiently effective. In addition, compliance with regulatory requirements is satisfactory. Compliance within the SCA or specific

area meets requirements and the CNSC expectations. Any deviation is only minor, and any issues are considered to pose a low risk to the achievement of regulatory objectives and the CNSC's expectations. Appropriate improvements are planned.

Below expectations (BE)

Safety and control measures implemented by the licensee are marginally ineffective. In addition, compliance with regulatory requirements falls below expectations. Compliance within the SCA or specific area deviates from requirements or CNSC expectations to the extent that there is a moderate risk of ultimate failure to comply. Improvements are required to address identified weaknesses. The licensee or applicant is taking appropriate corrective action.

Unacceptable (UA)

Safety and control measures implemented by the licensee are significantly ineffective. In addition, compliance with regulatory requirements is unacceptable and is seriously compromised. Compliance within the overall SCA or specific area is significantly below requirements or CNSC expectations or there is evidence of overall non-compliance. Without corrective action, there is a high probability that the deficiencies will lead to an unreasonable risk. Issues are not being addressed effectively, no appropriate corrective measures have been taken, and no alternative plan of action has been provided. Immediate action is required.

Appendix H: CNSC Safety Rating Definitions and Examples

H1: Radiation Protection Rating Definitions and Examples

Radiation protection

Safety Significance	Definition	Fuel Cycle Facility Specific Examples
High	Exposures to multiple workers in excess of regulatory limits. Widespread contamination to several persons or to a place. Incident that results in, or has reasonable potential for, a worker to exceed regulatory limits.	Examples: • nuclear energy worker (NEW) exceeding 50 millisievert (mSv)/year or 100 mSv/5 years • non-NEW exceeding 1 mSv
Medium	Exposure to a worker in excess of regulatory limits. An incident that would result in a licensee exceeding action level. Limited contamination that could affect a few persons or a limited area. Incident that results in or has reasonable potential to exceed an action level.	Example: • doses to workers of 1 mSv/week or 5 mSv/quarter
Low	Increased dose below reportable limits. Contamination that could affect a worker. Incident that results in, or has reasonable potential to exceed, the highest administrative level.	Example: • doses to workers close to but less than of 1 mSv/week or 5 mSv/quarter

H2: Environmental Protection Spill Rating Definitions and Examples

Environmental protection

Safety Significance	Definition	Fuel Cycle Facility Specific Examples
High	Nuclear or hazardous substances being released to the environment exceeding regulatory limits (including public exposure) or that results in significant impact to the environment. Incident that results in, or has reasonable potential to have, a significant or moderate impact or extensive future remediation.	Examples: • impairment of ecosystem functions • effluent licence limit exceedance • spill into fish bearing water • fish kill
Medium	Nuclear or hazardous substances being released to the environment exceeding action levels (including public exposure) or that result in impact to the environment outside the licensing basis. Incident that results in, or has reasonable potential to have, a minor impact or that requires some future remediation.	Examples: • effluent action level exceedance • spills to environment (including atmosphere) with short-term or seasonal impacts
Low	Release of hazardous or nuclear substances to the environment below regulatory limits. Incident that results in, or has reasonable potential to have, a negligible impact.	Examples: • effluent administrative level-exceedance • spills to environment (including atmosphere) with no future impacts

H3: Conventional Health and Safety Rating Definitions

Safety Significance	Definition
High	Fatality or serious injury
Medium	Serious injury or lost-time injury
Low	Minor injury

Appendix I: Historic and Decommissioned Sites Financial Guarantees

Facility	Canadian dollar amount
Gunnar	Responsibility of provincial government
Madawaska	$4,041,472
Lorado	Responsibility of provincial government
Beaverlodge	Responsibility of provincial government
Rayrock	Responsibility of federal government
Port Radium	Responsibility of federal government
Agnew Lake	Responsibility of provincial government
Bicroft	$2,691,000
Dyno	$1,871,543
Elliot Lake	$32,749,000
Denison & Stanrock	$2,480,000
Total	$43,833,015

Appendix J: List of Indigenous Nations and Communities

List of Indigenous Nations and communities whose traditional and/or treaty territories are in proximity to the sites covered by this report:

Saskatchewan Sites:

English River First Nation (ERFN)

Lac La Ronge Indian Band (LLRIB)

Métis Nation – Saskatchewan (MN-S) (Northern Region 1, Northern Region II and Northern Region III)

Pinehouse Kineepik Métis Local (KML)

Birch Narrows Dene Nation (BNDN)

Buffalo River Dene Nation (BRDN)

Clearwater River Dene Nation (CRDN)

Athabasca Chipewyan First Nation (ACFN)

Prince Albert Grand Council (PAGC)

Meadow Lake Tribal Council (MLTC)

Ya'thi Néné Lands and Resource Officer (YNLR) who represents Black Lake Denesuliné First Nation, Fond-du-Lac Denesuliné First Nation, Hatchet Lake Denesuliné First Nation, Camsell Portage, Stony Rapids, Uranium City and Wollaston Lake

Elliot Lake Area Sites:

Atikameksheng Anishnabek

Métis Nation of Ontario (Region 4)

Mississauga First Nation

Sagamok Anishnawbek Nation

Serpent River First Nation

Thessaon First Nation

Whitefish River First Nation

Southern Ontario Area Sites:

Métis Nation of Ontario (Region 6 and 8)

Mohawks of the Bay of Quinte

Williams Treaties First Nations, which include Alderville First Nation, Chippewas of Georgina Island First Nation, Chippewas of Beausoleil First Nation, Chippewas of Rama First Nation, Curve Lake First Nation, Hiawatha First Nation and Mississaugas of Scugog Island First Nation

Northwest Territories Area Sites:

Port Radium Mine (Sahtu Settlement Area):

Déline First Nation

Rayrock Mine (Tlicho Settlement Area):

Dechi Laot'I First Nations

Dog Rib Rae

Gameti First Nation

Wha Ti First Nation

Appendix K: Participant Funding Recipients for the 2023 UMM Regulatory Oversight Report

Recipients
English River First Nation
Ya'thi Néné Lands and Resource Officer
Kineepik Métis Local
Athabasca Chipewyan First Nation
Nuclear Transparency Project

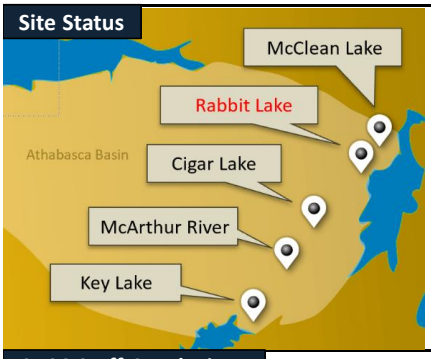
Further information on the CNSC's participant funding program can be found on the CNSC Participant Funding Program website

Appendix L: Regulatory Oversight Report Outreach Sessions Dashboard

Purpose of the ROR

The uranium mines and mills regulatory oversight report (ROR) provides detailed information on the regulation of operating uranium mine and mill (UMM) facilities in 2023. The ROR provides an opportunity to share information with Indigenous Nations and communities impacted by the facilities, and provides an opportunity to present concerns to the Canadian Nuclear Safety Commission. For more information, the QR code on the right will take you to visit our website.

Site Status



In 2023, Key Lake, McArthur River, Cigar lake and McClean Lake were all actively operating, while Rabbit Lake remained in a state of care and maintenance. Facilities in a state of care and maintenance still hold a licence to operate a mine or mill while not producing uranium products. Sufficient staff maintain safety and security at facilities during this time.

9 CNSC Inspectors
Dedicated to UMM sites

23 CNSC Subject Matter Experts
With direct regulatory effort at UMM sites

CNSC Staff Conclusions

All UMM sites operated safely in 2023

Events 2023 (Previous values)

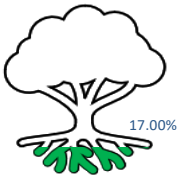
Lost-Time Injuries	Radiation Action Level Exceedances
10 ↑ (5)	11 ↑ (2)
Environmental Action Level Exceedances	**Reportable Releases to the Environment**
0 ↓ (5)	13 ↑ (9)

Compliance Activities

- **22** CNSC compliance Inspections
- **93** CNSC Notices of Non-Compliance (NNCs)
- **1** Order(s) Issued

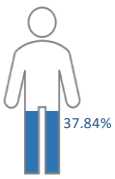
The Order, NNCs and events did not have an impact on safety at UMM sites

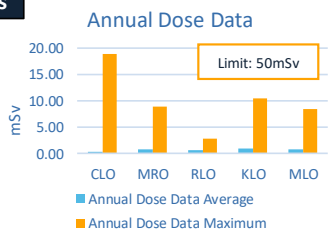
Environmental Releases



Releases to the environment have been remediated with low impacts to the environment. CNSC staff are satisfied with corrective actions performed by licensees.

Radiation Doses





Doses to nuclear energy workers remained low, with the highest dose recorded in 2023 18.92 mSv, or 37.84% of the regulatory limit of 50 mSv in a calendar year.

Indigenous Engagement

CNSC staff worked with Indigenous Nations and communities to identify opportunities for formalized and regular engagement throughout the lifecycle of UMM sites. In 2023 CNSC staff:

- Met with nations and communities who had concerns from the 2023 ROR.
- Participated in the Northern Saskatchewan Environmental Quality Committee meeting in La Ronge.
- Conducted outreach at communities near UMM sites.

Independent Environmental Monitoring Program (IEMP)

An IEMP sampling campaign was conducted at 1 UMM site in 2022: Rabbit Lake.

Analysis of samples indicate that the environment is protected. Scan the QR code to the right see all of the IEMP data to date.

Appendix M: Links to Websites

Benefits from Northern Mining

Cameco Corporation

Cameco Corporation - Beaverlodge

Cameco Corporation – Cigar Lake Operation

Cameco Corporation – McArthur River/Key Lake Operations

Cameco Corporation – Rabbit Lake Operation

CNSC Fact Sheet on Natural Background Radiation

CNSC Independent Environmental Monitoring Program

CNSC Indigenous Engagement

Eastern Athabasca Regional Monitoring Program

Health Canada's Guidelines for Canadian Drinking Water Quality

National Pollutant Release Inventory

Northern Saskatchewan Environmental Quality Committee

Orano Canada Inc.

Ontario's Surface Water Quality Objectives

Saskatchewan Environmental Quality Guidelines

Appendix N: Acronyms

AAR	After Action Report
ALARA	As Low As Reasonably Achievable
ALPC	Athabasca Lands and Protection Committee
AREVA	AREVA Resources Canada Inc. (now Orano Canada Inc.)
BE	Below Expectations
Bq/L	Becquerels per liter
Bq/m^3	Becquerels per cubic meter
Cameco	Cameco Corporation
CA	Complementary Access
CAP	Corrective Action Plan
CCD	counter current decantation
CCME	Canadian Council of Ministers of the Environment
CMD	Commission Member Document
CNSC	Canadian Nuclear Safety Commission
COPC	Contaminants of Potential Concern
CSA	Canadian Standards Association
CVC	Compliance Verification Criteria
DTMF	Deilmann Tailings Management Facility
EARMP	Eastern Athabasca Regional Monitoring Program
EBRL	Environmentally Based Reference Level
ECCC	Environment and Climate Change Canada
EP	Emergency Preparedness
EPR	Environmental Protection Report
EQC	Environmental Quality Committee
ERA	Environmental Risk Assessment
ERFN	English River First Nation
FS	Fully Satisfactory

HHRA	Human Health Risk Assessment
IAEA	International Atomic Energy Agency
ICRP	International Commission on Radiological Protection
IEMP	Independent Environmental Monitoring Program
JEB	John Everett Bates
Kg	Kilograms
KLM	Kineepik Métis Local
LCH	Licence Conditions Handbook
LLRD	Long-lived Radioactive Dust
LTI	Lost-Time Injury
MAP	Minerals and Products
mASL	Meters Above Sea Level
MBq	megabecquerels
MDMER	*Metal and Diamond Mining Effluent Regulations*
mg/L	milligram per litre
Mkg	Million kilograms
mSv	Millisievert
mSv/hr	Macrosievert per hour
NEW	Nuclear Energy Worker
NSCA	*Nuclear Safety and Control Act*
NPRI	*National Pollutant Release Inventory*
NTP	Nuclear Transparency Project
Orano	Orano Canada Inc.
OSLD	optically stimulated luminescence dosimeter
p-mSv	Person-millisieverts
PAD	Personal Alpha Dosimeter
PFP	Participant Funding Program
PIDP	public information and disclosure program
REGDOC	Regulatory Document

RIB	Regulatory Information Bank
RnG	Radon Gas
RnP	Radon Progeny
ROR	Regulatory Oversight Report
SA	Satisfactory
SABRE	Surface Access Borehole Resource Extraction
SCA	Safety and Control Area
SMA	Saskatchewan Mining Association
SO_2	Sulphur Dioxide
SRC	Saskatchewan Research Council
TID-EP	Technical Information Document – Environmental Performance
TMF	Tailings Management Facility
TRIR	Total Recordable Incident Rate
TSP	Total Suspended Particulate
TSS	Total Suspended Solids
U	Uranium
UA	Unacceptable
UMM	Uranium Mines and Mills
UMMD	Uranium Mines and Mills Division
WTP	Water Treatment Plant
YNLR	Ya'Thi Nene Lands and Resource

Appendix O: Summary of Engagement in Relation to CNSC's Terms of Reference for Long-Term Engagement and Associated Workplans In 2023

Ya'thi Néné Lands and Resource Office (YNLR):

As committed to with the Ya'thi Nene Lands and Resource Office (YNLR) as part of the Terms of Reference (ToR) for long-term engagement agreed between YNLR and the CNSC, the update below was prepared in collaboration with representatives from YNLR's seven Athabasca communities including Black Lake Denesųłiné First Nation, Hatchet Lake Denesųłiné First Nation, Fond du Lac Denesųłiné First Nation, the Northern Hamlet of Stony Rapids, the Northern Settlement of Camsell Portage, the Northern Settlement of Uranium City and the Northern Settlement of Wollaston Lake.

In December of 2021, CNSC staff and YNLR representatives started discussions to establish a formal long-term relationship with the YNLR, and a ToR was signed in July of 2022. This ToR enables YNLR to receive funding to participate in consultation and engagement activities throughout the year and provides a formalized structure for ongoing dialogue on CNSC-regulated facilities and activities of interest in the YNLR traditional and treaty territories.

As committed to with YNLR as part of the ToR the update below was prepared in collaboration with the YNLR staff and the Athabasca Lands and Protection Committee (ALPC) representatives who are members of the YNLR Working Group. The ALPC is made up of 8 appointed community members from 3 Denesųłiné First Nations (Hatchet Lake, Fond du Lac and Black Lake) and 4 communities (Uranium City, Camsell Portage, Stony Rapids, and Wollaston Lake) who report back to the communities and their leadership. The Executive Director of YNLR also participates in the Working Group along with CNSC representatives, other YNLR staff and invited guests.

In addition, an annual engagement work plan is developed each year between the CNSC and YNLR that provides information on the scope of work, detailed activities, and general timelines associated with work items for collaboration and engagement for each calendar year.

YNLR and CNSC staff have agreed to meet quarterly to advance work plan items and shared priorities. In September 2023, YNLR and CNSC staff worked together to develop a new workplan for 2023 and in January 2024 held the first quarterly ToR meeting in person in Saskatoon. Through these meetings and interactions, YNLR and the CNSC have developed a positive working relationship based on open communication, two-way dialogue and actions.

The 2023 engagement work plan included:

- ToR maintenance and updates
- Collaborative annual reporting to the Commission and to elected leadership of the 7 Athabasca communities
- Engagement and participation in the CNSC's Independent Environmental Monitoring Program (IEMP) in northern Saskatchewan
- Enhanced two-way information sharing and communication between CNSC and YNLR community members
- Updates and discussions on specific projects on uranium mines and mills (UMM) facilities of interest and upcoming licence activities including operating, decommissioned and any proposed CNSC regulated projects in northern Saskatchewan
- Communications on other topics and opportunities (i.e. regulatory document updates, feedback on UMM ROR, health studies, CNSC compliance activities, CNSC PFP opportunities, cumulative effects)

The facilities of interest in the workplan directly related to the Uranium Mines and Mills Regulatory Oversight Report of 2023 include the following: Rabbit Lake, Cigar Lake, McClean Lake, Key Lake, McArthur River operations, Beaverlodge Properties, Gunnar legacy mine site and Lorado former mill site.

Other topics of discussion have also included consultation and engagement activities with regards to the ongoing CEAA 2012 EAs of interest to YNLR, including NexGen's Rook I Project and Denison's Wheeler River Project, which are outside the scope of the 2023 UMM ROR as well as the ongoing non-designated projects in Saskatchewan including Fission's Patterson South Project.

In 2023, CNSC staff and YNLR collaborated together on the IEMP sampling campaign at Beaverlodge, Gunnar and Lorado former mine and mill sites. In August of 2023, a YNLR Community Land Technician (CLT) participated in a weeklong IEMP sampling campaign around Beaverlodge, Gunnar and Lorado. Having a YNLR CLT participate directly in the sampling campaign with CNSC staff contributed to a better understanding of the IEMP and of sampling methods and will improve input into sampling activities and plans by including YNLR species of interest, valued components, knowledge and sampling locations of interest and importance to local Elders and land users.

In addition, CNSC staff conducted a number of in-person engagement activities in YNLR communities including:

- In January of 2023 CNSC staff visited 3 Athabasca basin communities alongside SRC to provide an update on the Project CLEANS program and the status of former Gunnar uranium mine and mill and Lorado uranium mill sites
- Orano Cluff Lake public Commission hearing that took place virtually where YNLR provided both written and oral interventions to the Commission.

- In June 2023, YNLR participated in the Cameco Key Lake, McArthur River and Rabbit Lake licence renewal public Commission hearing that took place in Saskatoon, SK where YNLR provided both written and oral interventions to the Commission.
- In September of 2023 CNSC staff attended community outreach sessions alongside Uranium City residents and leadership from Fond du Lac Denesuline First Nation and YNLR staff regarding the Beaverlodge sites.
- In September 2023, CNSC funded YNLR through the Indigenous and Stakeholder Capacity Fund (ISCF) to hire an internal resource support for YNLR. This person was hired in November of 2023 and supports YNLR on all nuclear-related files and to coordinate and participate in activities with the CNSC for a period of 2 years.

CNSC staff and YNLR do not agree on all topics of discussion. However, both parties are interested in strengthening the relationship through on-going respectful dialogue to share knowledge, information on culture, history and perspectives that help CNSC staff and YNLR learn from each other. The activities completed in 2023 have been beneficial for building the relationship and advancing project-specific discussions. CNSC staff and YNLR look forward to continuing the collaborative work and continuing to strengthen the relationship in 2024.

Appendix P: Summary Table of The Status of Issues, Concerns and Requests from Indigenous Intervenors in the 2022 UMM ROR

In response to the Commission's action outlined in the Minutes of the CNSC Meeting on CMD 22-M29 to CMD 22-M34, CMD22-M37, and CMD 22-M40 to CMD 22- M42, held on November 1, 2, and 3, 2022 for CNSC ROB and ISRD staff to work towards the transparent resolution of intervenor recommendations. Where comments and recommendations are made by Indigenous Nations and communities, the Commission expects CNSC staff to provide an update to the Commission on whether and how such recommendations have been, or will be, addressed. Where there are disagreements CNSC staff have established an internal CNSC issues, concerns, and comments tracking table for each intervening Indigenous Nation or community in the 2022 UMM ROR to track and organize the requests concerns and comments submitted in their interventions. These tables also summarize and track CNSC's efforts to respond to and address intervenor requests concerns and comments, where feasible.

The purpose of this appendix is to provide a summary of information and data from CNSC's internal tracking process for issues and concerns submitted by Indigenous Nations and communities to the Commission. The tables below provide an overview of the issues raised in the interventions in relation to the previous year's ROR, and the proposed path forward to address them. Table A outlines the number of specific issues and concerns raised by each intervenor and their related themes, as well as CNSC responses and proposed path forward. Table B provides an overview of the key thematic categories raised by each intervenor and the total number of times each theme or topic was raised by intervenors in their interventions. Tracking this thematic information will provide a baseline to help direct CNSC staff's focus to areas that raise the most concerns. This is a new ROR initiative and will continue taking shape moving forward as CNSC staff begin tracking trends in intervention topics and track progress with Indigenous Nations and communities as well as repeat public intervenors.

The following table provides details regarding the number of specific issues and concerns raised in the interventions by Indigenous Nations and communities in relation to the 2022 UMM ROR, the number of thematic categories the issues and concerns are grouped by, and the status of the CNSC's approach to responding to and addressing each issue, concern or request raised in the interventions to date.

CNSC staff are committed to responding to and following up with intervenors with regards to their interventions and working collaboratively to identify options for a path forward to address the comments, where possible. For Indigenous Nations and communities that have a ToR for

long-term engagement with the CNSC, requests, concerns and comments raised in relation to the ROR have been integrated into the engagement work plan and regular meetings with each Indigenous Nation or community, including sharing the specific issues and concerns tracking table with each Indigenous Nation and community in order to verify the data and discuss a path forward for meaningfully addressing their comments.

In addition, CNSC staff have also followed up with Indigenous Nations and communities who the CNSC does not currently have a ToR for long-term engagement with, in order to follow up on or set a path forward on their comments and issues. An example of this would be KML's concern regarding science, technology, engineering and mathematics (STEM) in the community and wanting more youth involved in the STEM field so that they are able to get jobs in nuclear or other areas where STEM knowledge is required. Since last years ROR, CNSC staff have been working with KML on addressing this concern directly which includes the CNSC hosting our annual Women in STEM (WiSTEM) event for women and girls in Saskatoon in 2024. This will allow women and girls from northern Saskatchewan to participate in the event and learn more about careers in STEM and how they can achieve these milestones throughout their education and future career(s).

Table A. Issues and Concerns Raised in Interventions from Indigenous Nations and Communities from the 2022 UMM ROR Tracking and Response Table

2022 UMM ROR Interventions from Indigenous Nations and Communities	The number of requests/ Concerns/ Comments Raised in the intervention for the 2022 ROR	Requests/ Concerns/ Comments Responded to by CNSC staff*	Notes
English River First Nation (ERFN)	7 (falling within 3 main subjects/categories)	7	The issues, concerns and recommendations raised by ERFN in their intervention for the 2022 UMM ROR are being addressed and discussed with ERFN through an issues tracking table and regular monthly meetings. In addition, CNSC staff and ERFN have been working towards finalizing a long-term ToR which would include a workplan to address concerns raised by ERFN. CNSC staff look forward to signing a ToR for long-term engagement with ERFN and prioritizing discussions on addressing their comments, concerns and recommendations. Examples of the themes, issues raised by ERFN are environmental protection, Indigenous knowledge, language, and culture and CNSC's Indigenous consultation and engagement.

2022 UMM ROR Interventions from Indigenous Nations and Communities	The number of requests/ Concerns/ Comments Raised in the intervention for the 2022 ROR	Requests/ Concerns/ Comments Responded to by CNSC staff*	Notes
Kineepik Métis Local (KML)	4 (falling within 4 main subjects/ categories)	4	The issues, concerns and recommendations raised by KML in their intervention for the 2022 UMM ROR are being addressed and discussed with KML based on an issues tracking table and regular monthly meetings. CNSC is committed to working with KML to address each topic to the greatest extent possible. In addition, CNSC has offered KML a ToR for long-term engagement to continue to work through the concerns that KML has. KML is interested in signing a ToR for long-term engagement and are currently reviewing internally. Examples of the themes, issues raised by KML are CNSC's Indigenous consultation and engagement, economic development, environmental protection and Indigenous knowledge, language and culture.
Ya'thi Néné Lands and Resource Office (YNLR)	7 (falling within 6 main subjects/categories)	7	The issues, concerns and recommendations raised by YNLR in their intervention for the 2022 UMM ROR are being addressed and discussed with YNLR through an issues tracking table and quarterly meetings as part of the ToR between the CNSC and YNLR signed in 2022. This includes a workplan that was developed by both CNSC staff and YNLR where we discuss current projects, proposed projects and issues and concerns that YNLR may have. Example of the themes, issues raised by YNLR are improvements to the ROR process and ROR content, historic and decommissioned sites, environmental protection, and longer licensing.
Lac La Ronge Indian Band (LLRIB)	0	0	There were no issues, concerns or recommendations raised by LLRIB at the 2022 UMM ROR. CNSC will continue to meet and engage with LLRIB should concerns arise.

**"Responded to" refers to the number of requests/concerns/comments that CNSC staff have provided dispositions to, responded to directly, or have made requests with intervenors to have a specific meeting and discussions to address their concerns, comments and recommendations. See notes column for more details.*

Engagement with Other Public Intervenors

CNSC staff are committed to engaging with the public and learning more about their values, issues and concerns. Repeat public intervenors, including individuals and civil society organizations, have been reached out to, to follow up on their issues, concerns, and recommendations. This is being facilitated through existing opportunities for engagement and individualized bilateral meetings – the first of which have either been offered or already taken place.

Table B. Key Themes Raised by Intervenors

The following table provides an overview of the key thematic categories raised in the interventions in relation to the 2022 UMM ROR and the number of times each theme or topic was raised in total across all interventions that had concerns. In total for 2022 UMM ROR, there were 3 intervenors that raised concerns in the categories outlined below. The categories included in Table B have been ordered from most frequently raised to least. The thematic categories are derived from the review of the 2022 interventions and CNSC staff's analysis of the issues and topics raised.

CNSC staff are committed to continuing to follow up and work with each intervenor in Table A, as well as other repeat individuals and civil society organizations who intervened to continue discussions on how best to address these themes and areas of interest identified in their interventions.

Table B – Key Themes Raised by Intervenors

Requests/Concerns/ Comments Category in the intervention for the 2022 UMM ROR	Total number of times the topic was raised across interventions in relation to the 2022 UMM ROR	Total Number of Intervenors who raised the topic in their intervention
Environmental Protection (e.g. concerns around protecting the environment for future generations and traditional activities)	5	2
Indigenous knowledge, language, and culture (e.g. ensuring that Indigenous knowledge, language and culture is both incorporated as well as protected)	4	2
CNSC's Indigenous Consultation and Engagement (e.g. concerns regarding UNDRIP and how it is being considered in consultation and engagement activities and the need for the development of a safety and control area specific to Indigenous engagement and community comprehension)	2	2

Requests/Concerns/ Comments Category in the intervention for the 2022 UMM ROR	Total number of times the topic was raised across interventions in relation to the 2022 UMM ROR	Total Number of Intervenors who raised the topic in their intervention
Improvements to the ROR process and ROR content (e.g. requests related to: improving accessibility, providing additional information or clarification in specific sections of the report, providing information about the performance rating system, improving the format of the report and improving the ROR engagement session)	2	1
Economic Development (e.g. requests to ensure that the communities have equal economic opportunities)	1	1
Historic and decommissioned sites (e.g. concerns regarding legacy mining sites in northern Saskatchewan)	1	1
Longer licensing (e.g. concerns around requests for longer licences for current mining operations in northern Saskatchewan)	1	1
Environmental Monitoring (e.g. requests to be included in the development of monitoring plans and for additional monitoring to occur)	1	1
Cumulative impacts (e.g. concerns regarding the uptake of mining in northern Saskatchewan and the cumulative impacts that may occur in the future)	1	1

Conclusion

CNSC staff take the issues and concerns raised by intervenors seriously and are working with each intervenor identified in Table A who has raised issues and concerns on identifying approaches to addressing the different topic areas, requests and comments raised, as appropriate. Furthermore, the CNSC is committed to continuously improving the quality of data included in RORs, and the ROR reporting process. CNSC acknowledges that the 2 main themes of issues raised in the 2022 UMM ROR were “environmental protection and Indigenous knowledge, language, and culture”, and has made it a priority to further discuss and address these issues with each Indigenous Nation and community who has intervened, where feasible. As part of this commitment, CNSC staff have included annexes in all 2022 RORs with information on the issues and concerns raised by intervenors and the status of the CNSC’s work to follow-up, respond to and address each intervention as appropriate, and are working

towards the continued expansion and enhancement of reporting to the Commission on issues tracking and engagement efforts.

The CNSC is dedicated to continuous improvement, and actively works to identify meaningful ways and approaches for addressing the concerns, comments and recommendations made by intervenors identified in the 2022 UMM ROR, where appropriate. In instances where issues and concerns are raised that the CNSC and the intervenor may disagree, the CNSC is open to having dialogue and working towards finding solutions and building consensus around key issues within the CNSC's mandate and authority.