



**CAMECO CORPORATION
FUEL SERVICES DIVISION**

**2022 LICENCE RENEWAL APPLICATION
FOR THE
BLIND RIVER REFINERY**

SEPTEMBER 30, 2020

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1.0 INTRODUCTION

1.1 Cameco Corporation and the Fuel Services Division

Cameco Corporation (Cameco) is one of the world's largest uranium producers and is a prominent supplier of uranium processing services required to produce nuclear fuel for the generation of clean electricity. Cameco is committed to the safe, clean and reliable operation of all of its facilities and continually strives to improve safety performance and processes to ensure the safety of both its employees and the people in its neighbouring communities. Cameco's corporate business address is 2121-11th Street West, Saskatoon, Saskatchewan, S7M 1J3.

Cameco's Fuel Services Division (FSD) supplies the world's reactor fleet with fuel to generate one of the cleanest sources of electricity available today. The Blind River Refinery (BRR) is the world's largest commercial uranium refinery and processes uranium ore concentrates from uranium mines worldwide and natural uranium-bearing scraps from other facilities in the uranium fuel cycle. The business address for the Blind River Refinery is 328 Eldorado Road, PO Box 1539, Blind River, Ontario, P0R 1B0.

The safety of people and protection of the environment are the foundations of Cameco's operations. All employees share in the responsibility of continually improving the workplace safety and lessening impacts on the surrounding environment. Cameco values the contribution of every employee and respects individual dignity, creativity and cultural diversity. Through personal and professional integrity, Cameco employees lead by example, earn trust, honour commitments and conduct our business ethically. Through leadership, collaboration and innovation, Cameco employees strive to achieve their full potential in the pursuit of excellence in all that they do.

Cameco's four measures of success are:

- a safe, healthy and rewarding workplace,
- a clean environment,
- supportive communities, and
- outstanding financial performance.

These success measures provide the framework on which business decisions are made to ensure that Cameco remains qualified to carry out its licensed activities, in compliance with the applicable regulatory requirements in a manner protective of the environment, health and safety of people and ensuring that national security and international obligations are maintained.

1.2 Blind River Refinery

The refinery was built on a greenfield site in the early 1980s by Eldorado Resources Ltd. (ERL) and began producing uranium trioxide (UO₃) in 1983. ERL later became Eldorado Nuclear Limited (ENL). After the merger of ENL and the Saskatchewan Mining and Development Corporation in 1988, Cameco became the owner and licensed operator of the refinery.

The refinery processes natural uranium ore concentrates into natural uranium trioxide (UO₃). Cameco receives uranium ore concentrates from mines worldwide. Cameco also receives and processes small quantities of scrap natural uranium-bearing materials such as uranium dioxide (UO₂) and natural uranium metal. Other materials such as natural uranium metal scrap and natural uranium-bearing scraps such as wet filter cake are processed periodically and are packaged in a manner appropriate to the type and quantity of material.

1.3 Application for Licence Renewal

The Vice-President, Fuel Services Division is the licence applicant on behalf of Cameco Corporation. Cameco is seeking a licence renewal of the Class 1B Nuclear Fuel Facility Operating Licence FFO-3632.0/2022 for the Blind River Refinery for a term of 10 years with no changes to the authorized activities or approved production rates as set out in this application and referenced documents.

The current licence for BRR is valid until February 28, 2022 and authorizes Cameco to produce uranium trioxide (UO₃) at the refinery. Only natural uranium compounds are handled, processed and produced at this facility. In its decision for the current FFO, the Commission authorized an annual production capacity of 18,000 tonnes uranium as UO₃, with approval to increase the annual production rate to 24,000 tU as UO₃ subject to the following conditions:

- (a) The proposed modifications of the facility as specified in Cameco's letter dated June 28, 2011*, are completed and commissioned;
- (b) a final commissioning report on the proposed modifications specified in Cameco's letter dated June 28, 2011, is submitted to the Commission or a person authorized by the Commission for review and acceptance; and
- (c) the final commissioning report specified in (b) above is accepted in writing by the Commission or a person authorized by the Commission.

*Cameco letter - Cameco Responses to Third-Party Recommendations in Production Increase Engineering Assessment Report – June 28, 2011. The modifications involve export controlled nuclear equipment and information and are intended to remain confidential.

The licence also authorizes Cameco to possess, transfer, use, process, import, package, transport, manage store and dispose of the nuclear substances that are required for, associated with, or arise from the production of UO_3 and possess and use prescribed equipment and prescribed information that are required for, associated with, or arise from the production of UO_3 .

1.4 Licensing Basis

The basis for licensing consists of applicable laws and regulations, the safety and control measures in the licence and the licence application and documents in support of the application. This includes the *Nuclear Safety and Control Act* (NSCA) and associated regulations, including, but not limited to the following:

- *General Nuclear Safety and Control Regulations*
- *Class I Nuclear Facilities Regulations*
- *Radiation Protection Regulations*
- *Packaging and Transport of Nuclear Substances Regulations, 2015*
- *Nuclear Substances and Radiation Devices Regulations*
- *Nuclear Non-proliferation Import and Export Control Regulations*
- *Nuclear Security Regulations*

Other laws, regulations and international agreements that are applicable to the licensing basis include:

- *Impact Assessment Act* and its regulations;
- *Canadian Environment Protection Act, 1999* and its regulations;
- *Fisheries Act* and its regulations;
- *Nuclear Liability and Compensation Act*;
- *Transportation of Dangerous Goods Act, 1992* and its regulations;
- *Access to Information Act*;
- *Canada/IAEA Safeguards Agreements*;
- *Canada Labour Code, Part II*;
- *Ontario Environmental Protection Act* and its regulations;
- *Ontario Water Resources Act* and its regulations; and
- *Ontario Technical Standards and Safety Act, 2000* and its regulations;

The safety and control measures are described in the Licence Conditions Handbook (LCH). The CNSC regulatory framework uses CNSC regulatory documents (REGDOCs), Canadian Standards Association (CSA) standards, codes and other regulatory documentation to provide compliance verification criteria, additional recommendations and guidance for BRR in implementing control measures at the facility. The applicable REGDOCs, standards, codes and other regulatory documentation are provided in Appendix 1, along with current implementation status and implementation dates, as applicable.

The BRR maintains programs and plans to meet the requirements of the Safety and Control Areas (SCA) as required by its licence which are listed in Appendix 2. These are summarized in the Facility Licensing Manual (BRR). This application for licence renewal and the referenced supporting documents describe how BRR meets licensing requirements and provides the basis for renewal of the operating licence. This application, the FLM and summaries of significant reports supporting the licensing basis as described in the application will be made available to the public through the Fuel Services Division (FSD) community website (www.camecofuel.com). Documents referred to in the application and/or FLM are not publicly available; they contain confidential and proprietary information, controlled nuclear information or prescribed information as defined by the *General Nuclear Safety and Control Regulations* (GNSCR).

1.5 Application Format

This renewal application is written to describe Cameco's licensing basis for the ongoing operations at BRR. The remainder of this application will provide the information required to support renewal of the licence for a period of ten years.

The information is organized as follows, with a detailed mapping of the licence application requirements set out in the *General Nuclear Safety and Control Regulations*, *Class I Nuclear Facilities Regulations*, *Nuclear Substances and Radiation Devices Regulations* (NSRDR) and the *Nuclear Security Regulations* in Appendix 4.

Section 2 will provide a description of BRR operations and other licensed activities.

Section 3 will provide an overview of the site's performance in the current licence period, including achievements and improvement initiatives. A detailed operational performance report for the current licence period is included as Appendix 5.

Section 4 will describe the safety and control areas, programs to meet specific licence conditions, site performance and any improvement initiatives or future activities.

The appendices provide supporting information for the application and include:

- Appendix 1 – Standards and Guidance Relevant to Safety and Control Areas
- Appendix 2 – Documents Supporting the Licence Application
- Appendix 3 – Acronyms and Abbreviations
- Appendix 4 – Licence Renewal Application Requirements Matrix
- Appendix 5 – Detailed Operational Performance Report for FFOL-3632.0/2022

2.0 DESCRIPTION OF OPERATIONS AND OTHER LICENSED ACTIVITIES

2.1 Organization and Responsibilities

Cameco is governed by a board of directors. Operationally, the refinery is part of the FSD, which is led by a Vice-President. The Vice-President, FSD reports directly to the Chief Operating Officer, who ultimately reports to Cameco's Chief Executive Officer. Cameco's organizational chart, FSD's organizational chart as well as the refinery's organizational chart are shown in Figures 5 and 6.

Cameco's Chief Executive Officer is ultimately responsible to ensure that the facility is operated in accordance with the conditions of the licence, the NSCA and regulations listed in section 1.4 of this application. The licensing authority in accordance with subsection 15(a) of the *General Nuclear Safety and Control Regulations* for the facility is the General Manager, Blind River Operations. Day-to-day compliance activities are the responsibility of the site General Manager with support and direction from the site regulatory compliance staff. Divisional compliance responsibilities for FSD are handled by the Director of Regulatory Compliance and Licensing, with support and direction from divisional compliance and licensing staff. All personnel with the authority to act for BRR in dealings with the CNSC are identified in the FLM.

Additional details regarding BRR's organizational structure may be found in Section 4.1.1.

2.2 Facility Location and Layout

The Blind River Refinery is located about 5 km to the west of the Town of Blind River and south of the Mississauga First Nation, as shown in Figure 1. The refinery is situated on a portion of the lands owned by Cameco in the Town of Blind River, District of Algoma.

The property owned by Cameco extends north to the railway line and is bounded on the west by the Mississagi River and south by the North Channel of Lake Huron. The property is 257.6 hectares in total, which includes a secured area of 11.3 hectares, where the facility is located and where the CNSC licensed activities are carried out. Cameco has a lease arrangement for an additional 194.8 hectares to the east of the existing property boundary. The nearest residence is located approximately 1 km NE of the operating facility.

The legal description of the facility is provided in the FLM. Site drawings BRR700P-C-0002200-01 and BRR700P-C-0002200-02 provide detailed information regarding the facility layout.

The licensed area of the facility is shown in Figures 2 and 3. The UO₃ refinery, plant services and administration are located in a central building. There are also several smaller auxiliary buildings at the site, which support refinery operations. Some of these buildings provide a specific function, such as the cooling towers, effluent pump house,

Figure 1 – Location of Blind River Refinery

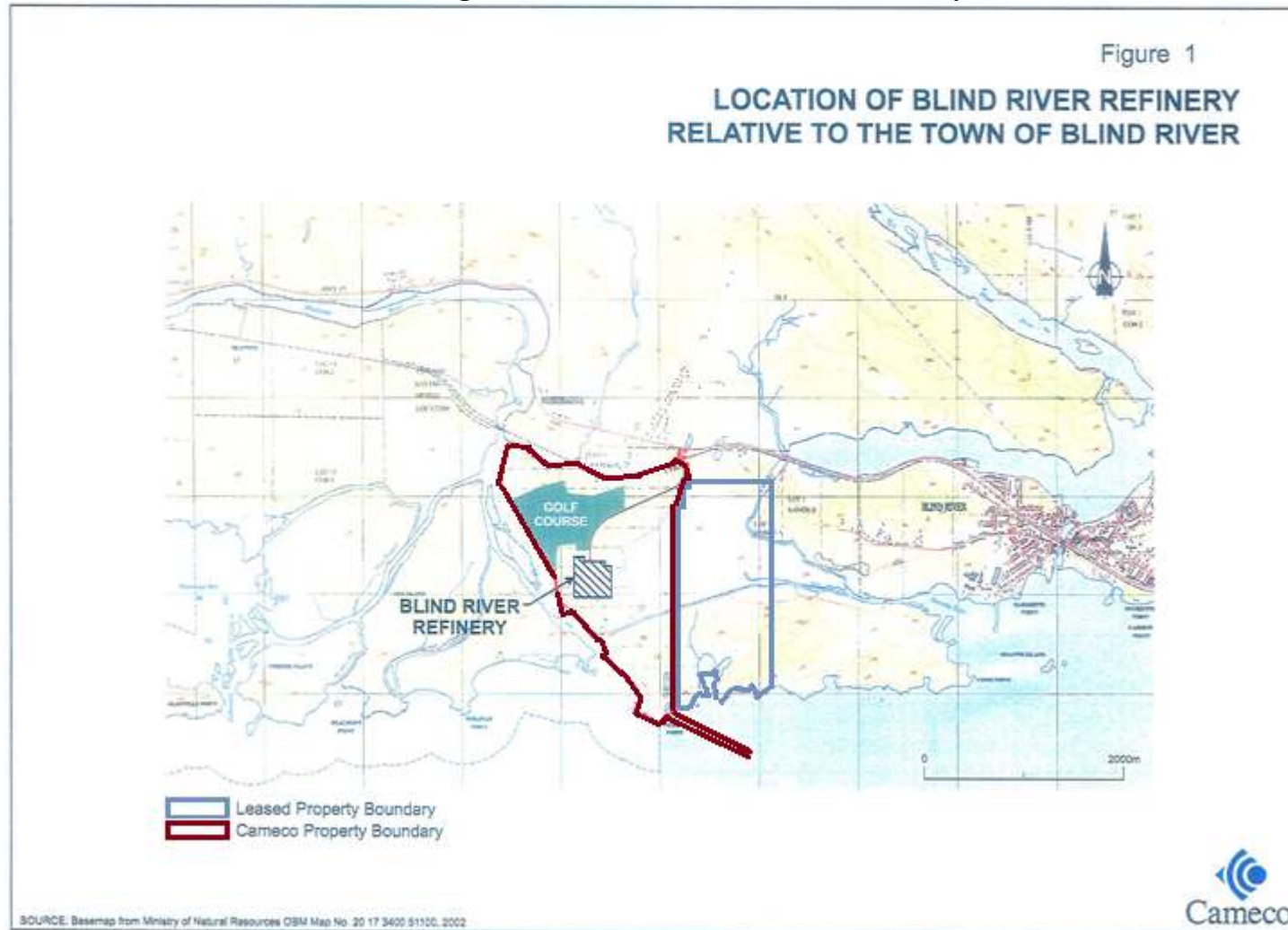
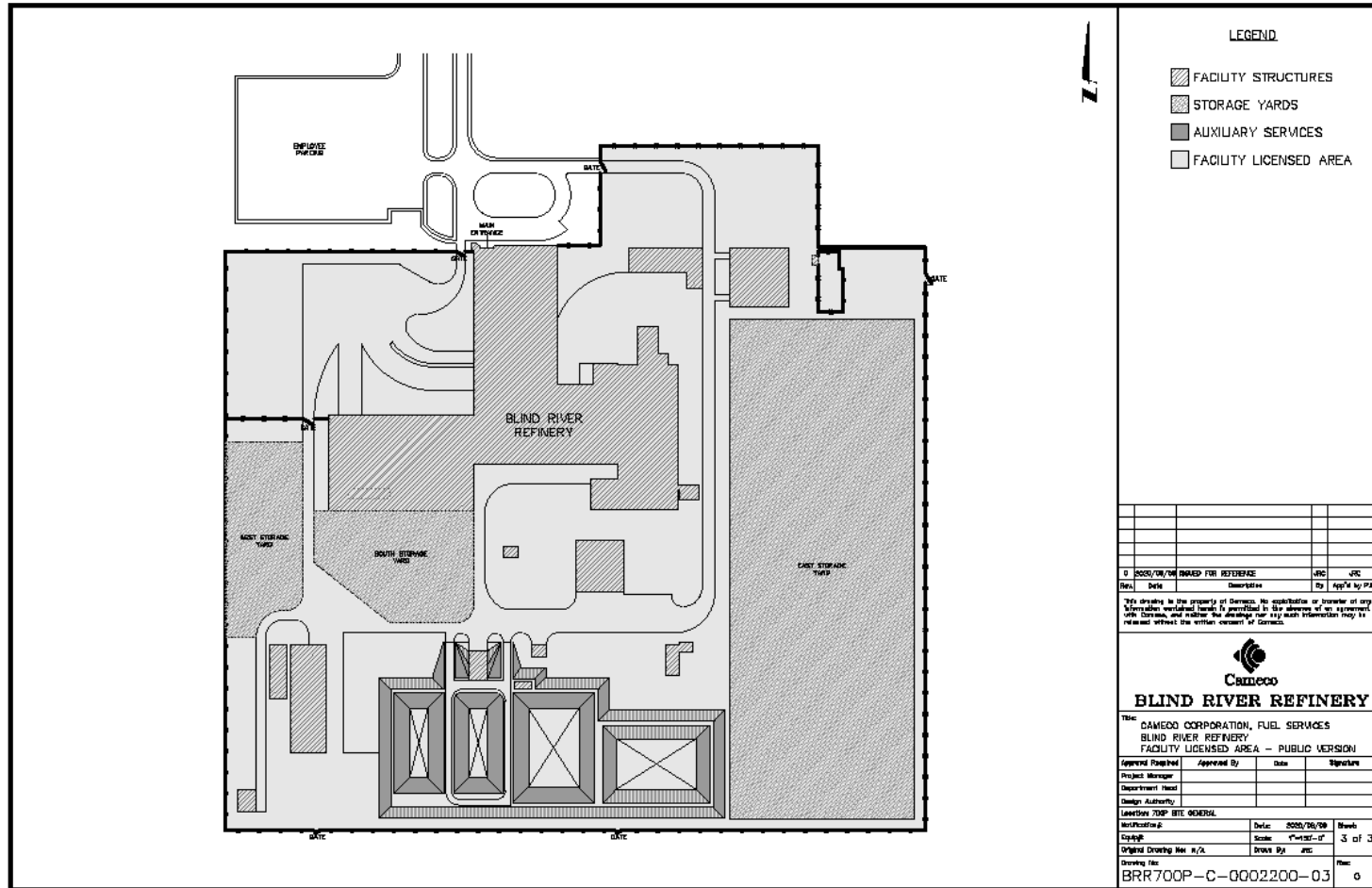


Figure 2 – Aerial View of the Blind River Refinery



solvent make-up building and sewage treatment plant, and others are used primarily for storage of chemical compounds or materials. There are also three separate buildings that can be used to store uranium-bearing products. A number of outside storage areas are used for storing chemicals and uranium-bearing materials. These materials are properly identified and stored in a safe manner.

Figure 3 – Facility Licensed Areas



2.3 Processes and Materials

2.3.1 Uranium Trioxide (UO₃)

The refinery processes natural uranium ore concentrates into uranium trioxide (UO₃). Cameco receives uranium ore concentrates from mines worldwide. Cameco also receives and processes small quantities of scrap natural uranium-bearing materials such as uranium dioxide (UO₂) and natural uranium metal. Other materials such as natural uranium metal scrap and natural uranium-bearing scraps such as wet filter cake are processed periodically and are packaged in a manner appropriate to the type and quantity of material. Bulk quantities of nitric acid, phosphoric acid and kerosene are stored on site for use in the process and other chemicals are used onsite in licensed activities.

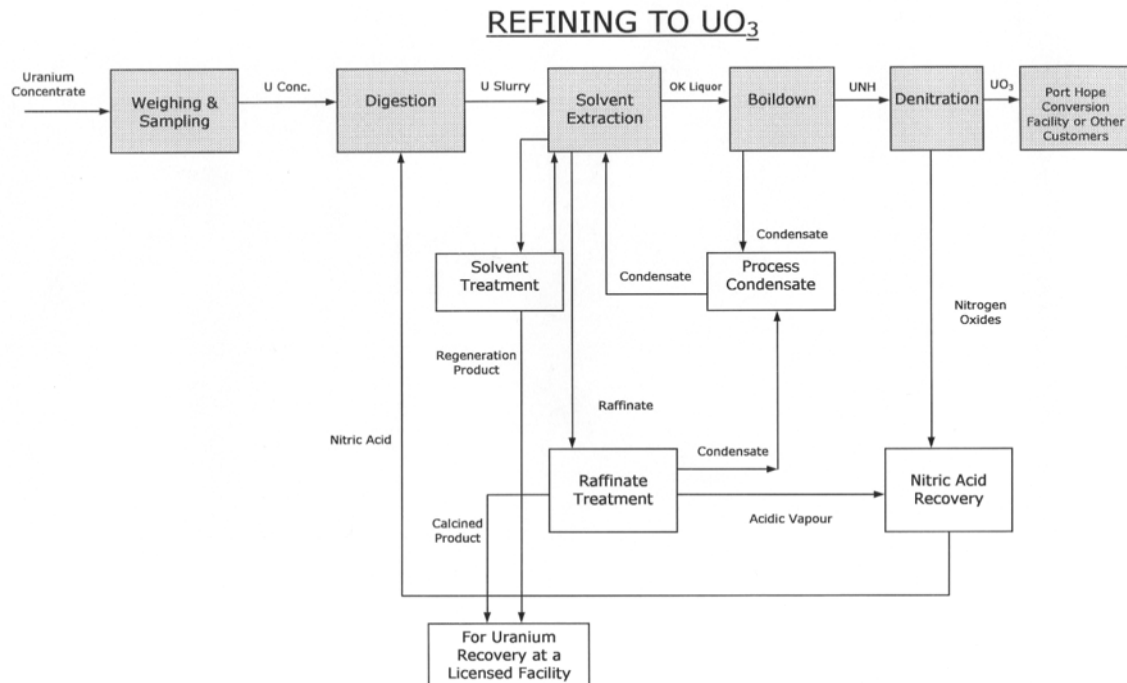
The refinery has a licensed capacity of 18,000 tonnes U/year as UO₃ with an approval to modify the plant to increase the annual production rate to 24,000 tonnes U as UO₃ subject to conditions and hold points approved by the Commission. The facility does not have a licence for and does not possess enriched uranium or other fissile materials.

An overview of the BRR process is shown in Figure 4. In the refining process, nitric acid is added to uranium ore concentrate to produce a uranyl nitrate solution. Impurities are removed from the uranyl nitrate solution using a solvent extraction process. The purified uranyl nitrate is then heated and concentrated, producing a nuclear-grade uranyl nitrate hexahydrate (UNH) liquid. This UNH is then thermally decomposed to form UO₃ powder. The UO₃ can be stored and shipped in specially designed bulk containers called tote bins, which contain approximately 9.5 tonnes of uranium each, to Cameco's Port Hope Conversion Facility (PHCF), or the UO₃ can be stored in steel drums for shipment to other customers.

The facility recovers oxides of nitrogen generated in the various processes in a nitric acid recovery circuit which is recycled to the digestion process. The solvent, tributyl phosphate (TBP) in a kerosene diluent, is recovered and recycled to the solvent extraction process.

The majority of the UO₃ produced at the facility is shipped to PHCF, where it is converted to either uranium dioxide (UO₂) or uranium hexafluoride (UF₆). However, the refinery periodically prepares and ships UO₃ to other customers who are licensed by the CNSC or the equivalent authority in another country in accordance with international agreements. In addition, the facility periodically receives, stores and may re-package prior to shipment, uranium ore concentrate without processing the material on site.

Figure 4 - Overview of the Refining Process



2.3.2 Other Activities Supporting UO₃ Operations

The refining process produces two recoverable uranium products: (1) regeneration product, which is produced in the solvent treatment circuit; and (2) calcined product produced in the denitrated raffinate. The calcined product is stored in steel drums and the regeneration product is stored in plastic drums. Both products are recycled via re-milling for uranium recovery at a licensed facility, though regeneration product could also be incinerated in the BRR incinerator, if required.

Cameco ships equipment and materials (i.e. natural uranium scrap, calcined product and contaminated combustible material) between licensed Cameco sites in order to reduce, re-use, recover and recycle items to the extent practicable. All shipments to and from the refinery are made in accordance with applicable regulations (as per section 1.4) as described in the FSD Packaging and Transportation Program (FSD-PGR-TRN-01).

Piloting work for various Cameco projects is also done at this facility on an as-required basis and may involve Cameco employees from other operations.

2.3.3 Nuclear Substances and Radiation Devices

The refinery maintains an inventory of sealed sources and tracks and reports their transfer as required by REGDOC 2.12.3: *Security of Nuclear Substances: Sealed Sources and Category 1, II, and III Nuclear Material, Version 2*. Site procedure Radioisotope Source Control, RP 3.2.4 describes the inventory and the monitoring, leak testing and lockout procedures to be followed to ensure that plant personnel are not unnecessarily exposed to radiation from radioisotope sources.

2.4 Public Information Program

The objective of the FSD Public Information Program (PIP) is to ensure local target audiences with an interest in Cameco's FSD CNSC-licensed facilities are informed on a timely basis about operations, activities, and potential effects on the environment and the health and safety of persons, and thereby build the trust and support of stakeholders. This includes a commitment to and protocol for ongoing, timely communication of information related to the licensed facilities during the licence periods. As a publicly traded company, Cameco must comply with strict disclosure requirements under securities laws both in Canada and the United States. These requirements may affect the content and timing of information releases to the public.

The PIP is designed to fulfill the requirements of the CNSC's REGDOC 3.2.1, *Public Information and Disclosure*.

2.4.1 Public Engagement Strategies

Cameco's overall public engagement process is guided by best practices garnered over decades of experience. These strategies are:

- Open Channels for Communication
 - Cameco will engage with target audiences through a variety of channels with the goal of building understanding and acting upon concerns.
- Clear and Uncomplicated Communications
 - Deliver fact-based, uncomplicated, and clear communications through the creation of communication materials to help ensure audiences can effectively build their understanding of the information.
- Adaptive Communications
 - Adapt communications to the target audiences and address/support any topics/issues identified through polling.

2.4.2 Target Audiences

Residents and Indigenous groups near the respective facilities are the primary audience for the PIP, and include the following in Blind River:

- Employees
- Local residents;
- Special interest groups;
- Blind River Town Council;
- Local Media;
- Blind River Area Environmental Monitoring Committee (BRAEMC);
- Business organizations such as the Blind River Chamber of Commerce;
- Local non-governmental organizations, charities and community groups; and
- Indigenous Groups
 - Mississauga First Nation

Cameco considers other groups and members of the general public to be the secondary audience, and include the following in Blind River:

- Blind River area residents, businesses and community groups/organizations
- Other interested persons/groups/organizations
- Indigenous Groups
 - Serpent River First Nation
 - Thessalon First Nation
 - Sagamok Anishnawbek Nation
 - Métis Nation of Ontario Region 4

2.4.3 Engagement Mechanisms

Cameco uses the following tools to reach its primary and secondary audiences and provide information to the public.

- Website
 - In addition to its corporate website (www.cameco.com), Cameco maintains a dedicated community website (www.camecofuel.com) to broadly communicate information about its Ontario operations.
- Social media
 - Cameco uses social media to provide news and information about Cameco's activities in Ontario, promote community events and engagement activities and drive traffic to Cameco's website. Cameco's social media channels are Facebook, Twitter, LinkedIn and Instagram.

- Advertising
 - Cameco uses radio, print and online advertising to support its communication initiatives in Ontario. Advertising is typically used to promote upcoming events and to deliver key messages.
- Media Relations
 - Requests for information from news media regarding Ontario operations are handled through Cameco's Fuel Services Division in Port Hope. Cameco monitors news coverage of its operations and the nuclear industry generally on an ongoing basis through subscriptions to media monitoring services as well as search-engine monitoring of news coverage undertaken by Cameco staff.
- Public Inquiries
 - Cameco aims to respond to inquiries in a timely manner and provide access to subject matter experts when needed.
 - Cameco has a variety of mechanisms in its PIP to provide target audiences with opportunities to comment or ask questions about its CNSC licensed Ontario operations as well as for Cameco to respond to issues raised. These include but are not limited to:
 - Social media channels
 - Public inquiry number (905.800.2020)
 - Email inquiry on camecofuel.com (cameco_ontario@cameco.com)
 - Cameco leadership and subject matter experts at community or Cameco-led events/activities
 - Cameco technical liaison contact information provided to CNSC staff for intervenor/public inquiries

2.4.4 Information Products

Cameco makes the following information available to all members of the public through its corporate and/or community websites.

- Technical Reports and Licensing Documentation
 - Summaries of significant reports supporting the licensing basis of the facilities are available on the dedicated community website, including environmental risk assessment, derived release limit assessment, safety report and preliminary decommissioning plans.
 - Documents supporting licensing activities and other select reports are also available to the public on the community website.
- Quarterly and Annual Compliance Reports
 - Quarterly Monitoring and Operational Performance Reports and Annual Compliance Reports are posted on camecofuel.com. The respective reports

are also sent to the Town of BR, Mississauga First Nation and the Serpent River First Nation.

- Videos
 - Cameco may choose to develop and deploy videos to help highlight various aspects of its operations and/or community activities. These videos may be utilized on its website and/or social media or used at off-site events.
- Printed Material
 - Print material is available for all visitors to Cameco facilities and made available at off-site information sessions. Other information products are made available through the community website, which is promoted through online, social media, print and / or radio advertisements.
- Information Boards
 - Cameco may choose to use information boards to help highlight various aspects of its operations and community investment activities. These boards may be deployed at community or Cameco-led events.

Additional information may be requested at any time through the public inquiry options described above.

2.4.5 Indigenous Engagement

Cameco is committed to provide opportunities to engage with First Nation and Métis communities regarding its operations in Ontario.

Cameco established an MOU with the Mississauga First Nation in 2010 that solidifies and documents a relationship built on effective communication and trust over many years that includes commitments for regular meetings.

Cameco provides its Quarterly Compliance Monitoring and Operational Performance Report and Annual Compliance Report to the Mississauga First Nation and the Serpent River First Nation.

Cameco has also identified Indigenous groups in its secondary target audience. Efforts to engage with these groups will include:

- Issuing an annual letter/email to determine interest in further engagement including meetings and/or facility tours.
- Informing of any licensing activities.
- As with any interested party, Cameco will review and respond accordingly to any request from an interested Indigenous group.

- Cameco will uphold commitments to notify the Métis Nation of Ontario Region 4 and the Serpent River First Nation about significant events at its BRR.

There are no changes to the activities described in the licence application from current licensed activities. As such, there are no new impacts to the environment nor the potential for new adverse impacts on an Indigenous group's potential or established Indigenous and/or treaty rights. Letters are being sent to the Indigenous groups identified in section 2.4.2 to advise of the submission of the licence application and invite their participation in the process.

2.5 Financial Guarantee

The BRR has a Preliminary Decommissioning Plan (PDP), which was prepared based on guidance provided in CSA N294.0-09 *Decommissioning of facilities containing nuclear substances*. The plan outlines the general requirements for returning the site to the status of unrestricted use and outlines the controls required for the protection of the environment during the decommissioning process. The PDP forms the basis for the financial guarantee as per CNSC regulatory document G-206 *Financial Guarantee for the Decommissioning of Licensed Activities*. The approved financial guarantee for \$48 million was approved by the Commission during the previous licensing proceedings and is maintained in the form of irrevocable letter of credit.

The PDP has recently been reviewed and determined not to require changes to the approach. The associated cost estimate has been reviewed and increased to \$57.5 million. Once the increased value of the financial guarantee has been approved by the Commission in the licence renewal hearing, Cameco will secure an irrevocable letter of credit to cover the full amount required by the updated cost estimate.

3.0 SITE PERFORMANCE OVERVIEW

This section describes operational highlights and improvement initiatives during the current licence period (Q1 2012 – Q2 2020). A detailed review of performance broken down by Safety and Control Area (SCA) is provided in Appendix 5.

3.1 Performance in the Current Licence Period

Cameco is committed to the safe, clean and reliable operation of all of its facilities and continually strives to improve safety performance and processes to ensure the safety of both its employees and local residents. BRR maintains the required programs, plans and procedures in the areas of health and safety, radiation protection, environment, emergency response, fire protection, waste management, and training. BRR's operations have maintained employee radiation exposures well below the regulatory dose limits. Environmental emissions and public radiation exposures are controlled to levels that are a fraction of the regulatory limits.

In its annual performance reports to the Commission, CNSC staff has rated BRR's performance as Satisfactory in all SCAs each year of the current licence period, with the exception of Conventional Health and Safety which has achieved a Fully Satisfactory rating between 2013 and 2018. Routine inspections by CNSC staff continue to confirm that BRR is in overall compliance with the CNSC regulatory and licensing requirements. Action notices and recommendations made by CNSC inspectors and specialists are reviewed and used to strengthen existing programs and controls to ensure that safety, security and the environment are not compromised.

Cameco is committed to continuous improvement at all of its operations. In the current licence period, BRR has enhanced its effective site programs to align with new and/or updated CSA standards and new REGDOCs. Requirements from more than 20 standards and REGDOCs have been incorporated into site programs since 2012.

3.2 Facility Operation and Physical Design

Throughout the licence period, BRR operated routinely with no major operating problems. The UO₃ plant shuts down annually in the summer for scheduled maintenance work, employee vacation time and to align production requirements with PHCF. BRR also has shorter shutdown periods throughout the year, ranging from a few hours to a few weeks. The shorter shutdowns are typically extended power outages due to storm events and/or to effect critical maintenance repairs, while the longer shutdowns are typically inventory or production requirements related. A five-week shut-down occurred in 2020 in response to the COVID-19 pandemic.

No significant modifications were carried out to the facility during the current licence period.

3.3 Radiation Protection

The well-established radiation protection program at BRR has been demonstrated to be effective in the prevention of unreasonable risk to the health and safety of workers. The total effective dose (TED) for all employees is shown in Table 1 which are well below the annual regulatory limit set out in the *Radiation Protection Regulations* of 50 mSv/yr.

Table 1 Total Effective Dose in Current Licence Period

2012 - 2019 Total Effective Dose				
Year	Number of Individuals	Minimum Dose (mSv)	Average Dose (mSv)	Maximum Dose (mSv)
2012	173	0	3.7	12.0
2013	162	0	3.3	12.1
2014	150	0	3.3	8.2
2015	154	0	1.7	7.4
2016	154	0	1.5	6.1
2017	145	0	0.9	3.3
2018	150	0	1.4	6.9
2019	174	0	1.6	7.7

The five-year regulatory limit of 100 mSv established in the *Radiation Protection Regulations* applies to unique five-year periods of time. The periods relevant to the current licence period extend from January 1, 2011 to December 31, 2015 and January 1, 2016 to December 31, 2021. For the first five-year period in under this licence (January 2011 to December 2015), the maximum TED for a single individual for all five years was 41 mSv. For the current period (January 2016 to December 2020) the highest individual result to date is 24.1 mSv (up to December 2019).

3.4 Conventional Health and Safety

BRR has a mature occupational health and safety program with a strong commitment to safety. A strong safety culture built from hard work, continuous training, a culture of looking out for all employees, and the relentless pursuit to be better is demonstrated through the achievement in June 2020 of 14 years without a lost time injury.

3.5 Environmental Protection

BRR controls and monitors all releases of nuclear and hazardous materials from the facility. Effluent and environmental monitoring is described in the Environmental Protection Program (EPP). During the current licence period, BRR did not exceed any environmental action levels.

In addition, the EPP and supporting documents were updated to incorporate requirements from the CSA N288 suite of environmental standards, including those for derived release limits, environmental monitoring, effluent monitoring, groundwater monitoring and development of action levels.

3.6 Public Information and Community Engagement

Cameco has a mature PIP to provide relevant information to the community on how activities at BRR affect the environment and the health and safety of employees and the community. The program is dynamic and utilizes traditional radio and print media, community-based activities, as well as web-based and social media to communicate with the public.

Cameco maintains a dedicated community website (www.camecofuel.com) to broadly communicate information about its Ontario operations. The site provides information about Cameco's Port Hope Conversion Facility (PHCF), Cameco Fuel Manufacturing (CFM) and BRR facilities, environmental programs, and community involvement. Documents supporting licensing activities, compliance reports, and other select reports or technical summaries are also available to the public on the community website.

Cameco is committed to providing information to interested Indigenous groups and proactively reaches out to provide information or extend invitations to Cameco initiatives.

Over the past decade, Cameco has periodically retained outside expertise to measure public opinion in Blind River to help determine the effectiveness of its PIP. The most recent public opinion polling has consistently demonstrated a continued high level (97%) of community support for Cameco's continued operations in Blind River.

4.0 SAFETY AND CONTROL AREAS

4.1 Management System

The management system program at BRR is the framework that currently guides the processes and programs required to ensure safety objectives are achieved, performance is monitored and a healthy safety culture is maintained. The Management System Program Manual (MSPM), AM 400, meets the requirements of CSA N286-12 (R2017): *Management System Requirements for Nuclear Facilities* and REGDOC 2.1.1: *Management System*.

The management system is based on the following principles, which are described in more detail in the MSPM, and applied in a graded manner commensurate with risk.

- Safety is the paramount consideration guiding decisions and actions;
- The business is defined, planned and controlled;
- The organization is defined and understood;
- Risks are identified and managed;
- Resources, generally captured as financial, human and infrastructure, are identified and managed;
- Communication is necessary and must be effective to achieve our business objectives;
- Information is identified and managed;
- Work is identified and managed;
- Problems are identified, assessed for significance and resolved as appropriate to the significance;
- Changes are identified and controlled;
- Assessments are performed;
- Experience is sought;
- The management system is continually improved; and
- Corporate oversight is defined and performed to ensure the management system meets the business needs of the organization.

The MSPM also applies to supplier(s) contracted to perform the life-cycle activities of design, supply chain, construction, commissioning, operation, and decommissioning, as appropriate, as they relate to the BRR. However, BRR's top management remains accountable to ensure the requirements of this program are met.

An annual site management review is held with site, divisional and corporate leadership to review the suitability, adequacy, and effectiveness of the corporate Safety, Health, Environment and Quality (SHEQ) policy and the site programs and procedures to ensure conformance to both Cameco and CNSC requirements. These reviews include assessing opportunities for improvement and the needs for changes to site programs, including

objectives and targets. Actions are assigned and tracked in the Cameco Incident Reporting System (CIRS).

4.1.1 Organizational Structure

The organizational structures of FSD and BRR are shown in Figures 5 and 6. The vice-president, fuel services, directs the operation of and maintains corporate responsibility for the BRR. The general manager, Blind River operations, has the responsibility of operating the facility in accordance with the corporate policies, principles and operating budgets approved by the company's board of directors. To facilitate administrative control within the facility, employees have been organized into a number of departments. Production and service-oriented departments have been segregated, but all departments report to the general manager.

Designated personnel are responsible for all operations within their departments which must be carried out in a manner consistent with company policies, programs, plans and procedures. In accordance with Section 15 of the *GNSCR*, the persons who have authority to act for BRR in dealings with the Commission, and the name and position titles of the persons who are responsible for the management and control of the licensed activities are documented in writing and provided to CNSC staff.

Figure 5 - Organizational Structure – Fuel Services Division and Corporate that Support BRR

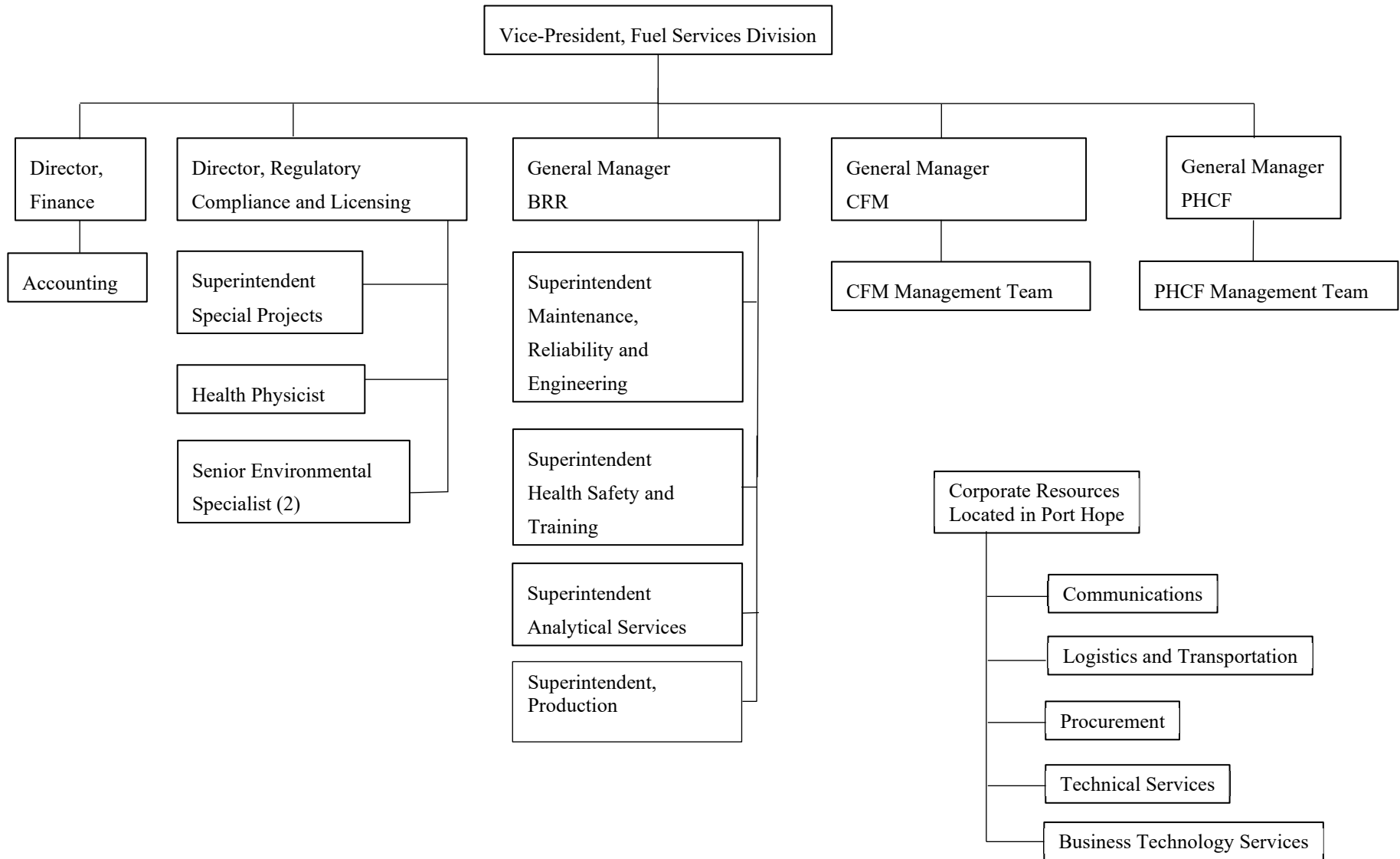
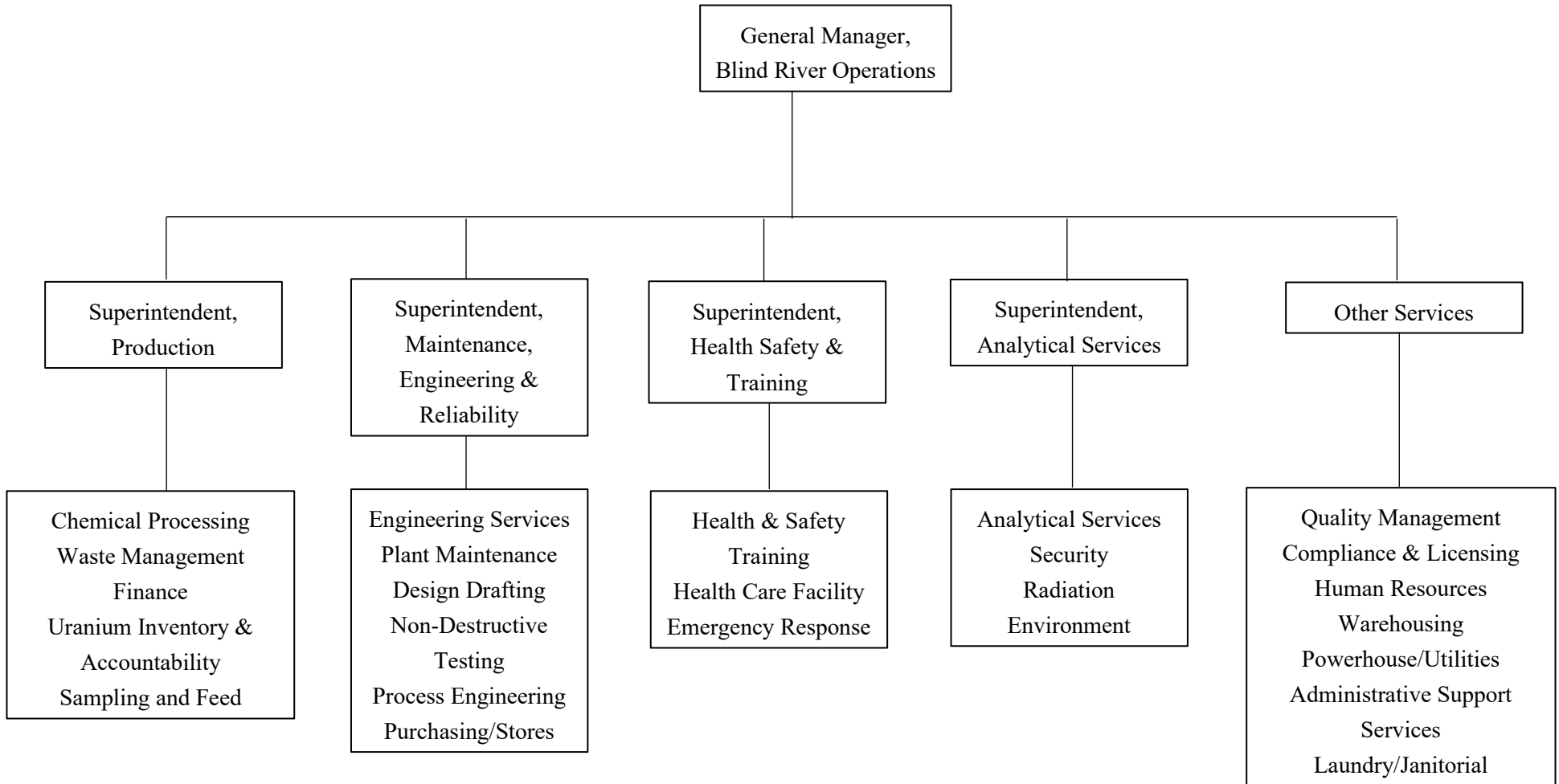


Figure 6 - BRR Organizational Structure



4.1.2 Safety, Health, Environment and Quality (SHEQ) Policy

Consistent with its vision, values and measures of success, Cameco emphasizes that the health and safety of workers and the public, protection of the environment, and quality of its processes are the highest corporate priorities during all stages of its activities, which include exploration, development, operations, restoration, decommissioning and reclamation. As such, Cameco is striving to be a world class performer in all aspects of our business through a strong safety culture, environmental leadership, operational excellence and our commitment to the following:

- Preventing injury, ill health, and pollution;
- Fulfilling compliance obligations;
- Keeping risks at levels as low as reasonably achievable, taking into account economic and societal factors;
- Ensuring quality of processes, products and services; and
- Continually improving our overall performance.

These commitments are reflected in the SHEQ policy which is publicly available on the Cameco website (www.cameco.com). These commitments are approved and supported by Cameco's board of directors. The officers, senior management and all employees are accountable for the performance of their jobs in compliance with this policy and all relevant legislation.

4.1.3 Safety Culture

Cameco's corporate focus on its management system through governance, quality and safety culture drives accountability and oversight at all operations. Divisional oversight and collaboration is enhancing the FSD safety culture through consistency, management system enhancements and/or divisional program development, to improve safety and environmental performance.

Cameco conducts safety culture surveys (also called safety culture assessments) approximately every five years at all sites within the FSD. These surveys gauge the perception of employees in relation to safety culture in a scientifically meaningful way. From these surveys/assessments action plans are developed in areas where opportunities for improvement are identified. Action plans will be entered into CIRS for tracking and follow-up. The most recent safety culture assessments were completed in 2013 and 2018 and are discussed in Appendix 5.

The BRR and FSD leadership teams are committed to enhancing a sustainable safety culture and will continue to work diligently to ensure that all employees remain engaged to the extent possible.

4.2 Human Performance Management

BRR maintains processes to support human performance in its operations. Aspects of human factors have been considered in the development and continual improvement of site management system programs, work instructions, engineering and operations activities, change control and the corrective action process.

Work instructions and operating documents are developed in consideration of the physical interaction of people and the production plant equipment or systems. Various risk assessment tools are used as part of continual improvement, project design and implementation and change control to identify and control error-likely situations.

4.2.1 Training Program

The BRR training program describes the processes in place for a Systematic Approach to Training (SAT). The Training Program Manual, BR AM 300, meets the requirements of REGDOC2.2.2, *Personnel Training, Version 2*. Operation of the refinery requires both professional and non-professional workers for which on-the-job training is required. The refinery also has training programs for specific areas such as emergency response, radiation safety, environment and health and safety. The goal of training is to develop and maintain a competent work force.

Training and development strategies at BRR strive to:

- Promote a culture of safety, health and environment
- Apply the corporate systematic approach to training
- Comply with and move beyond legal and regulatory requirements
- Incorporate adult learning principles
- Create a respectful and supportive learning environment by recognizing differences in styles and learner demographics
- Develop employees at every level
- Develop the full potential of all employees in a positive learning environment
- Contribute to business results and competitiveness

BRR provides training to meet legislative and internal company requirements to ensure that employees have adequate knowledge and skills to fulfill their roles and responsibilities. Employee training plans identify initial and continual qualification requirements of positions. Training plans include position specific, site specific, corporate, progression, and role specific requirements where applicable.

4.3 Operating Performance

An operating program includes an up-to-date set of operating limits for the facility and activities authorized under the licence, including: production limits and limits for the possession, use, management, transfer, storage of nuclear substances, and an inventory of nuclear substances possessed under the licensee's operating licence.

The FLM provides an overview of all the programs in place at the refinery to ensure that it operates in a safe manner. The performance of these programs is regularly assessed to assure the site management that these programs are implemented, adequate and effective. Corporate personnel perform audits of the site management programs on a regular basis to verify that site performance meets both corporate requirements and complies with all applicable regulatory requirements.

4.3.1 Operating Limits

Operating limits are defined in the licensing basis upon which the Commission rendered their decision to renew the refinery's operating licence in 2012. The current limits are set out in the licence, Licence Conditions Handbook (LCH) and the FLM and in Section 1.3 of this application.

Environmental release limits and radiation protection limits are established to ensure the protection of workers, the public and the environment. Radiation protection limits are set out in the *Radiation Protection Regulations* and documented in the Radiation Safety Program Manual, RS 100. Environmental release limits are documented in the Environmental Protection Program, ET 110 and further discussed in Section 4.9 of this application.

Radioisotope sources are used at the facility. The Radioisotope Source Control Procedure, RP 3.2.4 describes the inventory of sealed sources, and tracking and reporting requirements in accordance with REGDOC-2.12.3, Security of Nuclear Substances: Sealed Sources and Category I, II and III Nuclear Material, Version 2.

4.3.2 Operating Plan

Cameco develops three-year plans for strategic planning for the immediate future, with 10-year plans for business development purposes. In the three-year strategic plan, production plans are remaining at current levels, with the annual production targets based on PHCF demand for UO₃ as well as international customer orders. From a developmental planning perspective, the uranium market has not fully recovered from the aftereffects of the Fukushima accident in 2011. The production increase at BRR that was approved by the Commission in 2012 positions Cameco for a potential increase in demand for uranium, which is expected in the future. The existing approval and hold points set out the process to implement the production increase once the project begins.

4.3.3 Reporting Requirements

BRR reports information to the Commission as required under the NSCA, its regulations, and REGDOC- 3.1.2 *Reporting Requirements, Volume I: Non-Power Reactor Class I Nuclear Facilities and Uranium Mines and Mills*.

Quarterly compliance reports and an annual compliance and performance report are submitted to CNSC staff as per the LCH. These reports are available to the public on the FSD community website (www.camecofuel.com).

Non-routine reporting includes incidents related to plant operations, action level exceedances and environmental releases and other events as defined in sections 29-32 of the *General Nuclear Safety and Control Regulations*, section 27 of the NSCA, REGDOC-2.12.3 and the LCH. All non-routine reporting is included in the quarterly and annual reports. As per the Public Disclosure Protocol for Ontario Operations, the following events are also posted to the FSD community website:

- unusual operational events at our facilities that may have off-site consequences or that would be of interest to our target audience.
- environmental event that triggers a notification to the CNSC under Section 29 of the GNSCR.
- summaries of non-routine environmental incidents that are required to be reported to the Ontario Spills Action Centre.

4.3.4 Regulated Activities

The BRR is federally regulated by the CNSC as a Class 1B nuclear facility. However, BRR is also regulated by other government agencies through statute, regulation, permit, approval and/or licence. Table 2 provides a list of key regulatory authorities along with an overview of the key activities they regulate as they pertain to the refinery.

Table 2: Agencies with Jurisdiction over BRR Operations

Agency	Activities Under Jurisdiction
Environment and Climate Change Canada (ECCC)	National Pollutant Release Inventory, halocarbons, spills reporting, deleterious substances enforcement under the <i>Fisheries Act</i>
Department of Fisheries and Oceans	<i>Fisheries Act</i> and regulations related to protection of fish and fish habitat
Ontario Ministry of the Environment, Conservation and Parks (MECP)	Discharges to air and surface water and associated approvals, monitoring wells and spills reporting
Town of Blind River	By-laws related to noise, garbage and open-air burning
Department of Employment and Social Development Canada (ESDC)	Conventional health and safety issues through the Canada Labour Code
Ontario Ministry of Labour (MOL)	Contractors at the facility may fall under provincial health and safety regulation
Ontario Technical Standards and Safety Authority (TSSA)	Regulate boiler and pressure vessels and associated piping
Transport Canada	Transportation of dangerous goods and navigable waters regulation

4.4 Safety Analysis

The design, construction and operation of the BRR is intended to eliminate or minimize to the extent possible the potential of radiological, chemical or other physical hazard to facility personnel, the environment and the general public. This is accomplished not by a single approach but rather by a defense-in-depth approach. The hazards, preventative measures and mitigating controls associated with the licensed activities at the BRR have been systematically reviewed and documented from several perspectives, including but not limited to the following assessments:

- BRR Safety Analysis Report (SAR)
- Fire Hazard Analysis
- Environmental Risk Assessment
- Derived Release Limit
- Spill Prevention and Contingency Plan
- Environmental Aspects Registry

4.4.1 Safety Analysis Report

Hazard risk assessments and safety analyses are now the cornerstone of process safety management throughout the world. This is a widely accepted method and practice used by industry and regulators to assess the risk and potential impact from plant operations.

BRR utilized a Hazards and Operability (HAZOP) methodology to systematically identify and analyze hazards associated with the licensed activities. A HAZOP is a set of organized and systematic assessments of the potential hazards associated with an industrial process; provides information intended to assist managers and employees in making decisions for enhancing safety and reducing the consequences of unwanted or unplanned releases of hazardous chemicals; and, is directed toward analyzing potential causes and consequences of fires, explosions, releases of toxic or flammable chemicals and major spills of hazardous chemicals, focusing on equipment, instrumentation, utilities, human actions, and external factors that might impact the process.

The SAR takes the detailed analyses found in the HAZOPs and summarizes by area the hazards, potential accident scenarios and controls in place to prevent and/or mitigate the consequences of these scenarios. The SAR is reviewed periodically to assess the following and revise scenarios, safety measures and conclusions as appropriate:

- incidents that have occurred at the facility against the report to confirm the response of safety systems
- design changes, including those initiated as a result of an incident or accident
- results of supporting studies and reports
- credible accident scenarios and predictive modelling

The SAR was updated in 2020 to incorporate information from other supporting studies such as flood assessment and external event analysis, and to incorporate guidance from the International Atomic Energy Agency (IAEA) standard SSR-4, *Safety of Nuclear Fuel Cycle Facilities*. It will be submitted to CNSC staff in October 2020 as part of the suite of documents supporting the licence renewal application.

The SAR demonstrates that the current site safety systems, procedural controls and abatement equipment in place mitigate risk to the public and the environment arising from accidents associated with the uranium and hazardous materials stored, processed and transported to and from the BRR.

The SAR contains technical detailed information that is considered confidential and proprietary and includes controlled nuclear technology and is not publicly available. A technical summary of the SAR is available on Cameco's community website.

4.5 Physical Design

BRR is required to have a program for physical design of the facility to assess the ability of structures, systems and components to meet and maintain their design basis given new information arising over time and manage changes to ensure that safety is maintained.

4.5.1 Facility Design

Site details are provided in Section 2.2. The licensed areas is secured by a metal fence that encloses the entire perimeter other than the front of the main building.

Modifications to the facility are made in accordance with the *National Building Code of Canada, 2015*, the *National Fire Code of Canada, 2015* and *National Fire Protection Association, CSA N393, Fire protection for facilities that process, handle, or store nuclear substances*.

4.5.2 Facility and Process Changes

BRR's Change Management Procedure, AM 37 describes the process used to identify and manage changes at site in a manner appropriate to the type and significance of the change. All changes to the facility's design and equipment are reviewed and documented throughout the design control process described Design Control Procedure, PR 33. The design control review process involves subject matter experts and identifies potential implications with respect to operability, health and safety and the environment, including any regulatory and/or code implications.

4.5.3 Third Party Review for Fire Protection

Modifications for which the initial assessment indicates a potential impact on fire protection design basis, goals, or criteria shall be subject to a qualified third-party review as per CSA N393. All third-party reviews are conducted by qualified persons from organizations whose management and financial operations are independent of the design organization. All third-party fire reviews are submitted to CNSC staff as required by the licence and LCH.

4.5.4 Pressure Boundary Program

As required by the operating licence, the BRR maintains an agreement with an Authorized Inspection Agency (AIA) for the registration, inspection and other activities related to pressure systems. The Technical Standards and Safety Authority (TSSA) is the AIA for the BRR. The TSSA approves the quality control program which governs the shop fabrication, field installation, assembly, repairs and erection of piping systems in accordance with applicable codes and repairs and alterations of boilers and pressure vessels, piping and fittings in accordance with applicable codes.

The pressure boundary program, which meets the requirements of CSA B51-14, *Boiler, pressure vessel, and pressure piping code*, establishes the infrastructure and defines the activities necessary to maintain a sustainable process that allows BRR to perform activities associated with repairs, replacements, modifications and alterations to pressure retaining items, components, and systems including installation of new systems.

4.6 Fitness for Service

BRR is required to have a program for maintenance of the facility and a program for periodic inspection and testing for the facility. This area includes programs that ensure all equipment is available to perform its intended design function when called upon to do so.

4.6.1 Maintenance Program

The BRR has an established preventative maintenance program as described in the Preventative Maintenance System Program Procedure, MA 100. All preventative maintenance work is initiated and documented through the work notification system in SAP. For safety significant systems, structures and components, preventive maintenance plans are reviewed and updated periodically. The site maintenance program ensures that equipment functions as designed over its lifetime so that safety systems remain available, meet the design intent in the safety report and that equipment failures are minimized. This is accomplished by completion of corrective and preventative maintenance activities along with routine inspections on system components to ensure that they remain in good operating condition.

4.6.2 In-service Inspection Program

The BRR has an in-service inspection program that applies to the piping and vessels in the safety significant systems. Technicians performing the inspections are certified in accordance with the Canadian General Standards Board. Inspection methods (e.g. ultrasonic or liquid penetrant) have been selected based on the historical record of operation and inspection at the BRR and are considered the most appropriate for detecting potential problems and for revealing the type of deterioration most likely to occur as a result of the service conditions to which the equipment is subjected.

4.6.3 Periodic Inspection and Testing for Fire Protection Systems

Fire protection systems are tested according to an established schedule developed using the National Building Code and National Fire Code. Reviews of aspects of the fire protection systems are completed as required by CSA N393-13: *Fire protection for facilities that process, handle, or store nuclear substances*.

4.7 Radiation Protection

Radiation protection measures are in place to minimize and control the potential for radiation exposure to both employees and members of the public arising from the operation of the BRR. This exposure is due to the alpha, beta and gamma radiation emitted from the natural uranium compounds received, processed, and produced at the refinery. Exposure can be from beta or gamma radiation outside the body, or alpha, beta or gamma radiation

from inside the body as a result of inhalation, ingestion or absorption through the skin of uranium bearing materials.

This section will focus on radiation exposure for workers at the facility. Radiation exposure for the public is discussed as part of the Environmental Protection SCA in Section 4.9.

4.7.1 Radiation Protection Program

The Radiation Safety Program Manual (RSPM), RS 100 describes how the refinery meets the requirements of the *Radiation Protection Regulations* and ensures that contamination levels and radiation doses received by individuals are monitored, controlled and maintained As Low As Reasonably Achievable (ALARA).

The RSPM describes written procedures used to ensure that radiation exposures and doses are kept ALARA, social and economic factors taken into account. This is accomplished by various means; employee training and awareness, the use of specialized handling and personal protective equipment, the development of specialized procedures and monitoring methods, and by having a system in place to develop, implement and monitor the effectiveness of their efforts.

Radiation exposure for employees is monitored through a comprehensive dosimetry program that includes internal and external dosimetry monitoring. FSD maintains a dosimetry services licence issued by the CNSC for the urine analysis and lung counting programs.

4.7.2 Potential Radiological Hazards

Radiation hazards at BRR are associated with natural uranium and its associated daughter products (thorium) and impurities. While both external and internal radiation hazards are present at the refinery, the potential risk associated with internal hazards are of more significance. Working in the presence of uranium, exposure can result from inhalation, ingestion or contamination of an open wound. The primary hazards are chemical damage to the kidney, radiation dose to the bone, and radiation dose to the lung. The Technical Basis Document (TBD) for the dosimetry service licence provides detailed information on the dose implications of the uranium and thorium compounds found at the BRR.

The International Commission on Radiological Protection (ICRP) has developed a general classification system for inhaled compounds by their solubility or retention in the human body. The classification scheme divides compounds as type F (fast), type M (medium), and type S (slow). Type F compounds have a retention time of hours, type S ones have a retention time of years, and type M compounds have intermediate values (days-weeks).

At BRR, all three types of compounds are present. BRR has assessed the solubility of the uranium concentrates received and the solubility varies from producer to producer. The majority of the concentrates received are either type M or S, although type F concentrates

are also received. In-process materials and products (UO₃ and calcined product) have also been assessed for solubility and have been classed as either type M or F materials.

4.7.3 In-Plant Monitoring

Regular gamma surveys of the plant and storage areas are performed and areas with dose rates above 25 µSv/h are posted. This posting informs workers that the time spent in this area should be minimized.

Uranium in air is monitored using an in-plant air sampling system. Sample points are located at operator stations and general area stations throughout the facility. The air sampling results from these stations provide an indication of air quality, and the performance of engineering controls. Air samples from the raffinate area may also be analyzed for thorium in air. This data is used to determine whether respiratory protection is required.

In addition to the in-plant air sampling system, the refinery has installed continuous air monitoring systems in the auger sampling, calcination and denitration areas. These units operate continuously and are set to alarm when uranium concentrations approach levels requiring respiratory protection.

4.7.4 Nuclear Energy Workers

Any individuals having a reasonable probability of receiving a radiation dose greater than 1 mSv are designated as Nuclear Energy Workers (NEWs). At the BRR all employees are designated as NEWs. Other individuals, such as contractors performing work on site, may be designated as NEWs as well. All NEWs are notified in writing that they have been designated as such and female NEWs are also notified in writing of their rights related to pregnancy and breast feeding.

All NEWs also receive training on the risks associated with radiation, in addition to other radiation protection safety training topics. Visitors typically will not be made NEWs since they are on site for only a short period of time and are not involved in activities that would result in an appreciable radiation dose.

4.7.5 Personal Dosimetry

The annual dose assignment of NEW’s working at the BRR consists of both external and internal dosimetry inputs. External exposures are monitored using a licensed dosimetry service provider. The Fuel Services Division maintains a dosimetry service licence for the urine analysis and lung counting programs. The annual total effective dose is the sum of a worker’s whole body dose as measured by dosimeter badges plus their dose from uranium in urine plus dose from their lung burden. Each of the three components of the personal dosimetry program is described below. Cameco reviewed dosimetry action levels in 2019* and determined that they remained appropriate for the refinery operations.

*Cameco letter – Review of Radiation Protection Action Levels for the Blind River Refinery. April 1, 2019

4.7.6 External Dosimetry

Individually assigned dosimeters are used to determine external dose as both deep-dose equivalent and shallow-dose equivalent exposure from external sources of radiation. The external dosimetry service for Cameco is provided through a CNSC approved external dosimetry service provider. Action levels for external dosimetry are shown in Table 3. These action levels are also referenced in the RSPM and in the appropriate radiation safety procedures. Extremity dose measurements are also utilized for some individuals who work routinely in the raffinate treatment area; using ring-type dosimeters that are processed in the same manner as the conventional dosimeters.

Table 3 Action Levels for External Dosimetry

External Dosimetry Parameter	Frequency	Regulatory Action Level (mSv)
Whole Body Exposure	Monthly	2.0
	Quarterly	0.7
	Balance of Pregnancy	2.0
Skin Exposure	Monthly	15.0
	Quarterly	6.0

4.7.7 Internal Dosimetry

FSD holds a licence from the CNSC that authorizes Cameco to provide internal dosimetry services to PHCF, BRR and CFM. The internal dosimetry program meets the requirements of CNSC document S-106: *Technical and Quality Assurance Standards for Dosimetry Services in Canada*. Additional information regarding this program may be found in FSD’s TBD.

Internal dose is assessed and assigned through two programs – urine analysis and lung counting. When assigning dose through the urine analysis program, it is assumed that the exposure was to a fast (soluble) uranium material. When a dose is assigned due to a lung

burden, it is assumed that a combination of medium (slightly soluble) and slow (insoluble) uranium material is present. When the source of the exposure to a NEW is known (e.g. due to a process upset), the dose calculations are specific to that material.

4.7.8 Urine Analysis

All employees and contractor NEWs (dependent on where they are working on site) are required to submit routine urine samples for uranium analysis. Routine urine samples are used to calculate and assign dose to the worker. A computer-based system is used to generate labels for urine samples and to track the submission of urine samples for the purposes of assessing program compliance. Any urine result above a pre-defined screening level is reviewed by the Radiation Safety Officer and investigated as required. Urine analysis action levels are shown in Table 4.

Table 4 Action Levels for Urinalysis

External Dosimetry Parameter	Frequency	Regulatory Action Level (µg U/L)
Routine Sample	Bi-weekly	65
	Monthly	44

4.7.9 Lung Counting

The dose assessment of uranium in lung is performed using a germanium detector-based lung counting system. A group-counting technique is used for dose assignment where all employees in a similar work group are assigned an average internal dose. This method involves creating appropriate groupings of individuals based on similar exposure potential and measuring and assessing each individual's spectrum, taking detection criteria and physical conditions (e.g. individual chest wall thickness) into account.

The frequency of lung counting of NEWs is based on the work group to which the employee belongs and is described in the RSPM. Individuals who are not lung counted such as administrative support staff and contractors have internal dose based on lung exposure determined through prorating the average dose from an appropriate reference group.

Individuals with lung count results above the detection criteria are assigned an individual dose and this dose is not included in the group average. Dose from lung counting is assigned annually as part of every NEWs annual dose report. Individuals with a lung burden above the detection criteria are informed of their assigned dose as soon as possible after completion of all required lung counts. The action level for dose due to lung burden has been set at 5 mSv/year.

4.7.10 Contamination Control

The BRR maintains zone control and monitoring programs as described in the RSPM to identify areas of potential contamination and prevent the spread of radioactive contamination from these areas. The site has been divided into three zones. Zone 3 represents processing areas where there is the highest chance of contamination being present while Zone 1 represents clean areas. Zone 2 is referred to as the buffer zone. To maintain the integrity of the Zone 2 areas, boot boys are located at the most common Zone 2 to Zone 3 boundary passages into the services building. The effectiveness of the facility zone control program is assessed through a combination of Zone 1 and 2 floor contamination surveys, swipe sampling and monitoring of employee hands.

4.7.11 Monitoring at the Point of Final Exit

In order to prevent possible contamination of the surrounding environment with radioactive material, materials are monitored prior to being removed from the plant if they have been in Zone 3 areas or areas in Zone 2 where radioactive materials are present.

All vehicles entering the plant are checked in and out by trained security officers at either the main gate or the east gate. The officers are trained in the use of radiation monitoring equipment.

After uranium concentrate trailers are unloaded, warehouse personnel and/or radiation technologists check the empty trailers for radiation using a radiation meter. Trucks are not released if radiation levels exceed those noted above, and corrective action is taken.

Whole body monitors have been installed at the front entrance of the refinery. All employees, contractors and visitors are required to use them prior to exiting the facility.

4.7.12 Radioisotope Control

The refinery uses a number of radioisotopes that are regulated under the CNSC *Nuclear Substances and Radiation Devices Regulation*. Cameco maintains a record of the specific radioisotope sources on site that are present above an exemption quantity, the radioisotope used and the maximum activity of the device as described in the RSPM and the associated procedures. These sources can range in type from nuclear gauges to instrument calibration sources and tracer solutions. The controls associated with sealed sources, unsealed sources and radiation devices are described in the RSPM and associated procedures and include training, certification where required, leak testing, radiation warning signs and limited access to areas where sources are stored.

4.8 Conventional Health and Safety

This safety and control area covers the implementation of a program to manage non-radiological workplace safety hazards and to protect personnel and equipment. A key

element of a safe, clean and reliable operation is a comprehensive and well-established worker protection program which has been in place for many years at the BRR. The foundation of the program is based on the NSCA and its regulations as well as Part II of the *Canada Labour Code*.

4.8.1 Conventional Safety Program

The health and safety management program fosters and promotes a strong sustainable safety culture with a safe, healthy and rewarding workplace. Cameco has five key principles in the area of safety that form the framework of how safety is managed. These are:

- safety is our first priority;
- we are all accountable for safety;
- safety is part of everything that we do;
- safety leadership is critical to Cameco Corporation; and
- we are a learning organization.

The health and safety of workers at BRR is ensured through the Health and Safety Management System Program, BR HS 100, which meets the requirements of REGDOC-2.8.1 *Conventional Health and Safety*. Key components of the program include:

- compliance with all safety and health-related legal and regulatory requirements;
- the setting of site safety and health objectives;
- the implementation of corporate safety standards;
- the development and maintenance of a formal hazard recognition, risk assessment and change control processes; and
- the documentation of health and safety significant incidents from the start through to the verification of completion of corrective actions via the CIRS database.

BRR has a safety charter (the Charter) in place detailing our employee's commitment to safety. Each employee is asked to sign the Charter to demonstrate their personal commitment to safety. As new employees are hired, Cameco explains the Charter to them and requests they sign the Charter. A copy of the Charter with all employee signatures is posted at the refinery entrance.

4.8.2 Hazards

The BRR is a Class IB nuclear facility and a chemical processing plant. There are radiological hazards associated with the various forms of uranium present at the refinery as well as chemical hazards such as bulk quantities of nitric acid, phosphoric acid and kerosene. Other chemicals present on site include reagents used in the analytical labs, water treatment chemicals and lubricating agents. Aside from chemicals that are purchased

for refinery operations, the process of producing UO_3 from uranium concentrate generates other chemical compounds, such as oxides of nitrogen (NO_x).

There are also a variety of physical hazards that are monitored and controlled at the site such as heat, lighting, noise, vibration, traffic and extreme weather.

4.8.3 Work Controls

All site personnel have a general awareness of the occupational health and safety hazards that exist at the site and the various means of minimizing these risks. All groups attend regular department safety meetings where employees are encouraged to discuss safety issues or concerns. Safety awareness, training and re-training are done through in-class sessions, safety meetings, and computer-based training depending on the topic.

Hazardous materials are labeled or identified to meet applicable regulations. The proper identification of hazardous materials decreases the likelihood of improper use, handling and disposal, which reduces potential risks and negative consequences.

Work instructions, procedures, job hazard analysis (JHA), safety clearances and hazard specific clearances (i.e. hazardous energy, radiation) are some of the tools used to identify and control hazards in the workplace.

PPE is provided as necessary and is specified in the work instruction, JHA or clearance for the job. All PPE is approved to ensure that the correct PPE is available for each job. Chemical resistant gloves, chemical goggles and/or face shields, chemical suits and disposable coveralls are available for safe chemical handling. Half mask, full-face mask and supplied air respiratory protection with appropriate respirator cartridges are available for tasks where inhalation of uranium, chemicals and/or dust is possible. In addition to air-purifying respirators, process and emergency response personnel are trained in the use of self-contained breathing air apparatus. BRR's use of respiratory protection meets the requirements of CSA Z94.4-11 *Selection, use and care of respirators*.

Personal and area monitoring is performed to assess workplace exposures. These include in-plant uranium in air levels, thorium-in-air levels in the raffinate area and urine analysis program for uranium. Monitoring for other parameters (e.g. asbestos, lead in paint, heat, lighting) is performed on an "as needed" basis.

4.8.4 Health and Safety Committee

In accordance with Part II of the *Canada Labour Code*, the site Facility Health and Safety Committee (FHSC) fulfills the requirement for both a policy health and safety committee and a workplace health and safety committee. The FHSC has representatives from both management and the employee group. This committee participates in the implementation and monitoring of the occupational health and safety programs.

4.9 Environmental Protection

BRR is required to have in place a program that identifies, controls and monitors all releases of radioactive and hazardous substances from the facility

4.9.1 Environmental Protection Program

The BRR maintains an Environmental Protection Program (EPP) that meets the requirements of CNSC REGDOC-2.9.1: *Environmental Protection: Environmental Principles, Assessments and Protection Measures (Version 1.1)*, as well as the following CSA environmental standards:

- CSA N288.1, *Guidelines for calculating derived release limits for radioactive material in airborne and liquid effluents for normal operation of nuclear facilities*
- CSA N288.4, *Environmental monitoring programs at Class I nuclear facilities and uranium mines and mills*
- CSA N288.5, *Effluent monitoring programs at Class I nuclear facilities and uranium mines and mills*
- CSA N288.6, *Environmental risk assessments at Class I nuclear facilities and uranium mines and mills*
- CSA N288.7, *Groundwater protection programs at Class I nuclear facilities and uranium mines and mills*
- CSA N288.8, *Establishing and implementing action levels for releases to the environment from nuclear facilities.*

The FSD Environmental Management System, FSD-PGR-EMS-001 (EMS) describes the higher tier program elements that meet the requirements of the ISO 14001 standard and applicable CSA N288 series standards. The site EPP, ET 110 describes site-specific aspects associated with the environmental sampling that is carried out in support of the EMS and the Environmental Risk Assessment (ERA). This monitoring data is then compared to applicable action levels and limits to ensure operations remain in compliance with applicable regulations and license limits.

4.9.2 Environment Risk Assessment

BRR maintains an ERA in accordance with the requirements of CSA N286.6: *Environment Risk Assessments at Class I Nuclear Facilities and Uranium Mines and Mills*. The 2016 ERA found there were no undue risks to the environment or to human health as a result of refinery operations. A summary of the ERA and a redacted version of the ERA are available on the Cameco community website. In accordance with N288.6-12, a review of the ERA* was carried out in 2020 to determine whether current conditions are consistent with the conclusions reached in 2016.

A screening for COPCs using environmental monitoring data collected since the 2016 ERA did not identify new COPCs. The review concluded that there were no identified risks that have emerged since the ERA was completed in 2016. The changes in monitoring data and

changes in toxicity values and approaches to evaluation of aquatic receptors do not result in changes to the 2016 ERA conclusions.

*Cameco letter – Review of Environmental Risk Assessment for the Blind River Refinery. September 30, 2020.

4.9.3 Environmental Regulation

Airborne and liquid effluent discharge quality is defined and regulated by federal and provincial regulators. For Cameco, the main federal regulatory agencies are the CNSC and ECCC. Provincial regulation is by the Ontario MECP. The acts (and associated regulations) enforced by these agencies include the *NSCA*, *Canadian Environmental Protection Act, 1999*, *Fisheries Act*, *Ontario Water Resources Act* and the *Environmental Protection Act*. BRR must also comply with applicable municipal bylaws.

The refinery maintains the following approvals from MECP:

- Certificate of approval (C of A) for industrial sewage system
- C of A for water supply system (groundwater)
- C of A for industrial sewage – effluent and stormwater
- Permit to Take Water (PTTW) for water supply
- PTTW for irrigation
- Environmental Compliance Approval (ECA) – air
- ECA - incinerator

4.9.4 Airborne Emission Program

The Emission Summary and Dispersion Modelling Report (ESDM) documents the air emissions sources at the BRR and maintains the most current listing of all stacks/sources, their specifications and parameters emitted as required by the provincial ECA for air emissions. The majority of emissions from refinery operations are discharged through the dust collection exhaust vent (DCEV), absorber stack and the incinerator stack. The airborne effluent monitoring program is focused on these three stacks while the respective areas of the plant are operating.

Source Monitoring

The EPP describes the source monitoring program in detail. Uranium emissions from the DCEV, absorber and incinerator stacks are sampled nearly continuously during operations using a TSI sampler. NO_x emissions from the absorber stack are continuously monitored by an on-line analyzer. Additional monitoring from the incinerator stack as required by the ECA includes continuous emission monitoring is completed for oxygen concentration, carbon monoxide and nitrogen oxides in the undiluted flue gas.

Validation of Cameco's emissions and samplers is completed by compliance testing conducted by an independent third party. These sources are tested using approved sampling

protocols outlined by the United States Environmental Protection Agency (US EPA), Environment and Climate Change Canada (ECCC) and Ontario Source Testing Code (OSTC) for licensed parameters.

Total site emissions are documented and compared against point of impingement standards in the site ESDM report which is reviewed by the MECP annually. The ESDM predicts contaminant concentrations from the facility at the facility fence line and into the community using a developed worst-case emission scenario and an air dispersion model that meets the requirements of O. Reg. 419/05 and the amended ECAs for the refinery.

Ambient Monitoring

The atmospheric environmental monitoring program is intended to collect data for uranium to assess whether airborne emissions from the BRR may be detected at offsite locations in the vicinity of the refinery. This is used to support BRR operations in the event of an upset condition, to support validation of existing air dispersion models and periodic review of the ERA. The current program uses high volume (hi-vol) air samplers.

The hi-vol method involves drawing a large volume of air through a filter housing for a fixed period of time. Particulate is collected on a filter and analyzed for total particulate and uranium. The provincial Point of Impingement (POI) standards (0.03 $\mu\text{g}/\text{m}^3$ uranium – annual POI and 120 $\mu\text{g}/\text{m}^3$ particulate – 24 hr POI) are used as criteria to assess performance.

4.9.5 Liquid Emission Program

Liquid effluent from the process and powerhouse as well as treated effluent from the onsite sewage treatment plant (STP) is collected in the plant effluent sump and is then pumped to one of three lined lagoons. The facility also utilizes a storm water lagoon to collect surface water run-off from the paved areas on site. Water from the storm water lagoon is transferred to one of the three lagoons, where it is mixed with process effluent prior to being discharged. Storm water cannot be discharged directly without first being transferred to a lagoon.

Source Monitoring

There is one waterborne effluent from the BRR. Once the lagoon has been monitored and is deemed to meet release criteria, the drain valve is opened and the lagoon drains by gravity into the lake discharge sump which is discharged to the North Channel of Lake Huron via an outfall pipe and diffuser. The diffuser is designed to ensure a minimum 100-fold dilution at the point of entry into the lake under normal conditions. Effluent pumped to the lake is sampled as it is discharging by a flow proportional sampler. A flow meter accurately measures the flow rate from the effluent discharge sump.

Ambient Monitoring

The ambient water quality program is intended to collect data to monitor the impact of the aqueous discharges into offsite receiving waters in the vicinity of the refinery. The Mississagi River borders the facility property to the west and southwest, and the North Channel of Lake Huron borders the facility property to the south. Surface water samples from the river and lake are sampled in the spring and fall to assess the impact of facility emissions on the ambient environment. In addition to surface water sampling, there are a total of 43 borehole locations both inside and outside of the perimeter fence used for groundwater sampling.

4.9.6 Terrestrial Monitoring Program

The terrestrial environmental monitoring program is intended to collect data for uranium (as an indicator of all emissions) to assess whether airborne effluent emissions from the BRR are accumulating in soil.

Soil Monitoring

In order to support the periodic review of the ERA, Cameco collects soil samples at nine designated locations on an annual basis.

Gamma Monitoring

Gamma radiation emissions from the licensed sites can cause radioactive dose to members of the public via external gamma radiation exposure. Fenceline gamma measurements are performed around the facility each month using optically stimulated luminescence (OSL) dosimeters. In addition, dosimeters are placed at each hi-vol station quarterly to measure ambient gamma radiation fields.

4.9.7 Estimated Dose to the Public

The derived release limit (DRL) for a given radionuclide is defined as the release rate that would cause an individual of the most highly exposed group to receive and be committed to a dose equal to the regulatory annual dose limit. As part of the periodic review of the DRL, the most exposed receptor locations for each receptor activity is determined to identify the critical receptor. A person located at this receptor, given their proximity to the facility and the theoretical length of time that could be spent at this location, would be expected to receive the highest possible radiation dose that any member of the public could receive.

The DRL for BRR was revised in 2019 and is based on three components: dose to the public from air emissions, dose from water discharges and dose from gamma radiation. For the refinery, dose to the public from air and water emissions is a very small fraction of the public dose limit and the gamma component represents virtually all the estimate public dose. The critical receptor is an adult who works at the nearby golf course and lives in the

Lantain subdivision and is represented by the environmental dosimeter located at the hi-vol station on the golf course. The dose at this receptor location is used in the calculation of dose to the public.

4.9.8 Setting of Authorized Release Limits for Effluent Discharges

Release limits for radionuclides have previously been established set based upon the DRL for the facility. To support this application, the proposed licence limits utilize Exposure-Based Release Limits (EBRL) methodology. EBRLs are concentration-based release limits that are based on meeting endpoint parameters which consider radiotoxicity, chemical toxicity, and protection of aquatic life.

The environmental release limits proposed for this licence period* are shown in Tables 5 and 6.

*Cameco letter – Proposed Release Limits for the Blind River Refinery. September 30, 2020.

Table 5 Proposed Release Limits - Air

Stack	EBRL		
	U (g/h) – Annual	NOx (kg/h) – 24 h	Particulate (kg/h) – 24 h
Absorber Stack	21	19	-
DCEV Stack	93	-	-
Incinerator	29	-	-
Combined Stacks	-	-	15

Table 6 Proposed Release Limits – Liquid Effluent

Parameter	Frequency	EBRL
Uranium	Weekly composite	1.7 mg/L

4.9.9 Setting of Action Levels

As per CSA N288.8-17 *Establishing and implementing action levels for release to the environment from nuclear facilities*, action levels are considered for the releases of contaminants or physical stressors, which are measured at the final discharge point as part of an effluent monitoring program or estimated using upstream measurements. For BRR, action levels are emission rates (for air) or a concentration (for water) that when reached, might indicate a loss of control of part of the environmental protection program and will require specific action to be taken.

In 2017, BRR established action levels following the guidance of N288.8-17 which were accepted by CNSC staff. Given the increased production levels in 2018 and 2019, a review of these action levels was completed in 2020* to ensure they remained appropriate for the refinery. The environmental action levels for the facility are shown in Tables 7, 8 and 9.

*Cameco letter – Review of Environmental Action Levels for the Blind River Refinery. September 30, 2020.

Table 7 Action Levels for Airborne Emissions

Release Source	Substance	Action Level	Frequency and Averaging Period
Absorber Stack	Uranium	0.0005 kg/h	Daily 24 hours
	Oxides of Nitrogen (NO _x + HNO ₃) as NO ₂	12 kg/h	Daily 24 hours
Dust Collection and Exhaust Ventilation (DCEV) Stack	Uranium	0.0022 kg/h	Daily 24 hours

Table 8 Action Levels for Liquid Emissions

Release Source	Substance	Action Level	Frequency and Averaging Period
Liquid Effluent	Uranium	0.2 mg/L	Weekly composite
	Nitrate (as Nitrogen)	120 mg/L	
	Radium-226	0.1 Bq/L	

Table 9 Action Levels for Gamma Emissions

Parameter	Action Level	Frequency
North Fence Gamma Radiation	1.0 µSv/h	Monthly

4.9.10 Reporting of Environmental Information

BRR makes information related to the environment and the public available through a variety of methods. Quarterly and annual compliance reports that are submitted to the CNSC are posted to the community website, and a record of spills and other events that may be of interest to the public is also maintained on the website. Cameco also provides its Quarterly Compliance Monitoring and Operational Performance Report and Annual Compliance Report to the Town of Blind River, the Mississauga First Nation and Serpent River First Nation. Additional updates are provided to the Town of Blind River and the Mississauga First Nation when needed.

4.10 Emergency Management and Fire Protection

BRR is required to maintain an emergency preparedness plan and a fire protection program to ensure that licensed activities do not result in an unreasonable risk to the health and safety of persons and the environment.

4.10.1 Emergency Response Plan

The BRR Emergency Response Plan (ERP), EP 100 is compliant with the requirements of REGDOC 2.10.1: *Nuclear Emergency Preparedness and Response*. In addition to the ERP, there are a number of other site documents that provide additional emergency response information, including information specific to emergency response related training.

The ERP assigns specific accountabilities and sets out processes and procedures to protect the health and safety of employees, contractors, the public and the environment in the case of an emergency. It outlines the actions to be taken to respond to emergencies including response team assembly, personnel accounting, event classification, emergency hazard monitoring, and the treatment of casualties as well as the return of the facility to normal operations.

In addition to the ERP, Standard Operating Guidelines (SOGs) and Pre-incident Plans (PPs) provide additional emergency response information. These documents outline the requirements for training, drills and exercises as well as emergency response facilities and equipment and interface with offsite organizations and community notification in event of an emergency.

In addition to the CNSC licensing requirements, ECCC and the MECP have requirements related to emergency planning and spill prevention. The federal *Environmental Emergency Regulations* identify specific chemicals and quantity levels that require the facility to develop release scenarios and conduct drills at prescribed frequencies as part of an Environmental Emergencies Plan (E2 Plan), EP 101. Ontario Regulation 224/07 *Spill Prevention and Contingency Plans* requires the site to maintain a site-specific Spill Prevention and Contingency Plan (SPCP), ET 240 as a resource for preventing, detecting and responding to spills. The E2 Plan and SPCP complement the site Emergency Response Plan (ERP).

4.10.2 Emergency Preparedness and Response Organizations

Depending on type and magnitude of an incident, the site may activate any or all of the following response organizations for the protection of human health, the environment and property: Emergency Response Team (ERT), Emergency Response Organization (ERO), Local Crisis Management Team, and Corporate Crisis Management Team. Each of these organizations has a manual and/or procedures or guidance documents to ensure that the organizational response to an emergency situation is systematic and meets the regulatory requirements commensurate with the nature of the emergency.

4.10.3 Emergency Response Team

The ERT consists of approximately 40 employees, and includes employees trained in firefighting, industrial rescue and first aid. There are ERT members on each process crew, as well as on day shift. There are a minimum of four ERT members on site at all times when the UO₃ plant is operating. This allows for a two-person entry team and a two-person rapid intervention team to respond to incidents at the facility within 10 minutes, 24 hours a day when the UO₃ plant is operating. Additional ERT members will be called in depending on the scenario.

A mutual aid agreement has been signed by the Blind River Fire Department (BRFD) and Cameco. The commitment for assistance by the BRFD provides an additional layer of support to the refinery's emergency response capability. In addition, Cameco provides the BRFD with support, either financial or through the donation of equipment, and conducts a joint training exercise with the BRFD so that in the event of an emergency at the refinery requiring off-site assistance, there will be a coordinated and effective response. It should also be noted that a number of the refinery's firefighters also belong to the town fire department.

4.10.4 Exercises and Drills

BRR completes a minimum number of drills and training exercises (tabletop and full simulations) each year to test the ERP and provides the members of the various EROs to improve and sustain their emergency response capability. Drills and exercises are an opportunity for continual improvement through the development and implementation of recommendations from previous drills and exercises, audits and inspections, lessons learned from external incidents and other sources of corrective actions or opportunity for improvement. Table top exercises, drills and full simulations are used for the following purposes:

- Table Top Exercises - round table discussions of a potential emergency situation. They are developed to practice elements of the ERP and structured to meet the specific objectives identified. Table top exercises will be conducted a minimum of one every three years.
- Drills - are hands-on activities that test a certain element of the emergency response system, such as facility evacuation and census. The drills are based on realistic scenarios that could impact the refinery. They involve activating personnel to handle the described emergency. Personnel will be required to respond to an evolving emergency event run on real time. Drills are completed quarterly and may be utilized in training/qualification of ERT members, involve a subset of the facility or ERO and/or be coordinated with a full simulation exercise.
- Full Simulations – to test the complete emergency response organization. An actual incident is staged and the complete organization is mobilized to deal with it. Community resources are invited to participate in the exercise simulation. BRR will

conduct a full simulation exercise to test specific elements of the ERP at least once every three years.

4.10.5 Emergency Response Assistance Plan

Cameco also has an Emergency Response Assistance Plan on file with Transport Canada. This plan has been approved by Transport Canada, pursuant to federal transportation of dangerous goods requirements, and applies to transportation emergencies. Transportation activities related to the shipping and receiving of goods at or from BRR are included in the plan. Cameco reviews and updates the Emergency Response Assistance Plan as required.

4.10.6 Fire Protection Program

The Fire Protection Program (FPP), FS 200 has been developed and implemented to comply with the requirements of the National Fire Code, National Building Code, and with CSA N393-13: *Fire Protection for facilities that process, handle, or store nuclear substances*.

The FPP consists of the following main elements: the Fire Hazard Analysis (FHA), the Fire Safety Plan (FSP), FS 100, Pre-incident Plans and related fire safety procedures. These documents are reviewed and updated on a periodic basis by qualified personnel, as required.

Routine inspections and testing of the fire protection system are conducted by or under the direction of Cameco personnel. A system is in place to enable detection and notification of fire. Emergency pull stations are located strategically throughout the facility. Areas with potential fire hazards are equipped with appropriate fire detection and/or suppression systems. Fire safety equipment is maintained with the use of preventive maintenance and periodic inspections.

4.10.7 Fire Hazards Analysis

BRR maintains a site Fire Hazards Analysis (FHA) that meets the requirements of CSA N393-13 *Fire Protection for Facilities that Process, Handle or Store Nuclear Substances* and supporting reference materials. The FHA evaluates the impact of fire on the facility and demonstrates that the fire protection objectives can be met under foreseeable fire events. To satisfy this objective, safety significant systems and equipment as well as fire hazards have been identified. An analysis has been made of the potential for a worst-case fire event to impact safety related systems and equipment.

4.10.8 Fire Safety Plan

The FSP is a key element of the site Fire Protection Plan and is intended to be a companion document to the site FHA. While the objective of the FHA of the site buildings is to identify fire hazards and fire protection features intended to meet nuclear and life safety

requirements, the objective of the FSP is to define the administrative controls required to maintain fire safe conditions and help the occupants in utilizing life safety features in the buildings, ensure an orderly evacuation at the time of an emergency and provide a maximum degree of flexibility to achieve the necessary fire safety for the buildings. fire safety features required by the FHA.

The following controls are documented in the FSP:

- Fire protection systems;
- Inspection, testing and maintenance program;
- Impairments;
- Fire separations;
- Emergency response plan;
- Emergency organization; and,
- Pre-incident plans.

4.10.9 Emergency or Fire Recovery Plan

The emergency recovery plan will depend on the nature of the emergency situation, i.e., whether the emergency is local (within the plant), external (off-site) or a transportation event. Depending on the situation, the recovery plan may require regulatory review and approval. Recovery plans would be developed to minimize the impact to personnel involved in the clean-up, the environment and the general public. Guidance on what is to be included in a recovery plans is provided in the ERP.

4.11 Waste Management

BRR is required to maintain a waste management program at the facility which covers the internal waste-related programs which form part of the facility's operations up to the point where the waste is removed from the facility. It also covers the planning for decommissioning.

4.11.1 Waste Management Program

The waste management program for BRR is described in the FSD Waste Management Program, FSD-PGR-WM-01, site Waste Management Program, PR 300 and Waste Management Procedure, PR110. The program meets the requirements for management of radioactive waste in solid, liquid or gaseous states as defined by CSA Standard N292.3-14 *Management of low- and intermediate-level radioactive waste*, CSA Standard N292.0-14 *General principles for the management of radioactive waste and irradiated fuel* and for hazardous waste as defined by Ontario Regulation 347 General – *Waste Management*.

The waste management activities are conducted with the following objectives:

- To manage and dispose of wastes in accordance with applicable laws and generally accepted industry practices so as to minimize the potential adverse impact to personnel and to the environment;
- To minimize and reduce the quantity of stored onsite waste through recycle, re-use and recovery to the extent possible;
- To segregate radioactively contaminated and non-contaminated waste materials;
- To maintain an inventory of waste materials produced, received, disposed of and stored, including quantities and location on site;
- To store waste materials only when re-use, recycle or recovery is not possible and then to do so with proper management systems and controls in place; until an acceptable method has been identified for their eventual disposal; and
- To continually evaluate disposal alternatives and new technologies for waste reductions.

4.11.2 Current BRR Waste Streams

Recoverable Uranium Materials

The refinery reprocesses natural uranium material from the PHCF and CFM in various forms (i.e. pellets, sludge, powder). In addition, the refinery produces calcined product and regeneration product which is sent to a uranium mill for recovery of the uranium. This prevents these materials from becoming waste.

Conventional Waste

The refinery also has processes in place for the collection, storage and disposal of non-contaminated, non-hazardous waste materials such as cardboards, plastics, clean chemical drums and lunchroom refuse. Materials that are sent to conventional landfill or recycling are scanned to ensure they are free of uranium contamination prior to release from the facility. However, combustible materials are processed with contaminated combustibles in the incinerator.

Contaminated Waste Materials (Radioactive Waste)

Waste materials contaminated with uranium will be stored onsite until appropriately managed.

Contaminated combustible waste materials from BRR, PHCF and CFM are stored in designated locations around the site until processed through the on-site incinerator.

Drums containing contaminated solid material are stored in yard areas, pending disposal at an appropriately licensed facility in the United States or decontamination of the material for recycle.

Drums containing contaminated liquid wastes are either stored inside a bermed area in the construction office or can be transferred to bulk liquid storage tanks contained inside the dyked area of the tank farm. These materials require further processing prior to uranium recovery and/or disposal at an appropriately permitted facility.

All waste materials will remain in safe, secure storage until acceptable permanent disposal or recycle options have been identified.

Hazardous Waste Materials

Non-contaminated hazardous waste materials are managed and disposed of in accordance with the requirements under the provincial waste management regulation, O. Reg. 347. Cameco maintains a Generator Registration Number (ON8571142) for a small number of hazardous waste classes that are registered through the MECP Hazardous Waste Information Network (HWIN).

Miscellaneous Contaminated Wastes

Miscellaneous radioactive contaminated wastes that do not have a current processing strategy or disposal outlet will be stored onsite in a safe manner. Radioactive waste that is also hazardous must be disposed of at a facility permitted for both the radioactive and chemical hazards. Any waste materials that are not managed by one of the programs listed will require the development of a specialized plan for disposal or management following the requirements of the FSD Waste Management Program (FSD-PGR-WM-01) and associated documents.

4.11.3 Preliminary Decommissioning Plan

The BRR has a Preliminary Decommissioning Plan (PDP), which meets the requirements provided in CSA N294.0-09 *Decommissioning of facilities containing nuclear substances*. The PDP outlines the general requirements for returning the site to the status of unrestricted use and outlines the controls required for the protection of the environment during the decommissioning process. The PDP forms the basis for the financial guarantee as per CNSC regulatory document G-206 *Financial Guarantee for the Decommissioning of Licensed Activities*. This is further described in section 5.1.3. A technical summary of the PDP is available on Cameco's community website.

4.12 Security

BRR maintains a security program to control access to the site of the activity to be licensed and the nuclear substance, prescribed equipment or prescribed information.

4.12.1 Security Plan

BRR's Security Plan presents an overview of the security operations at BRR and identifies the systems and processes in place to meet security program objectives. The Security Plan meets the requirements of REGDOC-2.12.3 *Security of Nuclear Substances: Sealed Sources and Category I, II and III Nuclear Material, Version 2*. Accordingly, this document is considered prescribed information and is subject to the requirements of the *General Nuclear Safety and Control Regulations*. The objective of the security plan is to ensure safe and secure operation of the facility, by maintaining protection through use of equipment, personnel, and procedures. The BRR Security Plan has continued to evolve in order to meet all regulatory requirements and commitments over the period of the current operating licence.

4.13 Safeguards and Non-Proliferation

BRR is required to have a program in place that ensures all obligations arising from the Canada/International Atomic Energy Agency (IAEA) Safeguards agreement are met. The objective of the Canada-IAEA safeguards agreements is for the IAEA to provide assurance on an annual basis to Canada and to the international community that all declared nuclear materials are in peaceful, non-explosive uses and that there is no indication of undeclared nuclear materials or activities.

4.13.1 International Obligations

BRR complies with 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*. Safeguards involves inspection and other verification activities undertaken by the IAEA to evaluate compliance with obligations under safeguards agreements with the IAEA.

4.13.2 Inventory and Reporting

BRR complies with REGDOC 2.13.1 *Safeguards and Nuclear Material Accountancy* as described in FSD Safeguards Program (FSD-PGR-SG-01). The facility maintains a natural uranium inventory system in which receipts and shipments are recorded. Monthly inventory reports are distributed to the CNSC that include safeguarded natural uranium as well as the inventory of non-safeguarded material.

BRR completes an annual Physical Inventory Taking (PIT) as part of the safeguards program which is followed by a Physical Inventory Verification (PIV) with the IAEA or a Physical Inventory Taking Evaluation with the CNSC. Short Notice Random Inspections (SNRIs) of the facility are conducted by the IAEA periodically throughout the year to ensure compliance with safeguards obligations.

4.14 Handling, Storing, Packaging and Transport

BRR is required to have a packaging and transport program that meets the requirements set out in the *Packaging and Transport of Nuclear Substances Regulations, 2015* and the *Transportation of Dangerous Goods Regulations*.

4.14.1 Packaging and Transport Program

As described in the FSD Packaging and Transportation Program (FSD-PGR-TRN-001), Cameco maintains corporate standards and site procedures that cover the safe packaging and transport of nuclear substances to and from its licensed facilities. All radioactive materials are transported in a package designed for its' contents. The contents, isotopic level and physical/chemical properties will determine the type of package.

The site has procedures related to the handling, storing, loading, transporting and receipt of nuclear substances and other dangerous goods. Employees are trained in the safe handling, packaging and shipping of dangerous goods commensurate with their responsibilities.

UO₃ is packaged in purpose-built Tote Bins for transport by road to the PHCF. UO₃ is also packaged in drums and transported by road and marine to other customers worldwide. These containers meet the Type IP-1 packaging requirements. UO₃ samples may be shipped by air in Type IP-3 packages.

If required by the *Nuclear Non-proliferation Import and Export Control Regulations*, an import or export licence is obtained from the CNSC prior to shipment and corresponding import or export permits are also obtained from Global Affairs Canada.

Other materials such as laboratory samples, other uranium-containing materials, and wastes (conventional, hazardous, radioactive or mixed) are packaged and safety marks applied in accordance with the appropriate regulations.

Appendix 1 – Standards and Guidance Relevant to the Safety and Control Areas

This appendix lists the REGDOCs, standards and other regulatory documents listed in the LCH for the facility. Compliance Verification Criteria (CVC) imply implementation of the requirements of the document as they are used by CNSC staff to verify and oversee BRR’s compliance with the licence conditions. Guidance is non-mandatory information on how BRR may comply with the licence conditions. New revisions to existing CVC or guidance documents or new REGDOCs or standards may be added throughout the term of the licence in accordance with the CNSC regulatory framework.

SCA	Document Title	Document Reference	CVC or Guidance	Status
General	Regulatory Fundamentals	REGDOC-3.5.3 (2018)	Guidance	N/A
Management System	Management System Requirements for Nuclear Facilities	CSA N286-12 (R2017)	CVC	Implemented
	Management System	REGDOC-2.1.1 (2019)	Guidance	N/A
	Commentary on N286-12, Management systems requirements for nuclear facilities	CSA N286.0.1 (2014)	Guidance	N/A
	Safety Culture	REGDOC-2.1.2 (2018)	Guidance	June 1, 2022*
	Reporting Requirements, Volume I: Non-Power Reactor Class I Nuclear Facilities and Uranium Mines and Mills	REGDOC-3.1.2 (2018)	CVC	Implemented
	Public Information and Disclosure	REGDOC-3.2.1 (2018)	CVC	Implemented
Human Performance Management	Personnel Training, Version 2	REGDOC-2.2.2 (2016)	CVC	Implemented
	Minimum Staff Complement	REGDOC-2.2.5 (2019)	Guidance	N/A

SCA	Document Title	Document Reference	CVC or Guidance	Status
Operating Performance	Boiler, pressure vessel, and pressure piping code	B51-2014	CVC	B51-2014 Implemented B51-2019 December 31, 2021
Safety Analysis	Safety of Nuclear Fuel Cycle Facilities	IAEA SSR-4 (2017)	Guidance	N/A
Physical Design	National Building Code of Canada 2015	NRCC 56190	CVC	Implemented
	National Fire Code of Canada 2015	NRCC 56192	CVC	Implemented
	Fire Protection for Facilities that Process, Handle or Store Nuclear Substances	CSA N393-13 (R2018)	CVC	Implemented
	General Design Considerations: Human Factors	REGDOC-2.5.1 (2019)	Guidance	N/A
Fitness for Service	National Fire Code of Canada 2015	NRCC 56192	CVC	Implemented
	Fire Protection for Facilities that Process, Handle or Store Nuclear Substances	CSA N393-13 (R2018)	CVC	Implemented
Radiation Protection	Reporting Requirements, Volume I: Non-Power Reactor Class I Nuclear Facilities and Uranium Mines and Mills	REGDOC-3.1.2 (2018)	CVC	Implemented
	Keeping Radiation Exposures and Doses “As Low As Reasonably Achievable (ALARA)”	CNSC G-129 Rev 1 (2004)	Guidance	N/A
	Developing and Using Action Levels	CNSC G-228 (2001)	Guidance	N/A
Conventional Health and Safety	Selection, use and care of respirators	CSA Z94.4-11	CVC	Z94.4-11 Implemented

SCA	Document Title	Document Reference	CVC or Guidance	Status
				Z94.4-18 March 31, 2021
	Conventional Health and Safety	REGDOC-2.8.1 (2019)	Guidance	N/A
Environmental Protection	Environmental Protection Policies, Programs and Procedures	CNSC REGDOC 2.9.1 (2013)	CVC	Implemented
	Reporting Requirements, Volume I: Non-Power Reactor Class I Nuclear Facilities and Uranium Mines and Mills	REGDOC-3.1.2 (2018)	CVC	Implemented
	Guidelines for Calculating Derived Release Limits for Radioactive Material in Airborne and Liquid Effluents for Normal Operation of Nuclear Facilities	CSA N288.1-14 (2014)	CVC	Implemented
	Environmental Monitoring Programs at Class I Nuclear Facilities and Uranium Mines and Mills	CSA N288.4-10 (R2015)	CVC	Implemented
	Effluent Monitoring Programs at Class I Nuclear Facilities and Uranium Mines and Mills	CSA N288.5-11 (R2016)	CVC	Implemented
	Environmental Risk Assessments at Class I Nuclear Facilities and Uranium Mines and Mills	CSA N288.6-12 (R2017)	CVC	Implemented
	Groundwater Protection Programs at Class I Nuclear Facilities and Uranium Mines and Mills	CSA N288.7-15 (2015)	CVC	Implemented
	Establishing and implementing action levels for releases to the environment from nuclear facilities	CSA N288.8-17 (2017)	CVC	Implemented
Emergency Management and Fire Protection	Nuclear Emergency Preparedness and Response	REGDOC 2.10.1 (2016)	CVC	Implemented

SCA	Document Title	Document Reference	CVC or Guidance	Status
	National Building Code of Canada 2015	NRCC 56190	CVC	Implemented
	National Fire Code of Canada 2015	NRCC 56192	CVC	Implemented
	Fire Protection for Facilities that Process, Handle or Store Nuclear Substances	CSA N393-13 (R2018)	CVC	Implemented
Waste Management	General Principles for the Management of Radioactive Waste and Irradiated Fuel	CSA N292.0-14 (2014)	CVC	Implemented
	Management of Low- and Intermediate –level Radioactive Waste	CSA N292.3-14 (2014)	CVC	Implemented
	Managing Radioactive Waste	CNSC P-290 (2004)	Guidance	N/A
	Decommissioning of Facilities Containing Nuclear Substances	CSA N294-09 (R2014)	CVC	Implemented
	Decommissioning Planning for Licensed Activities	CNSC G-219 (2000)	Guidance	N/A
	Financial Guarantees Guide for the Decommissioning of Licensed Activities	CNSC G-206 (2000)	Guidance	N/A
Security	Security of Nuclear Substances: Sealed Sources and Category I, II and III Nuclear Material, Version 2	REGDOC-2.12.3 (2019)	CVC	Implemented
Safeguards and Non-Proliferation	Safeguards and Nuclear Material Accountancy	REGDOC-2.13.1 (2018)	CVC	Implemented

SCA	Document Title	Document Reference	CVC or Guidance	Status
Packaging and Transport	Information Incorporated by Reference in Canada's Packaging and Transport of Nuclear Substances Regulations, 2015	REGDOC-2.14.1 (2016)	Guidance	N/A
Facility Specific – Financial Guarantee	Financial Guarantee for the Decommissioning of Licensed Activities	CNSC G-206 (2000)	Guidance	N/A

Appendix 2 – Documents Supporting the Licence Application

BRR has identified the following documents to be relevant to supporting this application for the renewal of its Fuel Facility Operating Licence (FFOL-3632.0/2022)

Document Title	Document Type	Available on Website
Safety, Health, Environment and Quality Policy	Corporate Policy	Yes
Facility Licensing Manual (FLM)	Site Program	Yes
Management System Program Manual, AM 400	Site Program	Description in FLM
Training Program Manual, AM 300	Site Program	Description in FLM
Radiation Safety Program Manual, RS 100	Site Program	Description in FLM
Environmental Protection Program, ET 100	Site Program	Description in FLM
Health and Safety Management System Program Manual, HS 100	Site Program	Description in FLM
Fire Protection Program, FS 200	Site Program	Description in FLM
Waste Management Program, PR 300	Site Program	Description in FLM
Internal Dosimetry Technical Basis Document	Divisional Program	No
Public Information Program, FSD-PGR-PIP-001	Divisional Program	Summary available
FSD Environmental Management System, FSD-PGR-EMS-001	Divisional Program	No
FSD Waste Management Program, FSD-PGR-WM-01	Divisional Program	Summary available
FSD Safeguards Program, FSD-PGR-SG-01	Divisional Program	No
FSD Packaging and Transportation, FSD-PGR-TRN-01	Divisional Program	No
Facility Licensed Area Drawing, BRR700P-C0002200-02	Site Drawing	A version is available in the FLM
Owned and Leased Property Boundaries Drawing BRR700P-C0002200-02	Site Drawing	A version is available in the FLM
Radioisotope Source Control RP 3.2.4	Site Procedure	No
Change Management Procedure, AM 37	Site Procedure	No



Document Title	Document Type	Available on Website
Design Control Procedure, PR 33	Site Procedure	No
Quality Control Manual for TSSA Certificates of Authorization	Site Procedure	No
Preventative Maintenance System Procedure, MA 100	Site Procedure	No
Authorized Inspection Agency Services Agreement	Procurement Document	No
Security Plan, ST 100	Site Plan	No
Emergency Response Plan, EP 100	Site Plan	No
Fire Safety Plan, FS 100	Site Plan	No
Spill Prevention and Contingency Plan, ET 240	Site Plan	No
Environmental Aspects Registry	Site Plan	No
Cameco Responses to Third-Party Recommendations in Production Increase Engineering Assessment Report	Supporting Study	No
BRR Safety Report, EP 200	Supporting Study	Summary Available
Derived Release Limit	Supporting Study	Summary Available
Fire Hazard Analysis	Supporting Study	No
2016 Environmental Risk Assessment	Supporting Study	Yes
2020 Review of the Environmental Risk Assessment	Supporting Study	Yes
Review of Environmental Action Levels to Support the Environmental Protection Program	Supporting Study	No
Preliminary Decommissioning Plan	Supporting Study	Summary Available

Appendix 3 – List of Acronyms Used in the Application

AIA	Authorized Inspection Agency
ALARA	As low as reasonably achievable
BRR	Blind River Refinery
BRFD	Blind River Fire Department
Cameco	Cameco Corporation
CFM	Cameco Fuel Manufacturing Inc.
CIRS	Cameco Incident Reporting System
CNSC	Canadian Nuclear Safety Commission
C of A	Certificate of Approval
CSA	Canadian Standards Association
CVC	Compliance Verification Criteria
DRAFF	Denitrated raffinate
DRL	Derived Release Limit
DCEV	Dust Collection Exhaust Vent
EBRL	Exposure Based Release Limits
ERL	Eldorado Resources Ltd
ENL	Eldorado Nuclear Limited
E2	Environmental Emergency
ECCC	Environment and Climate Change Canada
ECA	Environmental Compliance Approval
EMS	Environmental Management System
EPP	Environmental Protection Program
ERA	Environmental Risk Assessment
ERO	Emergency Response Organization
ERP	Emergency Response Plan
ERT	Emergency Response Team
ESDC	Department of Employment and Social Development Canada
ESDM	Emission Summary and Dispersion Model
FFOL	Fuel Facility Operating Licence
FHA	Fire Hazards Analysis
FHSC	Facility Health and Safety Committee
FLM	Facility Licensing Manual
FPP	Fire Prevention Program
FSD	Fuel Services Division

FSP	Fire Safety Plan
GNSCR	<i>General Nuclear Safety and Control Regulations</i>
HAZOP	Hazards and Operability
Hi-vol	High volume (air monitor)
IAEA	International Atomic Energy Agency
ICRP	International Commission on Radiological Protection
JHA	Job Hazard Analysis
LCH	Licence Conditions Handbook
MFN	Mississauga First Nation
MECP	Ontario Ministry of the Environment, Conservation and Parks
MOL	Ontario Ministry of Labour
MSPM	Management System Program Manual
mSv	Millisievert
NEW	Nuclear Energy Worker
NOx	Nitrogen oxide
NSCA	<i>Nuclear Safety and Control Act</i>
NSRDR	<i>Nuclear Substance and Radiation Devices Regulations</i>
O. Reg.	Ontario Regulation
OSL	Optically stimulated luminescence
OSTC	Ontario Source Testing Code
PDP	Preliminary Decommissioning Plan
PHCF	Port Hope Conversion Facility
PIP	Public Information Program
PIT	Physical Inventory Taking
PIV	Physical Inventory Verification
PP	Pre-incident Plan
POI	Point of Impingement
PPE	Personal Protective Equipment
PTTW	Permit to Take Water
REGDOC	CNSC regulatory document
RSPM	Radiation Safety Program Manual
SAT	Systematic Approach to Training
SCA	Safety and Control Area
SHEQ	Safety, Health, Environment and Quality
SNRI	Short Notice Random Inspection
SOG	Standard Operating Guideline
SPCP	Spill Prevention and Contingency Plan

SAR	Safety Analysis Report
STP	Sewage Treatment Plant
TBD	Technical Basis Document
TBP	Tributyl phosphate
TED	Total Effective Dose
TSSA	Ontario Technical Standards and Safety Authority
UNH	Uranyl nitrate hexahydrate
UO ₂	Uranium dioxide
UO ₃	Uranium trioxide
µg	microgram
US EPA	United States Environmental Protection Agency

Appendix 4 – Licence Renewal Application Requirements Matrix

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Pursuant to subsection 3 of the General Nuclear Safety and Control Regulations Licences – General Application Requirements

Section 3. the <i>General Nuclear Safety and Control Regulations</i> Licences – General Application Requirements	Location in Application or Supporting Document(s)
(1) An application for a licence shall contain the following information:	
(a) the applicant’s name and business address;	Application Sections 1.1 and 1.3 Application Cover Letter
(b) the activity to be licensed and its purpose;	Application Sections 1.3 and 2.3 Facility Licensing Manual
(c) the name, maximum quantity and form of any nuclear substance to be encompassed by the licence;	Application Sections 1.3, 2.3 and 2.4
(d) a description of any nuclear facility, prescribed equipment or prescribed information to be encompassed by the licence;	Application Sections 1.3 and 2.3
(e) the proposed measures to ensure compliance with the Radiation Protection Regulations, the Nuclear Security Regulations and the Packaging and Transport of Nuclear Substances Regulations, 2015;	Documents referenced in Appendix 2 Supporting Documents - FLM, RS 100, ST 100, FSD-PGR-TRN-01
(f) any proposed action level for the purpose of section 6 of the Radiation Protection Regulations;	Application Sections 4.7.6, 4.7.8, 4.7.9
(g) the proposed measures to control access to the site of the activity to be licensed and the nuclear substance, prescribed equipment or prescribed information;	Application Sections 4.7 and 4.12 Supporting Documents - FLM, RS 100, ST 100
(h) the proposed measures to prevent loss or illegal use, possession or removal of the nuclear substance, prescribed equipment or prescribed information;	Application Section 4.12 Supporting Documents - ST 100
(i) a description and the results of any test, analysis or calculation performed to substantiate the information included in the application;	Application Sections 4.4, 4.7, 4.9 and 4.11 Supporting Documents - FLM, DRL, ERA, SAR
(j) the name, quantity, form, origin and volume of any radioactive waste or hazardous waste that may result from the activity to be licensed, including waste that may be stored, managed, processed or disposed of at the site of the activity to be licensed, and the proposed method for managing and disposing of that waste;	Application Sections 4.4 and 4.11 Supporting Documents - FLM, SAR, FSD-PGR- WM-01, PR 300
(k) the applicant’s organizational management structure insofar as it may bear	Application Sections 2.1 and 4.1.1

on the applicant's compliance with the Act and the regulations made under the Act, including the internal allocation of functions, responsibilities and authority;	Supporting Documents - FLM
(l) a description of any proposed financial guarantee relating to the activity to be licensed; and	Application Sections 2.5 and 4.11.3 Supporting Documents - PDP
(m) any other information required by the Act or the regulations made under the Act for the activity to be licensed and the nuclear substance, nuclear facility, prescribed equipment or prescribed information to be encompassed by the licence.	All relevant information is contained within the application, the FLM and supporting documents referenced in the application and FLM.

Pursuant to subsection 3(1.1) of the General Nuclear Safety and Control Regulations and Other Information Requested by CNSC Staff

Subsection 3(1.1)¹ of the <i>General Nuclear Safety and Control Regulations and Other Information Requested by CNSC Staff</i>	Location in Application or Supporting Document(s)
Summary of programs and supporting documentation needed to support the licence application organized under each SCA, including other matters of regulatory interest (see Attachment 1). The programs and supporting documentation should be sufficiently detailed to describe the safety and control measures that will be implemented at the facility for each SCA.	Application Section 4.0 (incl. 4.1 – 4.14) Application Appendix 2 Facility Licensing Manual
Description of Cameco BRR's approach to safety, including reference to corporate and facility specific documents which enunciate the safety policies and standards to which Cameco BRR must adhere.	Application Section 4.8 Supporting Documents - HS 100
Documents describing the organizational structure, roles and responsibilities of organizational units and management, including documents governing the day-to-day operation and conduct of the organization.	Application Sections 2.1 and 4.1.1 Supporting Documents - FLM
Information on BRR's performance for each SCA during the current licence period, relative to Cameco's expectations, including any trends	Application Appendix 5

¹ The Commission or a designated officer authorized under paragraph 37(2)(c) of the Act, may require any other information that is necessary to enable the Commission or the designated officer to determine whether the applicant: (a) is qualified to carry on the activity to be licensed, or (b) will, in carrying on that activity, make adequate provision for the protection of the environment, the health and safety of persons and the maintenance of national security and measures required to implement international obligations to which Canada has agreed.

Assessment of existing and future safety challenges, along with a safety improvement plan to address these challenges during the next licence period	Application Appendix 5 Section 1.4
Describe opportunities for improvements and any safety improvement plans to address identified safety challenges	Application Appendix 5 Section 1.4
A description of the proposed operating plan for the next licensing period	Application Sections 3.2 and 4.3 Appendix 5 Section 1.3
Information on significant activities envisaged beyond the end of the next licensing period, if any	No known significant activities beyond the next licensing period
Provide a list of federal, provincial, municipal or other regulations, other than the regulations pursuant to the NSCA, which Cameco BRR must abide by	Application Section 4.9.3 Supporting Documents – ET 110
Provide a description of any obligations for municipal, provincial or other federal authorities and any obligations for public and/or private organizations.	Application Sections 4.3 and 4.9.3 Supporting Documents – ET 110
Provide a self-assessment to determine if the licence applications could have any new adverse impacts on Indigenous or treaty rights and therefore raise the duty to consult and trigger the requirements of REGDOC-3.2.2, <i>Indigenous Engagement</i> . REGDOC-3.2.2 also outlines what to consider when conducting this activity.	Application Section 2.4 Letter from R. Peters (Cameco) to M. Jones (CNSC). Self-Assessment of REGDOC-3.2.2, Indigenous Engagement for the Blind River Refinery. September 22, 2020
Provide a description of outreach activities to engage Indigenous groups and members of the public with respect to licence renewal.	Application Section 2.4 Supporting Documents – FSD-PGR-PIP-01
Provide a list of any permits, certificates and licences issued by authorities other than the CNSC.	Application Section 4.9.3 Supporting Documents – ET 110
Provide updated Derived Release Limits and Operating Release Limit reports for the facility	Letter from J. DeGraw (Cameco) to R. Rashapov (CNSC), subject: Update to Derived Release Limits (DRL) for the Blind River Refinery, September 26, 2018 (e-Doc 5645706). Letter from R. Peters (Cameco) to M. Jones (CNSC). Proposed Release Limits for the Blind River Refinery. September 30, 2020.
Provide Cameco’s plans and schedule, including dates, with respect to	Already addressed in current LCH. Additional

<p>complying with each of the standards, codes and CNSC regulatory documents required for implementation as per Attachment 1 (unless recommended to be included under recommendations and guidance), including transition measures as appropriate.</p>	<p>comments in the performance report.</p>
<p>Summary of the current status of all open actions items, as well as issues and requests that were discussed during the last BRR Commission hearings or meetings, including a plan and date for resolution.</p>	<p>Appendix 5</p>
<p>A description of any planned major facility modification projects during the proposed licence period, including the schedule for these projects and, if known, the hazards associated with these projects and the safety and control measures Cameco will plan to implement to mitigate those hazards.</p>	<p>Cameco letter – Cameco Responses to Third-Party Recommendations in Production Increase Engineering Assessment Report – June 28, 2011.</p>

Pursuant to subsection 5 of the General Nuclear Safety and Control Regulations: Licences – Application for Renewal of Licence

Subsection 5 of the <i>General Nuclear Safety and Control Regulations</i> – Application for Renewal of Licence	Location in Application or Supporting Document(s)
5. An application for the renewal of a licence shall contain	
(a) The information required to be contained in an application for that licence by the applicable regulations made under the Act; and	Application and identified supporting documentation.
(b) A statement identifying the changes in the information that was previously submitted.	N/A

Pursuant to subsection 15 of the General Nuclear Safety and Control Regulations: Obligations – Representatives of Applicants and Licensees.

Subsection 15 of the <i>General Nuclear Safety and Control Regulations</i>: Obligations – Representatives of Applicants and Licensees	Location in Application or Supporting Document(s)
15. Every applicant for a licence and every licensee shall notify the Commission of	
(a) The persons who have authority to act for them in their dealings with the Commission;	Application Sections 2.1 and 4.1.1 Supporting Documents - FLM
(b) The names and position titles of the persons who are responsible for the management and control of the licensed activity and the nuclear substance, nuclear facility, prescribed equipment or prescribed information encompassed by the licence; and	Application Sections 2.1 and 4.1.1 Supporting Documents - FLM
(c) Any change in the information referred to in paragraphs (a) and (b), within 15 days after the change occurs.	FLM

Pursuant to subsection 3 of the Class I Nuclear Facilities Regulations: Licence Applications – General Requirements

Subsection 3 of the <i>Class I Nuclear Facilities Regulations</i>: Licence Applications – General Requirements	Location in Application or Supporting Document(s)
3 An application for a licence in respect of a Class I nuclear facility, other than a licence to abandon, shall contain the following information in addition to the information required by section 3 of the General Nuclear Safety and Control Regulations:	
(a) A description of the site of the activity to be licensed, including the location of any exclusion zone and any structures within that zone;	Application Section 2.2 Supporting Documents - BRR700P-C-0002200-01 and BRR700P-C-0002200-02
(b) Plans showing the location, perimeter, areas, structures and systems of the nuclear facility	Supporting Documents - BRR700P-C-0002200-01 and BRR700P-C-0002200-02
(c) evidence that the applicant is the owner of the site or has authority from the owner of the site to carry on the activity to be licensed;	Copies of relevant deeds and leases have previously been submitted to the CNSC and are available upon request
(d) the proposed management system for the activity to be licensed, including measures to promote and support safety culture;	Application Section 4.1 Supporting Documents – FLM, AM 400
(d.1) the proposed human performance program for the activity to be licensed, including measures to ensure workers’ fitness for duty.	Application Section 4.2 Supporting Documents – FLM, AM 300
(e) the name, form, characteristics and quantity of any hazardous substances that may be on the site while the activity to be licensed is carried on;	Application Section 4.4 Supporting Documents – FLM, SAR, ERA, DRL
(f) the proposed worker health and safety policies and procedures;	Application Section 4.8 Supporting Documents – BR HS 100
(g) the proposed environmental protection policies and procedures;	Application Section 4.9 Supporting Documents – FSD-PGR-EMS-001, ET 110
(h) the proposed effluent and environmental monitoring programs;	Application Section 4.9 Supporting Documents – FSD-PGR-EMS-001, ET 110

Subsection 3 of the <i>Class I Nuclear Facilities Regulations</i>: Licence Applications – General Requirements	Location in Application or Supporting Document(s)
3 An application for a licence in respect of a Class I nuclear facility, other than a licence to abandon, shall contain the following information in addition to the information required by section 3 of the General Nuclear Safety and Control Regulations:	
(i) If the application is in respect of a nuclear facility referred to in paragraph 2(b) of the <i>Nuclear Security Regulations</i> , the information required by section 3 of those Regulations;	Not applicable to BRR
(j) the proposed program to inform persons living in the vicinity of the site of the general nature and characteristics of the anticipated effects on the environment and the health and safety of persons that may result from the activity to be licensed; and	Application Section 2.4 Supporting Documents – FSD-PGR-PIP-01
(k) the proposed plan for the decommissioning of the nuclear facility or of the site.	Application Sections 2.5 and 4.11.3 Supporting Documents – FLM, PDP

Pursuant to subsection 6 of the Class I Nuclear Facilities Regulations: Licence Applications – Licence to Operate

Subsection 6 of the <i>Class I Nuclear Facilities Regulations</i>: Licence Applications – Licence to Operate An application for a licence to operate a Class I nuclear facility shall contain the following information in addition to the information required by section 3:	Location in Application or Supporting Document(s)
(a) a description of the structures at the nuclear facility, including their design and their design operating conditions;	Application Sections 2.2, 2.3, 4.4, 4.5 and 4.6 Supporting documents – FLM, SAR Detailed information on specific structures and their design and operation was previously submitted to the CNSC (AECB) at the time the structures were commissioned.
(b) a description of the systems and equipment at the nuclear facility, including their design and their design operating conditions;	Application Sections 2.2, 2.3, 4.4, 4.5 and 4.6 Supporting documents – FLM, SAR Detailed information on specific structures and their design and operation was previously submitted to the CNSC (AECB) at the time the structures were commissioned.
(c) a final safety analysis report demonstrating the adequacy of the design of the nuclear facility;	Application Section 4.4 Supporting documents – FLM, SAR
(d) the proposed measures, policies, methods and procedures for operating and maintaining the nuclear facility;	Application Sections 4.1, 4.2, 4.3, 4.5, and 4.6 Supporting documents – FLM, AM 400 and referenced documents
(e) the proposed procedures for handling, storing, loading and transporting nuclear substances and hazardous substances;	Application Sections 4.2, 4.3, 4.7, and 4.14 Supporting documents – FLM, RS 100, FSD-PGR-TRN-01
(f) the proposed measures to facilitate Canada’s compliance with any applicable safeguards agreement;	Application Section 4.13 Supporting documents – FLM, FSD-PGR-SG-01
(g) the proposed commissioning program for the systems and equipment that will be used at the nuclear facility;	Application Sections 4.1 and 4.5 Supporting documents – FLM, AM 400, AM 37, PR 33

Subsection 6 of the <i>Class I Nuclear Facilities Regulations</i>: Licence Applications – Licence to Operate An application for a licence to operate a Class I nuclear facility shall contain the following information in addition to the information required by section 3:	Location in Application or Supporting Document(s)
(h) the effects on the environment and the health and safety of persons that may result from the operation and decommissioning of the nuclear facility, and the measures that will be taken to prevent or mitigate those effects;	Application Sections 4.4, 4.7 and 4.9 Supporting documents – FLM, ERA, SAR, DRL
(i) The proposed location of points of release, the proposed maximum quantities and concentrations, and the anticipated volume and flow rate of releases of nuclear substances and hazardous substances into the environment, including their physical, chemical and radiological characteristics;	Application Sections 4.4 and 4.9 Supporting documents – FLM, SAR, ERA, DRL, ET 100
(j) the proposed measures to control releases of nuclear substances and hazardous substances into the environment;	Application Sections 4.4 and 4.9 Supporting documents – FLM, SAR, ERA, DRL, ET 100
(k) the proposed measures to prevent or mitigate the effects of accidental releases of nuclear substances and hazardous substances on the environment, the health and safety of persons and the maintenance of national security, including measures to	Application Sections 4.4, 4.9 and 4.10 Supporting documents – FLM, SAR, ERA, DRL, EP 100, FS 200
(i) Assist off-site authorities in planning and preparing to limit the effects of an accidental release,	Application Sections 4.4, 4.9 and 4.10 Supporting documents – FLM, SAR, ERA, DRL, EP 100, FS 200
(ii) Notify off-site authorities of an accidental release or the imminence of an accidental release,	Application Sections 4.4, 4.9 and 4.10 Supporting documents – FLM, EP 100
(iii) Report information to off-site authorities during and after an accidental release,	Application Sections 4.4, 4.9 and 4.10 Supporting documents – FLM, EP 100
(iv) Assist off-site authorities in dealing with the effects of an accidental release, and	Application Sections 4.4, 4.9 and 4.10 Supporting documents – FLM, EP 100
(v) Test the implementation of the measures to prevent or mitigate the	Application Sections 4.4, 4.9 and 4.10

Subsection 6 of the <i>Class I Nuclear Facilities Regulations</i>: Licence Applications – Licence to Operate An application for a licence to operate a Class I nuclear facility shall contain the following information in addition to the information required by section 3:	Location in Application or Supporting Document(s)
effects of an accidental release;	Supporting documents – FLM, EP 100
(l) the proposed measures to prevent acts of sabotage or attempted sabotage at the nuclear facility, including measures to alert the licensee to such acts	Application Section 4.12 Supporting documents – ST 100
(m) The proposed responsibilities of and qualification requirements and training program for workers, including the procedures for the requalification of workers; and	Application Section 4.2 Supporting documents – FLM, AM 300
(n) The results that have been achieved in implementing the program for recruiting, training and qualifying workers in respect of the operation and maintenance of the nuclear facility.	Application Section 4.2 Supporting documents – FLM, AM 300

Pursuant to Subsection 3 of the Nuclear Substances and Radiation Devices Regulations: Licence Applications – General Requirements

Subsection 3 of the <i>Nuclear Substances and Radiation Devices Regulations</i>: Licence Applications – General Requirements	Location in Application or Supporting Document(s)
3(1) An application for a licence in respect of a nuclear substance or a radiation device, other than a licence to service a radiation device, shall contain the following information in addition to the information required by section 3 of the <i>General Nuclear Safety and Control Regulations</i>:	
(a) the methods, procedures and equipment that will be used to carry on the activity to be licensed;	Application Sections 2.3, 4.4, 4.7, 4.9 and 4.10 Supporting documents – FLM, RS 100, ET 100, EP 100
(b) The methods, procedures and equipment that will be used while carrying on the activity to be licensed, or during and following an accident, to	Application Sections 2.3.3, 4.7 and 4.9 Supporting documents – FLM, RS 100, ET 100, EP 100
(i) Monitor the release of any radioactive nuclear substance from the site of the activity to be licensed,	
(ii) Detect the presence of and record the radiation dose rate and quantity in becquerels of radioactive nuclear substances at the site of the activity to be licensed,	Application Sections 2.3.3, 4.7 and 4.9 Supporting documents – FLM, RS 100, ET 100, EP 100
(iii) Limit the spread of radioactive contamination within and from the site of the activity to be licensed, and	Application Sections 2.3.3, 4.7 and 4.9 Supporting documents – FLM, RS 100, ET 100, EP 100
(iv) Decontaminate any person, site or equipment contaminated as a result of the activity to be licensed;	Application Sections 2.3.3, 4.7 and 4.9 Supporting documents – FLM, RS 100, ET 100, EP 100, PR 300
(c) a description of the circumstances in which the decontamination referred to in subparagraph (b)(iv) will be carried out;	Application Sections 4.4, 4.7, 4.9, 4.10, 4.11 Supporting documents - FLM, RS 100, ET 100, EP 100, PR 300
(d) The proposed location of the activity to be licensed, including a description of the site;	Application Section 2.2 Supporting Documents - BRR700P-C-0002200-01 and BRR700P-C-0002200-02

Subsection 3 of the <i>Nuclear Substances and Radiation Devices Regulations</i>: Licence Applications – General Requirements	Location in Application or Supporting Document(s)
3(1) An application for a licence in respect of a nuclear substance or a radiation device, other than a licence to service a radiation device, shall contain the following information in addition to the information required by section 3 of the <i>General Nuclear Safety and Control Regulations</i>:	
(e) The roles, responsibilities, duties, qualifications and experience of workers	Application Section 4.2 Supporting documents – AM 300
(f) The proposed training program for workers;	Application Section 4.2 Supporting documents – AM 300
(g) The proposed instructions for dealing with accidents, including fires and spills, in which the nuclear substance may be involved;	Application Sections 4.4, 4.7, 4.9, 4.10 Supporting documents – FLM, RS 100, ET 100, EP 100, PR 300, FS 200, FS 100
(h) The proposed inspection program for the equipment and systems that will be used to carry on the activity to be licensed;	Application Sections 4.4, 4.7, 4.9, 4.10 Supporting documents – FLM, RS 100, ET 100, EP 100, PR 300, FS 200, FS 100
(i) The methods, procedures and equipment that will be used to calibrate radiation survey meters in accordance with these Regulations;	Application Sections 2.3.3 and 4.7 Supporting documents – RP 3.2.4, RS 100 and referenced procedures
(j) The methods, procedures and equipment that will be used to calibrate and verify the calibration of dosimeters referred to in paragraphs 30(3)(d) and €;	Application Sections 2.3.3 and 4.7 Supporting documents – RP 3.2.4, RS 100 and referenced procedures
(k) The methods, procedures and equipment that will be used to conduct the leak tests and surveys required by those Regulations;	Application Sections 2.3.3 and 4.7 Supporting documents – RP 3.2.4, RS 100 and referenced procedures
(l) Where the application is in respect of a nuclear substance that is in an unsealed source and that is to be used in a room , the proposed design of the room;	Application Sections 2.3.3 and 4.7 Supporting documents – RP 3.2.4, RS 100 and referenced procedures
(m) If the application is in respect of a nuclear substance that is contained in a	Application Sections 2.3.3 and 4.7

Subsection 3 of the <i>Nuclear Substances and Radiation Devices Regulations</i>: Licence Applications – General Requirements	Location in Application or Supporting Document(s)
3(1) An application for a licence in respect of a nuclear substance or a radiation device, other than a licence to service a radiation device, shall contain the following information in addition to the information required by section 3 of the <i>General Nuclear Safety and Control Regulations</i>:	
radiation device, the brand name and model number of the radiation device, and the quantity of the devices;	Supporting documents – RP 3.2.4, RS 100 and referenced procedures
(n) Where the application is in respect of Category I, II or III nuclear material, as defined in section 1 of the <i>Nuclear Security Regulations</i> ,	Not applicable
i. The measures that will be taken to prevent nuclear criticality	
ii. The information required by section 3 or 4 of the <i>Nuclear Security Regulations</i> , as applicable;	
(o) If the applicant will be manufacturing or distributing radiation devices referred to in paragraph 5(1)© or section 6 or 7, or check sources mentioned in section 8.1, the proposed procedure for the disposal of each radiation device or check source for its return to the manufacturer	Not applicable

Pursuant to Part 2 of the Nuclear Security Regulations: Part 1 Security of Nuclear Facilities Listed in Schedule 2 – Licence Applications

Subsection 41 of the <i>Nuclear Security Regulations</i>: Licence Applications – General Requirements	Location in Application or Supporting Document(s)
An application for a licence in respect of a nuclear facility shall contain, in addition to the information required by sections 3 to 8 of the <i>Class I Nuclear Facilities Regulations</i> , a description of the physical protection measures to be taken to ensure compliance with sections 42 to 48.	Application Section 4.12 Supporting documents – ST 100

Appendix 5 – Detailed Operational Performance Report for FFOL-3632.0/2022



**2012-2019 Operational Performance Report and Forward
Outlook in Support of the Renewal of:**

**Blind River Refinery
Operating Licence
FFOL-3632.00/2022**

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1.0 INTRODUCTION

1.1 Background

As described within this report, the performance of this facility over the current and licence period demonstrates that Cameco is qualified to carry out the activities permitted under the Licence for a period of 10 years. This report reaffirms Cameco's commitment to take all reasonable precautions to protect the environment and the health and safety of employees and the public, to maintain the security of the facility and the nuclear substances associated with the facility, and the necessary measures to facilitate Canada's compliance with international safeguards obligations.

1.2 Production Highlights 2012 to 2019

Detailed plant production information is considered confidential and proprietary and is submitted to the Canadian Nuclear Safety Commission (CNSC) on an annual basis under a separate cover. The following production summarizes BRR operating performance between 2012 and 2019:

- The annual production of uranium as uranium trioxide (UO₃) did not exceed the licensed limit of 18,000 tonnes uranium as UO₃

1.3 Forward Outlook for Operations

Cameco's production plans for the refinery are anticipated to remain similar to the current licence period, with the annual target based on the UO₃ demands of the Port Hope Conversion facility and international customers. However, Cameco will maintain the option to increase the refinery production approved by the Commission in the previous licence renewal with the current hold points in the Operating Performance section of the Licence Conditions Handbook (LCH) in order to adapt to the potential for increase in uranium demand.

In addition to maintaining the option to install equipment to support a production increase, the refinery anticipates completing a refurbishment of the third stage boil down heat exchanger and replacement of the existing cooling tower. A new drum lid cleaning circuit will also be designed and installed to eliminate this waste stream. These activities will be completed under the refinery's change control processes.

1.4 Safety Challenges and Opportunities for Improvement

The refinery is a mature operation with an outstanding safety record, this is in part due to its long-tenured employees. Looking to the next licence period, Cameco recognizes that as these employees retire, there is a potential to see a shift in the safety performance of the site. The refinery's strong safety record, excellent training program, well established programs and procedures, along with increased oversight of new employees will be required to maintain the strong culture of safety in Blind River.

2.0 SAFETY AND CONTROL AREAS

2.1 Management System

This safety and control area (SCA) covers the framework that establishes the processes and programs required to ensure that the organization achieves its safety objectives and continuously monitors its performance against these objectives, as well as fostering a healthy safety culture.

Operational Performance

During the current licence period, BRR replaced its Quality Management Program with the Management Systems Program Manual (MSPM), AM 400. The MSPM was written to meet the requirements of CSA Standard N286-12 *Management System Requirements for Nuclear Facilities* and Cameco's corporate Management System. The MSPM also meets the requirements of REGDOC 2.1.1 – *Management System*.

Audits and inspections completed during the licence period did not identify any significant non-conformances to various criteria. All findings were assessed, and corrective actions developed, as appropriate; to continually improve all aspects of site performance.

Safety culture assessments were completed in 2013 and 2018 and re-affirmed that the refinery has a strong commitment to safety and that there is a high degree of trust and confidence in site leadership.

Management review was completed annually during the licence period to review suitability, adequacy and effectiveness of policies and programs as well as site performance. Opportunities for improvement were identified and incorporated into site objectives.

Between 2012 and 2019, CNSC staff have rated BRR as satisfactory in the Management System SCA.

Forward Outlook

To continue to improve its management system, Cameco has committed to the full implementation of REGDOC-2.1.2 – *Safety Culture* at the next scheduled safety culture assessment which will be completed prior to June 1, 2022.

2.2 Human Performance Management

This SCA covers activities that enable effective human performance through the development and implementation of processes that ensure that licensee staff members are sufficient in numbers in all relevant job areas, and have the necessary knowledge, skills and tools in place, in order to safely carry out their duties.

Operational Performance

During the current licence period, BRR has maintained a highly trained and competent workforce through its Systematic Approach to Training (SAT) based training program which meets the requirements of REGDOC2.2.2, *Personnel Training, Version 2*.

Summary statistics for the training program during the current licence period are provided in Table 1. Yearly fluctuations are the result of changes to personnel (new hires, job transfers, return to work) or training program requirements (requalification periods, new qualifications).

Table 1 Training Statistics for Current Licence Period

Year	Total Training Hours	Number of Qualifications Granted	% Qualifications Held
2012	12,771	4,292	96.1
2013	13,769	3,135	96.2
2014	10,070	3,409	97.1
2015	8,388	3,301	95.7
2016	8,651	3,595	96.6
2017	7,930	3,829	95.7
2018	8,167	3,907	95.7
2019	11,671	5,802	96.7

Between 2012 and 2019, CNSC staff have rated BRR as satisfactory in the Human Performance Management SCA.

Forward Outlook

In the upcoming licensing period, the development and implementation of HPM tools will continue as CNSC staff develop and publish additional guidance through applicable REGDOCs and Cameco establishes its corporate framework to meet these requirements. Cameco will review, and incorporate the applicable aspects of a human performance management program as part of the CNSC regulatory framework improvements.

2.3 Operating Performance

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

Operational Performance

During the current licence period, BRR has operated in a manner that supports safe, clean and reliable production and in compliance with applicable acts and regulations, corporate, divisional and site programs and procedures. Annual operating production targets were achieved for UO₃ operations during the current licence period. Detailed plant production information is considered “protected proprietary” and is submitted to CNSC staff on an annual basis.

Cameco reports unplanned events as required by the NSCA, its regulations and the licence conditions (Table 2). During the current licence period, BRR reported transportation

incidents, radiation protection action level exceedances, injuries reportable under the Canada Labour Code and a fire. These incidents were investigated in accordance with Cameco’s corrective action process and corrective actions taken as appropriate.

Table 2 Reportable Incidents in the Current Licence Period

Year	Transportation	Action Levels	Environmental Releases	Other	Total
2012	1	3	0	0	4
2013	0	2	0	1	3
2014	0	7	0	0	7
2015	1	0	0	0	1
2016	2	0	0	1	3
2017	3	1	0	0	4
2018	1	0	0	1	2
2019	1	1	0	3	5
2020 (to June 30)	0	0	0	1	1

Regulatory actions from CNSC staff inspections and follow-up activities from CNSC staff reviews of Cameco submissions, including those from event reports are tracked in CIRS. As of the end of August 2020, the refinery had 23 open actions related to CNSC inspections and reviews. The status of open actions are routinely discussed with the project officer.

Between 2012 and 2019, CNSC staff have rated BRR as satisfactory in the Operating Performance SCA.

Forward Outlook

Looking ahead to the next licensing period, Cameco will implement projects to further support improved health, safety and environmental performance.

2.4 Safety Analysis

This SCA covers the maintenance of the safety analysis, which supports the overall safety case for the facility. This 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.

Operational Performance

BRR has a safety analysis report (SAR) that summarizes the systematic review of site operations to identify and assess hazards and potential risks to the public and environment from the refinery. A hazards and operability (HAZOP) methodology was utilized to systematically assess risk and safety measures in all areas of the facility. The SAR incorporates all of the HAZOP assessments as well as more recent changes assessed through the design control process and an analysis of the probable worst-case release event. The SAR was updated and submitted to CNSC staff in 2012 and 2016.

A 2020 version of the SAR to be submitted in October 2020 will incorporate information from other supporting studies of the facility to better align with the guidance provided in the International Atomic Energy Agency (IAEA) standard SSR-4, *Safety of Nuclear Fuel Cycle Facilities*. It will be submitted to the CNSC as part of the suite of documents supporting the licence renewal application.

Between 2012 and 2019, CNSC staff have rated BRR as satisfactory in the Safety Analysis SCA every year.

Forward Outlook

REGDOC-2.4.4 *Safety Analysis for Class 1B Facilities* is expected to be published in the next licence period. There is an established process for review of new standards and REGDOCs and their incorporation as Compliance Verification Criteria (CVC) or guidance in the LCH. As per the process, BRR will identify and address any gaps in the facility safety analysis on a schedule accepted by CNSC staff.

2.5 Physical Design

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

Operational Performance

Changes to the physical design of equipment, processes and the facility with the potential to impact safety are evaluated through a design control process from initial planning through to completion of the project. This review identifies impacts and potential impacts to the environment, radiation protection, health and safety and fire protection. A site design control procedure is in place, which ensures that any equipment changes or modifications will not have an adverse effect on the environment, on the health and safety of employees or on members of the public.

In the current licence period, BRR implemented a new CSA standard N393, *Fire protection for facilities that process, handle, or store nuclear substances* and implemented the changes in a new version of CSA B51-14, *Boiler, pressure vessel, and pressure piping code*.

BRR has a contractual arrangement with the provincial Technical Standards and Safety Authority to ensure that oversight of pressure retaining components and systems continues to be carried out by a third-party expert.

Between 2012 and 2019, CNSC staff have rated BRR as satisfactory in the Physical Design SCA.

Forward Outlook

While the site pressure boundary program meets the requirements of CSA B51-14 *Boiler Pressure Vessel and Pressure Piping Code*, the 2019 version of the code will be implemented by March 31, 2021.

2.6 Fitness for Service

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

Operational Performance

In the licence period, Cameco implemented an Operational Reliability program to detect early warning signs of aging infrastructure and to prescribe rehabilitation programs or proactive replacement strategies. The refinery improved its performance under this program from an emerging program to a proactive program based on a 3-year assessment.

BRR tracks Key Performance Indicators (KPIs) to monitor the effectiveness of the program. Detailed information regarding KPIs is considered protected proprietary and are not made publicly available. Overall, the KPIs reflected strong performance with improvements to the site uptime availability and overall equipment effectiveness, improvements in preventative maintenance schedule compliance and a decrease in the amount of reactive maintenance work.

In-service inspections of piping and vessels in safety significant systems and fire protection system tests were completed as required by site programs and regulatory requirements.

Between 2012 and 2019, CNSC staff have rated BRR as satisfactory in the Fitness for Service SCA every year.

Forward Outlook

Looking ahead to the next licensing period, the refinery to make improvements to this SCA through the Operational Reliability program and recommendations developed during management review of KPI performance.

2.7 Radiation Protection

This SCA covers the implementation of a radiation protection program, in accordance with the *Radiation Protection Regulations*. This program must ensure that contamination and radiation doses are monitored and controlled.

Operational Performance

BRR has an extensive Radiation Safety Program in place to meet the requirements of the *Nuclear and Safety Control Act* and the *Radiation Protection Regulations* and ensure exposures are kept to levels as low as reasonably achievable, social and economic factors considered (ALARA). Review of worker dose data between 2012 and 2019 indicates that the program is highly effective in the prevention of unreasonable risk to the health and

safety of workers (Cameco employees and contractors). All worker doses were well below the CNSC regulatory limits for effective dose for Nuclear Energy Workers (NEWs) of 50 millisieverts (mSv) per year and no more than 100 mSv over a specified five-year period.

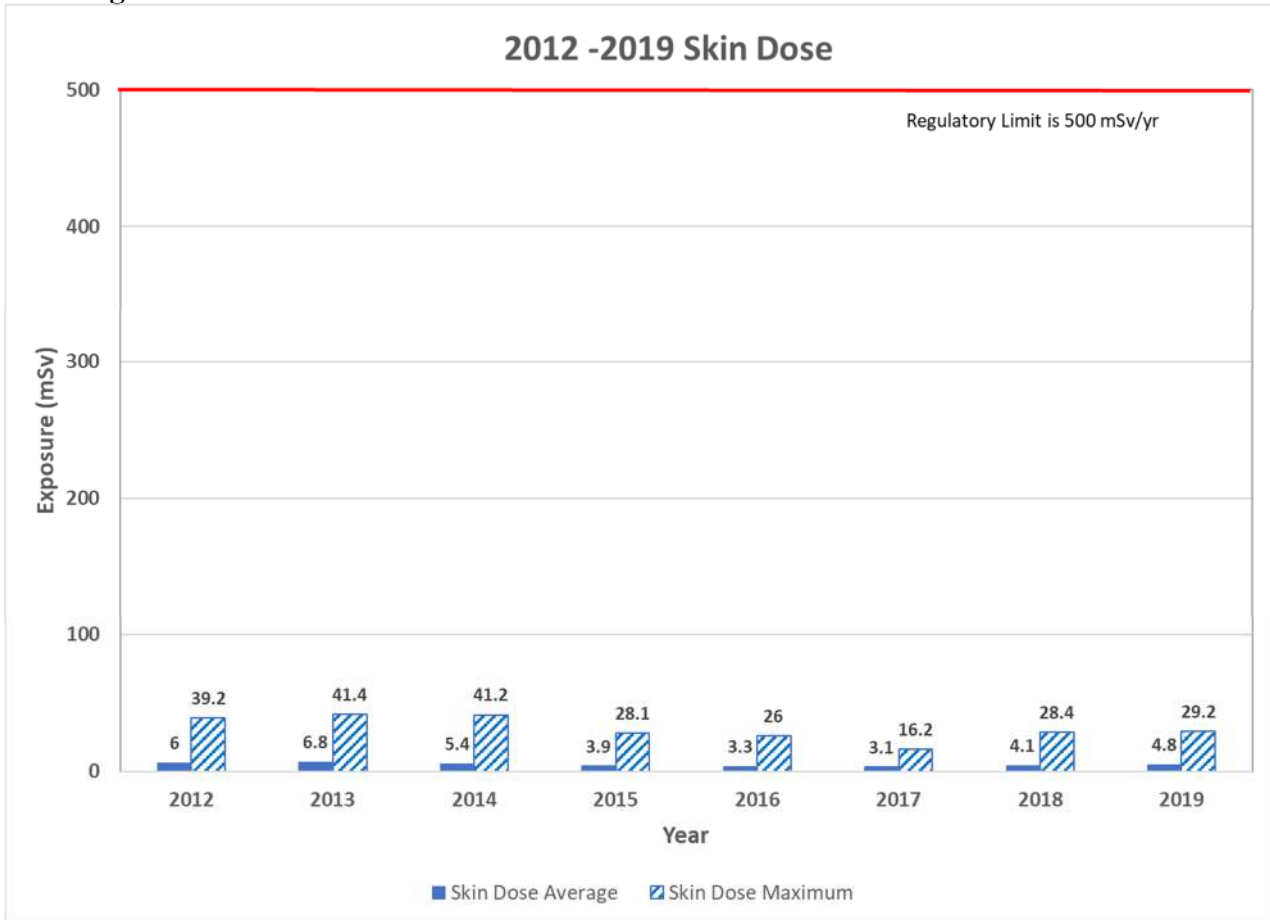
BRR uses a licensed dosimetry service provider that is accredited by the CNSC for external dosimetry. Internal doses are assigned through urine analysis and lung counting programs, which are part of Cameco's licensed internal dosimetry service.

Between 2012 and 2018, CNSC staff have rated BRR as satisfactory in the Radiation Protection SCA every year.

Equivalent Dose Limits - Skin Dose

Dose to skin is measured using dosimeters and compared to the corresponding equivalent dose limit of 500 mSv in the *Radiation Protection Regulations*. Figure 1 shows the average and maximum individual skin dose for NEWs in the period from 2012 - 2019. The average skin dose in this period was 1% of the dose limit. The maximum skin dose received in this period in 2013 was 8% of the dose limit.

Figure 7



Effective Dose Limits

As per the *Radiation Protection Regulations*, effective dose for NEWs at BRR is determined through the dose received from outside the body, as measured by optically stimulated luminescence (OSL) dosimeters as well as the dose received by and committed to the worker from sources inside the body, as measured through lung counting and urine analysis.

Whole Body Dose

The average whole body doses for NEWs are consistent and extremely low during the period from 2012 to 2019. The average annual whole body dose for NEWs ranged from 0.5 mSv to 1.0 mSv in this period. The maximum whole body dose in this period was 8.2 mSv in 2012. Managing external exposure dose at these levels ensures that total effective dose for workers remains a small fraction of the CNSC annual limit of 50 mSv.

Urine Analysis

The average internal doses for NEWs from urine analysis are extremely low during the period from 2012 to 2019. The average annual internal dose from urine analysis for NEWs ranged from 0.1 mSv to 0.3 mSv. The maximum dose from urine analysis in this period was 4.7 mSv in 2015. Managing the internal dose component from urine analysis at these

levels ensures that total effective dose for workers remains a small fraction of the CNSC annual limit of 50 mSv.

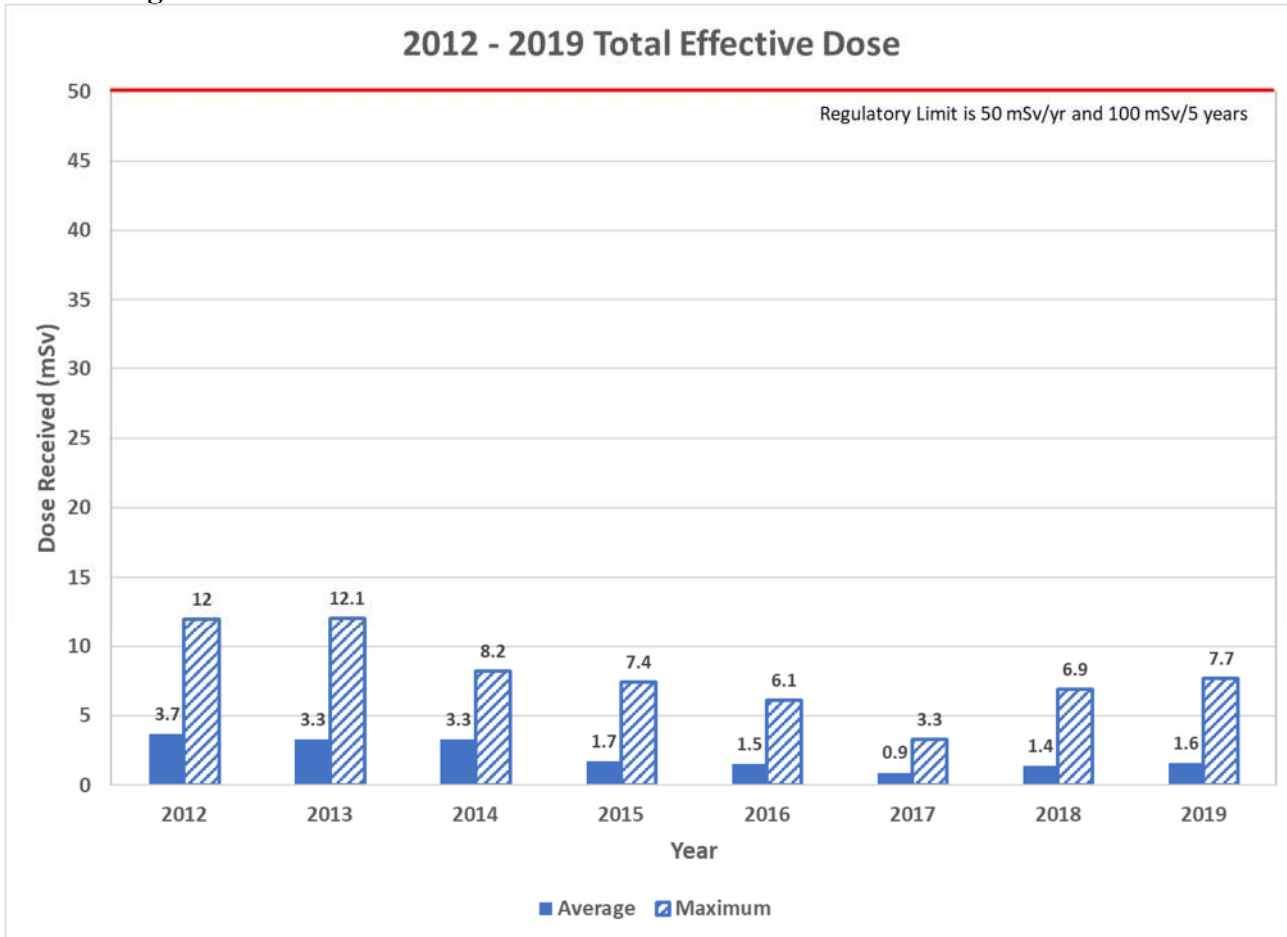
Lung Counting

As part of the licensed internal dosimetry program, Cameco employs the use of a lung counter to monitor and assess uranium exposure in the lungs of NEWs working at BRR. The average internal doses determined through lung counting decreased during the current licence period. The average annual internal dose from lung counting for NEWs ranged from 0.3 mSv to 2.5 mSv. The maximum dose from lung counting in this period was 4.6 mSv in 2012. Managing the internal dose component from lung counting at these levels ensures that total effective dose for workers remains a small fraction of the CNSC annual limit of 50 mSv.

Total Effective Dose (TED)

Figure 2 presents the total effective dose for workers (employees and contractors) designated as NEWs during the 2012 - 2019 period. The TEDs over the period are extremely low and the regulatory limit of 100 mSv five-year effective dose was not exceeded. The five-year regulatory limit of 100 mSv established in the *Radiation Protection Regulations* applies to unique five-year periods of time. The periods relevant to the current licence periods extends from January 1, 2011 to December 31, 2015 and January 1, 2016 to December 31, 2021. For the first five-year period in under this licence (January 2011 to December 2015), the maximum TED for a single individual for all five years was 41 mSv. For the current period (January 2016 to December 2020) the highest individual result to date is 24.1 mSv (up to December 2019).

Figure 8



Other Radiation Monitoring

The inventory of sealed and unsealed sources that are used or possessed on site was maintained between 2012 and 2019. Regular inspection and leak tests of the sealed sources were carried out and demonstrated that sources are in a state of safe operation and pose no undue risk to workers.

Between 9,200 and 13,900 in-plant air samples were collected each year in the current licence period, of those, less than 0.2% of these samples were above the respirator level. Approximately 15,000 contamination monitoring measurements are completed in Zone 2 each year, of those, less than 0.2% of these samples indicated contamination from Zone 3. There were no measurements that indicated contamination in Zone 1.

Forward Outlook

The RP Program is mature and enables Cameco to keep radiation exposures ALARA. REGDOC-2.7.1 *Radiation Protection* and REGDOC – 2.7.2 *Dosimetry Volume I: Ascertainig Occupational Dose* are expected to be published in the next licence period. There is an established process for review of new standards and REGDOCs and their incorporation as Compliance Verification Criteria (CVC) or guidance in the LCH. As per

the process, BRR will identify and address any gaps in the radiation protection program on a schedule accepted by CNSC staff.

2.8 Conventional Health and Safety

This SCA covers the implementation of a program to manage non-radiological workplace health and safety hazards and to protect personnel and equipment.

Operational Performance

The effectiveness of the conventional OHS system can be evaluated by the responsiveness of the site to leading safety activities such as audits, inspections, evaluations, reviews, benchmarking, training and employee participation and engagement. BRR has tracked leading and lagging safety indicators for many years. These consist of, but are not limited to, tracking safety meeting attendance, tracking the percentage of safety inspections completed and safety statistics. This data is reviewed by site and divisional management and has helped improve the overall safety performance at the refinery. The table 3 presents the safety statistics for the refinery for the current licence period.

Table 3 Health and Safety Statistics

Year/Parameter	2012	2013	2014	2015	2016	2017	2018	2019
First Aid Injuries	14	15	12	12	12	5	9	9
Medical Diagnostic Procedures	1	3	2	6	0	1	1	3
Medical Treatment Injuries	1	2	1	0	1	0	1	2
Lost Time Injuries	0	0	0	0	0	0	0	0
Total Recordable Injury Rate (TRIR)	0.6	1.32	0.7	0	0.82	0	0.87	2.37

Safety culture surveys in 2013 and 2018 reaffirmed the refinery’s strong commitment to safety.

Between 2012 and 2018, CNSC staff have rated BRR as fully satisfactory in the Conventional Health and Safety SCA every year. A binary rating system was used for assessment of 2019 performance due to the COVID pandemic, BRR achieved the highest possible rating of satisfactory for 2019.

Forward Outlook

While the respiratory protection program meets the requirements of CSA Z94.4-11 *Selection, use and care of respirators*, the 2018 version of the code will be implemented by March 31, 2021. BRR will continue to enhance its safety program where opportunities are identified during the upcoming licence period. We continue to strive for zero injuries through all of our operations.

2.9 Environmental Protection

This SCA covers the programs that monitor and control all releases of nuclear and hazardous substances into the environment, as well as their potential effects on the environment, as the result of licensed activities.

Operational Performance

There are both federal and provincial regulatory authorities that have legislative jurisdiction over environmental protection at the facility. The refinery's Environmental Protection Program (EPP) monitors the following parameters to ensure protection of people and the environment:

- water and air emissions;
- gamma levels;
- groundwater; and
- soil.

Changes to the Regulatory Framework for Environmental Protection

The refinery maintains an EPP that meets the requirements of the ISO14001 standard and Cameco's corporate requirements. During the current licence period, BRR aligned its EPP with the applicable CSA N288 series standards, which provide guidance on the framework and methodology for establishing a standardized EPP that is protective of people and the environment. This included:

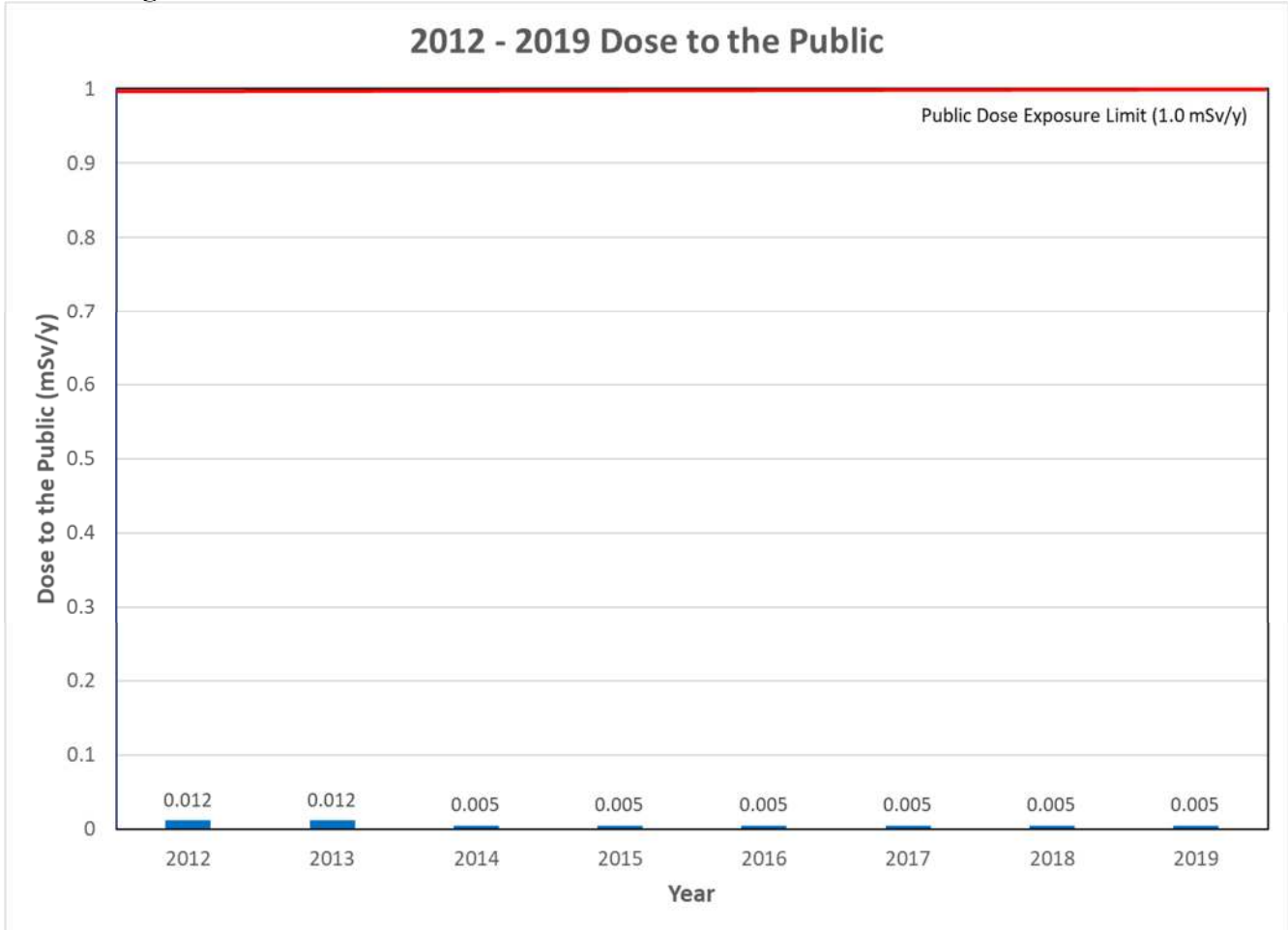
- an Environmental Risk Assessment (ERA) following the requirements of N288.6, *Environmental risk assessments at Class I nuclear facilities and uranium mines and mills*
- an updated Derived Release Limit (DRL) following the requirements of N288.1, *Guidelines for calculating derived release limits for radioactive material in airborne and liquid effluents for normal operation of nuclear facilities*
- revisions to the EPP to implement CSA N288.5, *Effluent monitoring programs at Class I nuclear facilities and uranium mines and mills* and CSA N288.6, *Environmental risk assessments at Class I nuclear facilities and uranium mines and mills*
- development of action levels in accordance with CSA N288.8, *Establishing and implementing action levels for releases to the environment from nuclear facilities*

Estimated Dose to the Public

Within the regulatory framework the radiation doses to the public are considered in the environmental protection SCA. The annual dose limit for a member of the public is 1.0 mSv. The annual dose to the public from BRR operations is determined by the use of a critical receptor who, given their proximity to the facility and the theoretical length of time that could be spent at this location, would be expected to receive the highest possible radiation dose that any member of the public could receive.

The annual dose to the critical receptor, located at the hi-vol station at the neighbouring golf course for the 2012 through 2019 period is shown in Figure 3. The dose to the critical receptor used to estimate dose to the public from Cameco’s operation is only a small percentage of the public dose limit of 1 mSv/year.

Figure 9



Gamma Monitoring

Environmental dosimeters have been used to monitor fenceline gamma emissions along each of the four perimeter fence lines since late 2012. The perimeter fence line surrounds the refinery and defines the boundary of the CNSC licensed facility. The gamma emissions from the facility are extremely low and have been well controlled during the current licence period.

Uranium Loadings

Total uranium loadings to the environment have remained low through the current licence period as seen in Table 4. Emissions to air represent a combination of uranium loadings from the two process stacks and the incinerator stack, as determined from the routine stack sampling program, and uranium loadings from the various process area ventilation exhaust systems, as determined by in-plant air sampling data and exhaust discharge rates. The variation in loadings is attributable to changes in annual production.

The variation in uranium loadings to water from year-to-year is attributable to changes in annual production levels and also to the volume of wastewater discharged in a given year. This volume will vary with annual precipitation received, as storm water run-off on site is collected, combined with and discharged simultaneously with other refinery liquid effluent streams.

Table 4 Total Uranium Loadings to the Environment

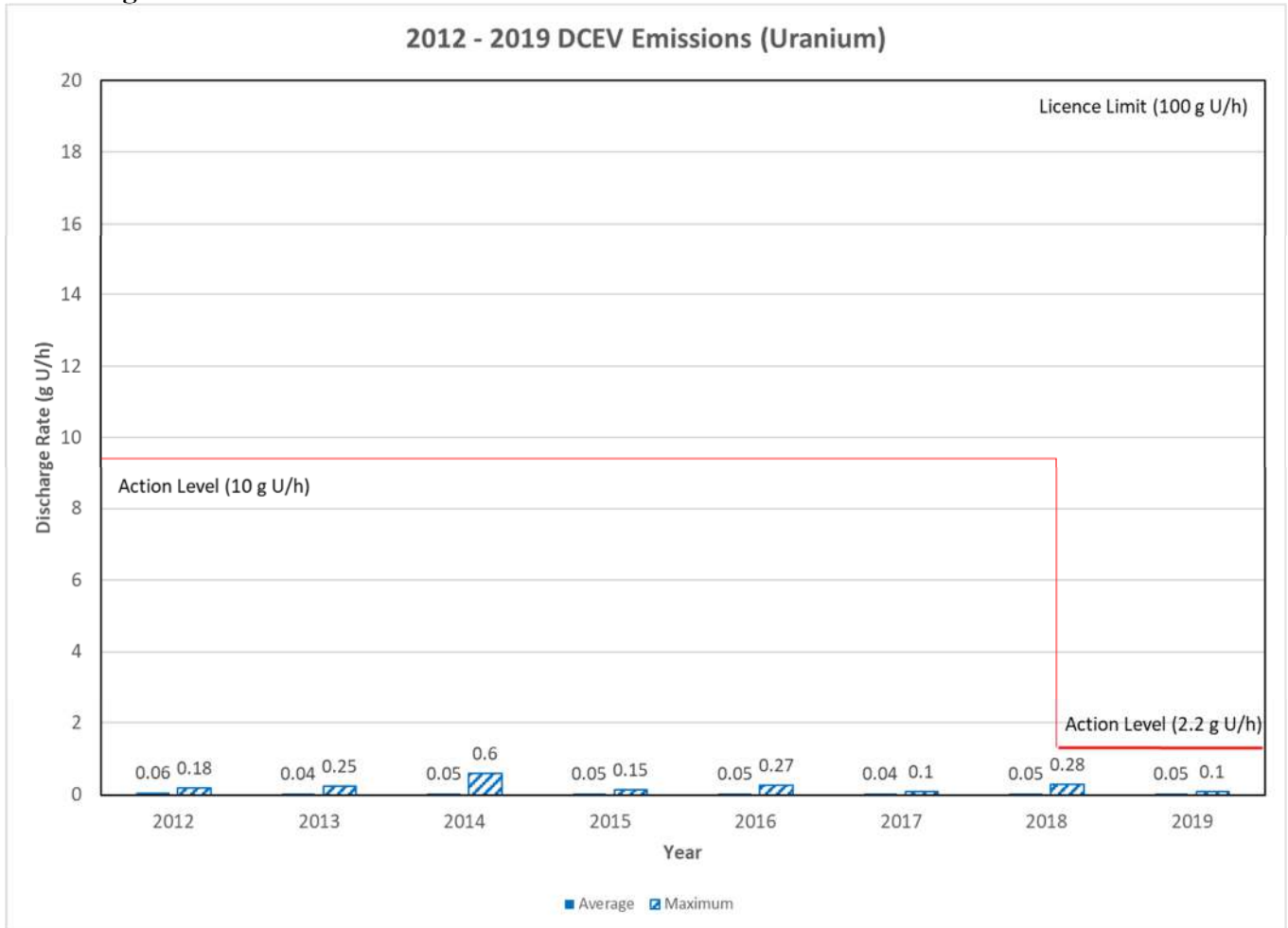
Emission	2012	2013	2014	2015	2016	2017	2018	2019
Air	3.6	4.1	1.5	1.3	1.0	0.8	1.2	2.0
Water	2.4	3.6	4.0	2.6	1.2	1.9	1.9	2.7
Total	6.0	7.7	5.5	3.9	2.2	2.7	3.1	4.7

Stack Monitoring Program

The stack monitoring program is used to determine the airborne uranium emission rates on a weekly basis from the DCEV stack and absorber stack and daily basis from the incinerator stack. Airborne NOx emission rates are also measured at the absorber stack.

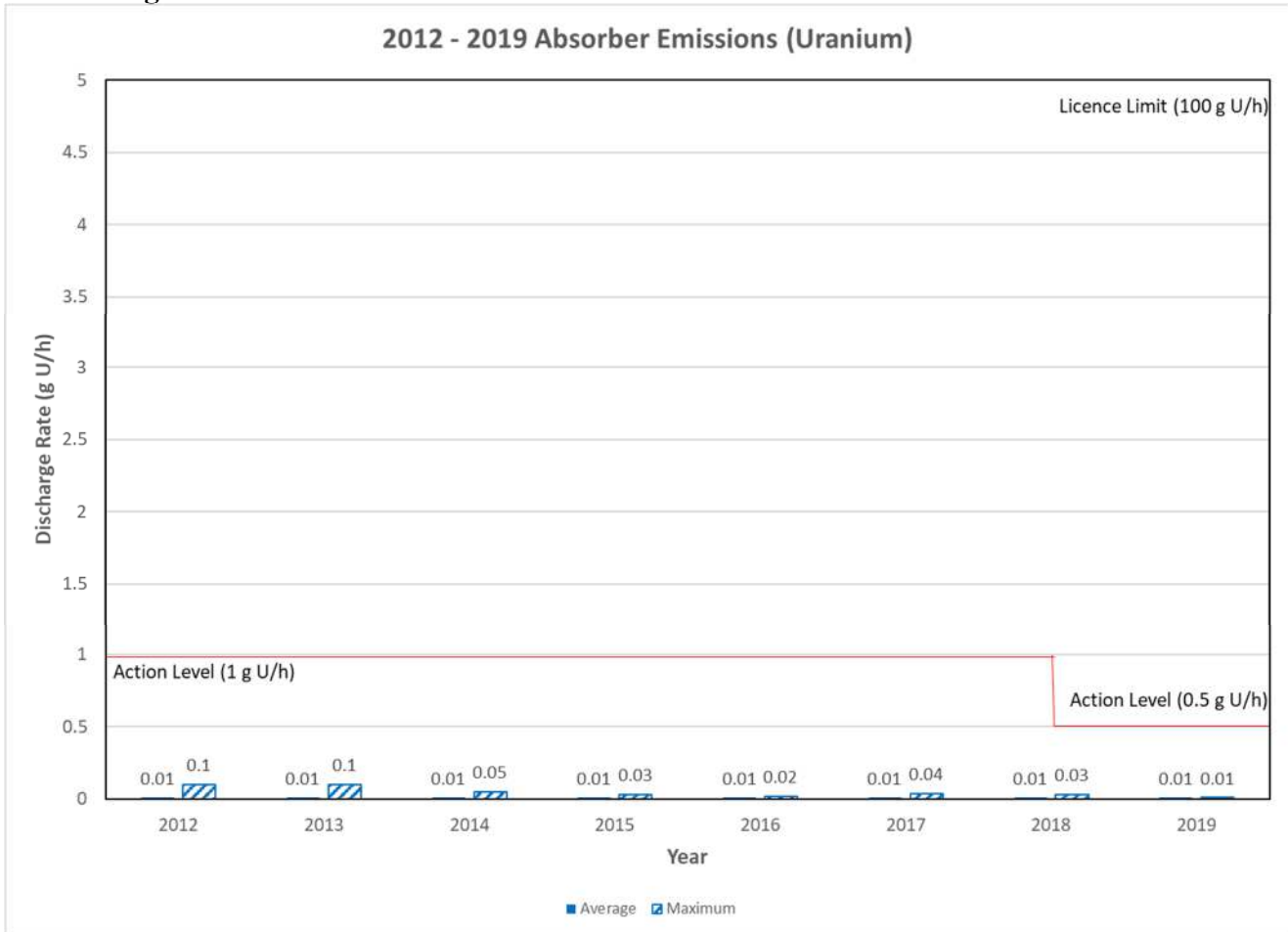
The annual average and maximum uranium emissions have typically remained low from the DCEV stack as shown in Figure 4. The DCEV action level was reduced from 10 g U/h to 2.2 g U/h in 2018. No action levels were exceeded for uranium emissions from the DCEV stack between 2012 and 2019.

Figure 10



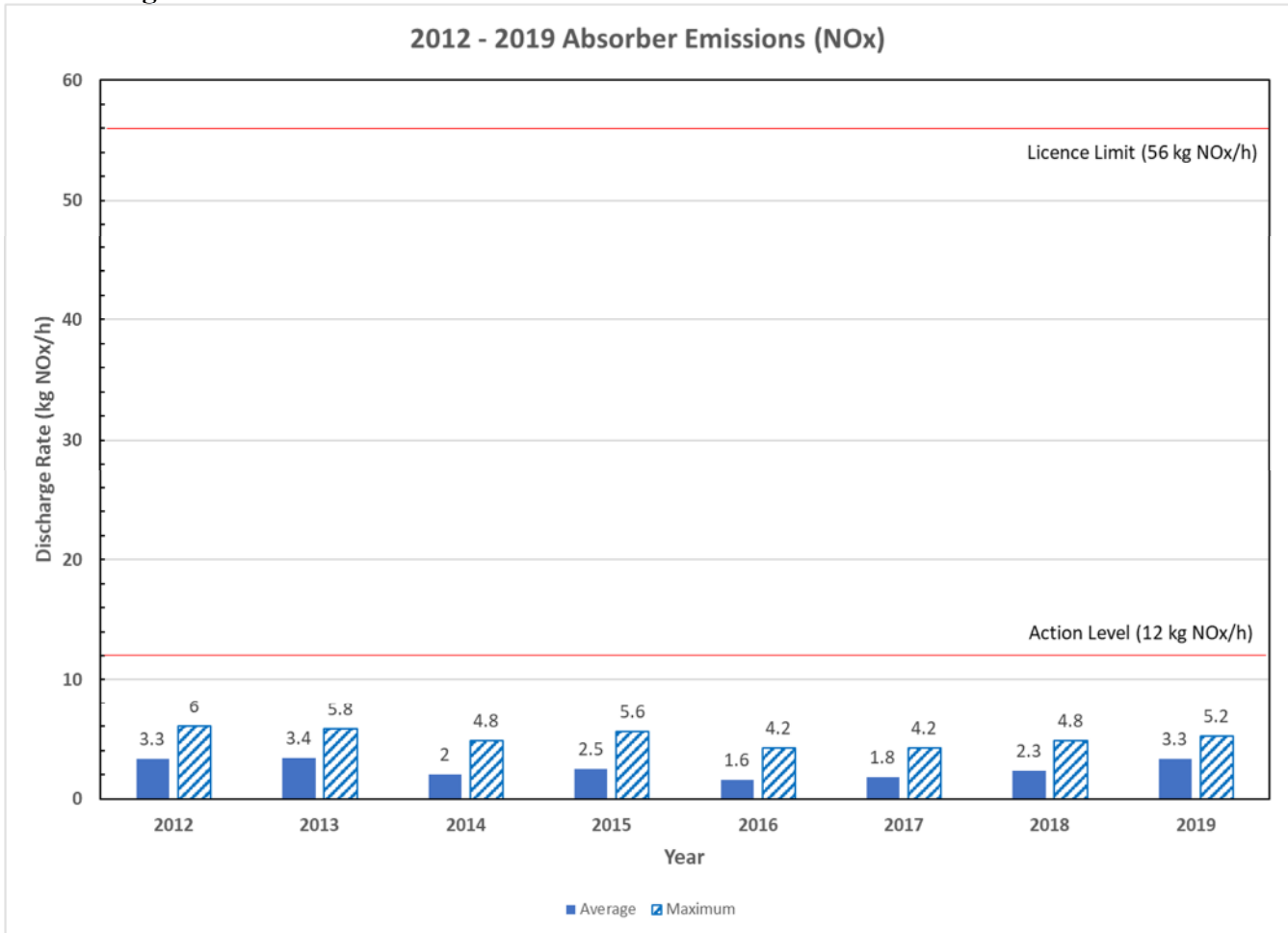
The annual average and maximum uranium emissions have typically remained low from the absorber stack as shown in Figure 5. The absorber action level was reduced from 1 g U/h to 0.5 g U/h in 2018. No action levels were exceeded for uranium emissions from the absorber stack between 2012 and 2019.

Figure 11



The annual average and maximum NO_x emissions have typically remained low from the absorber stack as shown in Figure 6. The absorber action level for NO_x was determined to be appropriate following N288.8 and was not changed in the licence period. No action levels were exceeded for NO_x emissions from the absorber stack between 2012 and 2019.

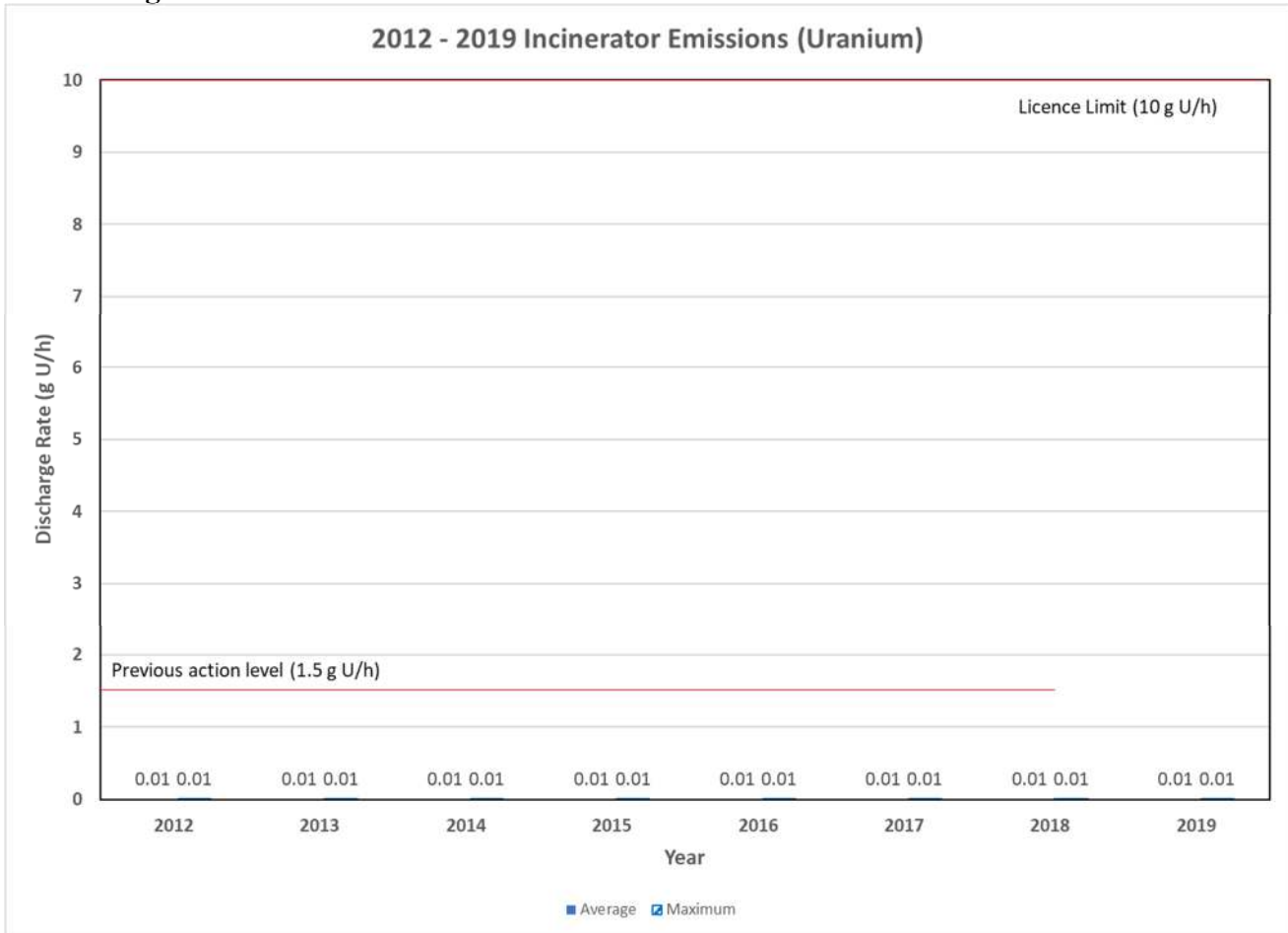
Figure 12



The uranium emissions from the incinerator are typically at or below the detection level as shown in Figure 7. This discharge point has a negligible contribution to the environmental risk in the ERA and the uranium loading is negligible in the DRL. Thus in 2018 the action level was removed as per N288.8-17.

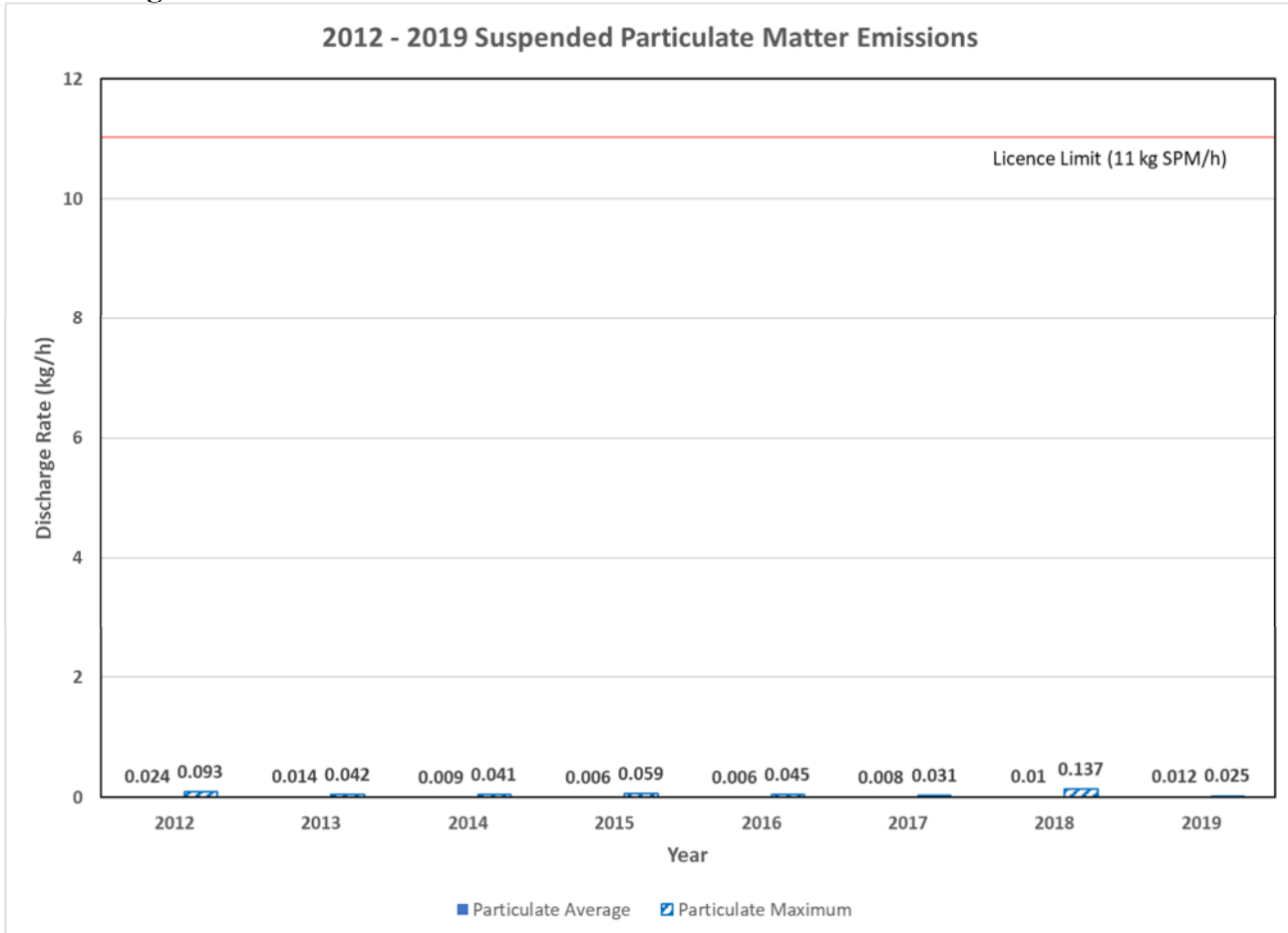
Stack sampling of the incinerator was also carried out by an independent third-party each year to demonstrate that emissions from the incinerator meet provincial MECP limits as specified in the Environmental Compliance Approval (ECA) for the incinerator. Year-to-year results for all parameters are not indicating any adverse trends, with all results well below their respective limits.

Figure 13



Total particulate emissions from the three main stacks have remained a fraction of the licence limit as shown in Figure 8.

Figure 14



Ambient Air Monitoring

In support of the stack sampling program, an ambient air program has been established to measure uranium in air near the refinery.

Uranium

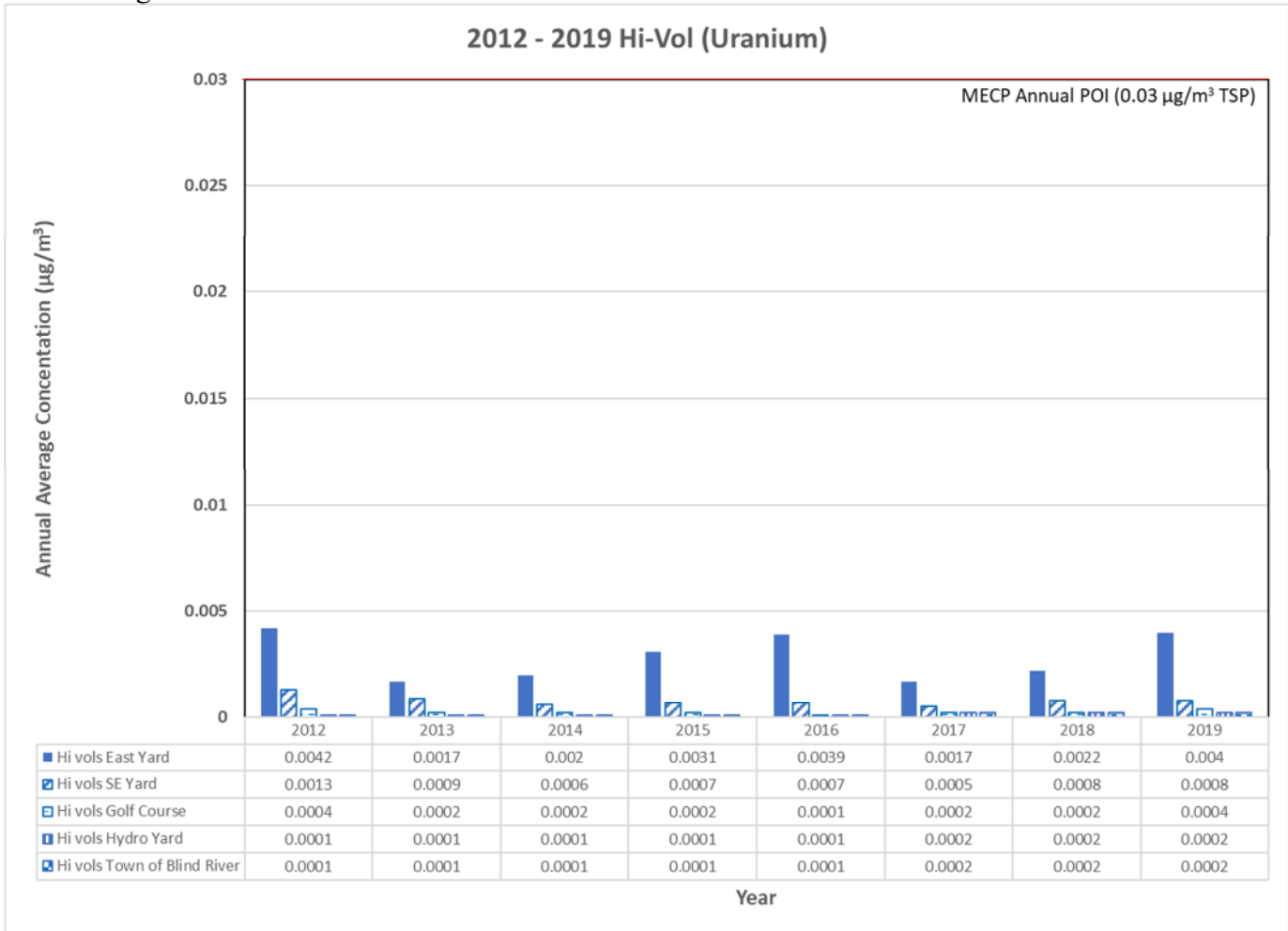
The Ministry of Environment, Conservation and Parks (MECP) annual average uranium point of impingement (POI) standard of 0.03 µg/m³ (PM10) took effect July 1, 2016. This regulates emissions for uranium using a modelled approach in which all U air emission sources are estimated or measured to determine an emission rate. Together with stack and building information, terrain and weather data, the air dispersion model predicts a POI concentration. This predicted concentration is compared against MECP POI standards. Facility emissions and predicted concentrations are summarized as a % of the standard and reported on annually as shown in Table 5.

Table 5 Facility Emission Rate

Year	Total Facility Emission Rate (g/s)	Maximum POI Concentration ($\mu\text{g}/\text{m}^3$)	Averaging Period	POI Limit ($\mu\text{g}/\text{m}^3$)	Percentage of POI Limit (%)
2012	0.000188	0.0014	Annual	0.03*	5%
2013	0.000199	0.0015	Annual	0.03*	5%
2014	0.000077	0.0005	Annual	0.03*	2%
2015	0.000065	0.0003	Annual	0.03*	1%
2016	0.000055	0.0002	Annual	0.03	1%
2017	0.000069	0.0002	Annual	0.03	1%
2018	0.000080	0.00036	Annual	0.03	1%
2019	0.000102	0.00063	Annual	0.03	2%
*Note the standard was not in force for the refinery in this reporting year					

The high volume (hi-vol) air-sampling program monitors the concentration of total uranium suspended in the air at five locations in the vicinity of the refinery: two inside the perimeter fence line and three outside perimeter fence line. Annual results from all stations remain well below the MECP annual average criteria of $0.03 \mu\text{g}/\text{m}^3$ as shown in Figure 9.

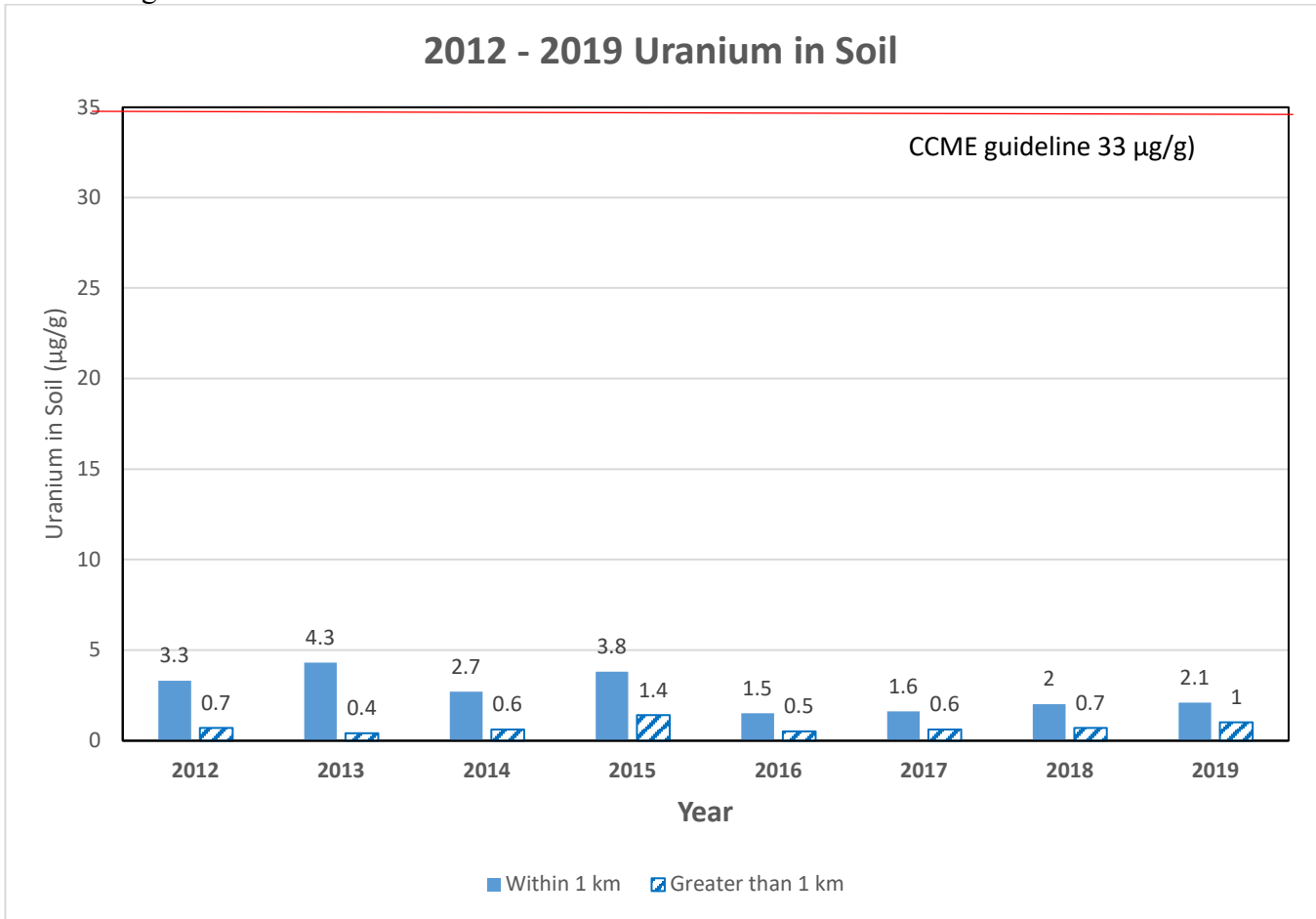
Figure 15



Soil Monitoring

Soil sampling for uranium in the vicinity of the refinery is also done for uranium on a periodic basis. The 2012 through 2019 uranium in soil is provided in Figure 10. All individual sampling location values were below the Canadian Council of Ministers of the Environment (CCME) agricultural and residential/parkland land use soil quality guideline of 23 mg/kg (ppm).

Figure 16



Discharge to Water

The refinery has one liquid effluent discharge location into Lake Huron. All liquid effluent is sampled and analyzed prior to discharge to ensure all federal and provincial regulatory discharge parameters are met. An effluent treatment circuit and supplementary pollution control equipment are installed in the UO₃ plant to control and reduce emissions to water.

As indicated in Figures 11, 12 and 13, concentrations of key parameters in liquid effluent emissions remain well below regulatory limits between 2012 and 2019. Data for uranium, nitrate and radium-226 is reported as the monthly average of weekly composite results. Though the data is not shown, pH is also monitored and all results in this period were between 7.1 and 8.6.

Figure 17

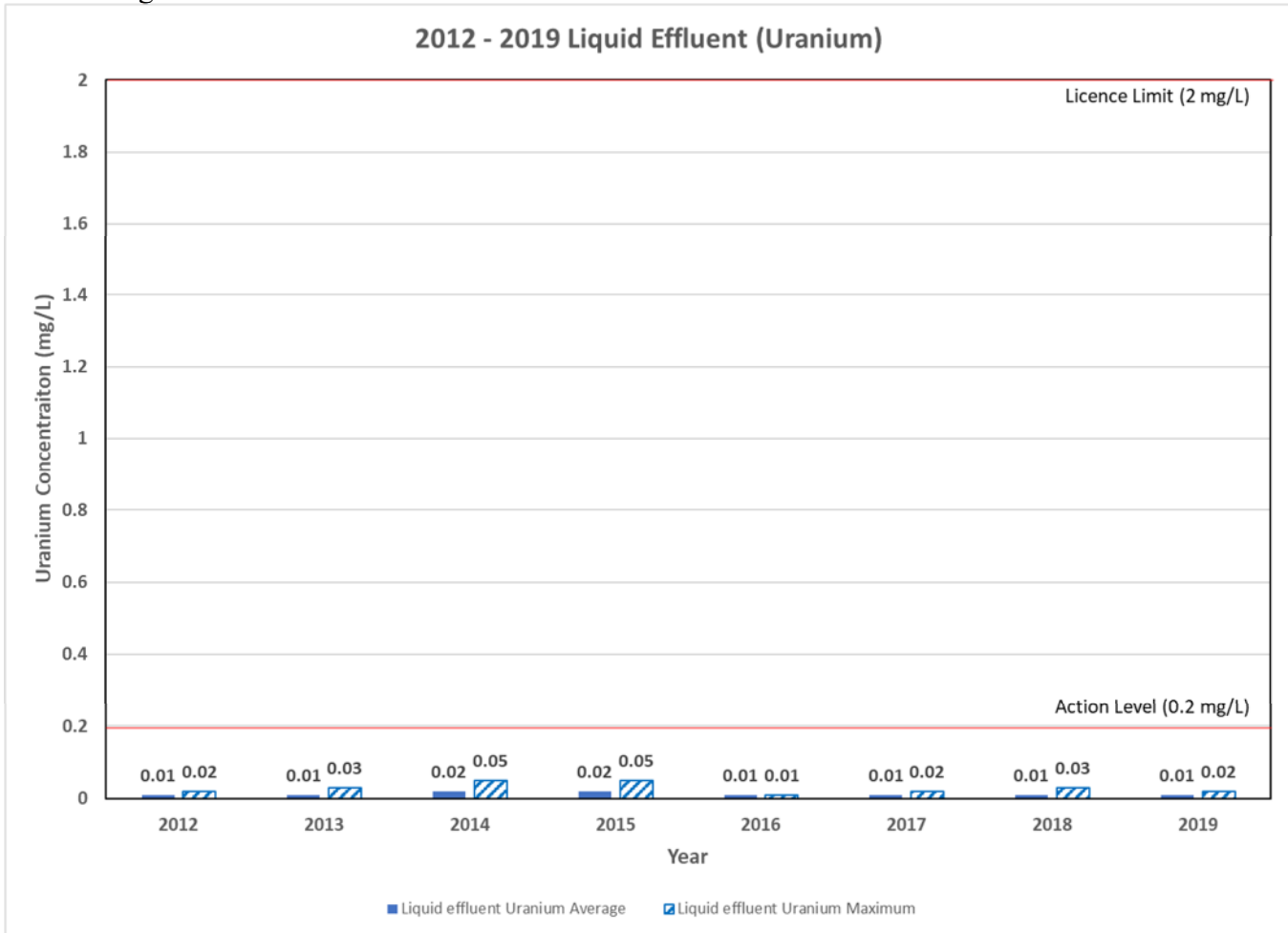


Figure 18

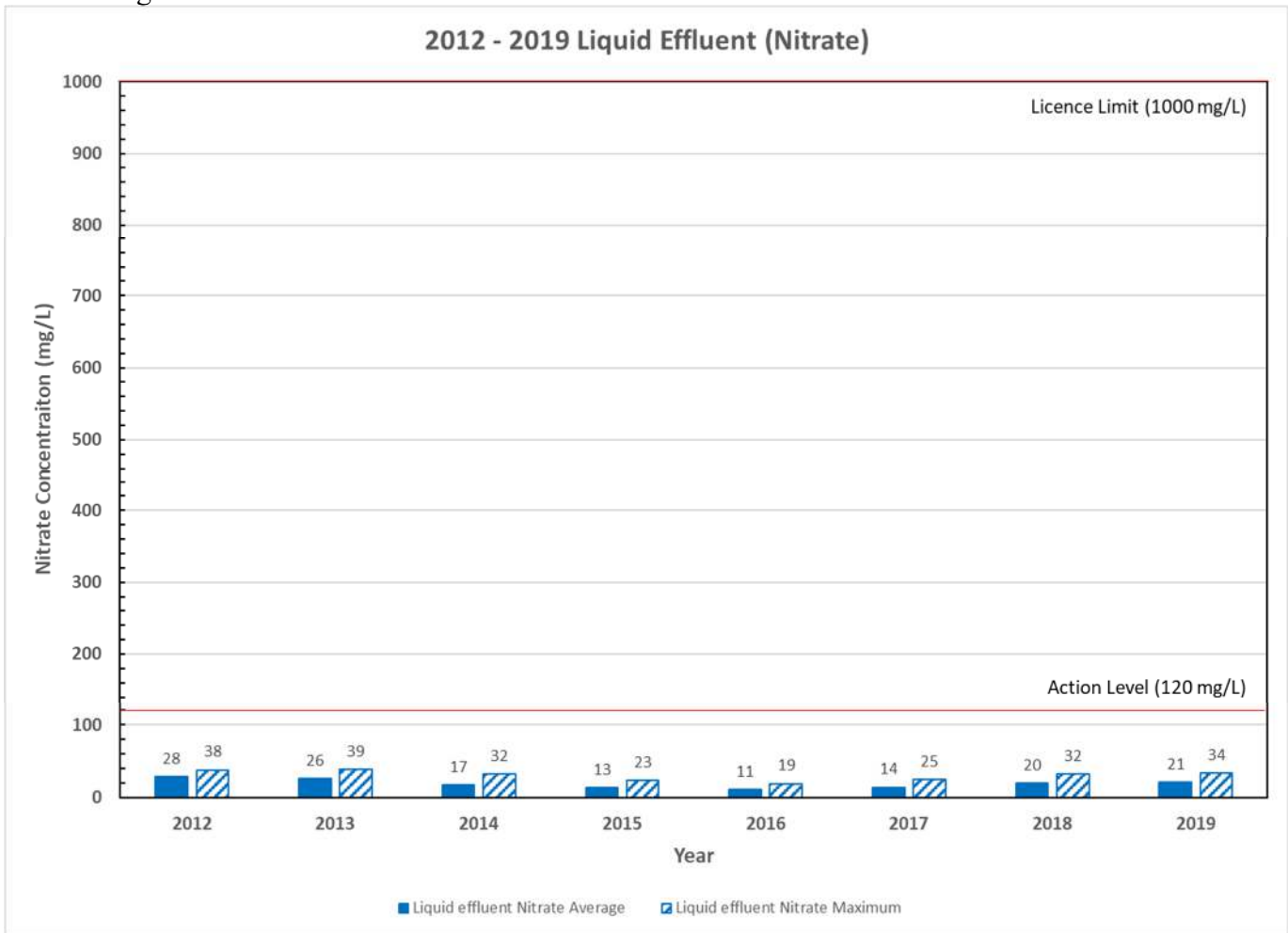
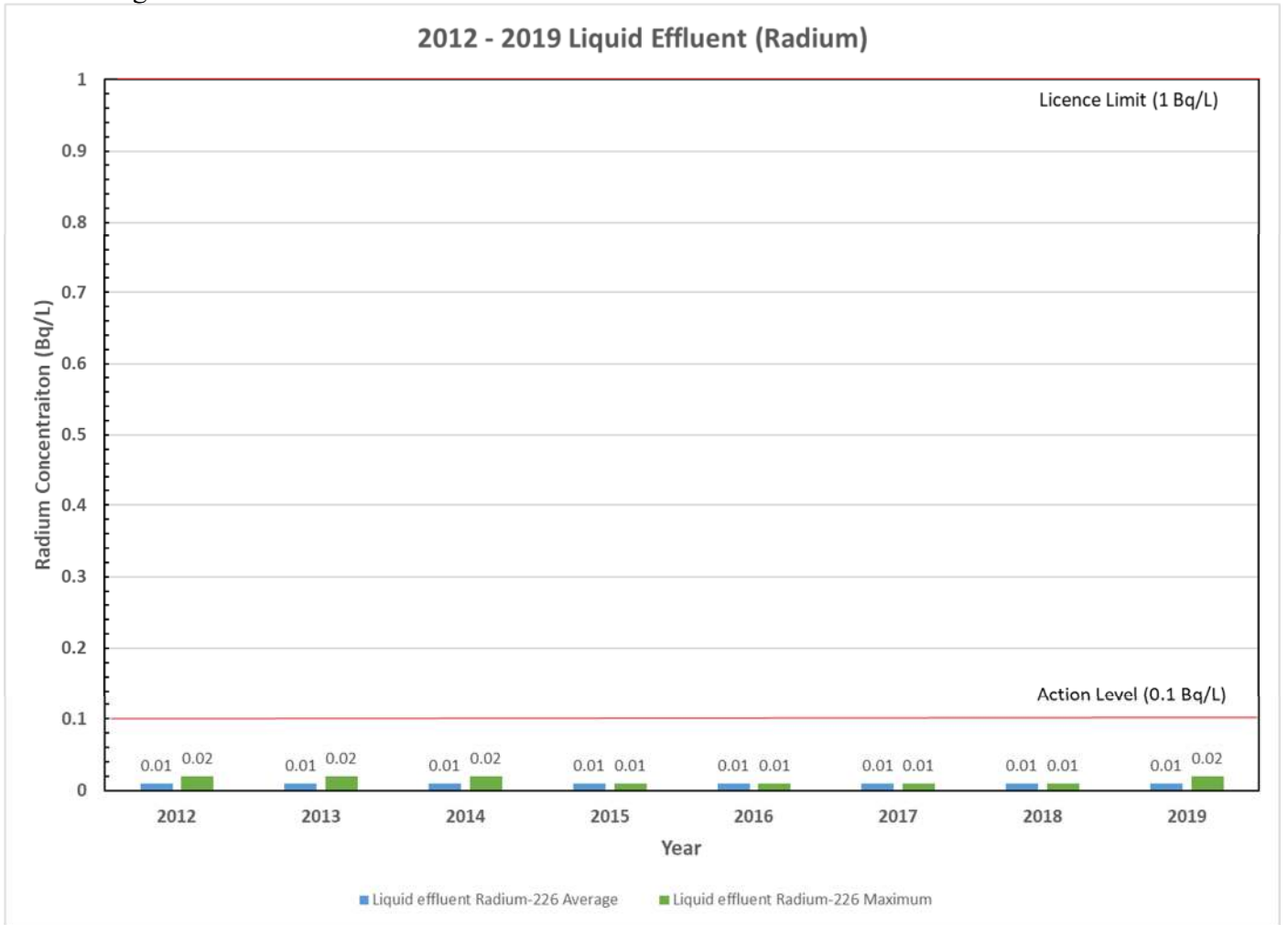


Figure 19



Surface Water Monitoring

Surface water is monitored at the location of the refinery outfall diffuser in Lake Huron. As indicated in Figures 14 and 15, concentrations of key parameters remain well below regulatory criteria between 2012 and 2019. Though the data is not shown, radium and pH are also monitored. All radium results were below 0.008 Bq/L (most below detection level) and all pH results in this period were between 7.2 and 8.3.

Figure 20

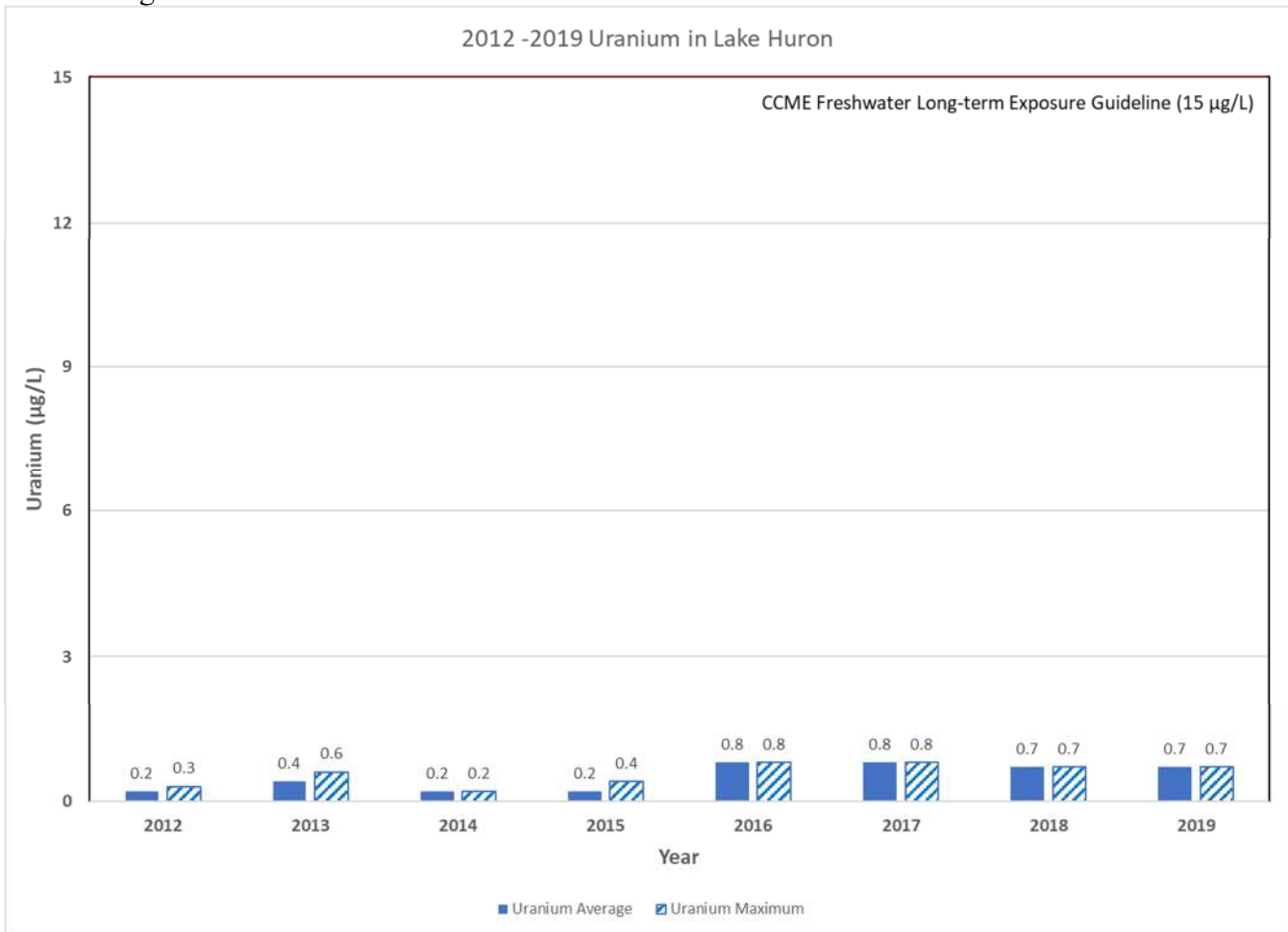
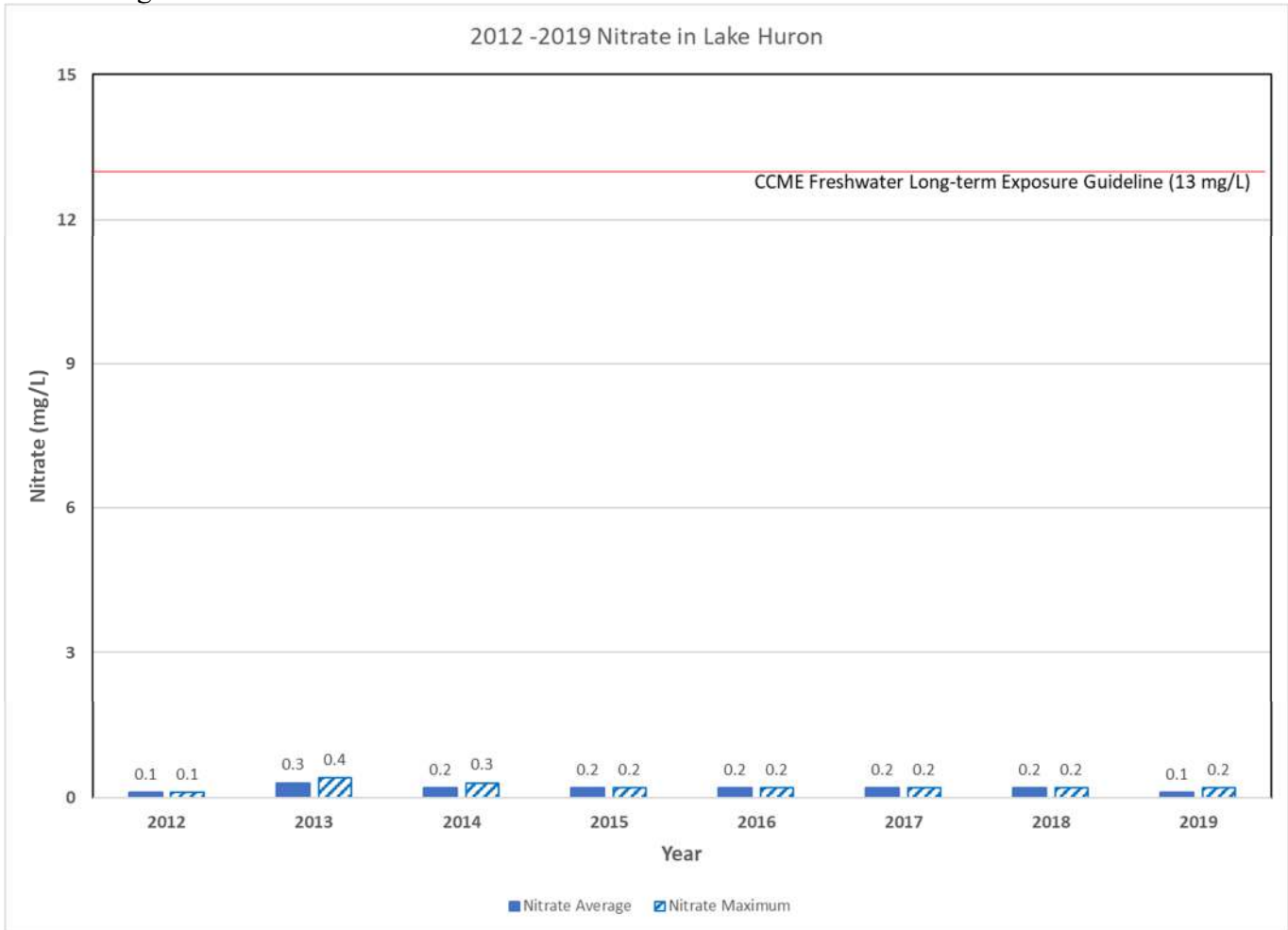


Figure 21

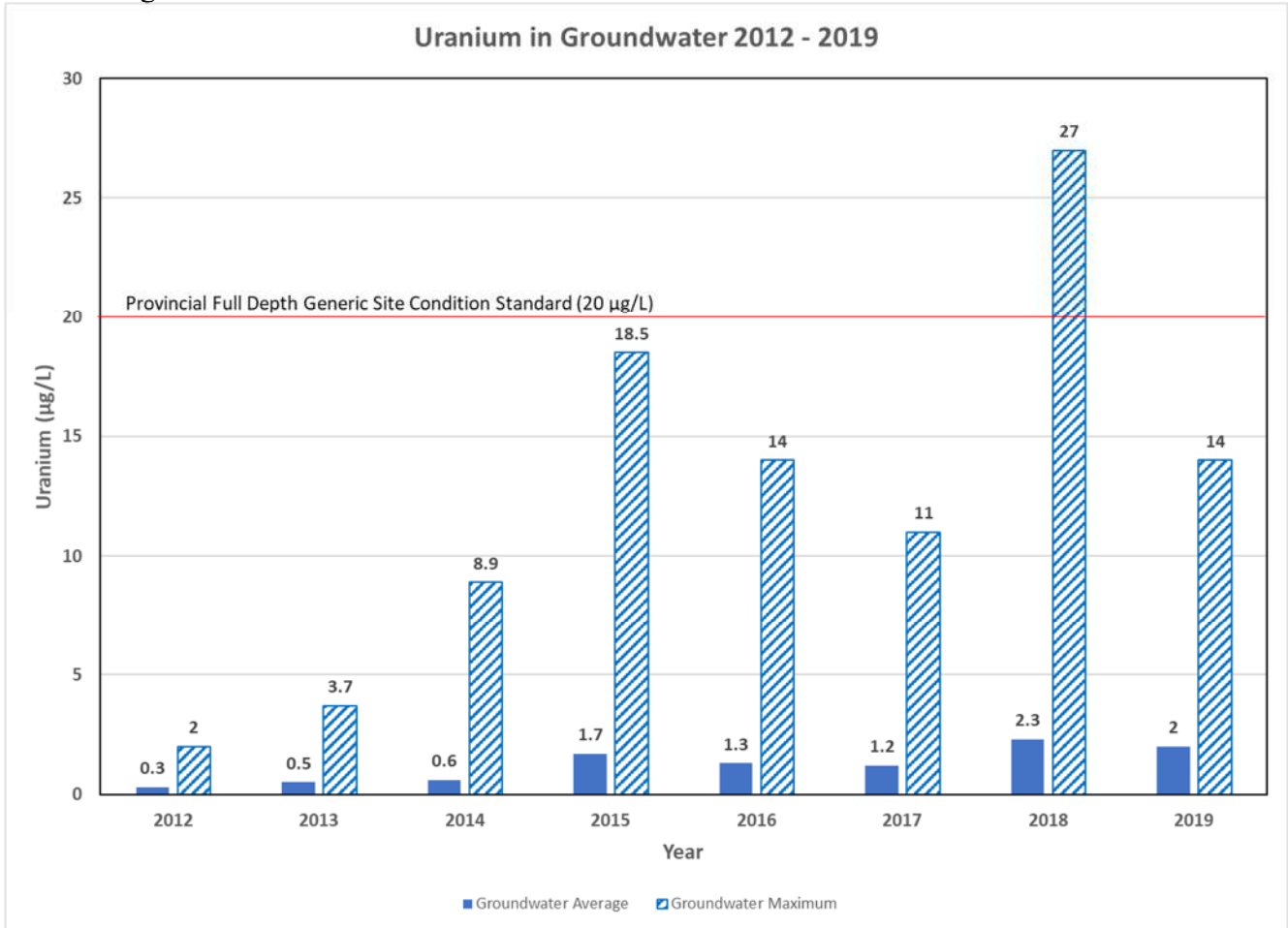


Groundwater Monitoring

Cameco has an extensive groundwater monitoring program in place around the refinery with a total of 35 monitoring wells: 14 inside the perimeter fence and 21 outside the fence line. Monitoring at each well location varies from once per year to three times per year depending on the location of the well relative to the refinery. A summary of groundwater uranium results between 2012 and 2019 is shown in Figure 16.

Groundwater results at all but one borehole (#22) in 2018 were below the Provincial Full Depth Generic Site Condition Standard in a Potable Groundwater Condition (Table 2) value of 20 µg/L uranium. The results were below the provisional guideline value for drinking water from the World Health Organization of 30 µg/L uranium. Results in 2019 at this borehole were below the provincial criteria, ranging between 10 and 14 µg/L. Cameco continues to monitor results from this location and should 2020 monitoring data exceed the criteria, additional investigation will be carried out. Given the location of the refinery and the direction of groundwater flow in the area, there is no possible impact to drinking water sources from supply wells downstream.

Figure 22



A review of the Environmental Risk Assessment was completed in 2020 which identified that new monitoring data and changes in toxicity values and approaches to evaluation of aquatic receptors do not result in changes to the 2016 ERA conclusions.

Between 2012 and 2019, CNSC staff have rated BRR as satisfactory in the Environmental Protection SCA every year.

Forward Outlook

REGDOC-2.9.2 *Environmental Protection: Controlling Releases to the Environment* is expected to be published in the next licence period. There is an established process for review of new standards and REGDOCs and their incorporation as Compliance Verification Criteria (CVC) or guidance in the LCH. As per the process, BRR will identify and address any on a schedule accepted by CNSC staff. It is expected that BRR will continue to maintain and enhance if necessary, its Environmental Protection Program during the next licence period.

2.10 Emergency Management and Response

This SCA covers emergency plans and emergency preparedness programs. These procedures must exist for emergencies and for non-routine conditions. This also includes the fire protection program and any results of emergency exercise participation.

Operational Performance

Emergency preparedness and response training is provided on an ongoing basis to ensure that responders have the knowledge and skills necessary to provide for an effective emergency response. The facility maintains personnel onsite to allow for an entry team, and a rapid intervention team to respond to incidents at the facility 24-hours a day when the facility is operating.

BRR conducts internal drills and training exercises to test the effectiveness of the site and the emergency response organization. This includes off-shift hazmat drills (2014, 2015, 2016, 2017, 2018, 2019) and full-scale emergency response exercises including the local emergency services and hospital (2012, 2015, 2018). Each year, more than 2000 person-hours of emergency response training is completed at the refinery.

During the current licence period, REGDOC 2.10.1: *Nuclear Emergency Preparedness and Response* and CSA N393-13: *Fire Protection for facilities that process, handle, or store nuclear substances* were published and incorporated into the licence requirements. BRR updated the Emergency Response Plan, Fire Protection Program and Fire Hazard Analysis to include new requirements from these documents to enhance its already strong emergency response capabilities.

On April 24, 2020, the refinery experienced a fire in the yard when containers of contaminated combustible material designated for the BRR's incinerator ignited. The fire was extinguished by members of the site Emergency Response Team (ERT) and assistance from the local fire departments. There was no loss of material and no effect on the environment, the health and safety of persons or national or international security. A report on the incident was prepared and submitted to CNSC staff.

Between 2012 and 2019, CNSC staff have rated BRR as satisfactory in the Emergency Management and Fire Protection SCA every year.

Forward Outlook

It is expected that BRR will continue to maintain and enhance if necessary, its Emergency Management and Fire Protection programs during the next licence period.

2.11 Waste Management

This safety and control area covers internal waste and by-product-related programs which form part of the facility's operations, up to the point where the waste is removed from the facility to a separate waste and/or by-product management facility. This SCA also covers the ongoing decontamination projects and planning for decommissioning activities.

Operational Performance

Ongoing wastes are those generated at the facility as a result of activities authorized by the licence. Solid wastes contaminated by uranium are reprocessed, recycled and re-used to the extent possible. Waste materials that cannot be reprocessed, recycled or re-used are safely stored on site until appropriate disposal options are available.

In the current licence period, BRR significantly reduced the inventory of scrap drums and other wastes stored at the facility through several projects. Approximately 24,000 drums of marginally contaminated materials were disposed of at a permitted hazardous waste landfill in the United States between 2012 and 2019. Over the same period approximately 212,500 scrap drums were decontaminated and released as clean scrap metal.

The refinery routinely shipped secondary products (calcined and regeneration product) to licensed facilities for uranium recovery. In the current licence period, over 36,000 drums of secondary products have been shipped for uranium recovery.

The BRR incinerator is considered a central processing operation for the FSD and processes contaminated combustible materials (CCM) from PHCF, CFM and BRR. Receipt of material from CFM for incineration at BRR began in 2014. Over 720,000 kg of CCM has been processed in the incinerator in the current licence period.

In the current licence period, BRR incorporated the requirements of CSA standard N292.3-14 *Management of Low- and Intermediate-Level Radioactive Waste* and CSA standard N292.0-14 *General Principles for the Management of Radioactive Waste and Irradiated Fuel* into its waste management program.

Decommissioning Planning

The BRR has a Preliminary Decommissioning Plan (PDP), which meets the requirements provided in CSA N294.0-09 *Decommissioning of facilities containing nuclear substances*. The PDP was updated in 2016 and reviewed in 2020. No changes were identified in the most recent review, however, a revised financial guarantee will be included for consideration by the Commission in the licence renewal.

Between 2012 and 2019, CNSC staff have rated BRR as satisfactory in Waste Management SCA every year.

Forward Outlook

REGDOC-2.11.1 *Waste Management, Volume I: Management of Radioactive Waste*, and REGDOC-2.11.2, *Decommissioning* are expected to be published in the next licence period. There is an established process for review of new standards and REGDOCs and their incorporation as Compliance Verification Criteria (CVC) or guidance in the LCH. As per the process, BRR will identify and address any gaps in the waste management program on a schedule accepted by CNSC staff.

2.12 Nuclear Security

This SCA covers the programs required to implement and support the security requirements stipulated in the regulations, in *Nuclear Safety and Control Regulations*, the *Nuclear Security Regulations* and other CNSC requirements.

Operational Performance

BRR maintains a comprehensive Facility Security Plan (Security Plan) which meets the requirements of the *General Nuclear Safety and Control Regulations*, the *Nuclear Security Regulations* and other CNSC requirements.

The Security Plan provides the basis for security operations at the facility and identifies the systems and processes in place to meet security program objectives; accordingly, this document is considered prescribed information and is subject to the requirements of the *General Nuclear Safety and Control Regulations*. BRR ensures that security operations and procedures are reviewed (and revised as needed) in order to maintain compliance with *General Nuclear Safety and Control Regulations*, the *Nuclear Security Regulations* and other CNSC requirements.

Between 2012 and 2019, CNSC Staff have rated BRR as satisfactory in the Security SCA every year.

Forward Outlook

BRR will continue to maintain and enhance if necessary, its Security Plan during the upcoming licence period.

2.13 Safeguards and Non-Proliferation

This safety and control area covers the programs 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 Non-Proliferation of Nuclear Weapons*.

Operational Performance

During the current licence period, Cameco implemented a new accountability system to align with electronic reporting requirements described in REGDOC-2.13.1 *Safeguards and Nuclear Material Accounting*. FSD Safeguards Program (FSD-PGR-SG-01) was developed to demonstrate how Cameco meets all requirements under the REGDOC. Periodic audits of the safeguards program are conducted by the IAEA, the CNSC and by Cameco internal auditors. During the current licence period a total of 22 Short Notice Random Inspections, six Physical Inventory Verifications and three Physical Inventory Taking Evaluations were carried out by the IAEA and CNSC as part of safeguards activities.

Between 2012 and 2019, CNSC Staff have rated BRR as satisfactory in the Safeguards and Non-Proliferation SCA every year.

Forward Outlook

BRR will continue to maintain and enhance if necessary, its Safeguards Program during the upcoming licence period.

2.14 Packaging and Transport

This safety and control area covers the packaging and transport of nuclear substances and other nuclear materials to and from the licensed facility.

Operational Performance

Uranium trioxide (UO₃) is produced, packaged in purpose built totes and transported by road to the PHCF. UO₃ is also packaged in drums and transported by road and marine to other customers worldwide. These containers meet the Type IP-1 packaging requirements as specified in the CNSC *Packaging and Transport of Nuclear Substance Regulations, 2015*.

Between 2012 and 2019, nine minor transportation events were reported by BRR, of which six were related to incoming shipments of uranium ore concentrate from other facilities. These were investigated, corrective actions put into place, and no environmental impacts occurred as a result.

Between 2012 and 2019, CNSC Staff have rated BRR as satisfactory in the Packaging and Transport SCA every year.

Forward Outlook

Cameco will continue to comply with the existing and new regulatory requirements in this SCA in the next licensing period.

3.0 OTHER MATTERS OF REGULATORY INTEREST

3.1.1 Public Information Program

FSD maintains a Public Information Program (PIP) that meets the requirements of REGDOC 3.2.1, *Public Information and Disclosure*. Cameco works to build and sustain the trust of local communities by acting as a good corporate citizen in the communities where we operate. A key element of building and sustaining that trust is a commitment to provide those in the community with accurate and transparent reporting of our environmental practices and performance. These are central values for Cameco and it is these values that drive the public information and disclosure program.

For many years Cameco has retained outside expertise to measure public opinion in Blind River to help determine the effectiveness of its public information program. The most recent survey of more than 200 residents of Blind River was completed by Fast Consulting in 2018. The final report is available on Cameco's community website.

The survey results indicate that residents of Blind River continue to show strong support for local Cameco operations. 97% of local residents support Cameco's continued operations in Blind River. The results of the survey, which has been conducted three times in the past decade, remain consistent, with other significant findings including:

- Nearly all respondents (95%) agree Cameco does everything possible to protect people and the environment, up from 86% in 2013 and 84% in 2009.
- Nearly all (95%) agree Blind River is a safe, healthy place to live, including 75% who 'strongly agree'. This is in line with previous surveys.
- The large majority (87%) agree that various federal and provincial regulatory processes adequately ensure the safety of Blind River residents, up from 75% in 2013.

The results of this public opinion research confirm that Cameco's public information program is seen as effective and appropriate by the vast majority of Blind River residents. Cameco will continue to explore opportunities to enhance the public information program for target audiences.

3.1.2 Indigenous Engagement

Cameco is committed to provide opportunities to engage with First Nation and Métis communities regarding BRR's ongoing operations.

In Blind River, Cameco has built a meaningful relationship with the Mississauga First Nation as its nearest neighbour but also acknowledges that there may be interest in its facility by other surrounding Indigenous groups. The FSD PIP that replaced the site PIPs in 2020 includes details of specific Indigenous outreach activities to be completed by Cameco.

Cameco will continue outreach to the local First Nations and Métis communities throughout the licensing process and subsequent licence period.

3.1.3 Financial Guarantee

The BRR has a Preliminary Decommissioning Plan (PDP), which was prepared based on guidance provided in CSA N294.0-09 *Decommissioning of facilities containing nuclear substances*. The current financial guarantee, maintained in the form of irrevocable letter of credit for \$48 million reflects the PDP accepted by the Commission during the previous licensing proceedings. A financial guarantee of \$57.5 million is proposed as part of this licence renewal.

4.0 CONCLUDING REMARKS

Cameco is committed to the safe, clean and reliable operations of all of its facilities and continually strives to improve safety performance and processes to ensure the safety of both its employees and the people in neighbouring communities.

During the current licence period, BRR exhibited strong performance in all safety and control areas. As a result of the effective programs, plans and procedures in place, the refinery was able to maintain individual radiation exposures well below all regulatory dose limits. In addition, environmental emissions continued to be controlled to levels that are a fraction of the regulatory limits, and public radiation exposures are also well below the regulatory limits.

Cameco's relationship with our neighboring communities remains strong and we are committed to maintaining these strong relationships.

As described above, Cameco is committed to continual improvement in all aspects of the BRR performance. The following have been identified as priorities for the next licensing period:

- Alignment of site programs with standardized regulatory expectations as described in REGDOCS
 - REGDOC 2.1.2 for Safety Culture
 - REGDOC 2.4.4 for Safety Analysis
 - REGDOC 2.9.2 for environmental protection
 - REGDOC 2.11.1 for Waste Management
 - REGDOC 2.11.2 for Decommissioning