# Cigar Lake Operation

# Northern Saskatchewan, Canada

## National Instrument 43-101

## Technical Report

**Effective Date: December 31, 2023**
**Date of Technical Report: March 22, 2024**

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# Units of measure and abbreviations

| | |
|---|---|
| 3D | three-dimensional |
| % | percent |
| ° | degrees |
| °C | degrees Celsius |
| CCD | counter current decantation |
| CLJV | Cigar Lake Joint Venture |
| $eU_3O_8$ | equivalent uranium oxide |
| g | grams |
| h | hour(s) |
| ha | hectares (10,000 square metres) |
| hp | horsepower |
| Hwy | highway |
| IRR | internal rate of return |
| JBS | jet boring system |
| km | kilometres |
| $km^2$ | square kilometres |
| kV | kilovolts |
| kW | kilowatts |
| L | litre |
| lbs | pounds |
| M | million |
| m | metres |
| $m^3$ | cubic metres |
| $m^3/h$ | cubic metres per hour |
| $m^3/s$ | cubic metres per second |
| MASL | metres above sea level (elevation) |
| MLJV | McClean Lake Joint Venture |
| mm | millimetres |
| MW | megawatts |
| NPV | net present value |
| SX | solvent extraction |
| t | tonnes (metric) |
| U | uranium |
| % U | percent uranium (% U x 1.179 = % $U_3O_8$) |
| $U_3O_8$ | uranium oxide (yellowcake) |
| % $U_3O_8$ | percent uranium oxide (% $U_3O_8$ x 0.848 = % U) |
| $Cdn | Canadian dollars |
| $US | US dollars |
| $/t | Canadian dollars per tonne |
| US$/lb | US dollars per pound |
| $>$ | greater than |
| $<$ | less than |

# 1 Summary

## 1.1 Preamble

This technical report replaces the previous Cigar Lake Operation technical report, filed in March of 2016 (2016 Technical Report). This report is based on new technical and scientific information, and reflects experience gained since 2016.

The Cigar Lake deposit has historically been divided into two parts. The eastern portion, previously referred to as Phase 1, is now referred to as the Cigar Lake Main (CL Main) portion of the deposit, whereas the western portion, previously referred to as Phase 2, is now referred to as the Cigar Lake Extension (CLEXT).

Key highlights of this report include:

- extension of the mine life to 2036 subject to receipt of all regulatory approvals
- an increase in Cameco's ownership interest in the Cigar Lake Joint Venture (CLJV) to 54.547% with the 2023 acquisition of a 4.522% interest from Idemitsu Canada Resources Ltd.
- estimated pre-tax net present value (NPV) at an 8% discount rate to Cameco of $2.5 billion for its share of current mineral reserves
- estimated pre-tax internal rate of return (IRR) of 8.3%, using Cameco's share of the total capital invested to date, along with the operating and capital cost estimates for the remainder of the mineral reserves
- on an undiscounted pre-tax basis, payback for Cameco, including total capital invested to date, is expected to be achieved in 2024
- increase in estimated average cash operating costs per pound—from $18.75 to $20.58
- total estimated Cigar Lake mine capital and McClean Lake mill capital to bring the remaining mineral reserves (CL Main and CLEXT) into production is approximately $1.2 billion (Cameco's share – $680 million)
- mine development and capital expenditures for CLEXT are expected to be approximately $895 million (Cameco's share – $487 million), including approximately $520 million (Cameco's share – $284 million) required in advance of first ore from CLEXT in 2030
- conversion of 73.4 million pounds of CLEXT mineral resources into mineral reserves based on information from 235 holes totaling approximately 99,000 metres of diamond drilling
- expected total packaged production of 205.9 million pounds $U_3O_8$, based on remaining mineral reserves and an overall milling recovery of 98.7%
- a plan to develop and mine CLEXT utilizing the same methods and approach as used for CL Main, including utilizing existing infrastructure for mine access, ventilation, dewatering, processing and jet bore mining support activities
- completion of modifications to the McClean Lake mill to increase capacity in the front-end circuits (leaching, CCD) from a nominal 45 kt ore/year to 59 kt ore/year plus regulatory approval for the continued expansion of the tailings management facility (TMF) at Orano's McClean Lake mill to allow processing of all Cigar Lake's current mineral reserves

## 1.2 Introduction

**PROFILE**

Located in northern Saskatchewan's Athabasca Basin, Cigar Lake is the world's highest grade uranium mine.

Cigar Lake is owned by the CLJV participants:

- Cameco Corporation (Cameco) (54.547%)
- Orano Canada Inc. (40.453%)
- TEPCO Resources Inc. (TEPCO) (5.000%)

Cameco has been the operator of Cigar Lake since January 2002.

**BACKGROUND**

In December 2004, the CLJV decided to proceed with development of the Cigar Lake mine and received a construction licence from the Canadian Nuclear Safety Commission (CNSC) that same month. Construction began in January 2005, but development was delayed due to water inflows in April and October 2006, and an additional water inflow in August 2008.

In October 2009, Cameco successfully sealed the August 2008 inflow, and the underground workings were dewatered in February 2010. Safe access to the 480-metre (480L) and 500-metre (500L) levels was restored and the restoration of underground mine systems and infrastructure was completed in 2011.

With the mine re-entry and remediation milestone attained, construction of the permanent underground infrastructure began and was substantially complete in 2013. Staged commissioning of the JBS machine and supporting underground circuits began shortly thereafter, with the first commissioning cavity mined in barren rock in October 2013, and first ore cavity mined in December 2013.

The first shipment of ore slurry to McClean Lake occurred in March 2014, and the first yellowcake was packaged in October 2014. With the completion of commissioning of all circuits attained and sustainable, and acceptable performance demonstrated, commercial production was declared in May 2015. Since that time, mine operation has achieved full nameplate capacity.

## 1.3 Property tenure

The mineral property consists of one mineral lease (ML 5521) and 38 mineral claims totaling 95,601 hectares. The mineral lease and mineral claims are contiguous.

The Cigar Lake deposit is located in the area subject to the mineral lease, totaling 308 hectares. The right to mine this uranium deposit was acquired under this mineral lease. The current mineral lease expires November 30, 2031, with the right to renew for successive 10-year terms, absent a default by the CLJV.

A mineral claim grants the holder the right to explore for minerals within the claim lands and to apply for a mineral lease.

The surface facilities and mine shafts for the Cigar Lake operation are located on lands owned by the Province of Saskatchewan. The CLJV acquired the right to use and occupy the lands under a surface lease agreement with the Province. The term of the surface lease expires May 31, 2044. The Cigar Lake surface lease covers a total area of 715 hectares of Crown land.

See *Section 4.2 and 4.3* for further detail.

## 1.4 Location and site description

The Cigar Lake mine site is located near Waterbury Lake, approximately 660 kilometres north of Saskatoon. The McClean Lake mill is located 69 kilometres northeast of the mine site by road.

The property is accessible by an all-weather road and by air. Site activities occur year-round, including supply deliveries.

The topography and the environment are typical of the taiga forested lands common to the Athabasca Basin area of northern Saskatchewan. The area is covered with 30 to 50 metres of overburden. The surface facilities are at an elevation of approximately 490 metres above sea level.

The site is connected to the provincial electricity grid with a 138-kilovolt overhead power line. There are standby generators in case of grid power interruption.

Personnel are recruited on a preferential basis from northern Saskatchewan. Development and construction work is tendered to a number of contractors.

More information is available in *Section 4*.

## 1.5 Geology and mineralization

The Cigar Lake deposit is located approximately 40 kilometres west of the eastern margin of the Athabasca Basin. It is an unconformity related uranium deposit occurring at the unconformity contact between rock of the Athabasca Group and underlying lower Proterozoic Wollaston Group metasedimentary gneiss and plutonic rocks. In this way, it is similar to the Key Lake, McClean Lake, Collins Bay and McArthur River deposits. As a result, Cigar Lake shares many geological similarities with these deposits, including general structural setting, mineralogy, geochemistry, host rock association and the age of the mineralization. However, the Cigar Lake deposit is distinguished from other similar deposits by its size, high grade, the intensity of its alteration process, and the high degree of associated hydrothermal clay alteration.

The Cigar Lake deposit is similar to the McArthur River deposit in that sandstone overlies the basement rock and contains large volumes of water at significant pressure, but unlike McArthur River, this deposit is flat-lying.

The Cigar Lake deposit is approximately 1,950 metres long, 20 to 100 metres wide, and ranges up to 13.5 metres thick, with an average thickness of about 5.4 metres. It occurs at depths ranging between 410 and 450 metres below surface.

Two distinct styles of mineralization occur within the Cigar Lake deposit:

- high-grade mineralization at or proximal to the unconformity ("unconformity" mineralization), which includes almost all of the mineral resources and mineral reserves
- low-grade, fracture controlled, vein-like mineralization which is located either higher up in the sandstone ("perched" mineralization) or in the basement rock mass

The high-grade mineralization located in proximity to the unconformity contains the bulk of the total uranium metal in the deposit and currently represents the only economically viable style of mineralization, in the context of the selected mining method and ground conditions. It is characterized by the occurrence of massive clays and very high-grade uranium concentrations.

The unconformity mineralization consists primarily of three dominant rock and mineral facies occurring in varying proportions: quartz, clay (primarily chlorite with lesser illite) and metallic minerals (oxides, arsenides, sulphides). In the relatively higher grade eastern CL Main zone, the ore consists of approximately 50% clay matrix, 20% quartz and 30% metallic minerals, visually estimated by volume. In this area, the unconformity mineralization is overlain by a weakly mineralized contiguous clay cap 1 to 10 metres thick. In the western CLEXT zone, the proportions change to approximately 20% clay, 60% quartz and 20% metallic minerals.

See *Section 7* for further detail.

## 1.6 Exploration of Cigar Lake deposit

The Cigar Lake uranium deposit was discovered in 1981 on lands now covered by ML 5521. The discovery was a result of initial airborne and ground geophysical surveys followed by a regional program of diamond drill testing.

The deposit was subsequently delineated by surface diamond drilling during the period 1982 to 1986 and was followed by several small campaigns of geotechnical and infill drilling to the end of 2007. Additional drilling campaigns were conducted by Cameco after 2007 which targeted a broad range of technical objectives, including geotechnical, geophysical, delineation and ground freezing.

Since 2012, diamond drilling managed by Cameco has mainly focused on underground geotechnical and surface ground freezing programs on CL Main along with continued delineation drilling on CLEXT.

The CL Main zone was discovered in 1983. Drilling was initially done at a nominal drillhole grid spacing of 50 metres east-west by 20 metres north-south. A surface drill program was conducted from 2010 to 2012 to tighten up the spacing in areas with gaps in coverage. Similarly, a small program of six holes was completed on mineralized zones situated between East Pod and West Pod in 2023. Apart from this area, CL Main has been fully delineated by surface freeze holes on a nominal 7 x 7 metre pattern.

The CLEXT zone had been outlined through several exploration drilling campaigns conducted between 1981 and 2012. Since 2016, Cameco has completed additional surface delineation drilling to confirm and upgrade the mineral resources contained in CLEXT and to collect metallurgical, hydrogeological and geotechnical information used to support the prefeasibility study for CLEXT. Drillholes are variably spaced 12 to 25 metres apart in the western portion and 20 to 50 metres in its eastern portion.

Diamond core drilling from underground locations has been done primarily to ascertain rock mass characteristics in advance of development and mining. Underground geotechnical drilling has occurred since 1989.

More information on exploration and drilling can be found in *Sections 9* and *10*.

## 1.7 Mineral resources and mineral reserves

The known mineralization at Cigar Lake is divided into two zones, the western CLEXT zone and the eastern CL Main zone. The CL Main mineral resource and mineral reserve estimates are based on 1,284 mineralized surface drillholes while the CLEXT mineral resource estimate is based on 135 mineralized surface drillholes. The vast majority of drillholes were drilled perpendicular to the mineralization and their intercepts approximate the true thickness of the mineralization.

The Cigar Lake mineral resources, exclusive of mineral reserves, with an effective date of December 31, 2023, are presented in *Table 1-1*. Al Renaud, P. Geo. with Cameco, is the qualified person within the meaning of National Instrument 43-101 *Standards of Disclosure for Mineral Projects* (NI 43-101) for the purpose of the mineral resource estimates.

The Cigar Lake mineral reserves estimates, with an effective date of December 31, 2023, are shown in *Table 1-2*. B. Bharadwaj, P. Eng., C. Scott Bishop, P. Eng., Al Renaud, P. Geo., and Lloyd Rowson, P. Eng., each with Cameco, are the qualified persons within the meaning of NI 43-101 for the purpose of the mineral reserve estimates.

### TABLE 1-1: CIGAR LAKE MINERAL RESOURCES – DECEMBER 31, 2023

| Category | Area | Total tonnes (x 1,000) | Grade % $U_3O_8$ | Total M lbs $U_3O_8$ | Cameco's share M lbs $U_3O_8$ |
|---|---|---|---|---|---|
| **Measured and Indicated** | | | | | |
| Measured | CL Main | 86.3 | 5.32 | 10.1 | 5.5 |
| Indicated | CL Main | 30.6 | 6.61 | 4.5 | 2.4 |
| Indicated | CLEXT | 113.0 | 4.98 | 12.4 | 6.8 |
| **Total Measured and Indicated** | | **229.9** | **5.32** | **27.0** | **14.7** |
| **Inferred** | | | | | |
| Inferred | CL Main | 6.2 | 4.41 | 0.6 | 0.3 |
| Inferred | CLEXT | 157.1 | 5.60 | 19.4 | 10.6 |
| **Total Inferred** | | **163.4** | **5.55** | **20.0** | **10.9** |

Notes:

(1) Cameco reports mineral reserves and mineral resources separately. Reported mineral resources do not include amounts identified as mineral reserves. Totals may not add up due to rounding.

(2) Mineral resources that are not mineral reserves do not have demonstrated economic viability.

(3) Cameco's share is 54.547% of total mineral resources.

(4) Inferred mineral resources are estimated using limited geological evidence and sampling information. We do not have enough confidence to evaluate their economic viability in a meaningful way. You should not assume that all or any part of an inferred mineral resource will be upgraded to an indicated or measured mineral resource, but it is reasonably expected that the majority of inferred mineral resources could be upgraded to indicated mineral resources with continued exploration.

(5) Reasonable expectation for eventual economic extraction of the mineral resources is based on a constant dollar average uranium price of $62.00 (US) per pound $U_3O_8$ with a $1.00 US = $1.26 Cdn fixed exchange rate, mining and process recoveries, production costs, royalties and mineralized area tonnage, grade, and spatial continuity considerations.

(6) Mineral resources have been estimated with a minimum mineralization thickness of one metre and a cut-off grade of 1.0% $U_3O_8$ for CL Main and 0.8% $U_3O_8$ for CLEXT based on the use of the JBS method combined with bulk freezing of the orebody.

(7) The mineralized lenses have been interpreted from drillhole information on vertical cross-sections or with 3D implicit modelling and validated on plan views and in 3D.

(8) Mineral resources have been estimated with no allowance for mining dilution and mining recovery.

(9) Mineral resources were estimated using 3D block models.

(10) There are no known environmental, permitting, legal, title, taxation, socio-economic, political, marketing or other relevant factors that could materially affect the above estimate of mineral resources.

### TABLE 1-2: CIGAR LAKE MINERAL RESERVES – DECEMBER 31, 2023

| Category | Area | Total tonnes (x 1,000) | Grade % $U_3O_8$ | Total M lbs $U_3O_8$ | Cameco's share M lbs $U_3O_8$ |
|---|---|---|---|---|---|
| Proven | Broken | 1.1 | 27.55 | 0.7 | 0.4 |
| | CL Main | 337.0 | 18.07 | 134.3 | 73.3 |
| **Total proven** | | **338.1** | **18.11** | **135.0** | **73.6** |
| | | | | | |
| Probable | CL Main | 1.7 | 7.17 | 0.3 | 0.1 |
| | CLEXT | 215.8 | 15.42 | 73.4 | 40.0 |
| **Total probable** | | **217.5** | **15.36** | **73.7** | **40.2** |
| | | | | | |
| **Total mineral reserves** | | **555.6** | **17.03** | **208.6** | **113.8** |

Notes: (1) Cameco reports mineral reserves and mineral resources separately. Totals may not add up due to rounding.

(2) Total pounds $U_3O_8$ are those contained in mineral reserves and are not adjusted for the estimated mill recovery of 98.8% for CL Main and 98.5% for CLEXT.

(3) Cameco's share is 54.547% of total mineral reserves.

(4) Mineral reserves have been estimated on the basis of designed JBS cavities having greater revenue than the cost to mine and process.

(5) Mineral reserves have been estimated with an average allowance of 34% dilution at 0% $U_3O_8$, inclusive of dilution material above and below the planned cavity and include dilution from the JBS pilot hole and from adjacent backfill.

(6) Mineral reserves have been estimated based on 86% mining recovery.

(7) Mineral reserves were estimated based on the use of the JBS mining method combined with bulk freezing of the orebody. Mining rate assumed to vary between 115 and 160 tonnes per day, and a full mill production rate of approximately 18 million pounds $U_3O_8$ per year. The reference point at which mineral reserves are defined is when the ore is delivered to the McClean Lake mill.

(8) An average uranium price of $54.00 (US) per pound $U_3O_8$ with a $1.00 US = $1.26 Cdn fixed exchange rate was used to estimate the mineral reserves.

(9) Broken ore is defined as ore that has been mined with the JBS but not yet processed at McClean Lake. This includes all in-circuit inventory at Cigar Lake plus the ore slurry stored in the ore storage pachucas at McClean Lake.

(10) Other than the challenges related to water inflows, jet boring and geotechnical issues described in *Section 15.4*, there are no known mining, metallurgical, infrastructure, permitting, or other relevant factors that could materially affect the above estimate of mineral reserves.

### CHANGES TO MINERAL RESOURCE AND RESERVE ESTIMATES

The updated mineral resource and mineral reserve estimates (December 31, 2023) reflect changes from the 2022 year-end estimates that are mainly due to:

- addition of 98 surface freeze holes in portions of CL Main
- addition of six delineation holes in the Central lenses
- addition of 12 surface delineation holes in CLEXT
- reinterpretation of the mineralized envelope of CL Main and CLEXT

- an adjustment to the correlation to convert corrected probe count rates into equivalent %$U_3O_8$ applied to address a slight $eU_3O_8$ overestimation bias
- reclassification of the mineral resources and mineral reserves based on drillhole spacing, geological and grade continuity, estimation confidence and reconciliation of mined production to the end of 2023
- updated operating cost estimates, metal price and exchange rate assumptions
- conversion of 73.4 million pounds (100% basis) of CLEXT mineral resources into mineral reserves based on information from 235 holes totaling approximately 99,000 metres of diamond drilling, with a corresponding decrease in mineral resources
- removal of the reserve estimates for the mined cavities contributing to the mill feed to December 31, 2023

More information on mineral reserves and mineral resources is available in *Sections 14* and *15*.

## 1.8 Mining

**JET BORING MINING SYSTEM**

The jet boring mining system, a non-entry mining method, has been selected to mine the Cigar Lake deposit because of the challenges associated with mining the deposit, including control of groundwater, weak rock formations, radiation protection, and relatively thin, flat-lying mineralization. This method was selected after many years of exploration and test mining activities following the discovery of the deposit in 1981.

The JBS mining method consists of cutting cavities out of frozen ore using a high-pressure water jet. Access to the orebody is achieved by drilling boreholes upwards from the production crosscuts below and then inserting specialized jetting tools to the ore horizon. Jetting begins at the top of a cavity and retreats vertically downward in thin slices, resulting in a cylindrical void with a height corresponding to the thickness of the orebody (up to 13.5 metres) and a diameter of 4.5 to 6 metres. The resulting void is tightly backfilled with concrete, and the cycle is repeated to recover adjacent ore.

This non-entry method was developed and adapted specifically for the Cigar Lake deposit, and does not directly expose personnel to the ore. The mining process is controlled from headings located in barren basement rock below the orebody, where the levels of radiation exposure to workers are very low. Radiation protection is further enhanced through the containment of the ore cuttings within cuttings collection and hydraulic conveyance systems, and via the application of ground freezing which limits the mobility of potentially radon-bearing water. These unique properties of the mining method have proven very effective at minimizing workers' exposure to radiation.

The mine production fleet is currently comprised of three JBS units and supporting infrastructure and ancillary equipment. This fleet size is sufficient for the remainder of the mine life, including CLEXT.

**MINE DEVELOPMENT**

Mine development for construction and operation uses two basic approaches: for good quality, competent rock mass, drill and blast with conventional ground support is applied; for poor quality, weak rock mass, the New Austrian Tunnelling Method (NATM) is applied. Most permanent areas of the mine, which contain the majority of the installed equipment and infrastructure, are hosted in competent rock mass and are excavated and supported conventionally. The production tunnels immediately below the orebody are primarily in poor, weak rock mass and are excavated and supported following NATM principles.

NATM, as applied at Cigar Lake, involves a multi-stage sequential mechanical excavation, extensive external ground support and a specialized shotcrete liner. The liner system incorporates yielding elements which permit controlled deformation required to accommodate additive pressure from mining and ground freezing activities. The production tunnels have an inside diameter of five metres and are circular in profile.

Cameco plans its mine development to take place away from known groundwater sources whenever possible. In addition, Cameco assesses all planned mine development for relative risk and applies extensive additional technical and operating controls for all higher risk development.

**MINE ACCESS**

The main access to the mine is via Shaft No. 1, a circular concrete-lined shaft, 4.9 metres in diameter which extends to a depth of 500 metres below the surface and provides direct access to the working level on the 480L. Shaft No. 1 is used as the main access and services shaft, and as a route for delivery of fresh ventilation underground.

Shaft No. 2 is a circular lined shaft, 6.1 metres in diameter, also sunk to a depth of 500 metres. This shaft is located 90 metres south of Shaft No. 1 and provides access to 480L. It is divided into two compartments by a central airtight partition: one compartment serves as the main path for exhaust air from the mine; the second compartment is used to downcast additional fresh ventilation air, as well as provide secondary egress and a number of additional services. The primary ventilation system has been designed to supply a volume of up to 240 $m^3/s$ of fresh air to the mine.

**MINE LEVELS – 480L AND 500L**

There are two main levels in the mine: the 480L and the 500L. Both levels are located in the basement rocks below the unconformity. Mining is conducted from the 480L, which is located about 40 metres below the ore zone. The main underground processing and infrastructure facilities are also located on this level. The 500L is accessed via a ramp from the 480L. The main ventilation exhaust drift for the mine, the mine dewatering sump and additional processing facilities are located on 500L.

**ARTIFICIAL GROUND FREEZING**

Cameco bulk freezes the ore zone and surrounding ground prior to mining an area. This system freezes the deposit and underlying basement rock in two to four years, depending on water content and geological conditions.

Freezing is key to the success of mining the deposit, and results in several enhancements to mining conditions, including: (1) increasing the stability of the area being mined; (2) minimizing the risk of water inflows into the mine from the water-bearing rock above the unconformity; and (3) reducing the radiation resulting from radon dissolved in the water.

In 2015, the CLJV decided to pursue a strategy of freezing exclusively from surface. This strategy has resulted in the following benefits:

- reducing risk to mine development
- allowing ground freezing to start before development of underground production tunnels
- simplifying mining operations, since ground freezing infrastructure and activities are located on surface

Artificial ground freezing for mining of CLEXT mineral reserves will follow a similar strategy of freezing exclusively from surface.

Artificial ground freezing is accomplished by drilling a systematic grid of boreholes through the orebody from surface. A network of supply and return pipes on surface convey a calcium chloride brine to and from each hole. The warmed brine returning from each hole is chilled to a temperature of approximately -30ºC at the surface freeze plant and recirculated.

The Cigar Lake production schedule relies upon the ground being sufficiently frozen prior to the start of JBS mining.

**WATER MANAGEMENT**

A mine water handling strategy was developed which includes increasing the mine's water-handling capabilities for routine and potential non-routine inflows above the existing capability previously assessed by Cameco in its 2004 environmental assessment. In addition to treating all routine water inflows (both seepage and process water) prior to releasing to the environment, water from any non-routine inflow will also be treated prior to releasing to the environment until such time as the inflow can be mitigated at the source.

As of early 2012, the installed mine dewatering capacity has been increased to 2,500 $m^3$/h. Mine water treatment capacity has been increased to 2,550 $m^3$/h, of which a minimum operational capacity of 1,740 $m^3$/h is maintained at all times. Regulatory approval to discharge routine and non-routine treated water to Seru Bay is in place. See *Sections 1.10, 16.2 and 20.4* for more details.

Cameco believes it has sufficient pumping, water treatment and surface storage capacity to handle the estimated maximum inflow.

The Cigar Lake orebody contains elements of concern with respect to water quality and the receiving environment. The distribution of elements such as arsenic, molybdenum, selenium and others is non-uniform throughout the orebody, and this could result in complications in attaining the effluent concentrations included in the licensing basis. Cameco continues to optimize the water treatment process to attain effluent quality consistent with the licensing basis.

Further information on mining at Cigar Lake is available in *Section 16*.

## 1.9 Processing

Cigar Lake ore is processed at two locations. Comminution is conducted underground at Cigar Lake, while leaching, purification and final yellowcake production and packaging occurs at the McClean Lake mill. The ore is trucked as a finely ground slurry from Cigar Lake to the McClean Lake mill in purpose-built containers identical to those used to transport McArthur River ore slurry to the Key Lake mill.

The McClean Lake mill is owned by the McClean Lake Joint Venture (MLJV) and operated by Orano Canada Inc. (Orano). The MLJV owners are:

- Orano (77.5%)
- Denison Mines Inc. (22.5%)

The milling arrangements are subject to the terms and conditions of a toll milling agreement made effective January 1, 2002 between the CLJV and the MLJV, and amended and restated effective November 30, 2011 (JEB Toll Milling Agreement).

In accordance with the JEB Toll Milling Agreement, the McClean Lake mill was expanded to process and package all of Cigar Lake's mineral reserves. Originally, the mill had a production capacity of 12 million pounds $U_3O_8$ per year. In order to process all of Cigar Lake's mineral reserves and other ores at McClean Lake, projects were identified to increase the total production capacity at the mill to 24 million pounds $U_3O_8$ per year. Construction of the expanded facility began in 2012 and was completed in 2016. Further changes were completed in 2021 to increase the capacity in the front-end circuits (leaching, CCD) from a nominal 45 kt ore/year to 59 kt ore/year.

No additional changes are required to the McClean Lake circuit to process the CLEXT mineral reserves.

During processing at McClean Lake mill, tailings are generated. The residue is treated in the upgraded McClean Lake mill tailings neutralisation circuit. Neutralised tailings are pumped to the existing TMF.

In 2022, Orano received regulatory approval for the continued expansion of the JEB TMF to allow the disposal of tailings up to a consolidated tailings elevation of 462 MASL, which is the approximate high point of the natural ground elevation. The expansion will be achieved by the continued construction of an engineered embankment and placement of the bentonite amended liner to an elevation of 468 MASL.

With these extensions, the JEB TMF will have the capacity to receive tailings from processing all of Cigar Lake's current mineral reserves.

See *Section 20.4* for a discussion of the TMF and the related licensing, and *Section 19.2* for a discussion of the JEB Toll Milling Agreement. See *Section 17* for information on processing at the McClean Lake mill.

## 1.10 Environmental assessment and licensing

The Cigar Lake operation has regulatory obligations to both the federal and provincial governments. Classified as a nuclear facility, primary regulatory authority resides with the federal government and its agency, the CNSC. The main regulatory agencies that issue permits / approvals and inspect the Cigar Lake operation are: the CNSC (federal), Fisheries and Oceans Canada (federal), Environment and Climate Change Canada (federal), Transport Canada (federal), Saskatchewan Ministry of Labour Relations and Workplace Safety (provincial), and Saskatchewan Ministry of Environment (provincial) (SMOE). Environment and Climate Change Canada, specifically, is responsible for administering the federal Metal and Diamond Mining Effluent Regulations (MDMER) and approves environmental effects monitoring programs required under the MDMER.

There are three key permits that are required to operate the mine. Federally, Cigar Lake holds a "Uranium Mine Licence" from the CNSC with a corresponding Licence Conditions Handbook (LCH). Provincially, Cigar Lake holds an "Approval to Operate Pollutant Control Facilities" from the SMOE and a "Water Rights Licence to Use Surface Water and Approval to Operate Works" from the Saskatchewan Water Security Agency (SWA). These documents are current.

The CNSC licence was issued for a ten-year term in June 2021, authorizing Cameco to mine, process and ship uranium ore to McClean Lake. Valid until June 30, 2031, this licence and associated LCH, authorizes an average annual production rate of 18 million pounds $U_3O_8$.

The SMOE Approval to Operate Pollutant Control Facilities was renewed in 2024 and expires on October 31, 2030. The SWA water rights licence was amended in 2023 and expires November 30, 2028. The SWA Approval to Operate Works was issued in January 2020 and is valid for an indefinite period of time.

The CNSC licence and LCH for the McClean Lake operation, issued by the CNSC in 2017, authorizes the production of up to 24 million pounds $U_3O_8$ annually. The licence and LCH were amended in 2022 to authorize the expansion of the JEB TMF. See *Section 20.4* for a discussion of the TMF and related licensing.

Previous environmental assessments (EAs) completed for Cigar Lake form the basis for the current CNSC licence, LCH, and SMOE approval to operate. Approvals, issued by SMOE pursuant to the Saskatchewan *Environmental Assessment Act*, for Cigar Lake are based on estimated annual production rates of 18 million pounds $U_3O_8$ for CL Main and 6 million pounds $U_3O_8$ for CLEXT. As such, it is anticipated that the planned annual production rate of 18 million pounds $U_3O_8$ for CLEXT represents a change to the approved development that will require Ministerial Approval. Cameco plans to submit the information required to obtain this approval in 2025.

A detailed history of Cigar Lake EAs is provided in *Section 20.3*.

## 1.11 Cigar Lake water inflow incidents and remediation

Over the period 2006 through 2008, Cigar Lake suffered setbacks as a result of three water inflows.

The first occurred in April of 2006, resulting in the flooding of the then partially completed Shaft No. 2. The two subsequent incidents involved inflows in the mine workings connected to Shaft No. 1 and resulted in flooding of the mine workings completed to that point in time.

Cameco developed and successfully executed recovery and remediation plans for all three inflows.

Through 2010 and 2011, Cameco developed a comprehensive plan and successfully proceeded with remediation to restore the underground workings at Cigar Lake.

Successful re-entry into the main mine workings was achieved in early 2010 and work to secure the mine was completed in 2011.

The mine is fully remediated, and entered commercial production in 2015. Lessons learned from the inflows have been applied to the subsequent mine plan and development in order to reduce the risk of future inflows and improve Cameco’s ability to manage water inflows. These improvements are detailed in sections throughout the report.

## 1.12 Current status of development

Construction of all major permanent underground development and process facilities required for the duration of the mine life is complete. A number of underground access drifts and production crosscuts remain to be driven as part of ongoing mine development to sustain production, most notably in the western CLEXT areas.

On surface, construction of all permanent infrastructure required to achieve nameplate capacity has been completed. As CLEXT progresses, new or expanded surface infrastructure will be required including:

- access road and adjacent pipe bench construction
- construction of surface freeze pads to the west and east of Cigar Lake, including runoff ponds for each pad
- freeze hole drilling, outfitting, activation and ongoing operation to facilitate ongoing bulk freezing of the orebody from surface
- construction of a new brine booster station and routing of additional brine supply/return and distribution piping for the freeze systems on the freeze pads
- routing of other required services to support surface freeze hole drilling and ongoing freeze system operation (e.g., drill fresh water supply, runoff pond water return, electrical and instrumentation)
- expansion of the waste rock crushing pad
- a minor expansion of the freeze plant capacity

McClean Lake has all major permanent infrastructure in place to process the remaining Cigar Lake mineral reserves.

## 1.13 Production plan

The remaining mine life based on current mineral reserves will be approximately 13 years, with estimated full annual production of 18 million pounds $U_3O_8$ recovered from the mill for 11 years followed by a two-year ramp down until depletion.

The following is a general summary of the Cigar Lake production schedule, based on current remaining mineral reserves:

- total mill production of 205.9 million pounds $U_3O_8$, based on an overall milling recovery of 98.7%
- total remaining mine production of 554,500 tonnes of ore (excluding mineral reserves already mined)
- average mill feed grade of 17.0% $U_3O_8$
- remaining mine operating life of approximately 13 years
- variable mining rate to achieve a constant production level of $U_3O_8$ (the average mine production varies annually from 115 to 160 tonnes per day, depending on the grade of ore being mined)

The mine and mill production schedules for Cigar Lake are shown in *Figures 1-1* and *1-2*, respectively.

See *Section 16* for more information on the production plan.

FIGURE 1-1: MINE PRODUCTION

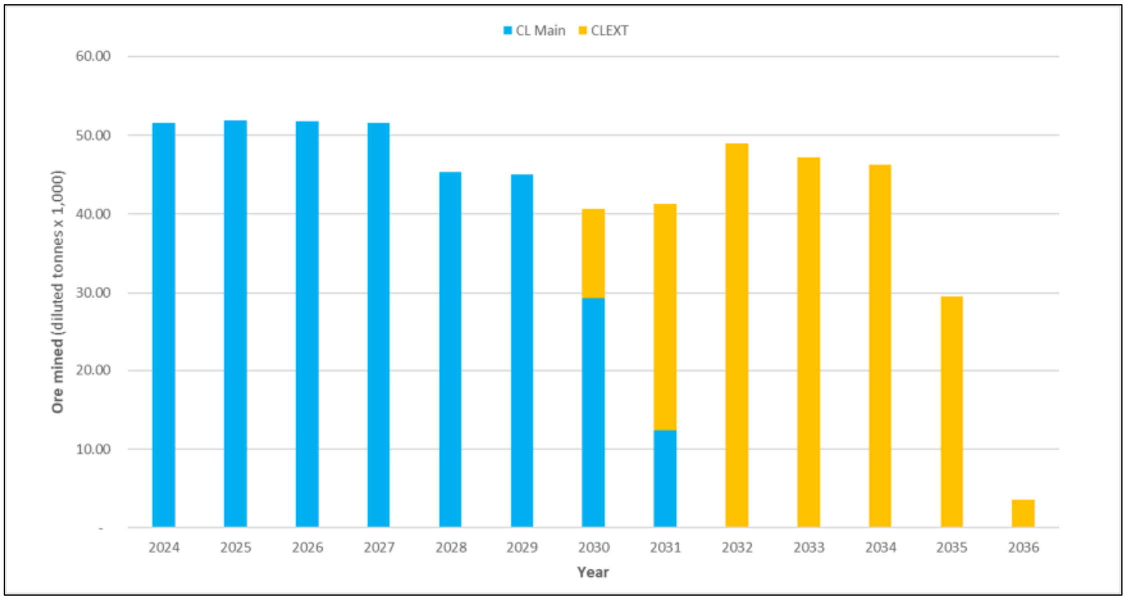
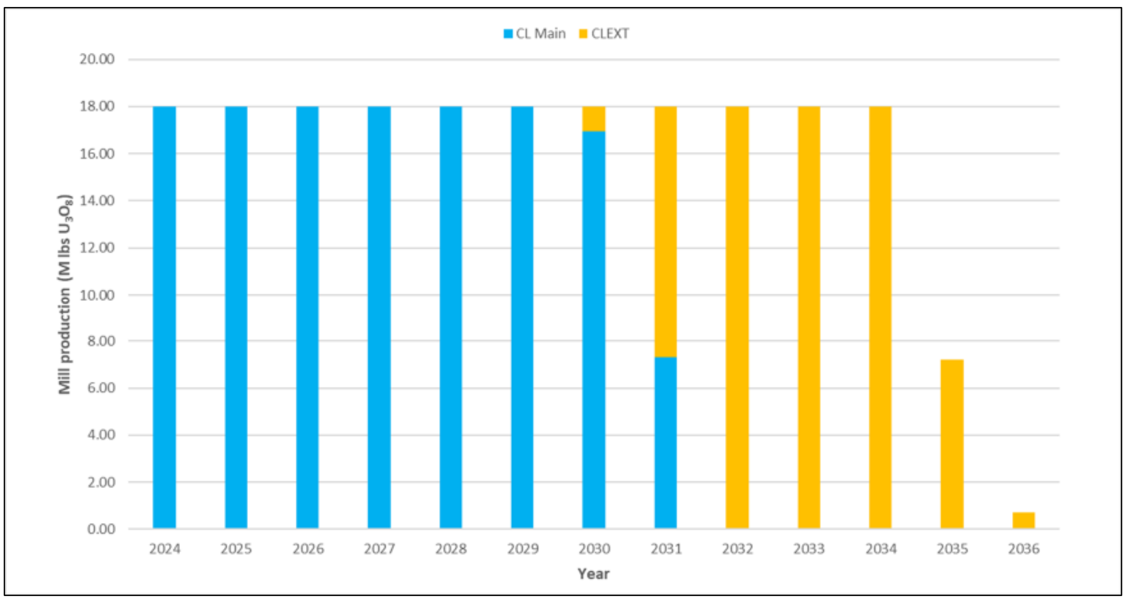



FIGURE 1-2: MILL PRODUCTION




## 1.14 Economic analysis and costs

The economic analysis results in an estimated pre-tax NPV (at a discount rate of 8%) to Cameco, for net cash flows from January 1, 2024 forward, of $2.5 billion for its share of the Cigar Lake mineral reserves. Using the total capital invested to date, along with the operating and capital cost estimates for the remaining mineral reserves, the pre-tax IRR has been estimated to be 8.3%.

Sensitivity analysis shows changes in uranium price and production can have a significant impact on the size of the positive NPV. On an undiscounted pre-tax basis, payback for Cameco, including total capital invested to date, is expected to be achieved in 2024. All future capital expenditures are forecasted to be covered by operating cash flow.

The CLJV's estimated capital cost to bring the remaining mineral reserves into production is approximately $1.2 billion and includes sustaining capital for the Cigar Lake mine and McClean Lake mill, as well as underground development at Cigar Lake.

The total capital cost estimate as of December 31, 2023 for the CLJV is discussed further in *Section 21* and summarized in *Table 21-1*.

Operating costs for the Cigar Lake operation are estimated to be $20.58 per pound $U_3O_8$ over the remaining life of the current mineral reserves. The current operating cost projections are based on operational experience to date and assumes the throughput described in *Section 1.13* and in more detail in *Section 16.3*.

The total operating cost estimate as of December 31, 2023 for the CLJV is discussed further in *Section 21* and summarized in *Table 21-2*.

## 1.15 Mining and milling risks

Cigar Lake is a challenging deposit to develop and mine. These challenges include, but are not limited to, variable or unanticipated ground conditions, ground movement and cave-ins, water inflows, performance of the water treatment system, variable dilution, recovery values, mining productivity, equipment reliability and other mining-related challenges. Additionally, the realization of risks associated with processing the ore at Orano's McClean Lake mill would adversely affect production at Cigar Lake.

Specific mining and milling risks are described in more detail in *Section 24.2.*

## 1.16 Conclusions and recommendations

### Conclusions

The Cigar Lake operation outlined in this report represents a significant economic source of feed material for the McClean Lake mill. With an estimated remaining operating mine life of approximately 13 years, Cigar Lake is expected to produce approximately 205.9 million pounds $U_3O_8$. At the forecast average realized uranium price over this 13-year period, it is estimated that Cameco will receive substantial positive net cash flows from its share of Cigar Lake production.

Since the previous technical report was issued, the following has been achieved:

- commissioned all circuits, demonstrating acceptable performance at both the mine and the mill
- achieved mine production rampup to full nameplate capacity of 18 million pounds $U_3O_8$ per year and produced 138.4 million pounds $U_3O_8$ to December 31, 2023
- completed JBS production from seven crosscuts excavated using the NATM technique
- completed the surface drilling program for bulk ground freezing of CL Main
- received 10-year Cigar Lake licence renewal from CNSC in 2021
- regulatory approval for the continued expansion of Orano's JEB TMF to allow the disposal of tailings up to a consolidated tailings elevation of 462 MASL
- finalized a prefeasibility study for the CLEXT portion of the deposit, leading to a production decision and declaration of mineral reserves
- increased Cameco's ownership interest in the CLJV to 54.547% with the 2023 acquisition of a 4.522% interest from Idemitsu Canada Resources Ltd.
- constructed a waste rock crushing pad to enable processing of waste rock into backfill aggregate

**ECONOMIC ANALYSIS AND COSTS (100% BASIS)**

Cameco's estimated pre-tax NPV (at a discount rate of 8%) of $2.5 billion for its share of the Cigar Lake mineral reserves supports the decision to extend the mine life to 2036. Economic sensitivity to factors such as average realized price, production rates and annual costs show that the reserves present a robust economic outlook in several scenarios.

**MINE PLAN**

Mine design changes and refinements since 2012 achieved their objective. Application of the NATM tunnel excavation technique has proven to be effective and reliable in reducing tunnel rehabilitation requirements. Lateral mine development is largely complete at CL Main.

The ground freezing system has seen a number of improvements, including optimizing of freezing capacity, drilling patterns and freeze hole installations.

The CLEXT mine plan is largely based on the design criteria, processes and experience gained during mining of the CL Main portion of the deposit. Application of the same mining methods and techniques are expected to continue to increase the reliability of development, production and cost forecasts.

**JBS MINING METHOD**

Since 2012, comprehensive JBS testing and commissioning was completed to advance three JBS units to full production. This mining method has been successfully demonstrated through the mining of 572 cavities and extraction of 358,000 tonnes of ore.

**MINE WATER TREATMENT**

Adjustments to our circuits have been successful in reducing the amount of water requiring treatment and release and increasing the amount of water that can be recycled.

**MCCLEAN LAKE MILL**

The McClean Lake mill was successfully restarted in 2014, and ongoing process improvement projects have been implemented in the mill to achieve required production rates.

With Orano's receipt of regulatory approval for the continued expansion of the JEB TMF, Cigar Lake has access to sufficient tailings capacity to allow mining of the current Cigar Lake mineral reserves.

**MINERAL RESOURCES AND MINERAL RESERVES**

The CL Main zone is now fully delineated and CL Main mineral reserves are largely in the proven category. Additional surface delineation drilling programs at CLEXT since 2016 were conducted in order to better define the mineral resource, gather metallurgical, hydrogeological and geotechnical information and used to support a prefeasibility study for CLEXT.

Mineral reserves in CLEXT are entirely in the probable category due to the sparser drilling density and are located in its western portion. The eastern portion of CLEXT is mostly in the inferred mineral resource category.

As of December 31$^{st}$, 2023, total proven and probable mineral reserves at Cigar Lake amount to 555,600 tonnes at a grade of 17.03% $U_3O_8$ and 208.6 million pounds. Mineral resources total 132,900 tonnes at a grade of 2.65% $U_3O_8$ and 7.8 million pounds in the measured and indicated category. Inferred mineral resources total 80,500 tonnes at a grade of 2.25% $U_3O_8$ for 4.0 million pounds.

Other than the challenges related to water inflows, jet boring and geotechnical issues described in *Section 15.4*, there are no known issues with respect to mining, metallurgical, infrastructure, permitting, or other relevant factors that could materially affect the mineral resource or reserve estimates.

### Recommendations

The Cigar Lake operation outlined in this report represents a significant economic source of feed material for the McClean Lake mill. To realize the economic benefits from this operation and to mitigate risk, the authors of this technical report make the following recommendations:

#### OPERATIONAL EXCELLENCE/RELIABILITY

- continue process and equipment optimization initiatives related to tooling, leveraging instrumentation and operational technology for improved cavity excavation control to increase recovery and reduce dilution
- continue to advance industry best practices related to asset management to improve equipment reliability for the life of mine
- investigate options for sustainable life of mine aggregate sources
- continue investigation of opportunities to optimize the leach circuit at McClean Lake to manage a wider range of arsenic to uranium slurry feed ratios to reduce potential throughput limitations in leaching while also providing positive effects in downstream unit operations
- continue monitoring the reliability of the arsenic block model to improve short-term forecasting

#### ENVIRONMENTAL PERFORMANCE

- continue to monitor and review the process water balance related to effluent generation and effluent concentrations that form part of the licensing basis
- investigate opportunities to reduce environmental liabilities during operations and decrease decommissioning costs associated with waste rock management

#### FREEZE INFRASTRUCTURE OPTIMISATION

- complete trade-off studies to determine optimal capital spending on freeze projects to sustain production for the life of the mine

#### GEOTECHNICAL DRILLING

- undertake geotechnical drilling ahead of the two main access drifts for CLEXT to allow for the collection of information to support excavation and ground support plans

#### MINERAL RESOURCES AND RESERVES

- focus exploration efforts mainly on the relatively sparsely drilled, eastern portion of CLEXT, given the current proven and probable mineral reserve inventory, the forecast rate of production and the 13-year mine life
- continue to invest in further exploration on the Waterbury Lake lands, subject to annual reviews of ongoing exploration results, to allow for the extended timelines associated with exploring, designing, permitting and developing new uranium deposits

# 2 Introduction

## 2.1 Introduction and purpose

The Cigar Lake Operation is a material property for Cameco under Canadian securities laws.

This technical report has been prepared for Cameco by, or under supervision of, internal qualified persons in support of disclosure of new scientific and technical information about the Cigar Lake operation as contained in Cameco's annual Management's Discussion and Analysis for the year ended December 31, 2023, Cameco's Annual Information Form and 40-F for the year ended December 31, 2023, and Cameco's press release dated February 8, 2024. This new information is the result of progress at Cigar Lake, combined with experience gained since the 2016 Technical Report.

This report has an effective date of December 31, 2023, and has been prepared in accordance with NI 43-101 by the following individuals:

- Biman Bharadwaj, P. Eng., Principal Metallurgist, Technical Services, Cameco Corporation
- C. Scott Bishop, P. Eng., Director, Technical Services, Cameco Corporation
- Alain D. Renaud, P. Geo., Principal Resource Geologist, Technical Services, Cameco Corporation
- Lloyd Rowson, P. Eng., General Manager, Cigar Lake Operation, Cameco Corporation

These individuals are the qualified persons responsible for the content of this report. All four qualified persons have visited the Cigar Lake site.

Mr. Bharadwaj has been a process engineer/metallurgist and operations manager in the mining/milling industry for over thirty years and has in-depth knowledge of the process unit operations associated with the Cigar Lake Operation and the McClean Lake Mill. Over the years Mr. Bharadwaj has been directly involved in several studies and projects related to the processing of the Cigar Lake ore and water treatment systems. Recently Mr. Bharadwaj was directly involved in the modelling of the CL Main and CLEXT outputs from a processing perspective. Mr. Bharadwaj's last visit to both the Cigar Lake Operation and the ore slurry receiving mill were in 2016, which included an end-to-end tour of both operations.

Mr. Bishop, from October 2004 to September 2010, was the Chief Mine Engineer of the Cigar Lake project and was present at the site at least several times a month for periods extending up to seven days. Since 2010, Mr. Bishop has been directly and indirectly involved in a number of studies, projects and technical reviews of specific Cigar Lake mine design and operational practices, including the prefeasibility study of the CLEXT. Mr. Bishop's last personal inspection of the Cigar Lake operation occurred from May 9-10, 2023, and included inspections of both the surface and underground facilities.

Mr. Renaud has been involved with the Cigar Lake Operation since 2016 and has visited the site on several occasions. Mr. Renaud's last personal inspection of the Cigar Lake Operation occurred from March 13-15, 2023, and included a review of drilling, core handling, radiometric probing, logging, sampling facilities, sampling and data verification procedures in place. Mr. Renaud was involved with the 2023 CL Main and CLEXT mineral resource updates as well as the year-end mineral reserves and resources compilation and review.

Mr. Rowson has been continuously involved in the Cigar Lake Operation since 2012 and is regularly present on site currently overseeing all aspects of the operation as General Manager. During this time, Mr. Rowson has held various site-based leadership roles initially focused on mine development and jet boring system commissioning and operations, followed by a focus on

Technical Services including Mine Engineering, Geology and Metallurgical Engineering functions. Mr. Rowson also visits the McClean Lake Mill one to two times per year, with the most recent personal inspection occurring February 14, 2024.

## 2.2 Report basis

This report has been prepared with available internal Cameco data and information, and data and information prepared for the CLJV. Technical and certain financial information for processing Cigar Lake ore at the McClean Lake mill was provided to Cameco by Orano.

The principal technical documents and files relating to the Cigar Lake operation and the McClean Lake mill that were used in preparation of this report are listed in *Section 27*.

All monetary references in this technical report are expressed in Canadian dollars, unless otherwise indicated. Illustrations (Figures) in this report are from Cameco, and are dated December 31, 2023, unless otherwise specified.

Within this technical report, three different coordinate systems are used: latitudes/longitudes, Universal Transverse Mercator (UTM) coordinates and mine grid. The UTM coordinates are calculated using the latest World Geodetic System (WGS) standard WGS 84. The conversion from mine grid to UTM coordinates is as follows:

UTM Northing = Mine Northing + 6426697.9
UTM Easting = Mine Easting + 516518.7
UTM Elevation = Mine Elevation + 1000 = MASL + 1000

# 3 Reliance on other experts

The authors have relied, and believe they have a reasonable basis to rely, upon the following individuals who have contributed the environmental, legal and taxation information stated in this report, as noted below in *Table 3-1*.

### TABLE 3-1: RELIANCE ON OTHER EXPERTS

| Name | Title | Section Number (description) |
|---|---|---|
| Kevin Nagy, M.Sc. | Director, Compliance and Licensing, Cameco | 1.10 (description of Environmental assessment and licensing)<br>4.5 (description of Known environmental liabilities)<br>4.6 (description of Permitting)<br>20 (description of Environmental studies, permitting and social or community impact), excluding Section 20.7 |
| Candice Murray, JD | Director Legal Services, SHEQ, Regulatory Relations and Corporate Responsibility, Cameco | 1.3 (description of Property tenure)<br>4.2 (description of Mineral tenure)<br>4.3 (description of Surface tenure)<br>6.1 (description of Ownership)<br>19.2 (description of Material contracts for property development) |
| Jill Johnson, MPAcc, CPA, CA | Senior Director, Tax and Treasury, Cameco | 4.4 (description of Royalties)<br>22.5 (description of Taxes)<br>22.6 (description of Royalties) |

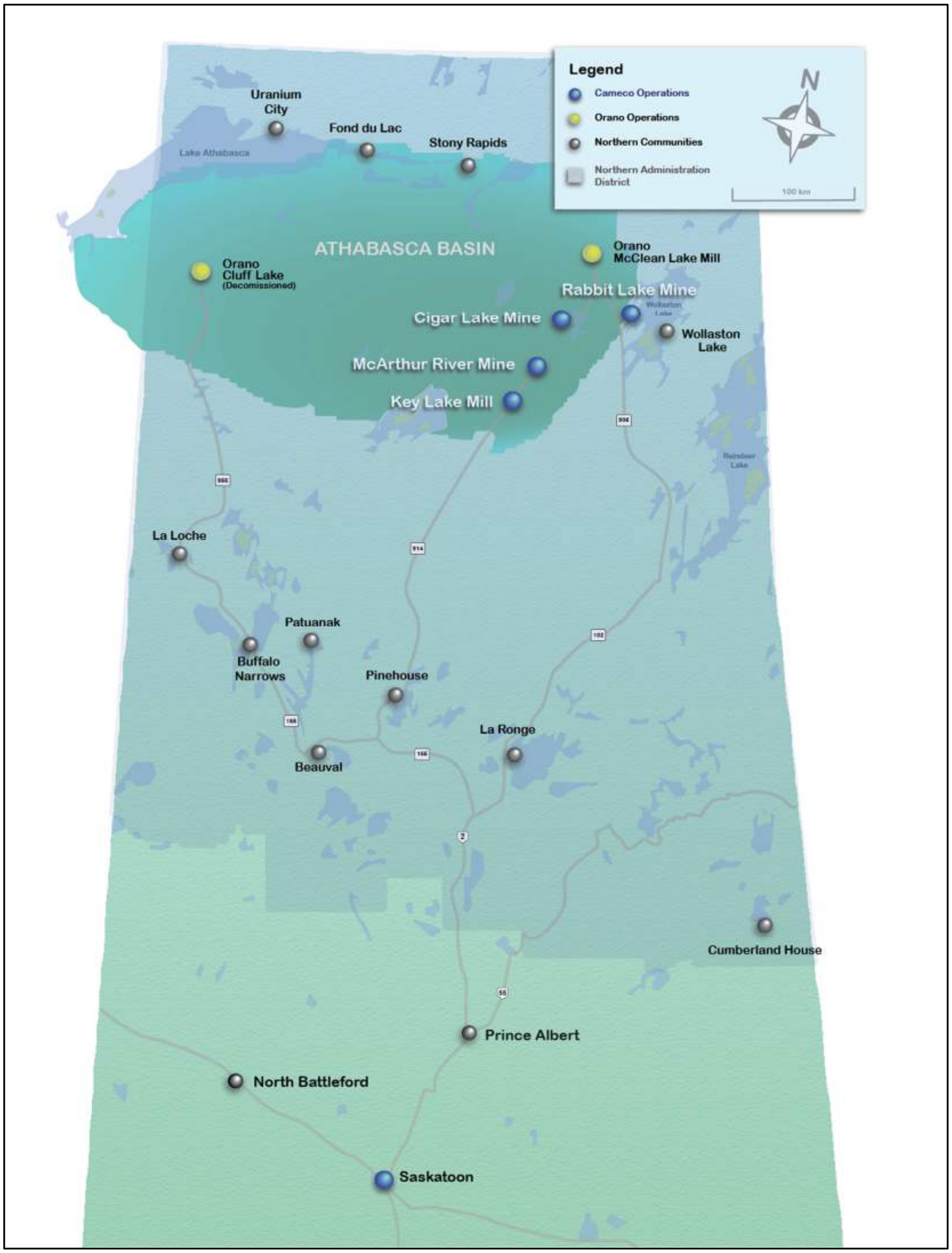
# 4 Property description and location

## 4.1 Location

The Cigar Lake mine site is located near Waterbury Lake, approximately 660 kilometres north of Saskatoon, at latitude $58^0$ 04’ 14” north and longitude $104^0$ 32’ 18” west, and about 40 kilometres inside the eastern margin of the Athabasca Basin region in northern Saskatchewan. See *Figure 4-1*.

The mine site is in close proximity to two uranium milling operations: McClean Lake is 69 kilometres northeast by road and Rabbit Lake is 87 kilometres east by road. The McArthur River mine is 46 kilometres southwest by air from the mine site.

FIGURE 4-1: CIGAR LAKE MINERAL PROPERTY LOCATION




## 4.2 Mineral tenure

- One mineral lease: ML 5521
- 38 mineral claims. See *Table 4-1*
- Total contiguous area: 95,601 hectares

The Cigar Lake deposit is located in the area subject to the mineral lease, totaling 308 hectares. The right to mine this deposit was granted by the Province of Saskatchewan under the *Crown Minerals Act* (Saskatchewan) through the mineral lease, effective December 1, 2001. The term of the current mineral lease is for 10 years and expires on November 30, 2031, but is subject to a right to renew for successive ten-year terms, absent a default by the CLJV. The Province of Saskatchewan may only terminate the lease if the CLJV breaches a provision of the lease or fails to satisfy any of its obligations under The *Crown Minerals Act* (Saskatchewan) or associated regulations, or in the event that any prescribed environmental concerns arise.

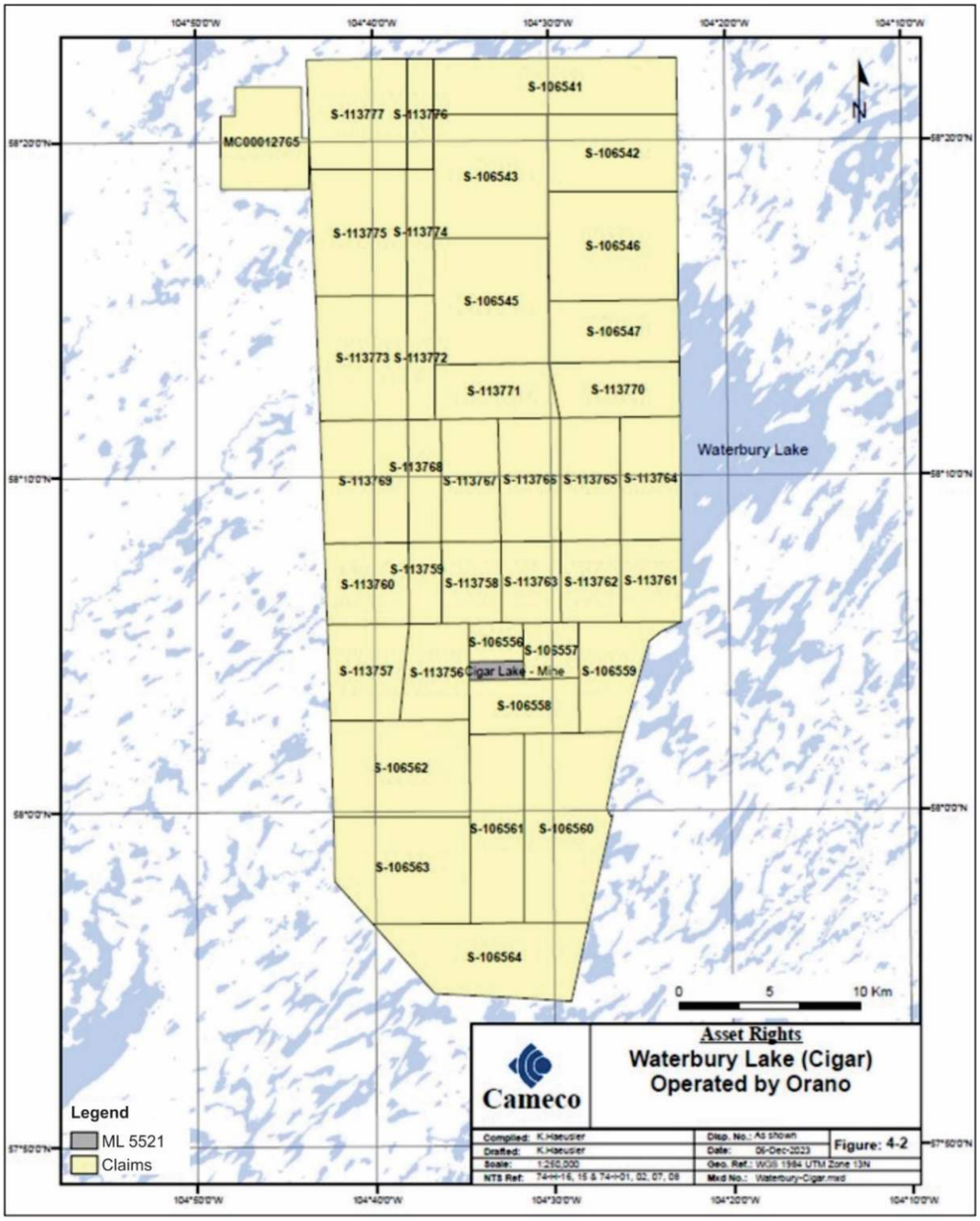
Adjoining the mineral lease, there are 38 mineral claims which were also granted by the Province of Saskatchewan under *The Crown Minerals Act* (Saskatchewan), totaling 95,293 hectares. These mineral claims grant the CLJV the right to explore for minerals within the claim lands, and to convert a mineral claim into a mineral lease if the CLJV remains in good standing. Surface exploration work of a mineral claim requires additional government approval.

There is an annual requirement of $2.4 million, either in work or cash, to retain title to the 38 mineral claims. Based on previous work submitted and approved by the Province of Saskatchewan, title is secured until 2037 or later. The mineral lease has a yearly rental payment of $3,080.00.

Under the Cigar Lake Joint Venture Agreement and related agreements, made effective January 1, 2002 and as amended on November 30, 2011 (CLJV Agreement), the mineral lease and the 38 mineral claims noted above were divided into the Cigar Lake lands, consisting of ML 5521 and claim S-106558, and the Waterbury Lake lands, consisting of the remaining 38 claims. Orano is the operator of the Waterbury Lake lands and is also contract exploration operator of the Cigar Lake lands other than the area on ML 5521 from which the mineral reserves are being mined. Cameco has been the mine operator for the Cigar Lake lands with respect to ML 5521 since 2002.

*Figure 4-2* shows the Cigar Lake mineral lease and mineral claims as currently registered with the Province of Saskatchewan.

## FIGURE 4-2: MINERAL LEASE AND MINERAL CLAIMS



### TABLE 4-1: CIGAR LAKE OPERATION - MINERAL CLAIMS STATUS

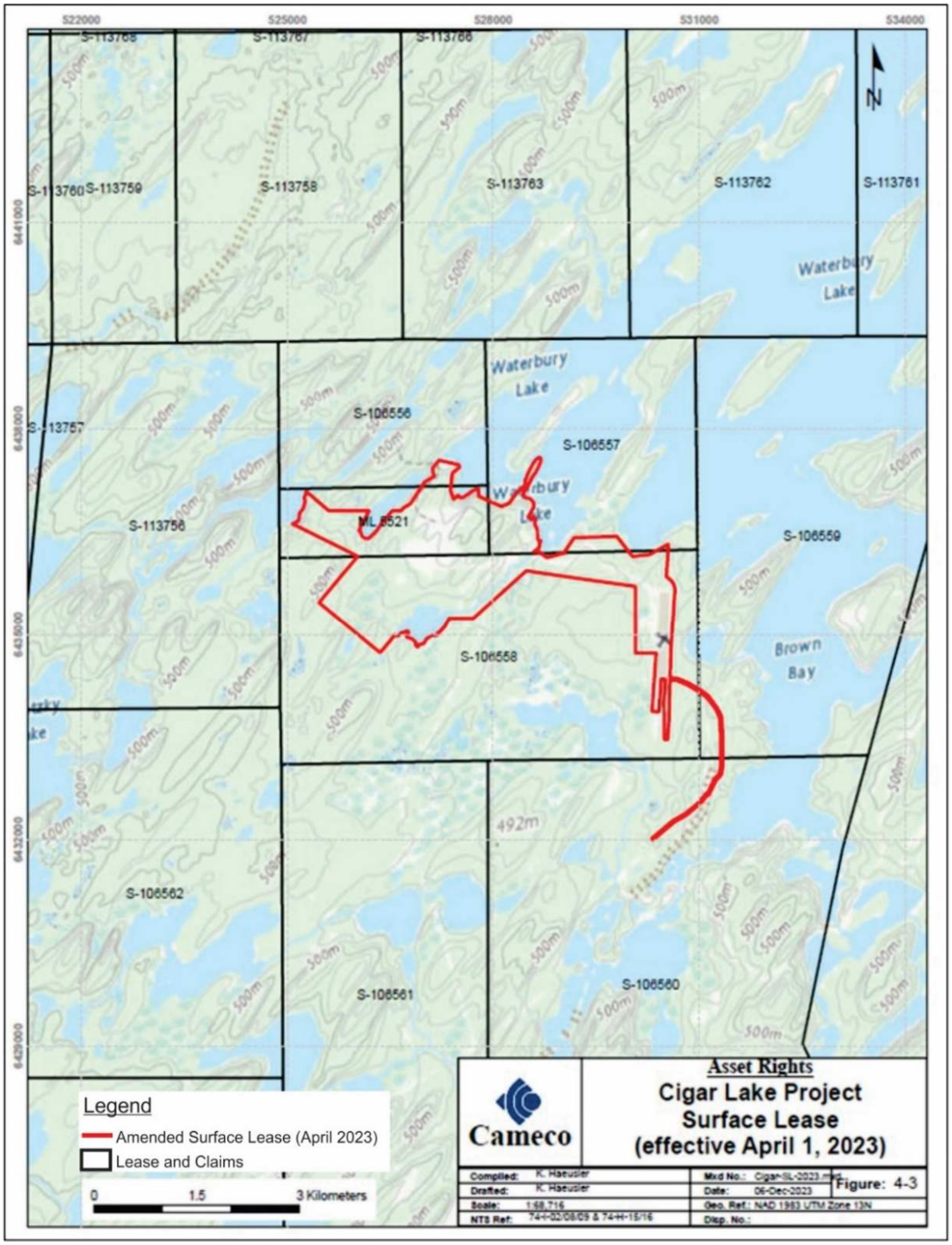
| Lease/Claim | Record Date | Area | Annual | Next Payment |
|---|---|---|---|---|
| ML 5521 (Lease) | 1981-Dec-01 | 308 | Yearly Rent | 2024-Dec-01 |
| MC00012765 | 2019-Mar-27 | 2,533 | $38,007 | 2042-Mar-28 |
| S-106541 | 1975-Dec-16 | 4,270 | $106,750 | 2043-Dec-16 |
| S-106542 | 1975-Dec-16 | 3,039 | $75,975 | 2037-Dec-16 |
| S-106543 | 1975-Dec-16 | 4,316 | $107,900 | 2041-Dec-16 |
| S-106545 | 1975-Dec-16 | 4,410 | $110,250 | 2041-Dec-16 |
| S-106546 | 1975-Dec-16 | 4,334 | $108,350 | 2042-Dec-16 |
| S-106547 | 1975-Dec-16 | 2,550 | $63,750 | 2043-Dec-16 |
| S-106556 | 1975-Dec-16 | 635 | $15,875 | 2042-Dec-16 |
| S-106557 | 1975-Dec-16 | 935 | $23,375 | 2042-Dec-16 |
| S-106558 | 1975-Dec-16 | 1,872 | $46,800 | 2042-Dec-16 |
| S-106559 | 1975-Dec-16 | 2,210 | $55,250 | 2042-Dec-16 |
| S-106560 | 1975-Dec-16 | 4,742 | $118,550 | 2042-Dec-16 |
| S-106561 | 1975-Dec-16 | 3,150 | $78,750 | 2042-Dec-16 |
| S-106562 | 1975-Dec-16 | 4,175 | $104,375 | 2041-Dec-16 |
| S-106563 | 1975-Dec-16 | 4,149 | $103,725 | 2042-Dec-16 |
| S-106564 | 1975-Dec-16 | 3,945 | $98,625 | 2041-Dec-16 |
| S-113756 | 1975-Dec-16 | 1,900 | $47,510 | 2043-Dec-16 |
| S-113757 | 1975-Dec-16 | 2,223 | $55,568 | 2042-Dec-16 |
| S-113758 | 1975-Dec-16 | 1,484 | $37,108 | 2042-Dec-16 |
| S-113759 | 1975-Dec-16 | 823 | $20,565 | 2041-Dec-16 |
| S-113760 | 1975-Dec-16 | 2,076 | $51,910 | 2042-Dec-16 |
| S-113761 | 1975-Dec-16 | 1,523 | $38,081 | 2042-Dec-16 |
| S-113762 | 1975-Dec-16 | 1,510 | $37,740 | 2042-Dec-16 |
| S-113763 | 1975-Dec-16 | 1,489 | $37,213 | 2042-Dec-16 |
| S-113764 | 1975-Dec-16 | 2,273 | $56,826 | 2042-Dec-16 |
| S-113765 | 1975-Dec-16 | 2,268 | $56,710 | 2042-Dec-16 |
| S-113766 | 1975-Dec-16 | 2,290 | $57,262 | 2042-Dec-16 |
| S-113767 | 1975-Dec-16 | 2,192 | $54,792 | 2042-Dec-16 |
| S-113768 | 1975-Dec-16 | 1,244 | $31,095 | 2043-Dec-16 |
| S-113769 | 1975-Dec-16 | 3,232 | $80,799 | 2042-Dec-16 |
| S-113770 | 1975-Dec-16 | 2,111 | $52,764 | 2043-Dec-16 |
| S-113771 | 1975-Dec-16 | 2,021 | $50,532 | 2042-Dec-16 |
| S-113772 | 1975-Dec-16 | 1,028 | $25,696 | 2043-Dec-16 |
| S-113773 | 1975-Dec-16 | 3,405 | $85,131 | 2042-Dec-16 |
| S-113774 | 1975-Dec-16 | 1,047 | $26,175 | 2043-Dec-16 |
| S-113775 | 1975-Dec-16 | 3,647 | $91,178 | 2042-Dec-16 |
| S-113776 | 1975-Dec-16 | 918 | $22,946 | 2043-Dec-16 |
| S-113777 | 1975-Dec-16 | 3,323 | $83,075 | 2040-Dec-16 |

## 4.3 Surface tenure

- Total area: 715 hectares of Crown land
- Covers a portion of ML 5521, along with portions of claims S-106556 to 106560, inclusive

*Figure 4-3* shows the outline of the surface lease in relation to the mineral lease and mineral claims

FIGURE 4-3: SURFACE LEASE, MINERAL LEASE AND MINERAL CLAIMS



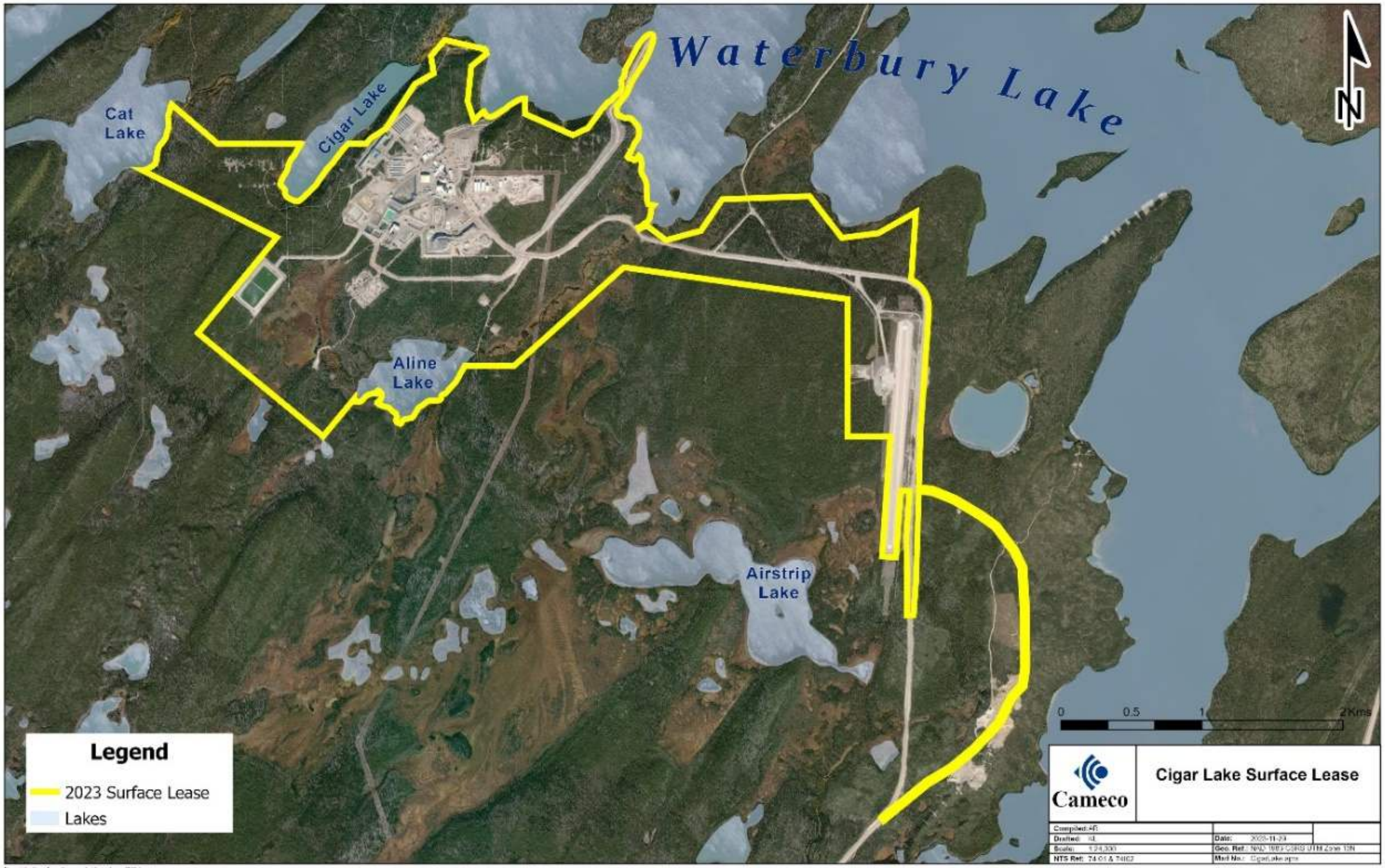
The surface facilities and mine shafts for the Cigar Lake mine are located on lands owned by the Province of Saskatchewan. The CLJV owners acquired the right to use and occupy these lands for the purpose of developing and mining the Cigar Lake deposit under a surface lease agreement with the Province of Saskatchewan. The surface lease was amended April 1, 2023 and expires May 31, 2044.

The Province of Saskatchewan uses surface leases as a mechanism to achieve certain environmental protection and socio-economic objectives. As a result, the Cigar Lake surface lease contains certain undertakings from the CLJV in that regard, including annual reporting on the status of the environment, land development and progress on northern Saskatchewan employment and business development.

*Figure 4-4* shows the general site arrangement with the outline of the surface lease.

In 2023, annual rent was approximately $390,000 for the surface lease, together with taxes of approximately $4,635,000 in respect thereof.

FIGURE 4-4: MAP OF MINE FACILITIES AND SURFACE LEASE BOUNDARY



## 4.4 Royalties

For a discussion of royalties, see *Section 22.6*.

## 4.5 Known environmental liabilities

For a discussion of known environmental liabilities, see *Section 20.6*.

## 4.6 Permitting

For a discussion of permitting, see *Section 20.2*.

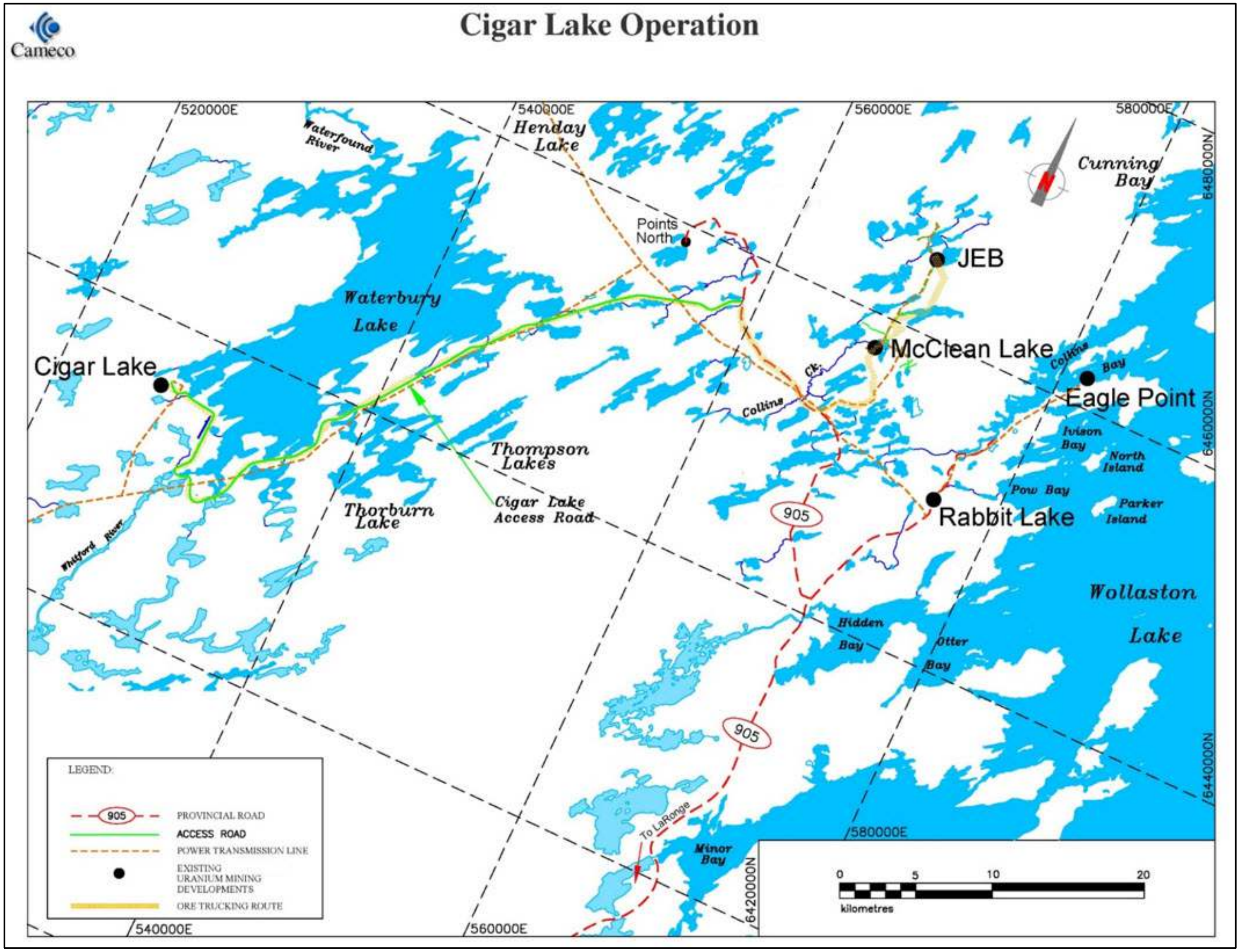
# 5 Accessibility, climate, local resources, infrastructure and physiography

## 5.1 Access

The property is accessible by an all-weather road and by air. Supplies are transported by truck and can be shipped from anywhere in North America through Cameco's transit warehouse in Saskatoon. Trucks travel north from Saskatoon on a paved provincial road through Prince Albert and La Ronge and further north along the gravel surfaced Provincial Road 905, and finally to the mine site via a 52-kilometre long two-lane gravel road. The latter section is accessible to the public from the intersection with Provincial Road 905 to the access gate near the Cigar Lake airstrip, situated approximately six kilometres from the mine site. Ore is shipped from Cigar Lake to McClean Lake by truck year-round. Yellowcake is shipped from the McClean Lake mill by truck to Saskatoon. *Figure 5-1* shows the regional location of the Cigar Lake site and local roads.

An unpaved airstrip is located east of the mine site, allowing flights to and from the Cigar Lake property.

FIGURE 5-1: CIGAR LAKE SITE - REGIONAL LOCATION AND ROADS



## 5.2 Climate

The climate is typical of the continental sub-arctic region of northern Saskatchewan. Summers are short and rather cool, even though daily temperatures can reach above 30°C on occasion. Mean daily maximum temperatures of the warmest months are around 20°C and only three months on average have mean daily temperature of 10°C or more. The winters are cold and dry with mean daily temperature for the coldest month below -20°C. Winter daily temperatures can reach below -40°C on occasion.

Freezing of surrounding lakes, in most years, begins in November and breakup occurs around the middle of May. The average frost-free period is approximately 90 days.

Average annual total precipitation for the region is approximately 450 millimetres, of which 70% falls as rain, more than half occurring from June to September. Snow may occur in all months but rarely falls in July or August. The prevailing annual wind direction is from the west with a mean speed of 12 kilometres per hour.

Site operations are carried out year-round, despite cold winter conditions. The fresh air necessary to ventilate the underground working areas is heated during winter months using propane-fired burners.

## 5.3 Physiography

The topography and vegetation at the Cigar Lake property are typical of the taiga forested lands common to the Athabasca Basin area of northern Saskatchewan. The area is covered with between 30 and 50 metres of overburden. The terrain is gently rolling and characterized by forested sand and dunes. Vegetation is dominated by black spruce and jack pine. Occasional small stands of white birches may occur in more productive and well-drained areas. Lowlands are generally well drained but can also contain some muskeg and poorly drained bog areas, with vegetation varying from wet, open non-treed vistas to variable density stands of primarily black spruce and tamarack, depending on moisture and soil conditions. Productive lichen growth is common to this boreal landscape, mostly associated with mature coniferous stands and treed bogs.

The mine site elevation is approximately 490 metres above sea level and Waterbury Lake is approximately 455 metres above sea level. The body of water known as Cigar Lake which, in part, overlays the deposit, is approximately 464 metres above sea level.

## 5.4 Local resources

The closest inhabited site is Points North Landing, 56 kilometres northeast by road from the Cigar Lake mine site, close to where the site access road connects to Provincial Road 905. The community of Wollaston Lake is approximately 80 kilometres by air east of the Cigar Lake site.

The Cigar Lake site is in close proximity to two other uranium milling operations: Orano’s McClean Lake operation is approximately 69 kilometres northeast by road, and Cameco’s Rabbit Lake operation is approximately 87 kilometres east by road.

Athabasca Basin community resident employees and contractors fly from various pick-up points to the mine site. Southern resident employees and contractors fly to site from Saskatoon with stop-over pick-up points in Prince Albert and La Ronge. Most employees and contractors are on a two-week-in and two-week-off schedule. Personnel are recruited on a preferential basis from northern Saskatchewan.

Site activities, such as mine development and construction work, are tendered to several northern owned or joint venture contractors, and major contractors that can hire qualified personnel from the major mining regions across Saskatchewan and Canada.

The Cigar Lake site is linked by road and by air to the rest of the province of Saskatchewan, facilitating easy access to any population centre for purchasing of goods at competitive prices. Saskatoon is a major population centre some 660 kilometres south of the Cigar Lake operation, with highway, rail and air links to the rest of North America.

## 5.5 Mine and infrastructure

Cigar Lake is a developed producing property with sufficient surface rights to meet its current mining operation needs. The Cigar Lake mine site contains all the necessary services and facilities to operate a remote underground mine, including personnel accommodation, access to water, airport, site roads and other necessary buildings and infrastructure.

**SITE FACILITIES**

- an underground mine with two shafts
- access road joining the provincial highway and McClean Lake
- site roads and site grading
- airstrip and terminal
- employee residence and construction camp
- Shaft No. 1 and No. 2 surface facilities
- freeze plants and brine distribution equipment
- surface freeze pads
- water supply, storage and distribution for industrial water, potable water and fire suppression
- propane, diesel and gasoline storage and distribution
- electrical power substation and distribution
- emergency power generating facilities
- compressed air supply and distribution
- mine water storage ponds and water treatment
- sewage collection and treatment
- surface and underground pumping system installation
- surface runoff containment infrastructure
- waste rock stockpiles and aggregate processing infrastructure
- garbage disposal landfill
- administration, maintenance and warehousing facilities
- ore load out facility
- concrete batch plant
- Seru Bay treated water effluent pipeline

***Water and electricity***

The Cigar Lake mine site has access to sufficient water from nearby Waterbury Lake for all planned industrial and residential activities. The site is connected to the provincial electricity grid with a 138-kilovolt overhead power line, and there are standby generators in case of power outages.

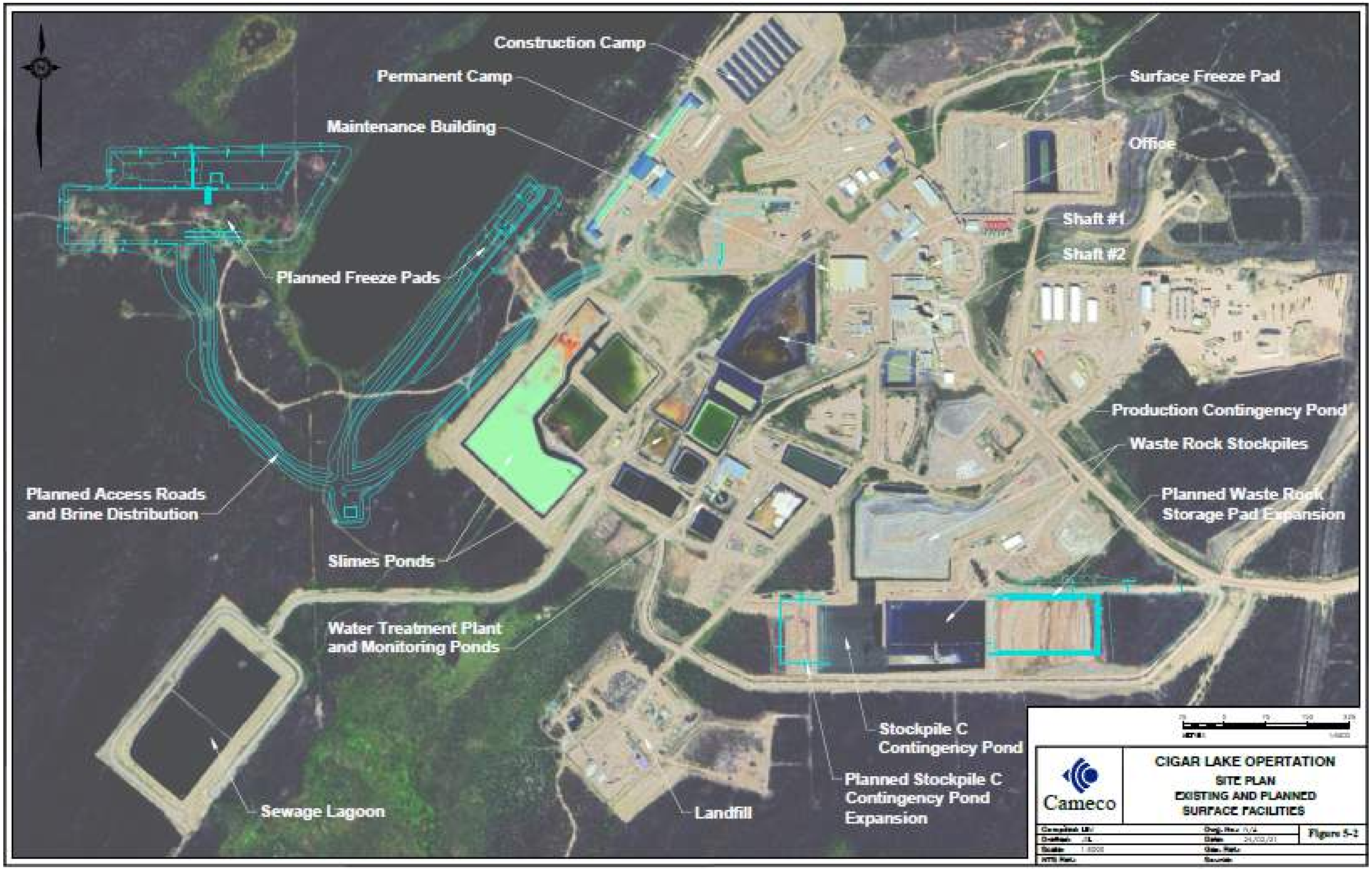
***Tailings and waste***

No tailings are stored at the Cigar Lake site since all ore mined is transported to Orano's McClean Lake mill for processing. The processing facility at the McClean Lake site is discussed in *Section 17*, and the TMF is discussed in *Sections 20.2* and *20.4*.

Waste rock piles from the excavation of the two shafts and all underground development are confined to a small footprint within the surface lease. The waste piles have been segregated into three types depending on the nature of the waste rock: The first is clean waste, which will remain at the mine site. The second is mineralized waste (>0.03% $U_3O_8$) contained on a lined pad, which is planned to be disposed of underground at the Cigar Lake mine. The third is potentially acid generating (PAG) waste rock, which will be temporarily stored at site on lined pads and will be transported to the Sue C pit at the McClean Lake facility for permanent disposal. Waste rock management is further discussed in *Section 20.4.*

A site plan of the existing and planned surface facilities is shown in *Figure 5-2.* A description of planned infrastructure for Cigar Lake can be found in *Section 18.1*.

FIGURE 5-2: SITE PLAN OF EXISTING AND PLANNED SURFACE FACILITIES



# 6 History

## 6.1 Ownership

There have been numerous changes in ownership of participating interests in the joint venture that governs Cigar Lake, the most recent of which occurred in 2022. The current owners and their participating interests in the CLJV are as follows:

- Cameco (54.547%)
- Orano (40.453%)
- TEPCO (5.000%)

**1976**

- Original joint venture established between Canadian Kelvin Resources Ltd. and Asamera Oil Corporation Ltd (Asamera) to explore the Keefe Lake area
  - Operator: Asamera

**1977**

- Saskatchewan Mining Development Corporation (SMDC) acquires 50% interest

**1979**

- Keefe Lake Joint Venture divides the Keefe Lake area into three separate project areas of Dawn Lake, McArthur River and Waterbury Lake (which includes a portion of the lands now known as Cigar Lake)

**1980**

- Joint venture agreement entered to govern exploration of the Waterbury Lake area
  - Operator: SERU (predecessor to Cogema Canada Ltd. (Cogema))

**1985**

- Waterbury Lake Joint Venture Agreement terminated and replaced by a new joint venture agreement, which divided the Waterbury Lake area into the Waterbury Lake lands and the Cigar Lake lands
  - Participating interests: SMDC (50.75%), Cogema (32.625%), Idemitsu (12.875%), Corona Grande Exploration Corporation (3.75%)
  - Operator (Waterbury Lake lands): Cogema
  - Operator (Cigar Lake lands): Cigar Lake Mining Corporation (CLMC)

**1988**

- Eldorado Resources Limited and SMDC merge to form Cameco

**2002**

- Cigar Lake reorganization takes place, and three agreements are entered into:
  - CLJV established to govern further exploration, development and production from the Waterbury Lake lands and the Cigar Lake lands
    - Joint venture owners: Cameco (50.025%), AREVA (37.1%), Idemitsu (7.875%), TEPCO (5%)
    - Operator (Waterbury Lake lands, includes claims No. S-106540 to 106557 and 106559 to 106564): AREVA

- Mine Operating Agreement established as part of reorganization, which engages Cameco as mine operator for the Cigar Lake mine property (which includes ML 5521, the Cigar Lake surface lease and the mine)
- Contract Exploration Agreement established, which engages AREVA (now Orano) as contract exploration operator to operate the Cigar Lake exploration property (Claim No. 106558 as well as the area of ML 5521 from which mineral reserves are not mined)

**2022**

- In May, Cameco and Orano reach agreement with Idemitsu to acquire its 7.875% participating interest in the CLJV, increasing Cameco's ownership stake to 54.547%

## 6.2 Exploration and development history

**1970s**

- Asamera (operator of the Keefe Lake Joint venture) conducts exploration work:
  - Lake sediment and water geochemistry, airborne magnetic and Input (Questor) surveys, airborne radiometric and VLF (Geoterrex) surveys, gravimetric (Kenting) and seismic surveys
- After the division of the Keefe Lake area into three separate projects, Cogema, (operator of the Waterbury joint venture) revisits all field survey results and conducts complementary exploration work:
  - Lake-bottom sediment geochemistry and airborne high resolution magnetic (Geoterrex) surveys, regional geology photointerpretation as well as outcrop and overburden mapping and sampling activities conducted across the mineral property
  - Ground geophysical surveys allowed depth and conductivity evaluation of geological formations using electromagnetic frequency (Geoprobe EMR-16) and time (Crone DEEPEM) methods

**1980s**

- Definition drilling programs conducted throughout the 1980s
- 1980 – 81: during the winter months, detailed DEEPEM work activity intensifies, targeting several Waterbury Lake zones with conductor structures previously identified, which are systematically drilled
- May 9, 1981: high-grade mineralized core is recovered from hole WQS2-015, which was the last hole planned to be drilled for the winter program
- October 21, 1987: test mine proposal to assess conditions and to field test new mining methods approved
- 1987 – 1992: test mining, including the sinking of Shaft No. 1 to a depth of 500 metres and lateral development on three levels takes place

**1990s**

- September 1992: Government Environmental Review Panel guidelines are issued for the Cigar Lake project by the Joint Federal-Provincial Panel (the Panel) on Uranium Mining Developments in Northern Saskatchewan. Later the same year, consulting firms are hired to perform engineering studies and, at the same time, metallurgical and environmental testing programs are launched
- 1993: mine site activities are placed on a care and maintenance basis and initial engineering studies for development and operation of the property based on the jet boring mining method

are started. These and other engineering studies are completed between 1993 and 1996. Several additions and improvements to site infrastructure are also performed

- 1997: detailed engineering studies are undertaken for the purpose of developing a feasibility study of the mining project. In addition, testing of a specially designed tunnel boring machine with capability to install a high-strength concrete liner (or mine development system) is conducted. In conjunction with this work, significant mine development is also carried out
- 1998: after an environmental review, carried out from 1996 to 1997, the Panel issues recommendations to the federal and provincial governments and the CLJV that the project proceed to the next stage of licensing. In April 1998, both governments respond favourably to the recommendations
- 1999: the specially designed jetting tools for the jet boring machine are successfully tested within a three-metre diameter culvert lined raise, filled with simulated ore

**2000s**

- 2000: activities at the mine site are focused on the testing of several tools and systems forming the basis of the future mining method, and the jet boring system is successfully tested in waste and frozen ore
- December of 2000: the mine site is again placed on a care and maintenance basis
- May 2001: feasibility study is completed, targeting peak annual production of 18 million pounds $U_3O_8$ for CL Main
- 2002: Cameco becomes mine operator
- December 2004: the CLJV approves development of Cigar Lake and construction of the project begins in January 2005
- 2006: Two water inflow incidents delay development. Work to remediate the underground development areas begins but is interrupted by another inflow in 2008

**2010s**

- 2010: Complete dewatering of underground development areas and backfilling of the 465-metre level. Underground development in the south end of the mine resumes
- 2011: Regulatory approval of mine plan is received
- 2013: Jet boring in ore begins and first Cigar Lake ore is shipped to McClean Lake mill for processing into uranium concentrate
- 2015: Commercial production is declared
- Definition drilling programs conducted at CLEXT

**2020s**

- 2020: Temporary production suspensions implemented in March as a precautionary measure due to the COVID-19 pandemic. Production resumes in September. Production is again temporarily suspended in December
- 2021: Announced plans to restart production in April 2021
- 2022: Announced plans to reduce production to 13.5 million pounds per year (100% basis) starting in 2024. Acquired additional 4.522 percentage points in Cigar Lake, increasing Cameco’s interest to 54.547%. Completion of prefeasibility study for CLEXT
- 2023: Surface freeze drilling at CL Main completed. Production plan updated to maintain 18 million pounds per year (100% basis) in 2024

## 6.3 Historical mineral resource and mineral reserve estimates

There are no historical estimates within the meaning of NI 43-101 to report.

## 6.4 Historical production

Historical mine production from the Cigar Lake deposit was initially from test mining in ore conducted during three separate test mining programs:

- boxhole boring of two cavities in 1991
- jet boring tests No. 1, 2 and 3 in 1992
- jet boring industrial tests in 2000: four cavities in waste and four cavities in ore

The mineralized material from the historical production tests, amounting to 767 tonnes at 17.4% $U_3O_8$, was sent to the McClean Lake mill and processed.

Cigar Lake mine production by the jet boring method and McClean Lake mill production from Cigar Lake to year-end 2023 is shown in *Table 6-1* below.

### TABLE 6-1: CIGAR LAKE HISTORICAL PRODUCTION (100% BASIS)

| | Mine Production | | | McClean Lake Packaged Production |
|---|---|---|---|---|
| **Year** | **Total tonnes (x 1,000)** | **Grade % $U_3O_8$** | **M lbs $U_3O_8$** | **M lbs $U_3O_8$** |
| 2013-2014 | 3.3 | 7.16 | 0.5 | 0.3 |
| 2015 | 30.3 | 20.03 | 13.4 | 11.3 |
| 2016 | 37.3 | 21.56 | 17.7 | 17.3 |
| 2017 | 36.5 | 22.24 | 17.9 | 18.0 |
| 2018 | 43.1 | 19.00 | 18.0 | 18.0 |
| 2019 | 46.1 | 17.86 | 18.1 | 18.0 |
| 2020 | 24.6 | 17.34 | 9.4 | 10.1 |
| 2021 | 34.3 | 16.60 | 12.5 | 12.2 |
| 2022 | 53.7 | 15.76 | 18.7 | 18.0 |
| 2023 | 48.8 | 14.09 | 15.2 | 15.1 |

# 7 Geological setting and mineralization

## 7.1 Regional geology

The Cigar Lake uranium deposit is located approximately 40 kilometres west of the eastern margin of the Athabasca Basin of northern Saskatchewan (*Figure 7-1*). Like other major uranium deposits of the basin, it is located at the unconformity contact separating late Paleoproterozoic to Mesoproterozoic sandstone of the Athabasca Group from middle Paleoproterozoic metasedimentary gneiss and plutonic rocks of the Wollaston Group.

The Athabasca Group appears largely undeformed and its maximum preserved thickness is about 1,500 metres. The Manitou Falls (MF) Formation, within the Athabasca Group, was deposited in an intra-continental sedimentary basin that was filled by fluviatile terrestrial quartz sandstone and conglomerate. On the eastern side of the basin, the sandstone units of the MF Formation, and the Wollaston Group metasedimentary gneiss that unconformably lie immediately beneath them, host most of the uranium mineralization. This sandstone which overlies the basement rock contains large volumes of water at significant pressure.

The Lower Pelitic unit of the Wollaston Group, which lies directly on the Archean granitoid basement, is considered to be the most favourable unit for uranium mineralization. During the Hudsonian orogeny (1800 – 1900 million years), the group underwent polyphase deformation and upper amphibolite facies metamorphism, with local greenschist facies retrograde metamorphism. The Hudsonian orogeny was followed by a long period of erosion and weathering along with the development of a paleoweathering profile that is locally preserved at, and beneath, the unconformity.

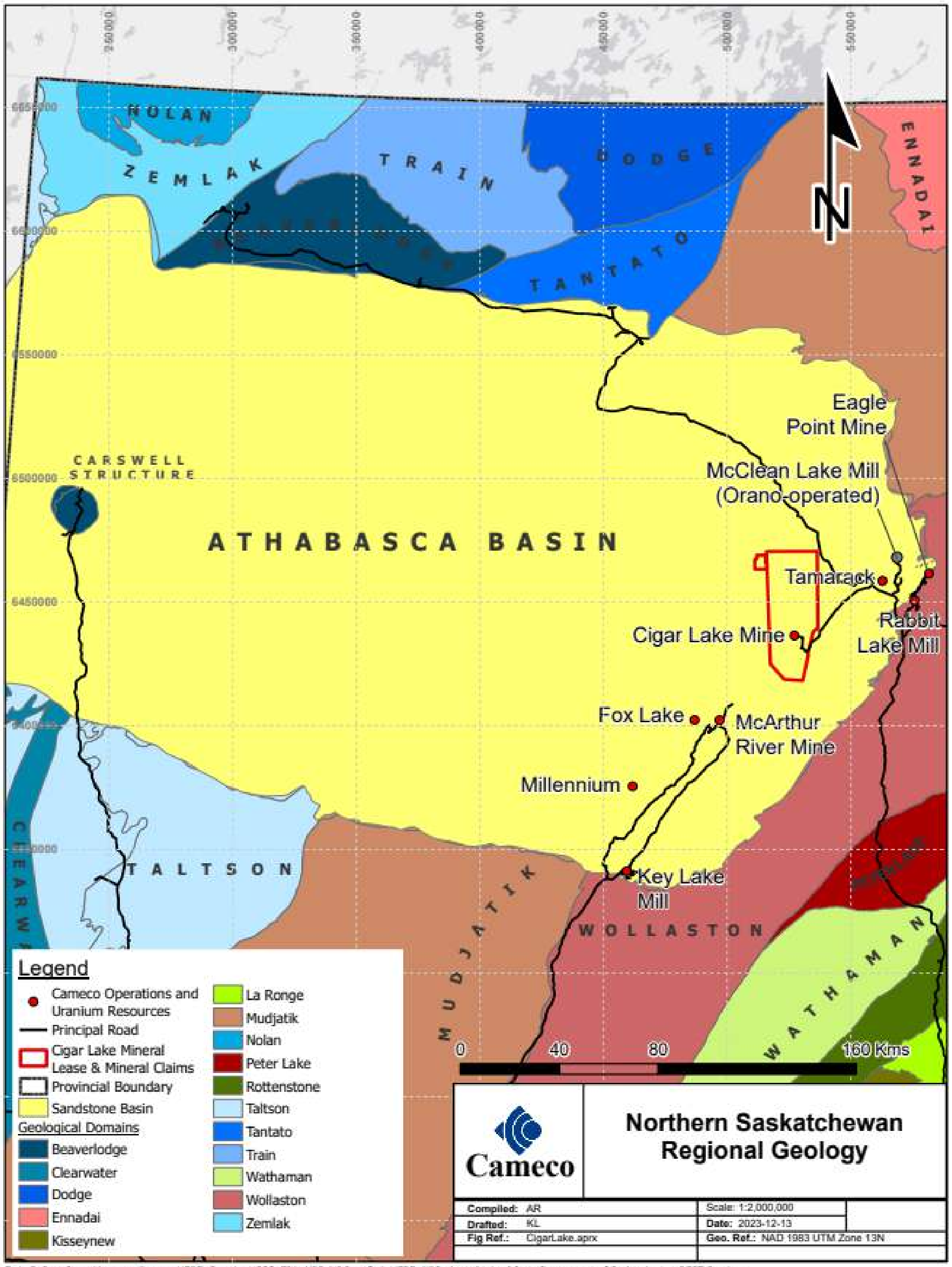
## 7.2 Local geology

In the Cigar Lake area, the MF Formation is 420 to 445 metres thick and corresponds to members MFd, MFc, and MFb. The MFb member hosts the Cigar Lake deposit, which is positioned atop an east-west trending 20-metre basement high. Overburden in the project area ranges up to a thickness of 50 metres.

Two major lithostructural domains are present in the metamorphic basement of the larger Waterbury/Cigar Lake property. These are as follows (*Figure 7-1*):

- Wollaston Domain: a southern area composed mainly of metasedimentary gneiss overlying Archean granitoids, with an overall northeast-trending structural orientation
- Mudjatik Domain: a northern area with large Archean granitoid domes and lesser inliers of metasedimentary gneiss with a dome and basin structural morphology

FIGURE 7-1: GEOLOGICAL MAP OF NORTHERN SASKATCHEWAN



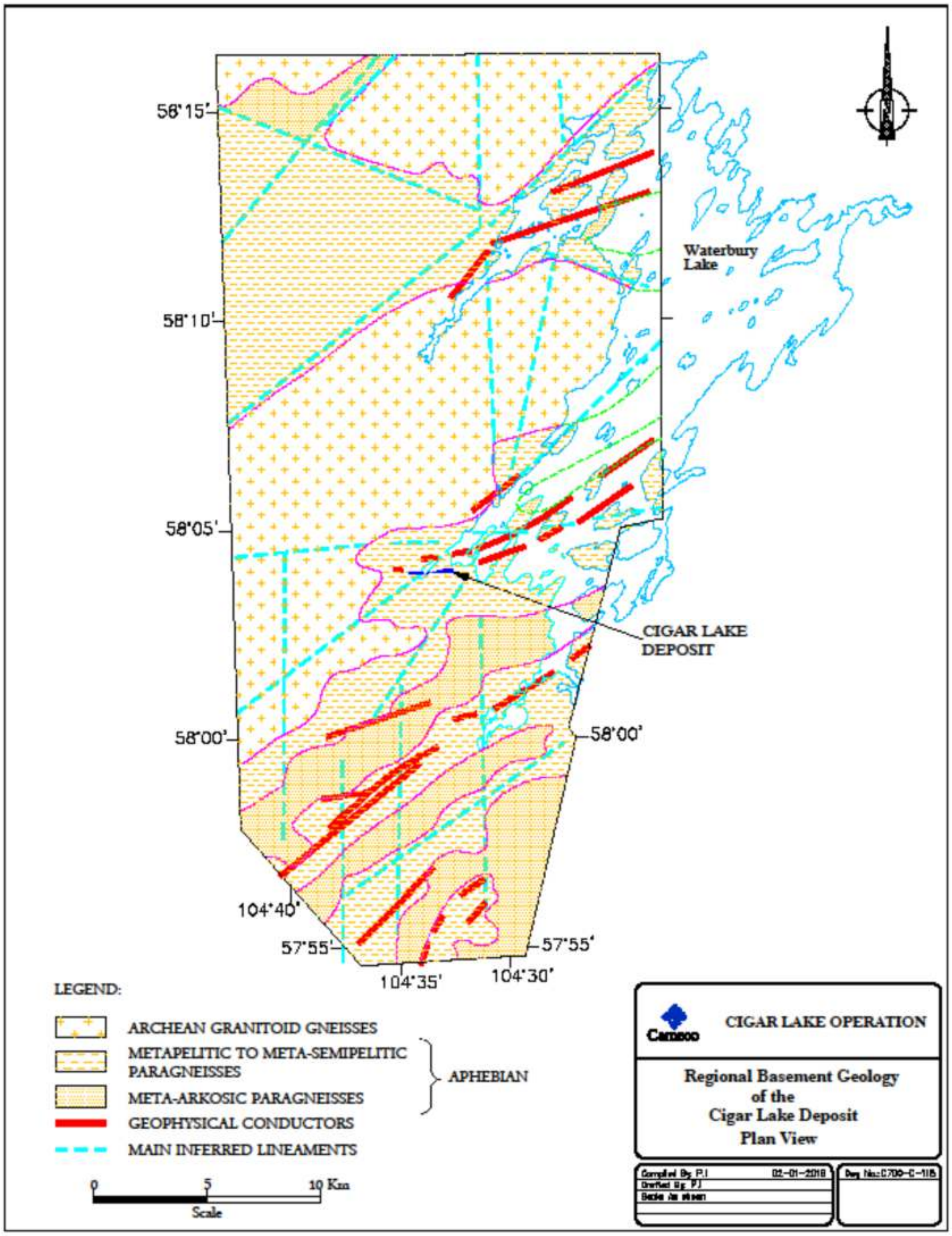

Esri, © OpenStreetMap contributors, HERE, Garmin, USGS, EPA, NPS, NRCan, Esri, HERE, NPS, data obtained from Government of Saskatchewan REST Service

The Cigar Lake east-trending psammopelitic to pelitic unit, which underlies the deposit, is located in the transitional zone between the two basement domains. The metamorphic basement rocks in this unit consist mainly of biotite, graphite and lesser amounts of calc-silicate paragneisses, which are inferred to be part of the Wollaston Group's Lower Pelitic sequence. Graphite and pyrite-rich “augen gneiss”, an unusual facies within the graphitic pelite gneiss, occurs primarily below the Cigar Lake deposit (*Figure 7-2*).

The mineralogy and geochemistry of the graphitic gneiss suggest that they were originally carbonaceous shales. The abundance of magnesium in the intercalated carbonate layers indicates an evaporitic origin.

The structural framework in the Cigar Lake mine area is dominated by large northeast-trending lineaments and wide east-trending mylonitic corridors. The unconformable contact between these mylonites, which contain the augen gneiss, and the overlying Athabasca sandstone, are considered to be the most favourable features for the concentration of uranium mineralization, specifically where graphitic basement fault zones were locally reactivated as brittle faults after sandstone deposition.

FIGURE 7-2: CIGAR LAKE - REGIONAL BASEMENT GEOLOGY




## 7.3 Property geology

The Cigar Lake uranium deposit, which has no direct surface expression, is located at the unconformity between the middle Paleoproterozoic Wollaston Group metasediments and the late Paleoproterozoic to Mesoproterozoic Athabasca Group, between 410 and 450 metres below surface. It has the shape of a flat, elongated lens, approximately 1,950 metres in total length, 25 to 100 metres in width, and ranges up to 15.7 metres thick, with an average thickness of about 5.4 metres. It shows longitudinal and lateral geological continuity. It has a crescent-shaped cross-sectional outline that closely reflects the topography of the unconformity. The deposit is subdivided into the eastern CL Main and the western CLEXT zones. CL Main is further divided into the East and West Pods.

The deposit and host rocks consist of three principal geological and geotechnical elements:

- the deposit itself
- the overlying sandstone
- the underlying metamorphic basement rocks

The MF Formation is 420 to 445 metres thick. The basement lithological domains consist of:

- a variably graphitic pelite unit located directly below the deposit
- a biotite pelite unit located to the south of the deposit area within which most of the mine access infrastructure is located
- a minor calc-silicate rich unit located near the boundary between the graphitic and biotite pelites

The graphitic pelite unit has been further divided into two sub-domains, including a graphite and sulphide-rich portion located directly below the uranium mineralization that has undergone variable and locally significant shear deformation, and a lesser graphite-rich portion that contains significantly less sulphides and shows less shear deformation. *Figures 7-3 and 7-4* depict the basement lithological domains in the immediate vicinity of the CL Main and CLEXT mineralization.

The structural framework in the Cigar Lake area is dominated by an east-west trending protomylonitic zone containing numerous steeply dipping, east-striking fault zones. Directly below the ore zone, these east-striking faults consist of graphitic breccia zones that are up to several metres wide and largely coincide with the 20-metre basement high, along which the uranium mineralization is located. This area of east-striking faults generally controls the most extensive clay alteration observed within the Cigar Lake area, both at the mineralized horizon and down to the 500L.

The deposit is surrounded by a strong alteration halo affecting both sandstone and basement rocks, characterized by extensive development of Mg-Al rich clay minerals (illite-chlorite). This alteration halo in the sandstone is centred on the deposit and reaches up to 200 metres in width and 250 metres in height, tapering with elevation. In the basement rocks, this zone extends in the range of 200 metres in width and as much as 100 metres in depth below the deposit. The mineralization is hosted principally by the Athabasca Group and consists mainly of uraninite and pitchblende along with nickel and cobalt arsenides (Bruneton, 1983).

*Figure 7-5* shows a schematic geological cross-section of the CL Main deposit that illustrates the shape of the deposit, fault structures, the main fracture zone and the clay alteration halo in the sandstone and the basement rocks.

FIGURE 7-3: BASEMENT GEOLOGY OF THE CL MAIN AREA RELATIVE TO MINERALIZATION

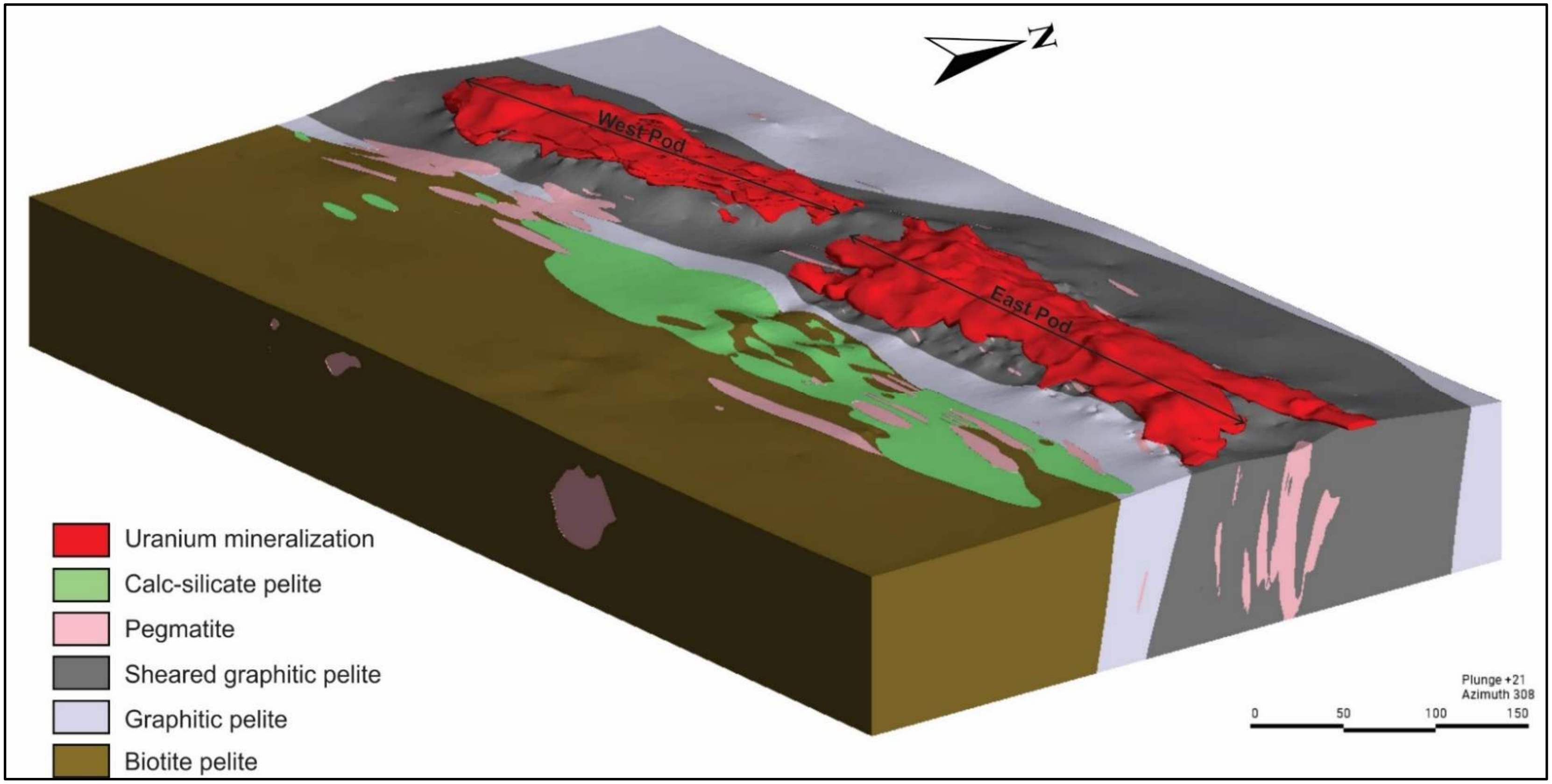


FIGURE 7-4: BASEMENT GEOLOGY OF THE CLEXT AREA RELATIVE TO MINERALIZATION

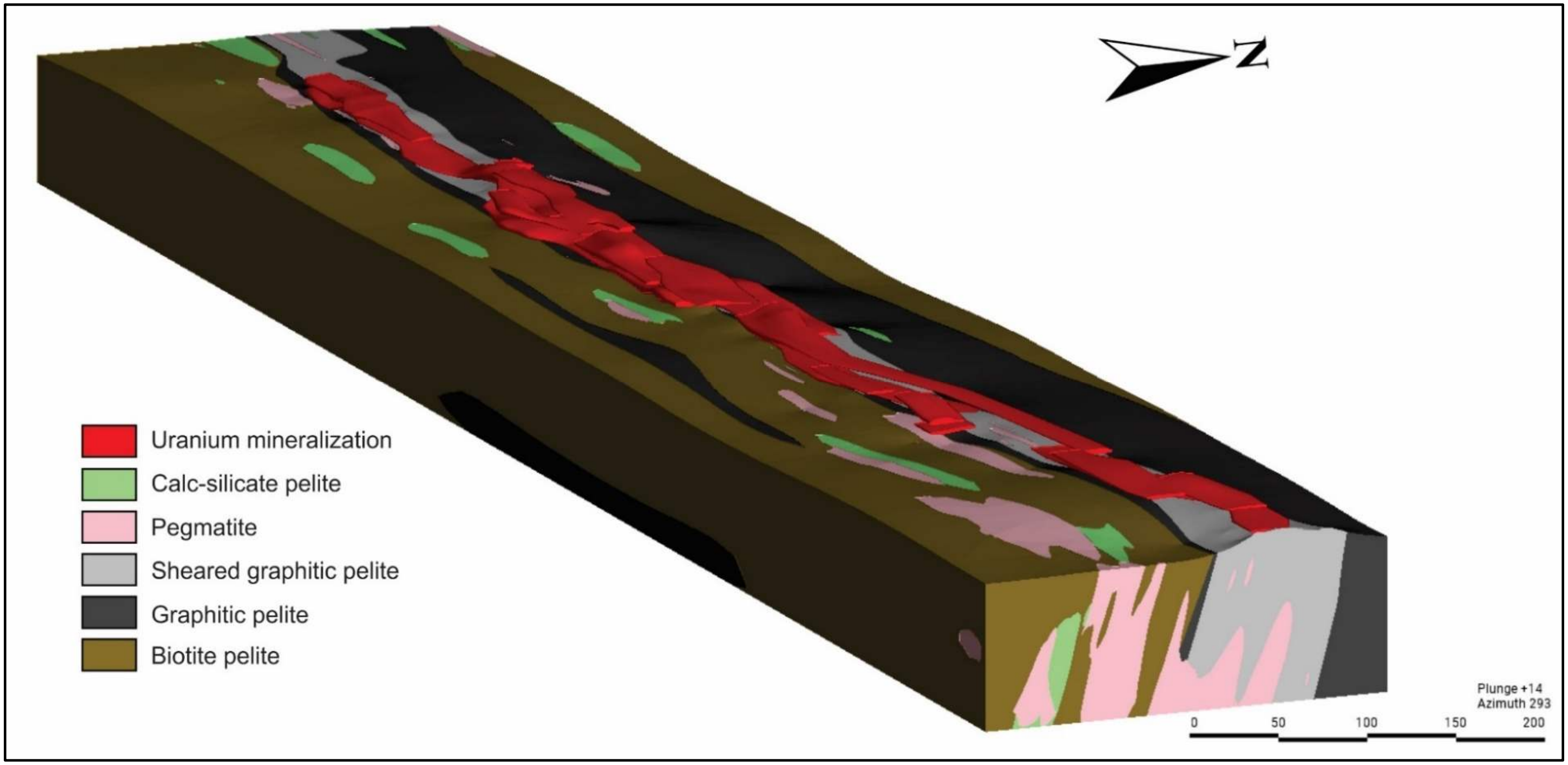
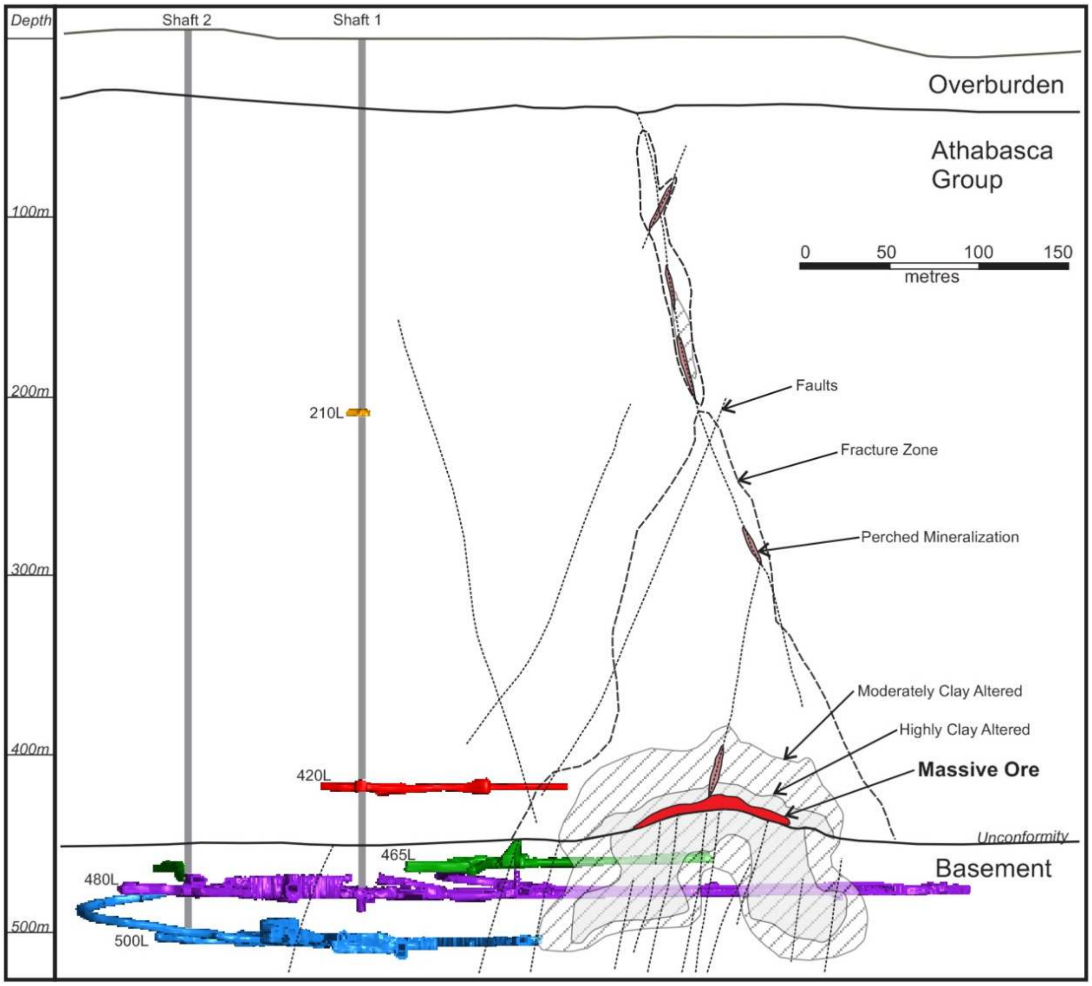


FIGURE 7-5: CL MAIN DEPOSIT - SCHEMATIC CROSS SECTION LOOKING WEST




## 7.4 Mineralization

Two distinct styles of mineralization occur within the Cigar Lake deposit (*Figure 7-5*):

- high-grade mineralization at or proximal to the unconformity ("unconformity" mineralization), which includes all of the mineral resources and mineral reserves
- low-grade, fracture controlled, vein-like mineralization which is located either higher up in the sandstone ("perched" mineralization) or in the basement rock mass

The high-grade mineralization located in proximity to the unconformity contains the bulk of the total uranium metal in the deposit and currently represents the only economically viable style of mineralization, in the context of the selected mining method and ground conditions. It is characterized by the occurrence of massive clays and very high-grade uranium concentrations.

The unconformity mineralization consists primarily of three dominant rock and mineral facies occurring in varying proportions. These are quartz, clay (primarily chlorite with lesser illite) and metallic minerals (oxides, arsenides, sulphides). In the relatively higher grade eastern CL Main zone, the ore consists of approximately 50% clay matrix, 20% quartz and 30% metallic minerals, visually estimated by volume. In this area, the unconformity mineralization is overlain by a weakly mineralized contiguous clay cap 1 to 10 metres thick. In the western CLEXT zone, the proportion changes to approximately 20% clay, 60% quartz and 20% metallic minerals.

While pre- and post-mineralization faulting played major roles in creating preferential pathways for uranium-bearing fluids and, to some extent, in remobilizing uranium, the internal distribution of uranium within the unconformity mineralization has likely been largely controlled by geochemical processes. This is reflected in the continuity and homogeneity of the mineralization and its geometry, particularly in the eastern part of the deposit. A very sharp demarcation exists between well mineralized and weakly mineralized rocks, both at the upper and particularly at the lower surface of the deposit.

Uranium oxide in the form of uraninite and pitchblende occurs in both a sooty form and as botryoidal, metallic masses. It occurs as disseminated grains in aggregates ranging in size from millimetres to decimetres, and as massive metallic lenses up to a few metres thick in a matrix of sandstone and clay. Coffinite (uranium silicate) is estimated to form less than 3% of the total uranium mineralization. The mineralized rock is variably black, red and/or green in colour.

Uranium grades of the unconformity mineralization range up to 86% $U_3O_8$ for a 0.5 metre interval from a drillhole intersection within the mining area. Geochemically, the deposit contains quantities of the elements nickel, copper, cobalt, lead, zinc, molybdenum, arsenic and rare earth elements, but in non-economic concentrations. Higher concentrations of these elements are associated with massive pitchblende or massive sections of arseno-sulphides. Primary age of the unconformity mineralization has been estimated at 1.3 billion years.

The deposit has been subjected to faulting after its formation, which has contributed to the formation of vein-type mineralization that has been termed “perched” within the sandstone and vein-type mineralization within the basement. These mineralized bodies form, volumetrically, a very small part of the total mineralized rock and are currently of no economic significance.

# 8 Deposit types

Cigar Lake is an unconformity-related uranium deposit. Deposits of this type are believed to have formed through an oxidation-reduction reaction at a contact where oxygenated fluids meet with reducing fluids. That contact broadly coincides with the unconformity surface. The Cigar Lake deposit occurs at the unconformity contact between rock of the Athabasca Group and underlying Wollaston Group, an analogous setting to the Key Lake, McClean Lake, Collins Bay and McArthur River deposits. It shares many similarities with these deposits, including general structural setting, mineralogy, geochemistry, host rock association and the age of the mineralization; however, it is distinguished by its flat-lying geometry, size, the intensity of its alteration process, the high degree of associated hydrothermal clay alteration and the presence of massive, extremely rich, high-grade uranium mineralization.

The Cigar Lake deposit is similar to the McArthur River deposit in that the sandstone that overlies the basement rock contains large volumes of water at significant pressure. Unlike McArthur River, however, this deposit is flat-lying with the ore zone being overlain by variably developed clay alteration as opposed to silica enrichment.

# 9 Exploration

The Cigar Lake deposit is located within ML 5521, which is surrounded by 38 mineral claims. Orano is responsible for all exploration activity on these claims, as per the CLJV agreements. *Section 9.1* is a synopsis of exploration activities on the 38 mineral claims. For the purpose of the discussion in that section, the 38 mineral claims are called the Waterbury Lake lands. *Section 9.2* is a summary discussion of geophysical programs that have been conducted by Cameco on behalf of the CLJV within ML 5521 since the October 2006 water inflow.

Drilling activity is described in *Section 10.*

## 9.1 ORANO 1980 – present

From 1980 to 1986, SERU (which became Cogema in 1984, AREVA in 2006 and subsequently Orano in 2018) completed various airborne and ground geophysical programs, lake sediment and water sampling programs and substantial diamond drilling. The Cigar Lake uranium deposit was discovered in 1981, on lands now covered by ML 5521, by a regional program of diamond drill testing of geophysical anomalies (electromagnetic conductors) located by airborne and ground geophysical surveys.

All exploration activities ceased after the 1986 field season for a period of 12 years until work on the Waterbury Lake lands recommenced in 1999. After initially focusing upon data compilation and a review of all work conducted to date, new exploration has focused upon developing further understanding of the Cigar trend, and developing knowledge of the large, unexplored parts of the project. Concurrent with this new work, a program of reboxing, relogging and sampling of historical exploration drillholes was undertaken to develop a further understanding of the Cigar Lake mineralization, alteration processes and structural setting to aid with near-mine and greenfields exploration on the project.

Electromagnetic (EM) and resistivity surveys have been used as the primary exploration geophysical tools with a variety of surveys conducted. EM surveys starting with an airborne GEOTEM survey in 1999 have consisted of Moving Loop UTEM, Fixed Loop TEM, moving loop transient electromagnetic induction coil (ML-TEM), and Moving Loop SQUID transient EM. ML-SQUID TEM has been the dominant EM survey type since 2011. Dipole-Pole-Dipole DC resistivity is heavily used on the Power Line grid, as EM is not possible with the presence of the high voltage transmission line. Pseudo 3D resistivity surveys were completed along a portion of the Cigar trend and the Kelly Bay grid, with limited success.

Ground geophysics has been completed on a number of grids and has produced drill-ready targets. These areas include Cigar East, Cigar West, Cigar Southwest, Contact Conductor, Powerline East, Powerline Central, Powerline West, Tucker East, Waterbury Central, Waterbury North and Waterfound grid areas. The 2019 VTEM survey helped to identify areas for future ground geophysical work, to infill existing coverage, modernize existing data sets, or in some cases, as a first pass ground survey. Areas identified for future ground geophysical work include Tucker East, Andrew Lake, Kelly Bay, Johnston East, Waterbury Central, Waterbury North and the Johnston North grid areas.

Numerous spectral clay and geochemistry sampling, core reviews and core box replacement programs have been completed throughout the history of the project. These have included both reconnaissance exploration drill holes and numerous drill fences through the Cigar Lake orebody.

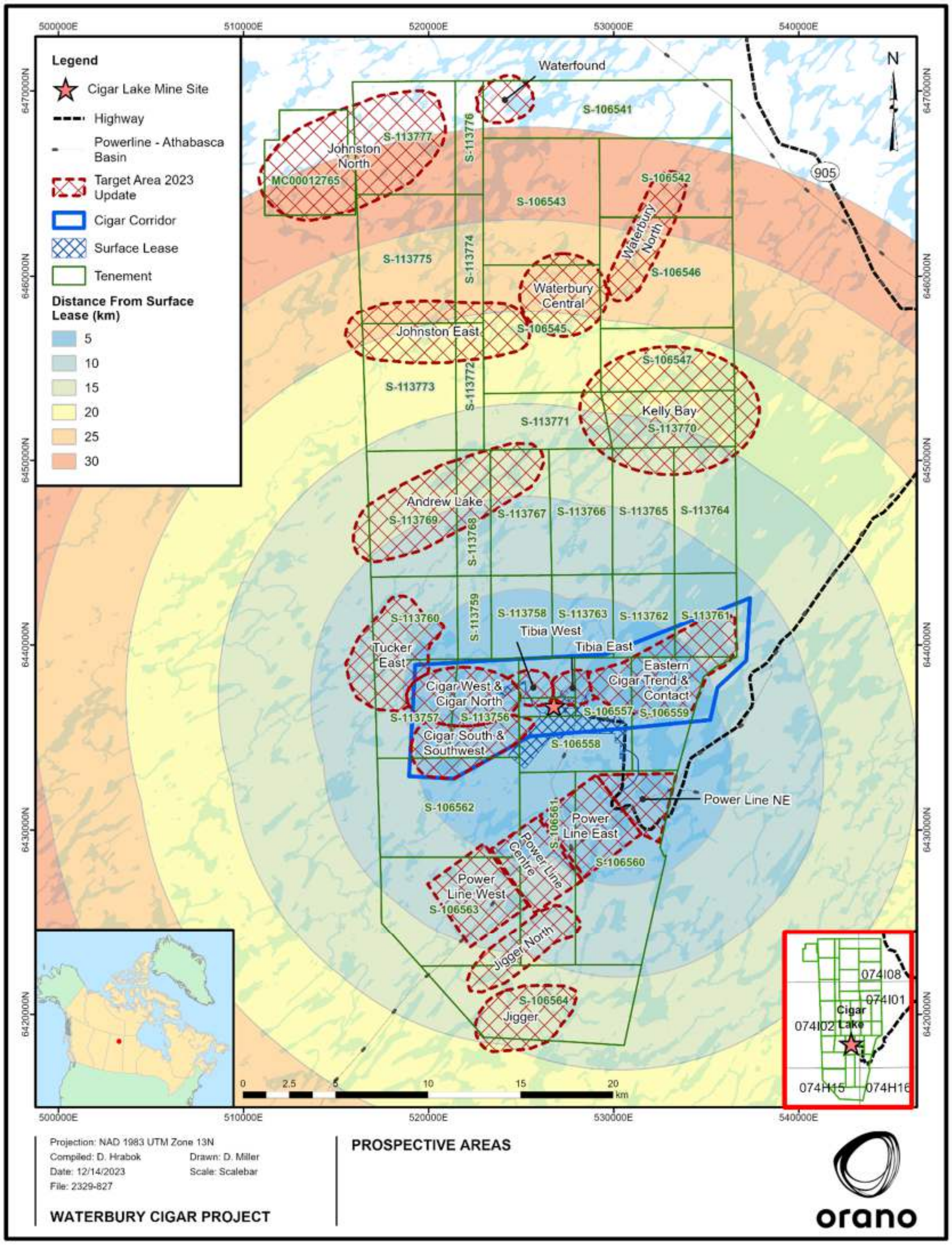
A property-wide boulder lithogeochemistry survey was completed in 2000.

Diamond drilling programs have focused mainly on the Cigar Lake corridor, with specific attention on Cigar East, Cigar North, Tibia, and Tibia East zones. Grids outside of the Cigar Lake corridor, Power Line trend, Jigger and Jigger North, Andrew Lake, Kelly Bay, and Waterbury North, were drilled with varying intensity through the history of the project.

In 2006, drill hole WC-244 discovered the Cigar East zone that is located outside ML 5521, approximately 650 metres east of CL Main mineralization. Further exploration has been conducted in this area since 2006 and has delineated a zone of unconformity style uranium mineralization approximately 210 metres in length and 30 metres in width. No mineral resource has been reported for the Cigar East zone.

A figure displaying the location of all current exploration work areas outside of ML 5521 is included as *Figure 9-1*. A list of all work completed outside of ML 5521 between 1980 and 2023 is included as *Table 9-1*.

## FIGURE 9-1: EXPLORATION WORK AREAS OUTSIDE OF ML 5521



## TABLE 9-1: SUMMARY OF EXPLORATION OUTSIDE OF ML 5521

| Year | Diamond drillholes | | Airborne geophysics | | Ground geophysics | | Other exploration |
|---|---|---|---|---|---|---|---|
| | # holes | Metres drilled | Type | Line km | Type | Line km | Type |
| **1980** | | | Magnetic VLF and radiometric survey | Project-wide | EM soundings DEEPEM | 60 | |
| **1981** | 13 | 5,208 | | | DEEPEM | 134 | Lake sediment sampling |
| **1982** | 4 | 1,845 | | | DEEPEM | 588 | Lake sediment sampling |
| | | | | | EM-37 | 28 | |
| | | | | | Gravity | 59 | |
| **1983** | 4 | 2,616 | INPUT | 2,685 km | DEEPEM | 545 | Lake sediment sampling |
| **1984** | 4 | 1,657 | | | | | |
| **1985** | 14 | 7,132 | | | DEEPEM | 120 | Lake sediment sampling |
| **1986** | 17 | 8,113 | | | | | |
| | 38 | 2,138 | | | DEEPEM | 135 | Shallow geochemistry |
| **1987-1998** | No exploration activities | | | | | | |
| **1999** | | | | | | | Data compilation, structural study, re- logging and resampling of historical drill core |
| **2000** | | | GEOTEM | 3,587 km | | | Boulder lithogeochemistry on most of the property |
| **2001** | | | | | Moving Loop EM | 26 | |
| | | | | | Fixed Loop EM | 57 | |
| | | | | | Pole-pole DC 2D Resistivity | 5 | |
| **2002** | 2 | 1,150 | | | Pole-pole 2D Resistivity | 16 | |
| | | | | | EScan Pole-pole DC3D Resistivity | 51 | |
| **2003** | 4 | 1,790 | | | UTEM Moving Loop EM | 11 | Historical drill core logging and resampling |
| **2004** | | | | | Moving Loop EM | 29 | Historical drill core logging and resampling |
| | | | | | Pole- pole DC 2D Resistivity | 18 | |
| **2005** | 3 | 1,680 | | | | | |
| **2006** | 7 | 4,075 | | | Pole- pole DC 2D Resistivity | 84 | Historical drill core logging and resampling |
| **2007** | 12 | 6,044 | FALCON gravity magnetic and radiometric surveys | Project-wide | Moving Loop EM | 11 | Historical drill core logging and resampling |
| **2008** | 12 | 5,492 | High resolution magnetic gradiometer survey | Project-wide | Pole- pole DC 2D Resistivity | 86 | Historical drill core logging and resampling |
| | | | | | Fixed Loop EM | 51 | |

| Year | Diamond drillholes | | Airborne geophysics | | Ground geophysics | | Other exploration |
|---|---|---|---|---|---|---|---|
| | # holes | Metres drilled | Type | Line km | Type | Line km | Type |
| **2009** | 14 | 7,733 | | | Fixed Loop EM | 51 | Historical drill core logging and resampling |
| | | | | | Small Moving Loop EM | 44 | |
| | | | | | Pole- pole DC 2D Resistivity | 51 | |
| **2010** | 15 | 8,040 | | | | | Relogging and resampling of historical drill core |
| **2011** | 11 | 5,366 | | | Moving loop EM | 37 | |
| | | | | | Moving loop EM | 44 | |
| **2012** | 10 | 4,108 | | | Dipole-pole-dipole DC Resistivity | 89 | Re-sampling and re-boxing of historical drill core |
| | | | | | Moving loop EM | 32 | |
| **2013** | 16 | 8,040 | | | Dipole-pole-dipole DC Resistivity | 80 | Re-sampling and re-boxing of historical drill core |
| | | | | | Moving loop EM | 37 | |
| **2014** | 19 | 9,044 | | | Dipole-pole-dipole DC Resistivity | 68 | |
| | | | | | Moving loop EM | 63 | |
| **2015** | 24 | 12,456 | | | Stepwise moving loop EM | 4 | |
| | | | | | ML-SQUID TEM | 108 | Petrography samples and Hyperspectral scanning of drill core |
| **2016** | 25 | 13,302 | | | Swath Resistivity | 67.7 | |
| | | | | | ML-SQUID TEM | 8.95 | |
| **2017** | 30 | 16,937 | | | DC Resistivity | 135.2 | Relogging program of Cigar North drill holes. |
| **2018** | 27 | 14,634 | VTEM | 3990.0 | ML-SQUID TEM | 35.9 | |
| **2019** | 28 | 14,904 | | | ML-SQUID TEM | 54.3 | |
| | | | | | ML-SQUID TEM | 11.9 | Water hammer drill test holes (included in reported meterage) |
| **2020** | 13 | 6,180 | | | DC Resistivity | 17.5 | |
| **2023** | 14 | 5,068 | | | | | Borehole EM (WC-592) |
| **Total** | **380** | **174,753** | | | | **3,153** | |

*Source: Orano*

## 9.2 Cameco 2007 – present

After the 2006 water inflow events, it was recognized that more detailed geophysical information in the immediate deposit area was required. The initial focus was to gain an understanding of the structure associated with the Shaft No. 2 inflow. Ground surveys, including gravity, TITAN (DC/IP resistivity and magnetotelluric survey), and VLF electromagnetic surveys were conducted in the summer of 2007 over a portion of the CL Main area of the deposit.

In the fall of 2007, a supplementary geophysical program was conducted over a portion of the CL Main area of the deposit to identify major structures within the sandstone column. The survey was conducted in six boreholes to produce three vertical seismic profiles and six single-hole side-scan seismic surveys around the mine site to meet these objectives. Both survey designs are best for optimally imaging vertical to sub-vertical structures at various scales based on their input frequencies.

In 2015, Cameco conducted a geotechnical drill program consisting of nine surface diamond holes (drilled to a vertical depth of 525 metres) over the western portion of the CL Main deposit. Downhole cross-well seismic was done within these boreholes to image major fault structures and geotechnical characteristics of this portion of the deposit.

The knowledge gained of structures and fault zones, identified through the correlation of all the geophysical datasets, particularly seismic, with geological mapping and engineering parameters has allowed for better mine planning and mitigation of potential risk.

# 10 Drilling

## 10.1 Surface drilling

Surface drilling on the Waterbury Lake lands conducted by Orano and its predecessor companies since 1981 is presented in *Table 9-1*. Initial exploration activities by SERU were conducted in the southern region of the Waterbury Lake lands near Jigger Lake. Thirteen exploration drillholes (totaling 5,208 metres) were completed prior to the discovery hole during the first drilling campaign in 1981, eight of which were drilled on the Q17 grid (Jigger Lake). The last drillhole (WQS2-015), completed to a depth of 563 metres in 1981, was located on the QS-2 grid south of Cigar Lake and was the discovery hole for the Cigar Lake uranium deposit.

The deposit was subsequently delineated by surface diamond drilling during the period 1982 to 1986 and was followed by several small campaigns of drilling to gather geotechnical and infill data between 1986 and 2007. Additional drilling campaigns were conducted by Cameco after 2007 which targeted a broad range of technical objectives, including geotechnical, geophysical, delineation and ground freezing. Since 2012, diamond drilling managed by Cameco has mainly focused on underground geotechnical and surface ground freezing programs on CL Main along with continued delineation drilling on CLEXT.

Drillhole location maps are provided in *Figures 10-1* and *10-2*, which depict the locations for surface delineation and surface freeze holes, respectively. Drill depths for surface delineation holes range from approximately 460 to 550 metres.

The CL Main zone was discovered in 1983. Drilling was initially done at a nominal drillhole grid spacing of 25 to 50 metres east-west by 20 to 25 metres north-south. A surface drill program was conducted from 2010 to 2012 to tighten up the spacing in areas with gaps in coverage (*Figure 10-1*). Similarly, a small program of six holes was completed on mineralized zones situated between East and West Pods in 2023. Apart from this area, CL Main has been fully delineated by surface freeze holes on a nominal 7 x 7 metre pattern (*Figure 10-2*). A total of 1,328 surface freeze holes have been completed totaling over 613,000 metres of drilling. *Figure 10-3* provides a geological cross-section along mine grid easting 10781, depicting the predominant lithological domains, location of the orebody and uranium grade distribution.

The CLEXT zone had been outlined through several exploration drilling campaigns conducted between 1981 and 2012. Since 2016, Cameco has completed additional surface delineation drilling to confirm and upgrade mineral resources contained in CLEXT. Several holes were additionally used to collect metallurgical, hydrogeological and geotechnical information including: five holes used for detailed ore zone metallurgical investigations, four holes with deep packer testing and two holes with deep piezometer installations. Information from 235 holes totaling approximately 99,000 metres of diamond drilling has been used to support the prefeasibility study for CLEXT. *Figure 10-1* illustrates the CLEXT drillhole coverage, with drillhole fences and clusters variably spaced 12 to 25 metres apart in the western portion and 20 to 50 metres in its eastern portion.

The orientation and shape of the deposit was recognized at an early stage of the exploration drilling. It was soon learned that the bulk of the mineralization was high grade and positioned at and sub-parallel to the unconformity, although rare vein-like bodies of mineralized rock were also present. Subsequently, almost all drilling was completed using vertical drillholes rather than inclined drillholes because it was recognized that vertical intersections were essentially normal to the dominant orientation of the deposit. These intersections, therefore, represent the true thickness of the flat-lying deposit (*Figure 10-3*).

Well established drilling industry techniques were used in the drilling programs, including wireline core drilling. Core recovery was generally very good; in some areas where ground conditions dictated, triple tube drilling to maximize core recovery was done. Wedging techniques were used in some areas to obtain step-out intersections without the expense of collaring additional holes.

All pre-2007 holes were surveyed for direction using single shot or multi-shot surveying tools. Holes drilled since January 2007 have been surveyed either with a gyroscope or a Reflex tool. The collar locations of drillholes within the area of the surface infrastructure footprint have been surveyed by Cameco and their locations confirmed.

The more recent surface delineation drillholes (since 1988) have been grouted in their entirety. Holes drilled prior to 1988 were plugged in the range of 250 to 350 metres by mechanical plugs and/or cement plugs up to 10 metres thick.

In almost all cases, gamma surveys have been conducted through the mineralization in these holes. For further discussion see *Section 11.7*.

Drilling results have been used to delineate and interpret the 3D geometry of the mineralized areas, the lithostructural settings, the geotechnical conditions, and to estimate the distribution and content of uranium and other elements within the CL Main and CLEXT mineral resources and mineral reserves.

FIGURE 10-1: CIGAR LAKE DEPOSIT - SURFACE EXPLORATION AND DELINEATION DRILLHOLE LOCATIONS

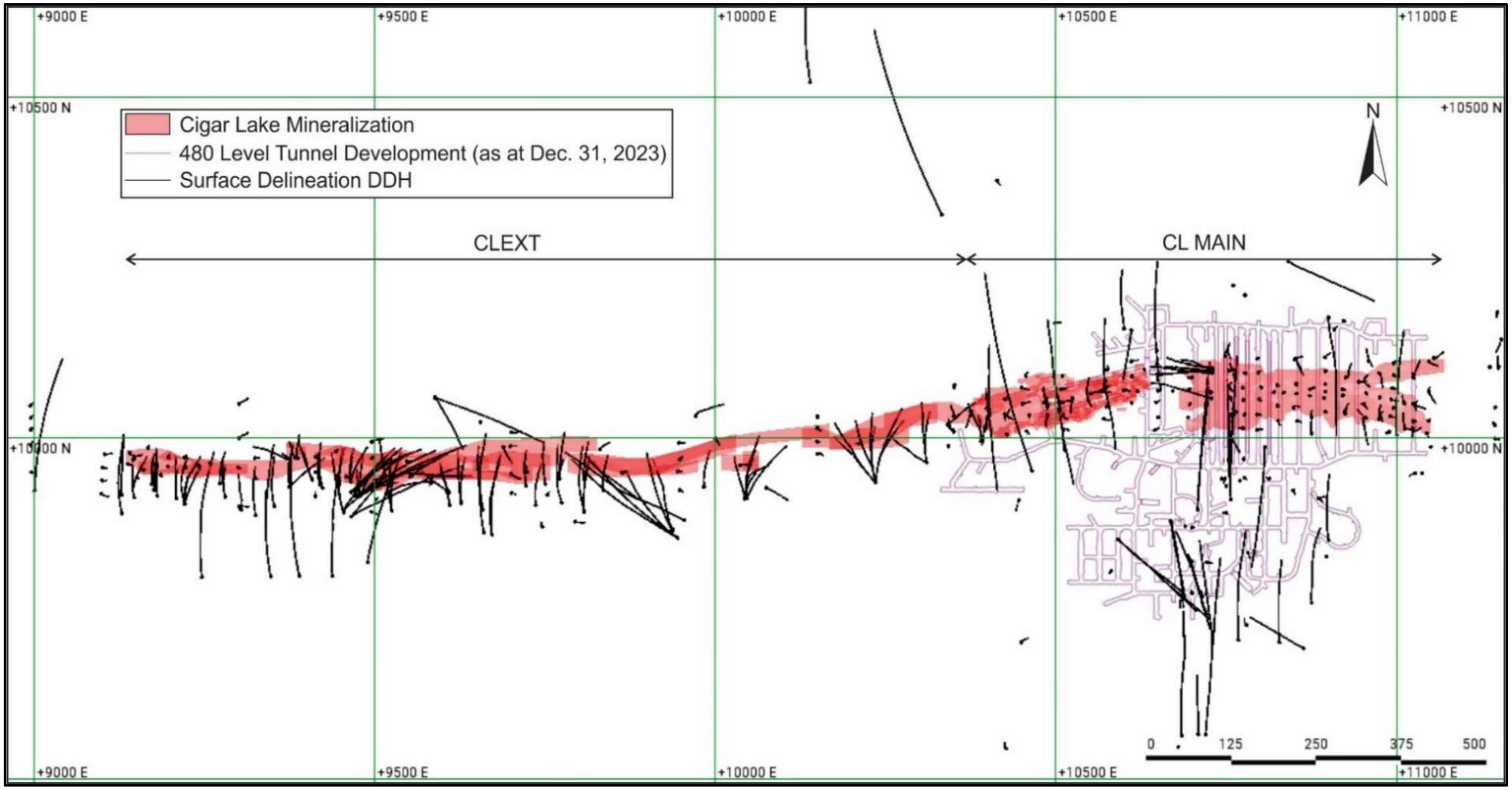


FIGURE 10-2: CIGAR LAKE DEPOSIT - SURFACE FREEZE HOLE LOCATIONS (CL MAIN)

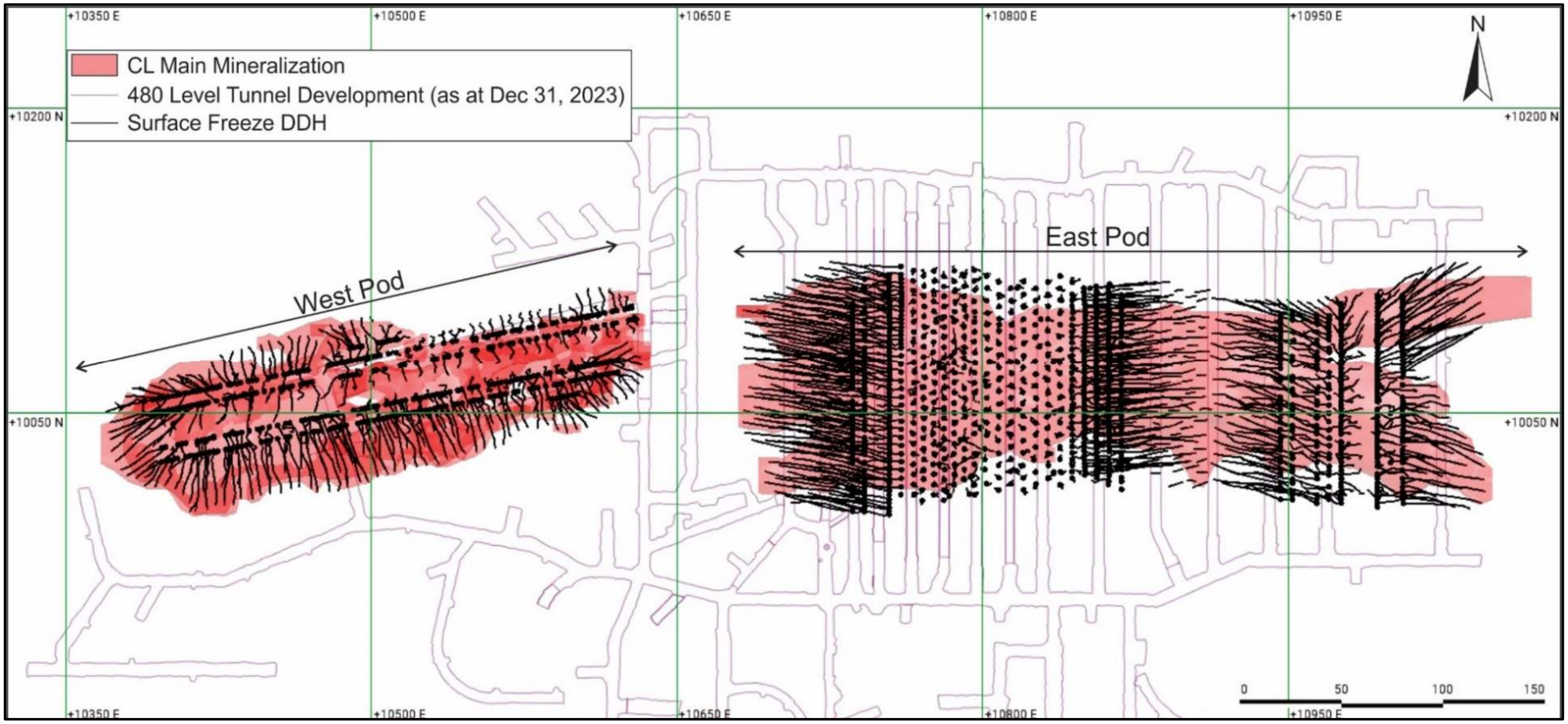
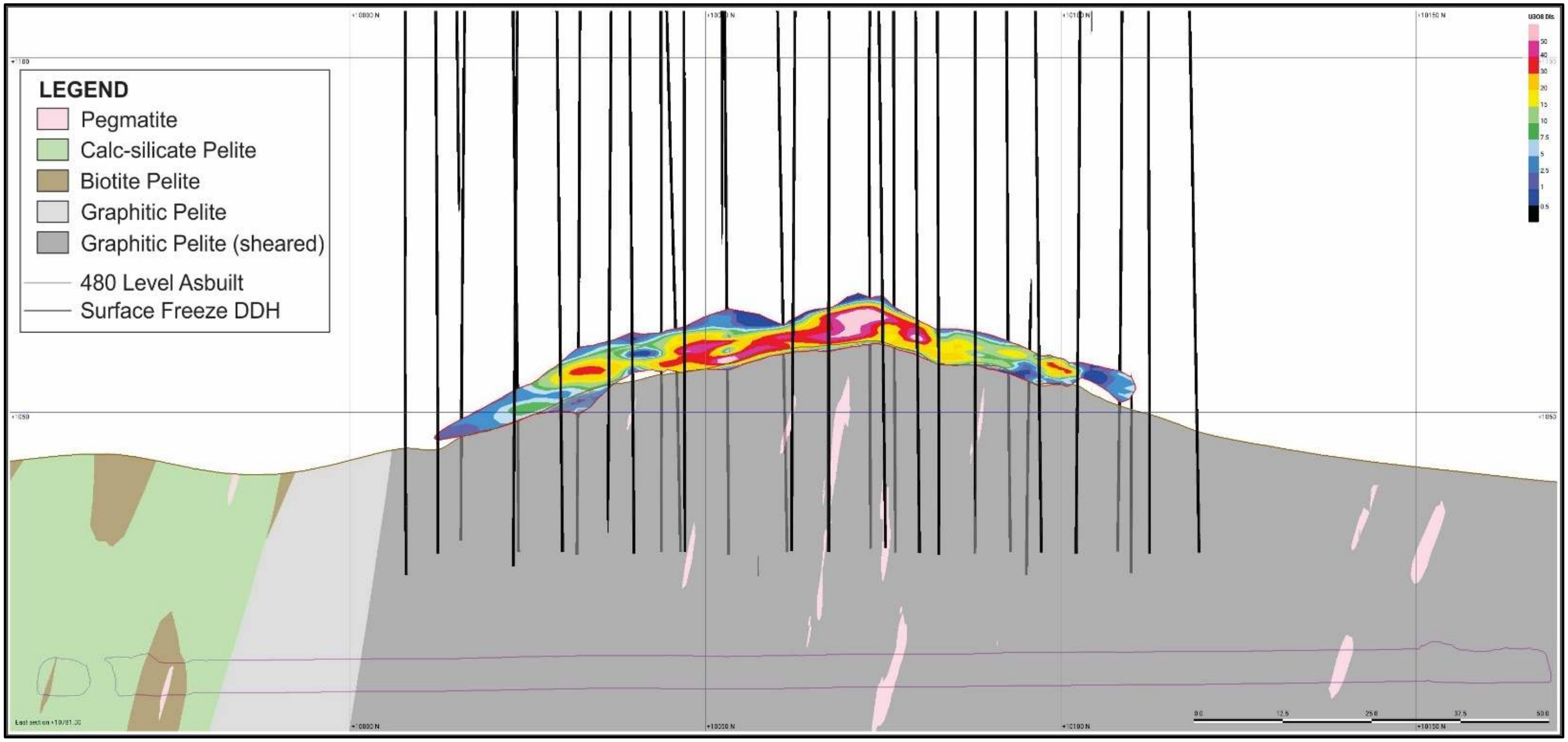


FIGURE 10-3: CL MAIN GEOLOGICAL CROSS SECTION AT 10781E – LOOKING WEST (±3 m)



## 10.2 Underground drilling

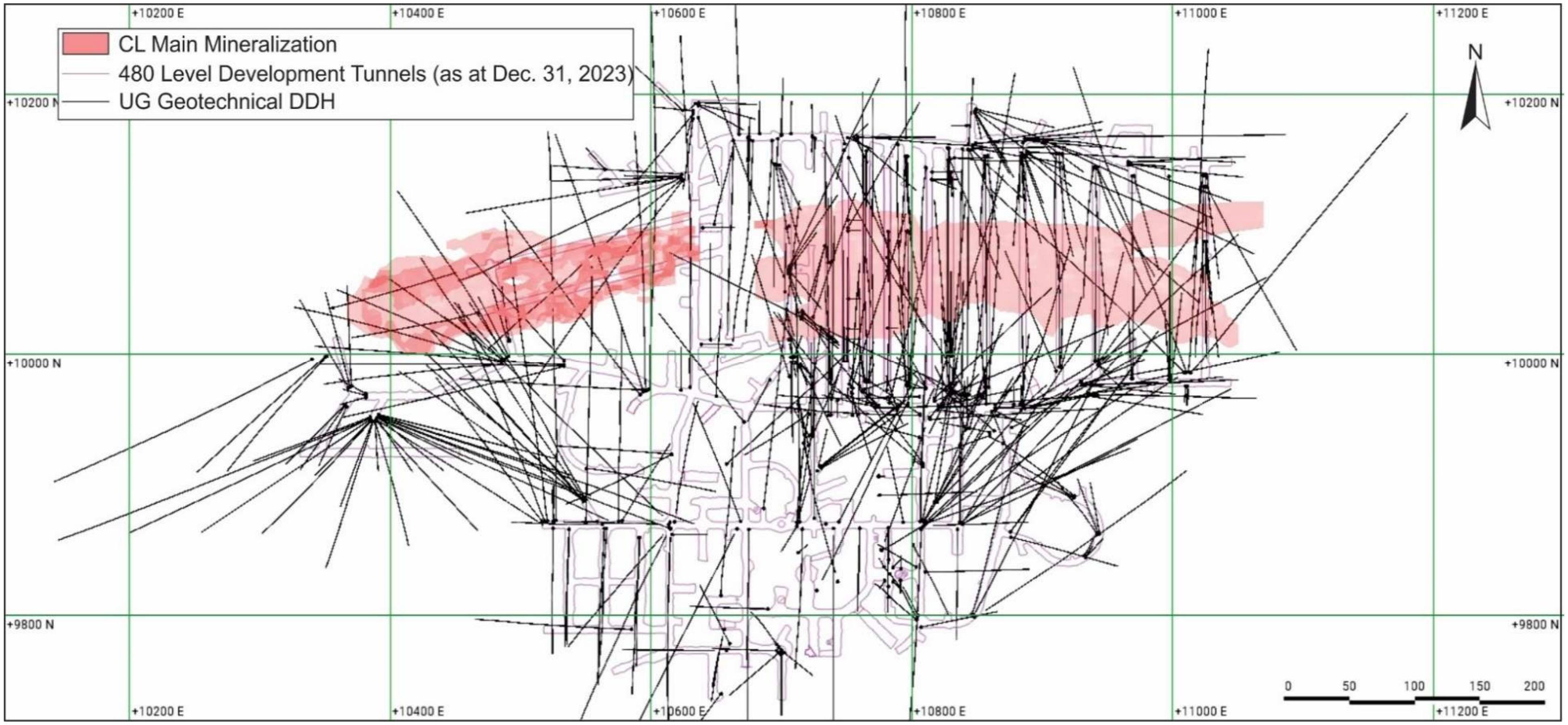
Diamond core drilling from underground locations is primarily to ascertain rock mass characteristics in advance of development and mining. CLMC and Cameco have conducted underground geotechnical drilling at Cigar Lake since 1989. A total of 519 underground geotechnical holes have been completed on CL Main. In addition, 24 holes have been completed with respect to the CLEXT ramp access south-southwest of the West Pod. Holes drilled prior to 2001 were surveyed for downhole deviation using a single shot or multi-shot survey tool. Since 2001, holes have been surveyed for downhole deviation using a Reflex survey tool and, locally, a gyroscope.

Underground freeze holes were drilled into the deposit for the purposes of freezing the ground prior to mining during the test mining phase. A total of 83 holes at a spacing of 1 to 1.5 metres were drilled in two periods of drilling in 1991 and again in 1999. Generally, these upward holes were rotary drilled holes from which no core was recovered; however, in a limited number of cases, core was recovered and sampled, and in almost all cases, gamma surveys of the holes were done through the deposit.

Underground freeze hole drilling started up again in late 2004 with the start of the construction phase of development. During this phase, a total of 347 freeze and temperature monitoring holes were drilled, of which 182 were gamma surveyed. The latter freeze holes were all drilled by percussion methods, so no core was available for assays. The gamma surveys show the mineralization to generally conform with the projected ore outline. A gyro tool was used for directional surveying in the 2004 to 2006 phase of freeze hole drilling. No underground freeze holes have been drilled since 2006.

The locations of the underground geotechnical holes in CL Main are shown in *Figure 10-4*. Additional underground geotechnical drilling is planned to assist in the design of the remaining underground tunnels in both CL Main and CLEXT. Underground freeze holes are not shown in this figure.

FIGURE 10-4: UNDERGROUND GEOTECHNICAL DIAMOND DRILLHOLE LOCATION MAP - CL MAIN



## 10.3 Factors that could materially affect the accuracy of the results

Except for the underground freeze holes, there are no known drilling, sampling or core recovery factors that could materially affect the accuracy and reliability of the results. Underground freeze holes were not used in the 2023 mineral resource estimate due to data quality concerns and their redundancy given the presence of overlapping surface freeze hole data. For a further discussion of sampling and core recovery factors, see *Section 11*.

# 11 Sample preparation, analyses and security

## 11.1 Sample density and sampling methods

Delineation drilling in the CL Main zone, 670 metres long by 100 metres wide, was originally completed at a nominal drillhole fence spacing of 25 to 50 metres (east-west), with holes at 20 to 25 metres (north-south) spacing on the fences. Since then, the entire portion of the CL Main deposit has had surface freeze holes installed at a nominal 7 x 7 metre pattern.

The CLEXT zone, approximately 1,280 metres long by 75 metres wide, was historically drilled at a nominal drillhole fence spacing of 200 metres, with holes at 20 metres spacing on the fences. Subsequent drill programs occurring between 2011 and 2023 have since reduced the drillhole spacing down to 15 x 15 metres in local areas of the deposit. Geological, geotechnical and hydrological information was collected and assessed.

Across the deposit, all surface holes were core drilled and gamma probed when possible. In-hole gamma surveys and hand-held scintillometer surveys were used to guide sampling of core for assay purposes. After recognition of the significance of the deposit and its geometry in 1982, sampling of core was thereafter primarily concerned with ensuring that all core within the mineralized zone containing at least 0.10% $U_3O_8$ was sampled and assayed. An Automess GmbH gamma detector was used to determine the outer limits of sampling and to validate the core depths.

In the early stages of exploration drilling, sampling of mineralized intervals was done on a geological basis, whereby sample limits were determined based on geological differences in the character of the mineralization. Samples were of various lengths, up to 0.5 metre. Since 1983, sampling intervals for core from the deposit have been fixed at a standard guideline of 0.5 metre. Sample results are generally composited to the standard interval of 0.5 metre for mineral resource estimation purposes. In the case of CL Main, approximately 25% of surface freeze holes were sampled for uranium analysis while the remaining holes rely solely on equivalent grade determinations from downhole radiometric probing.

On each of the upper and lower contacts of the mineralized zone, at least one additional 0.5 metre sample was taken to ensure that the zone was fully sampled at the 0.10% $U_3O_8$ cut-off.

Since 2012, all core logging and sampling of uranium mineralized drill core has been conducted in a separate core logging facility. Sampling is done only after all other geological logging, including photography of the core, is completed. Sampling is done in a separate room attached to the core shack to maintain cleanliness in the sampling area and reduce radiation levels in the core logging area.

The typical sample collection process includes the following procedures:

- marking the sample intervals on the core boxes at the nominal 0.5 metre sample lengths
- collection of the samples in plastic bags, taking the entire core
- documentation of the sample location, assigning a sample number and description of the sample, including radiometric values from a hand-held device
- bagging and sealing, with sample tags inside bags and sample numbers on the bags
- placement of samples in steel drums for shipping

## 11.2 Core recovery

Reliance for uranium grade determinations in surface delineation drillholes has been placed primarily on chemical assays of drill core. Core recovery through the ore zone has generally been very good. Where necessary, uranium grade determinations have been supplemented by downhole radiometric probing.

For mineral resource and reserve estimation purposes, assayed values where core recovery is above 75% are deemed representative of the whole interval. If the core recovery was below 75%, the sample was replaced by probing values. These replacement values account for approximately 5% of the overall sample database.

From about 1983 onward, all drilling and sampling procedures have been standardized and documented resulting in increased confidence in the accuracy and reliability of results of all phases of the work.

## 11.3 Sample quality and representativeness

Most of the exploration and delineation drilling completed by Cameco on the surface of the mineral lease consists of wireline diamond drilling recovering NQ size (47.6 millimetres) drill core. All surface freeze hole core is of PQ size (85.0 millimetres). Except for some of the earliest sampling in 1981 and 1982, the entire core from each sample interval was taken for assay. This was done to reduce the potential for sampling bias, given the high-grade nature and variability of the grades of the mineralization, and to minimize human exposure to gamma radiation and radon gas during the sampling process. Some of the core remains available for viewing at the site in a gated compound.

## 11.4 Sample preparation by Cameco employees

None of the samples sent to testing laboratories prior to January 1, 2002 were prepared by an employee, officer or director of Cameco; however, limited assaying was carried out at Cameco's Rabbit Lake mill laboratory, as discussed in *Section 11.6*. All samples for Cigar Lake prior to this date were prepared by employees of Orano or its predecessor companies or CLMC. This would include a very minor number of samples used in the mineral resource and mineral reserve estimates.

Beginning in 2009, numerous surface delineation and surface freeze holes were drilled through the CL Main and CLEXT deposits. Drill cores selected for assaying were sampled by Cigar Lake personnel.

Since 2016, the qualified person for this section has been involved with providing support and guidance for sampling of mineralization.

## 11.5 Sample preparation

The majority of historical samples used for the mineral resource estimate were prepared and analysed by Loring Laboratories Ltd. (Loring), which is located in Calgary, Alberta, and is independent of the CLJV owners.

Sample preparation at Loring consisted of drying the sample, if necessary, followed by primary (jaw) and secondary (cone) crush, homogenization, and cutting the sample using a Jones-type riffle splitter down to 25- to 300-gram portions for pulp preparation. The material was then pulverized in a TM Vibratory Pulverizer to maintain a 95% passing 150 mesh sieve. Samples were then rolled 100 times on a rolling mat to ensure total homogeneity and placed in a numbered sample bag ready for analysis. Any particulates created from sample preparation were carefully swept up from all areas and placed in a separate container for return to the property site, along with all pulps and reject material after the sample had been analyzed.

Since 2002, sample preparation has been done at Saskatchewan Research Council Geoanalytical Laboratories (SRC), which is located in Saskatoon, Saskatchewan, and is independent of the CLJV owners. It involves jaw crushing to 80% passing at less than two millimetres and splitting out a 100- to 200-gram sub-sample using a riffle splitter. The sub-sample is pulverized to 90% passing at less than 106 microns using a puck and ring grinding mill. The pulp is then transferred to a bar coded plastic snap top vial.

## 11.6 Assaying

Assaying of drill core for uranium and other elements has been performed at different commercial laboratories and Cameco's Rabbit Lake laboratory since 1981.

As referenced in *Section 11.5*, Loring did all the assaying for uranium between 1983 and 1994. They were not certified by any standards association at that time.

Cameco's Rabbit Lake mill laboratory has carried out limited assaying since 1994, and SRC was used after 2001. The Rabbit Lake laboratory was not formally certified at that time; however, between July 1994 and July 1997, there were inter-laboratory tests on uranium determination involving Rabbit Lake, Key Lake, Cluff Lake, Rio Algom and SRC laboratories. Different analytical methods were used in the comparison studies and showed that results from the Rabbit Lake laboratory were within acceptable limits.

Records indicate that SERU deemed the assay results from two commercial laboratories, from drilling done in 1982, were not calibrated properly. As a result, the assay results from this period were adjusted in 1983 based upon a systematic comparison of laboratory results and cross checks. These adjusted grades applied to only three holes (38, 39, 39A) out of 641 holes used for the CL Main uranium block model. Nineteen of the 23 holes affected were from the CLEXT portion of the mineralization. These 23 holes have not been reassayed and the adjusted results are included in the mineral resource and mineral reserve estimates.

Assaying by Loring was done by both the fluorimetric method and the volumetric method (volumetric ferrous iron reduction in phosphoric acid). All samples assaying greater than 5% $U_3O_8$ as determined by fluorimetry were reassayed using the volumetric method. Chemical standards were systematically assayed on a regular basis to ensure the accuracy of the assaying procedure. Senior staff of the operator at the time (CLMC) visited Loring on a regular basis to view and discuss laboratory procedures with Loring.

Assaying at the Rabbit Lake mill was done by the fluorimetric method for low-grade samples, and by a combination of titration and x-ray fluorescence for high-grade samples, collected for metallurgical purposes in 1998.

Sample analysis since 2002 has been conducted by SRC. SRC is licenced by the CNSC for possession, transfer, import, export, use and storage of designated nuclear substances under CNSC Licence Number: 01784-1-09.3. SRC is an accredited testing laboratory assessed by the Standards Council of Canada under the requirements of ISO/IEC 17025:2017, *General Requirements for the Competence of Mineral Testing and Calibration Laboratories*. Assaying by SRC involved digesting an aliquot of pulp in concentrated 3:1 $HCl:HNO_3$ on a hot plate for approximately one hour, then making up to volume in a 100 millilitre volumetric flask with deionized water prior to analysis by ICP-OES. Instruments used in the analysis are calibrated using certified commercial solutions.

Chemical assay results were systematically checked against radiometric results to ensure their accuracy. Sample pulps and reject materials are retained and systematically catalogued. Check assays were done on an as-required basis.

## 11.7 Radiometric surveying

For drillholes completed prior to 2011, the reliance on downhole radiometric probing for determination of uranium grades for mineral resource estimation is minimal. Boreholes completed prior to 2011 were consistently sampled to obtain $U_3O_8$ chemical assays when uranium mineralization was encountered. In areas of poor core recovery or missing sample intervals, equivalent %$U_3O_8$ grades from downhole radiometric data were used to supplement the assay data. However, this accounts for a very small proportion of the grade data for holes completed prior to 2011.

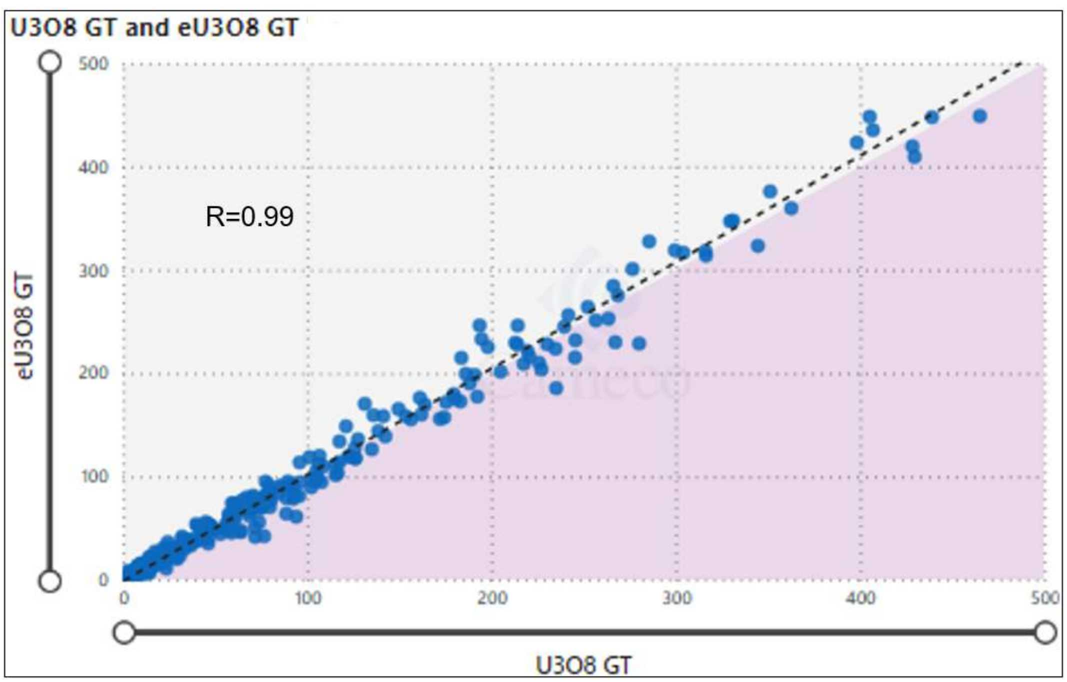
Since 2011, downhole radiometric data has provided most of the grade data used for mineral resource estimation in areas where freeze holes have been installed. To the end of 2023, 1,328 surface freeze holes have been completed at Cigar Lake, and approximately 75% of these rely on equivalent grade data obtained from downhole probing.

Cigar Lake uses a high-flux (HF) gamma probe designed and constructed by alphaNUCLEAR, a member of the Cameco group of companies. This HF gamma probe utilizes two Geiger Müller tubes to detect the amount of gamma radiation emanating from the surroundings. Servicing and recalibration is performed annually or when probes undergo repairs and the accuracy of the probes is verified in a designated calibration hole prior to use. If accuracy issues are identified at any time, the probe in question is sent for repair and recalibration and its past radiometric measurements are reviewed.

The count rate obtained from the high-flux probe is compared against chemical assay results to establish a correlation to convert corrected probe count rates into equivalent %$U_3O_8$ grades. The consistency between probe data and chemical assays demonstrates that secular equilibrium exists within the deposit.

The correlation to convert corrected probe count rates into equivalent %$U_3O_8$ is periodically reviewed and updated as required based on comparisons between probing results and chemical assays which are performed on a quarterly basis. A comparison of radiometric probing grade x thickness (GT) against chemical assay GT intervals using the correlation at year-end of 2022 is shown in *Figure 11-1*. Following review in 2023, an adjustment to the correlation was applied to address a slight $eU_3O_8$ overestimation bias.

### FIGURE 11-1: GT COMPARISON OF $eU_3O_8$ CORRELATION AGAINST CHEMICAL ASSAY



## 11.8 Density sampling

Density sampling and analysis has occurred at Cigar Lake since the initial exploration campaign in the early 1980s. Historical density analysis was performed using two methodologies:

- competent drill core samples were oven dried, weighed in air, then submersed in water and weighed again
- less competent and/or altered core samples were oven dried, and the volume of the sample was determined by measuring the length and diameter of the sample

Since 2010, density sampling and analysis has been conducted at SRC using a dry bulk method. For this method, samples are weighed dry, then coated with an impermeable layer of wax and re-weighed. Samples are then submersed in water and weighed. Weights are recorded into a database and rock densities are calculated for the samples.

Comparison of recent and historical density estimates has demonstrated there is good correlation between the two datasets. Therefore, historical measurements are deemed reliable for use in further studies.

## 11.9 Quality assurance/quality control

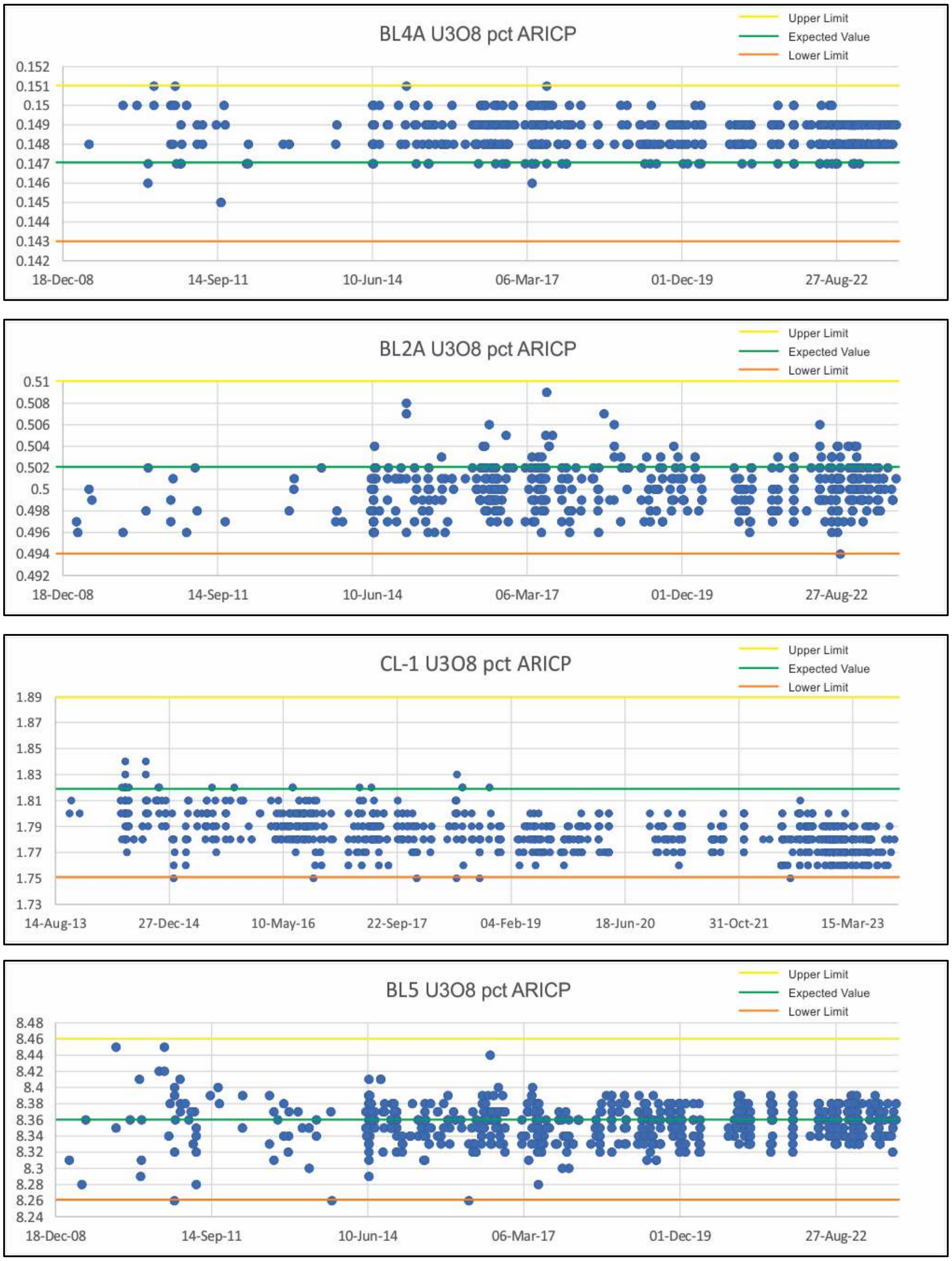
From 1983 to 1994, assaying was done by Loring. For uranium assays up to 5% $U_3O_8$, 12 standards and two blanks were run with every sample batch (certified standards were used). For uranium assays over 5% $U_3O_8$, a minimum of four standards were analyzed with each run. These historical assays represent a very small portion of assay results in the current mineral resource estimate and their results have been reviewed against more recent drilling results from the infill surface freeze hole program.

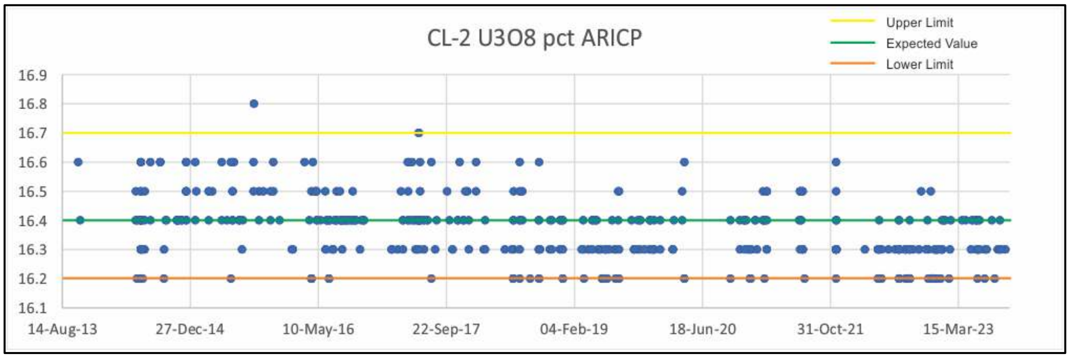
Quality control for the more recent assaying at SRC includes the preparation and analysis of standards, duplicates and blanks. Prior to June 2013, standards used included BL2a, BL3, BL4a and BL5, all from CANMET, and in-house samples, UHU-1 and USTD5. In June 2013, five new standards were developed at the SRC from Cigar Lake ore (CL-1, CL-2, CL-3, CL-4 and CL-5) to provide more robust quality control and assurance due to the high-grade nature of the Cigar Lake deposit.

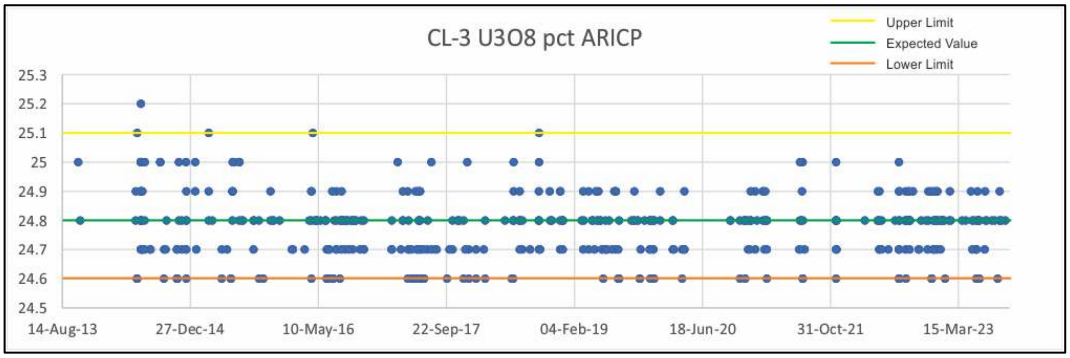
At least two standards are analyzed for each 40-sample batch as well as one replicate pulp analysis using an aqua regia (AR) digestion followed by ICP. We also include one split sample repeat with every group. See *Figures 11-2 and 11-3* for relevant results of standards and pulp duplicates from CL Main and CLEXT sample batches. Except for two results on standards CL-2 and CL-3 in 2014 and 2015, all quality control results are within specified limits. Samples that fail quality controls are re-analyzed.

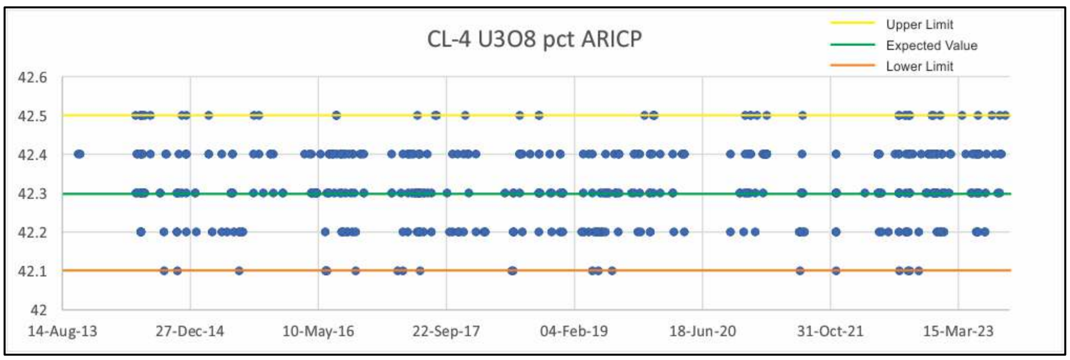
Quality control for equivalent grade determination is described in S*ection 11.7*.

## FIGURE 11-2: CIGAR LAKE STANDARDS (CL MAIN AND CLEXT): BL4A, BL2A, CL-1, BL5, CL-2, CL-3, CL-4, AND CL-5




CL-2 U3O8 pct ARICP
Upper Limit
Expected Value
Lower Limit
16.9
16.8
16.7
16.6
16.5
16.4
16.3
16.2
16.1
14-Aug-13
27-Dec-14
10-May-16
22-Sep-17
04-Feb-19
18-Jun-20
31-Oct-21
15-Mar-23


CL-3 U3O8 pct ARICP
Upper Limit
Expected Value
Lower Limit
25.3
25.2
25.1
25
24.9
24.8
24.7
24.6
24.5
14-Aug-13
27-Dec-14
10-May-16
22-Sep-17
04-Feb-19
18-Jun-20
31-Oct-21
15-Mar-23


CL-4 U3O8 pct ARICP
Upper Limit
Expected Value
Lower Limit
42.6
42.5
42.4
42.3
42.2
42.1
42
14-Aug-13
27-Dec-14
10-May-16
22-Sep-17
04-Feb-19
18-Jun-20
31-Oct-21
15-Mar-23

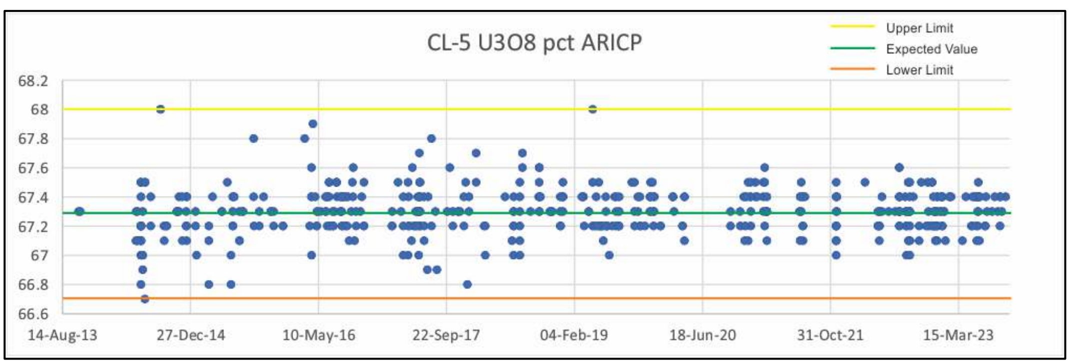
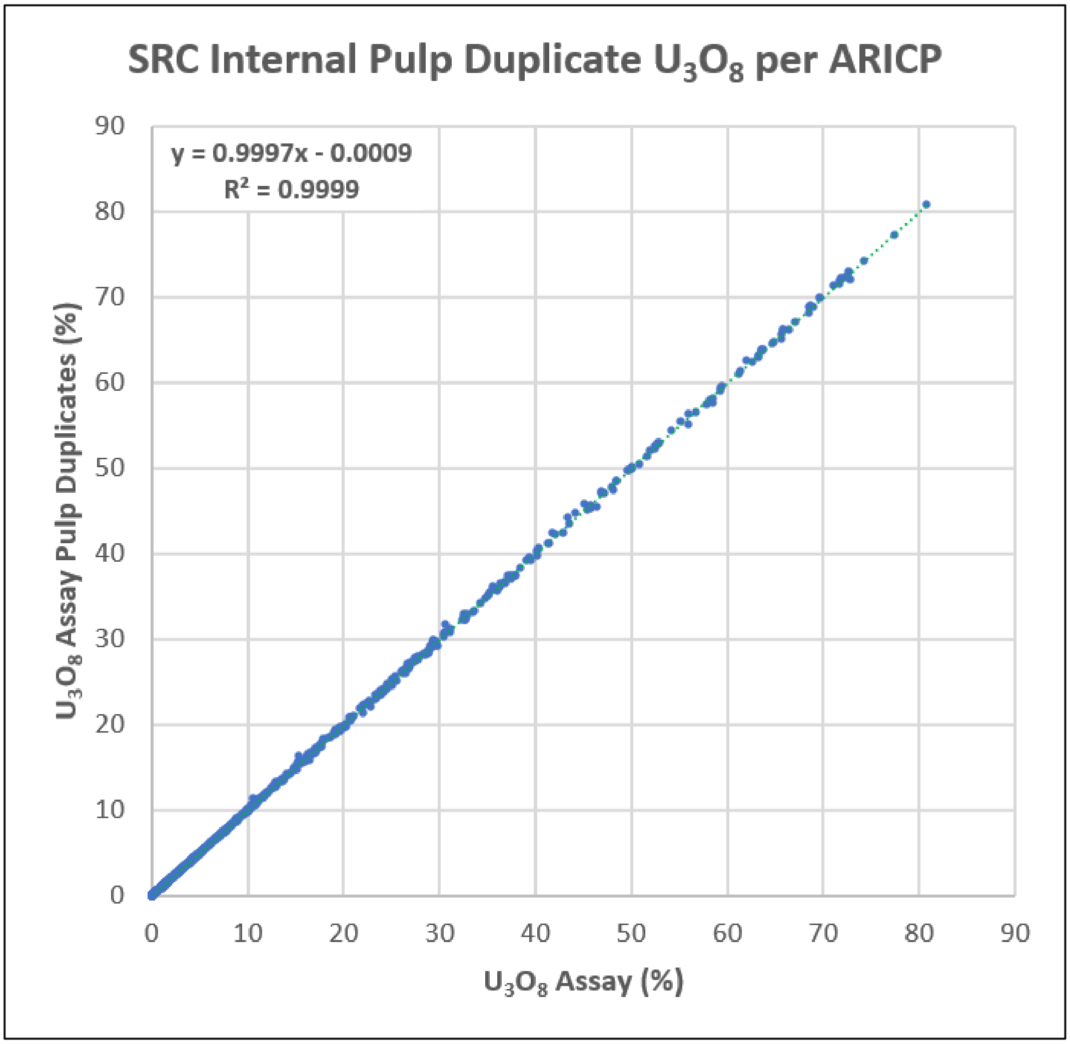

CL-5 U3O8 pct ARICP
Upper Limit
Expected Value
Lower Limit
68.2
68
67.8
67.6
67.4
67.2
67
66.8
66.6
14-Aug-13
27-Dec-14
10-May-16
22-Sep-17
04-Feb-19
18-Jun-20
31-Oct-21
15-Mar-23

FIGURE 11-3: CIGAR LAKE (CL MAIN AND CLEXT) PULP DUPLICATE AR-ICP RESULTS




The QA/QC program results have not identified issues with the analytical procedures. The qualified person for this section has reviewed the data and is of the opinion that it is of adequate quality to be used for mineral resource and mineral reserve estimation purposes. Supporting this opinion is the fact that since 2014, the model performance is within 6% on tonnage and 1% on uranium content of the reported mine production, as presented in *Section 14.6*.

## 11.10 Adequacy of sample preparation, assaying, QA/QC and security

Current sampling protocols dictate that all samples are collected and prepared under the close supervision of a qualified geoscientist in a restricted core processing facility. The core samples are collected and transferred from the core boxes to high-strength plastic sample bags, then sealed. The sealed bags are then placed in steel drums and shipped under the Transportation of Dangerous Goods Regulations with tamper-resistant security seals through the Cameco warehouse facilities directly to the laboratory. Chain of custody documentation is present from inserting samples into steel drums to final delivery of results by SRC. All samples collected are prepared and analyzed under close supervision of qualified personnel at SRC, which is a restricted access laboratory licensed by the CNSC.

The qualified person for this section is satisfied with all aspects of sample preparation and assaying. The sampling records are documented and samples were whole core assayed to reduce bias. The assaying was done to a high standard and the QA/QC procedures employed by the laboratories were adequate. Regarding the 23 holes, predominantly in CLEXT, that had their grades adjusted in 1983 by SERU, the qualified person for this section is satisfied that the mineral resources classification for the general area they cover and their subsequent conversion to mineral reserves reflects the degree of uncertainty attached to the grade.

The qualified person for this section is not aware of the historic security measures in place at the time of the deposit delineation, from 1981 to 1986. Sample security is largely defined by regulation, and since 1987 all samples have been stored and shipped in compliance with regulations. The qualified person believes that the sample security was and is maintained throughout the process. There has been no indication of significant inconsistencies in the data used for the latest update of the mineral reserve and resource estimates.

# 12 Data verification

The original database, which forms part of the database used for the current mineral resource and mineral reserve estimates, was compiled by previous operators. Many of the original signed assay certificates are available and have been reviewed by Cameco geoscientists.

In 2013, Cigar Lake implemented an SQL server based centralized geological data management system to manage all drillhole and sample related data. All core logging, sample collection, downhole probing and sample dispatching activities are carried out and managed within this system. All assay and geochemical analytical results obtained from the external laboratory are uploaded directly into the centralized database, thereby mitigating potential for manual data transfer errors.

Additional data verification measures taken on the data collected at Cigar Lake are as follows:

- surveyed drillhole collar coordinates and downhole deviations are entered into the database and visually validated and compared to the planned location of the holes
- all CLEXT holes drilled in 2011 and 2012 were resurveyed between the summer of 2012 and summer of 2015
- comparison of the information in the database against the original data, including paper logs, assay certificates and original probing data files as required
- validation of core logging information in plan and section views, and review of logs against photographs of the core
- using the Maptek Vulcan software package, a validation query was developed that checks for data entry errors such as overlapping intervals and out of range values
- downhole radiometric probing results are compared with radioactivity measurements made on the core and drilling depth measurements
- downhole radiometric probes are subjected to control probing to ensure precision and accuracy
- equivalent %$U_3O_8$ grades based on radiometric probing are validated with chemical assay results

A discussion of quality assurance and quality control measures relating to assay and radiometric results is included in *Sections 11.6, 11.7, 11.8* and *11.10.* The geotechnical information collected from drilling was validated visually in excavated areas underground. Validity of the metallurgical samples is discussed in *Section 13.2*.

The qualified person for this section supervised professional geoscientists who verified the data at the site and at the corporate office. The qualified person was involved in reviewing a portion of the assay and probing results, as well as the correlations between radioactivity and uranium grade, and between density and multi-elements. The qualified person attended all internal peer reviews involving the data informing interpretation and estimation, communicating regularly with internal personnel including the Mine Chief Geologist. In consideration of the above, the qualified person for this section is satisfied with the quality of the data and considers it valid for use in the estimation of the mineral resources and mineral reserves. Comparison of life-of-mine production with the mineral reserve model supports this opinion.

# 13 Mineral processing and metallurgical testing

## 13.1 Cigar Lake processing metallurgical test work

The design for processing ore at Cigar Lake was largely based on the experience gained at McArthur River, including modifications and improvements incorporated since that operation was commissioned in early 2000. The primary difference between the two sites is that mining at McArthur River is carried out using dry methods, while high-pressure water is used to mine the deposit at Cigar Lake. As a result, coarse low percent solids/density slurry is pumped at Cigar Lake from the discharge of the JBS mining machines to the underground ore storage facilities.

Several pump and pipeline testing programs were conducted between 1996 and 1999 to establish design criteria for the system, utilizing simulated Cigar Lake ore at SRC's Pipeline Research Centre. Slurries in the one to four percent solids by weight range were produced using solids consisting of clay, selected size fractions of rock, and various sizes and shapes of steel pieces. The key findings from these test programs included the determination of minimum slurry velocities and practical pump box designs. In 2011, further pumping tests were done at the centre to ensure that large, heavy particles could be transported by pipeline. In the tests, different sizes, shapes and densities of particles were pumped in pipes that were sloped between 0 and 90 degrees. A report of these tests was prepared by SRC.

In addition, wet crushing test work on simulated Cigar Lake ore was carried out in 1998 by Cron Metallurgical Engineering Ltd. using a prototype of a reduced size version of a Nordberg water flush cone crusher. Capacities exceeding 40 tonnes per hour were achieved on a maximum 75-millimetre feed to produce a product suitable for grinding in a ball mill.

The operational experience thus far has been consistent with metallurgical test work expectations. Due to the geological and geotechnical similarities between the CL Main and CLEXT orebodies, no significant changes are expected in the comminution of the ore.

The CLEXT ore will be mined in the same manner as the CL Main ore. A low percent solids discharge slurry from the JBS will be pumped from the CLEXT zone to the run of mine (ROM) ore storage sumps and processed in the existing CL Main underground crushing and grinding circuits before being pumped to surface for thickening and eventually shipped to the Orano McClean Lake mill.

Due to the additional distance of the CLEXT ore workings and cavities from the CL Main processing area, booster stations will be installed to move the JBS produced low percent solids slurry. The design of the boosting and ore handling system is based on the slurry test work completed between 1996 and 1999 at the SRC Pipeline Research Centre and the experience and operational information gained during the historical and ongoing CL Main ore processing.

The existing process design criteria was updated for CLEXT; however, no further test work was deemed necessary due to the relative similarities of the CLEXT and CL Main ore. The inherent high variability within the CL Main ore itself and subsequent successful processing of the slurry provides another validation of the processing circuit's robustness and ability to process a wide range of ore characteristics.

## 13.2 McClean Lake processing metallurgical test work

Extensive metallurgical test work was performed on core samples of Cigar Lake ore from 1992 to 1999. Samples used for the metallurgical test work during this period may not have been representative of the deposit as a whole. Additional test work completed by Orano in 2012 with drill core samples verified that a high uranium recovery rate could be achieved regardless of the variability of the ore. Test work also concluded that more hydrogen gas evolution took place than previously anticipated, which resulted in safety related modifications being implemented in the leaching circuit. Leaching modifications began in 2013 and were completed in 2014, with mill start-up in September 2014.

The 1992 to 1999 work was performed in France at Orano's CIME test centre. The results of this test work program provided the process design criteria for the additions and modifications required at the McClean Lake mill for processing Cigar Lake ore. Since 2014, the McClean Lake mill has processed on a daily basis a range of ore grades, at times in excess of 28% U.

**CLEXT METALLURGICAL TEST WORK**

Testing was completed in 2018 and 2019 by Orano on both discrete core and composite samples to account for ore variability within the CLEXT deposit. The laboratory testing on CLEXT ore focused on the following primary areas of interest:

- hydrogen evolution rates
- leaching efficiencies and retention time
- CCD settling
- tailings preparation, settling and aging tests

Hydrogen generation was observed to varying degrees, but it was concluded that the existing leach circuit is capable of handling the observed $H_2$ gas generation.

Leaching uranium extraction in the 2018 test work was noted as typically >99% in a wide range of uranium and arsenic values within the range of ore samples. A 7-hour minimum retention time was deemed acceptable for both uranium and arsenic leaching with arsenic leaching efficiency being more variable than uranium. Based on that test work and the expected performance of the downstream circuits, the overall mill recovery for the CLEXT ore is projected to average 98.5%.

The test work confirmed that no modifications would be required to the leaching circuit to process CLEXT ore but that the CCD circuit would need to be looked at more closely. Ongoing optimization in the CCD circuit since that time has significantly reduced the production related risk.

The tailings neutralization and aging tests completed in 2019 verified that the current operating practices at the McClean Lake Mill will produce tailings that are stable over the long-term and meet the requirements of the decommissioning plans related to the control of contaminants to the environment.

**MILL RECOVERY**

Based on the test results and mill performance processing Cigar Lake ore since 2014, overall uranium recoveries of 98.8% for CL Main and 98.5% for CLEXT are expected for the remainder of the mine life. Anticipated losses are distributed as follows:

- leach residue loss: 0.5% – 0.8%
- CCD soluble loss: 0.3 – 0.5%
- solvent extraction loss: 0.2 – 0.4%

The actual overall mill recovery is shown below in *Table 13-1* on a yearly basis and overall weighted average since the McClean Lake mill began processing Cigar Lake ore.

The expected mill recovery is similar to that achieved at Cameco's other Saskatchewan operations. For reference, historically, the Key Lake mill treating McArthur River mine ore achieves an overall recovery of approximately 99.0%, and the Rabbit Lake mill treating Eagle Point mine ore achieved a recovery of approximately 97.0%. The lower recovery at the Rabbit Lake mill is due to the lower feed grade from the mine to the mill as compared to the McArthur River ore feeding the Key Lake mill.

### TABLE 13-1: McCLEAN LAKE OVERALL MILL RECOVERY (2014 TO 2023)

| Year | Average Overall Mill Recovery[2] |
|---|---|
| 2014[1] | 97.6 |
| 2015 | 99.0 |
| 2016 | 99.1 |
| 2017 | 99.0 |
| 2018 | 98.9 |
| 2019 | 98.9 |
| 2020 | 98.8 |
| 2021 | 98.7 |
| 2022 | 98.9 |
| 2023 | 98.9 |
| **Average[3]** | **98.9** |

[1]September to December, inclusive

[2]weighted monthly average for year (production is reconciled on a monthly basis)

[3]weighted average for the period 2014 to 2023, inclusive

**DELETERIOUS ELEMENTS IN CIGAR LAKE ORE**

The average arsenic content in CLEXT ore is higher than CL Main based on the existing geological drill core data. Ore higher in arsenic requires more reagents for processing, increasing the overall operating costs. The primary reagents used in the control of arsenic include:

- Ferric sulphate - used to neutralise and stabilize arsenic in the tailings preparation circuit. Lime is used to neutralise the ferric sulphate
- Hydrogen peroxide - utilized in the leaching process in order to ensure efficient leaching of the highly reduced arsenic mineralization present in Cigar Lake ores

The McClean Lake mill produces ferric sulphate on site. During periods of peak ferric sulphate demand, commercial ferric sulphate may be required to supplement the ferric sulphate produced on site based on the ore blend arsenic content. With the additional ferric sulphate addition, the tailings tonnage and associated volume requirement increases. The arsenic concentration is factored into tailings projections, which are re-visited annually.

Molybdenum is an uneconomic constituent of the Cigar Lake ore. However, molybdenum content in the final concentrate above certain thresholds results in refinery penalties, which are refinery dependent. The McClean Lake mill uses activated carbon columns to remove molybdenum prior to the precipitation of yellowcake. These carbon columns have an efficiency of approximately 60%. Refinery penalties attributable to molybdenum content have been negligible to date.

For a further discussion of ore processing at Cigar Lake, see *Section 17*. A high-level operation flow sheet of the ore processing activities is shown in *Figure 17-1*.

# 14 Mineral resource estimates

The most recent mineral resource estimates of the CL Main and CLEXT deposits were completed in late 2023 using the latest drilling results and updated mineralized envelopes. Methodologies, assumptions and parameters used for these estimates are described in this section.

The Cigar Lake mineral resource estimates have been updated and reviewed by Cameco. Peer reviews have been conducted internally. No independent verification of the current mineral resource estimate has been performed; however, an independent consultant audited the database and estimation process in 2022 with no material issues raised.

## 14.1 Definitions

The classification of mineral resources and their subcategories conform to the definitions adopted by the Canadian Institute of Mining, Metallurgy and Petroleum Council (as amended), which are incorporated by reference in NI 43-101. Cameco reports mineral reserves and mineral resources separately. The amount of reported mineral resources does not include those amounts identified as mineral reserves. Mineral resources, which are not mineral reserves, do not have demonstrated economic viability.

## 14.2 Key assumptions, parameters and methods

As illustrated in *Figure 14-1*, the known mineralization at Cigar Lake has been divided into two zones, referred to as CL Main and CLEXT. Mineral resources for both zones have been estimated using the same general methodology.

The key assumptions, parameters and methods used to estimate the mineral resources are as follows:

**Key assumptions**

- mineral resources do not include allowances for dilution and mining recovery

**Key parameters**

- uranium grades at Cigar Lake are extremely variable and range from hundreds of parts per million to more than 80% $U_3O_8$ over a standard sample length
- grades of $U_3O_8$ are obtained from chemical assaying of drill core or from equivalent $\%U_3O_8$ grades obtained from radiometric probing results. In areas of poor core recovery (usually < 75%) or missing samples, the grade is determined from probing
- for CL Main, a correlation between density and $U_3O_8$, Ni, Co, Mo, $Al_2O_3$, MgO, $K_2O$ and $Fe_2O_3$ content is applied where the density is not directly measured for each sample while for CLEXT, the correlation is based on $U_3O_8$, $Al_2O_3$, As and $Fe_2O_3$ content
- the density of the composite samples varies widely. For CL Main, it ranges between 1.4 grams per cubic centimetre to 7.0 grams per cubic centimetre. For CLEXT, it ranges between 1.4 grams per cubic centimetre and 6.5 grams per cubic centimetre. The variability in density is dependent on the intensity of the clay alteration, the variable presence of the uraninite and various arsenic-nickel-cobalt sulphides
- mineral resources have been estimated using a minimum mineralization thickness of 1.0 metre and a minimum grade of 1.0% $U_3O_8$ for CL Main and 0.8% $U_3O_8$ for CLEXT
- mineral resources have been estimated on the basis of mining with the JBS method
- reasonable expectation for eventual economic extraction of the mineral resources is based on a constant dollar average uranium price of \$62.00 (US) per pound $U_3O_8$ with a \$1.00 US = \$1.26

Cdn fixed exchange rate, mining and process recoveries, production costs, royalties and mineralized area tonnage, grade, and spatial continuity considerations

**Key methods**

- the geological interpretation of the orebody was done in section views and in 3-dimensions from surface drillhole information
- mineral resources were estimated using 3-dimensional block models. Ordinary kriging and inverse distance squared methods were used to estimate the grade and density
- Maptek Vulcan and Leapfrog Geo were used to generate the mineral resource estimates

## FIGURE 14-1: MINERAL RESOURCE AND RESERVE ESTIMATES - DECEMBER 31, 2023


Note. Reserves shown are in situ and do not include material in broken inventory.

## 14.3 Geological modelling

### CL MAIN

The 3D model of CL Main, based on drillhole data and underground mapping, was updated in 2023 using a combination of Seequent Leapfrog Geo (version 2023.2.1) and Maptek Vulcan (version 2023.1) mining software. The model was interpreted using an explicit modelling approach from polylines digitized on north-south oriented vertical sections using lithological, structural and uranium grade information. The primary mineralization has been interpreted on five to eight metre spaced north-south oriented vertical cross-sections and validated in plan view and in 3D. The cut-off grade used in the interpretations was 1.0% $U_3O_8$ over one metre vertical width, and mineralization was extended halfway to a barren drillhole or up to a maximum of 12.5 metres lateral distance.

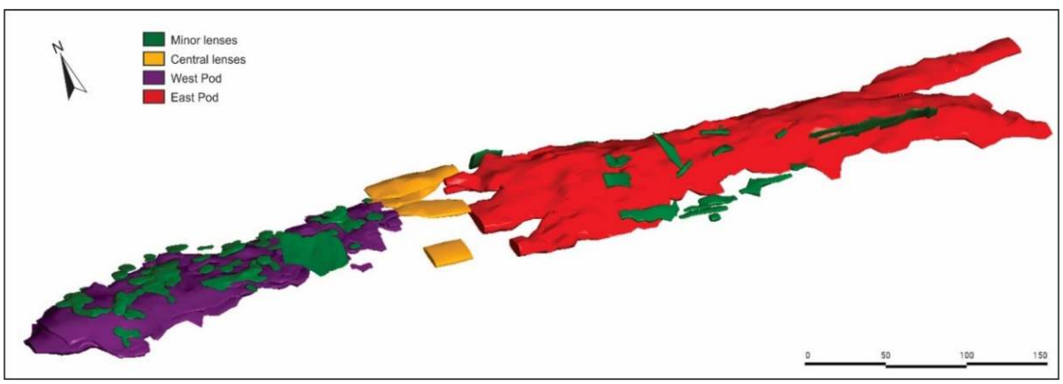
The mineralization is interpreted as two primary (East and West) pods and 35 secondary lenses, with the latter mostly located higher up in the sandstone as shown in the *Figure 14-2*.

High-grade domains for East Pod and West Pod were developed using an implicit modelling technique, using the Leapfrog indicator interpolant workflow. In this workflow, the unconformity surface and other interpreted polylines were used as structural trends to impose an overprinting control on the interpolation parallel to these features.

All modelled lenses including high-grade domains were validated on sections and in 3D.

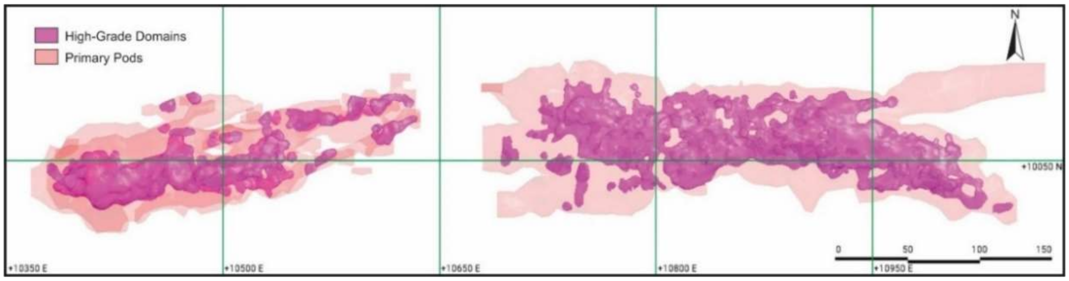
The CL Main model was developed from 1,501 drillholes, of which 1,284 intersected mineralization above the specified cut-off criteria. These holes are comprised of underground and surface diamond drillholes as well as surface freeze holes. Underground freeze holes were not used in the 2023 mineral resource estimate due to data quality concerns and their redundancy given the presence of overlapping surface freeze hole data.

FIGURE 14-2: ISOMETRIC VIEW OF CL MAIN MINERALIZED PODS AND LENSES

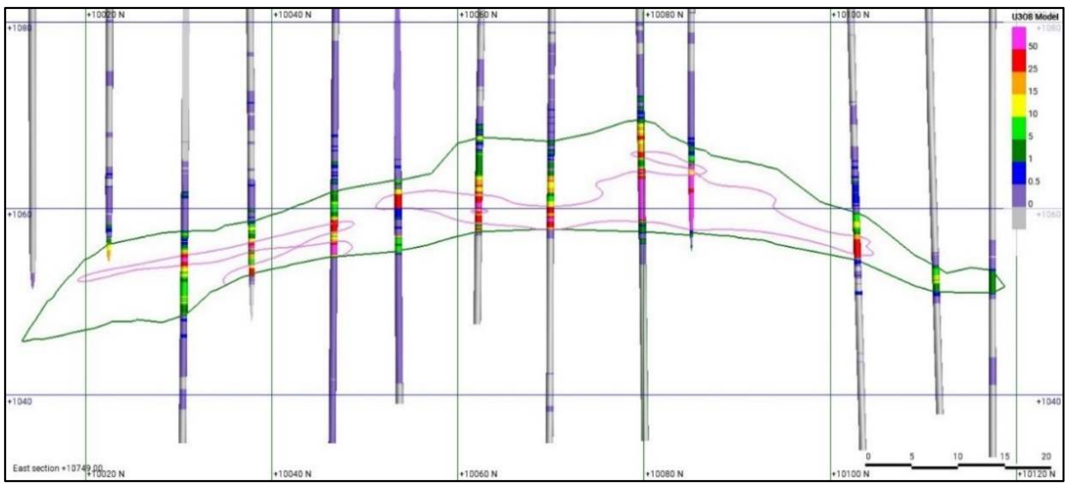



Encapsulated within the primary East and West Pods are high-grade domains, which were interpreted using a cut-off grade of 25% $U_3O_8$ (see *Figure 14-3* and *Figure 14-4*).

## FIGURE 14-3: CL MAIN INTERNAL HIGH-GRADE DOMAINS




## FIGURE 14-4: SECTION 10749E (±1 m) SHOWING HIGH-GRADE DOMAIN (MAGENTA) WITHIN EAST POD (GREEN) RELATIVE TO DRILL COMPOSITE GRADES – LOOKING WEST




### CLEXT

Modelling of the CLEXT zone utilizes 235 surface exploration and delineation holes of which 135 intersected mineralization that is part of the mineral resource model. The vast majority of drillholes were drilled perpendicular to the mineralization and, as a result, their intercepts approximate the true thickness of the mineralization.

Much of the CLEXT mineralization has been interpreted to be vertically stratified in two separate horizons proximal and adjacent to the unconformity surface and appears to be offset horizontally and vertically in several lenses. The two main horizons are separated by up to three metres of barren rock but locally come in direct contact with one another. Several secondary lenses above the unconformity were modelled as part of the 2023 update and may have different controls than the main zones. The cut-off grade used in the interpretations was 0.8% $U_3O_8$ over one metre vertical width.

For CLEXT, unless constrained by a barren drillhole, the boundaries of the model were extrapolated halfway to the next section to a maximum of 25 metres along strike and 12.5 metres across strike. The model was interpreted using an explicit modelling approach built in Maptek Vulcan (version 2023.2.1) from polylines digitized on north-south oriented vertical sections spaced approximately 12.5 to 25 metres apart.

The CLEXT mineralization was modeled into 25 lenses: four lower unconformity-contact lenses, nine upper unconformity lenses, nine secondary lenses (structurally controlled), and three basement hosted lenses. The unconformity and some of the proximal, flat-lying, sandstone lenses are the primary zones of economic interest while the other lenses, mostly located higher up into the sandstone, are more variable and lower grade. Similar to the primary pods (East and West) on CL Main, the unconformity lenses on CLEXT utilized a high-grade domain with a threshold of 25% $U_3O_8$.

All modelled lenses including high-grade domains were validated on sections and in 3D.

FIGURE 14-5: ISOMETRIC VIEW OF CLEXT MINERALIZED LENSES

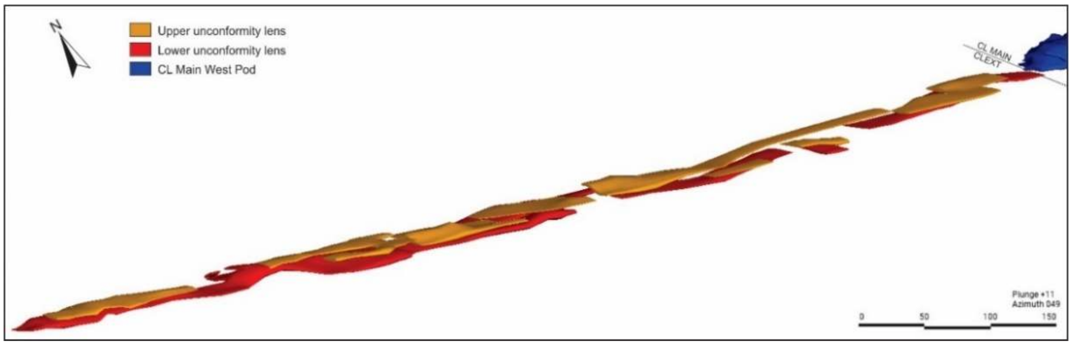
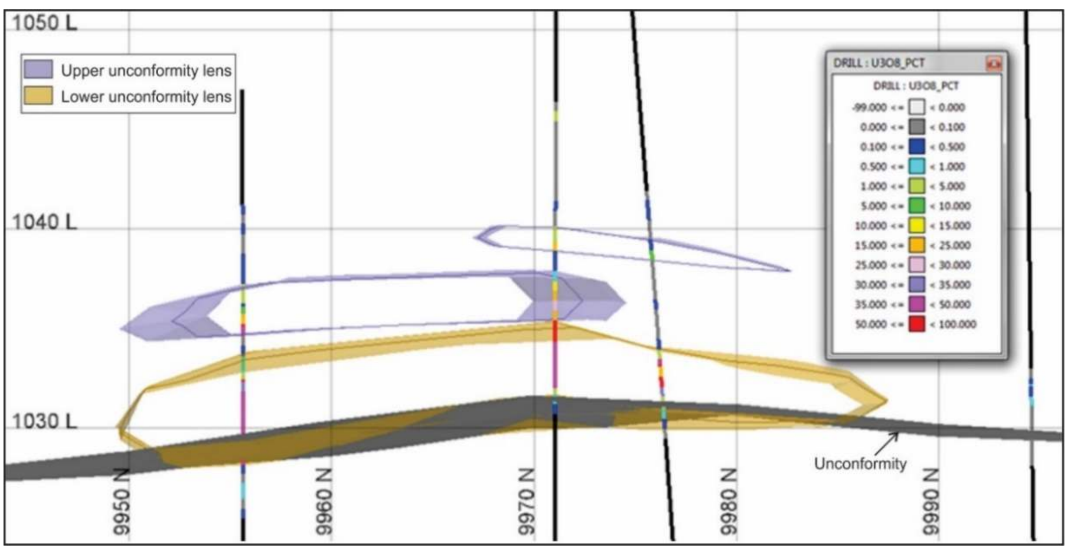



FIGURE 14-6: SECTION 9170E (±8 m) SHOWING LENSES AND DRILL COMPOSITES - LOOKING WEST




## 14.4 Compositing

Composites for both CL Main and CLEXT have been generated for $\%U_3O_8$ grade (G), density (D), and density x $\%U_3O_8$ grade (DG). A general composite length of 0.5 metre was chosen for all holes as most chemical assays interval lengths are approximately 0.5 metre. Grades from probing were capped at 87% $eU_3O_8$ and density at 7.0 grams per cubic centimetre during compositing, as geochemical sampling has yet to intersect values greater than those values. No high-grade capping was applied on assay results for CL Main. For CLEXT, capping at 60% $U_3O_8$ on the grade and 5.0 grams per cubic centimetre on the density were applied on the westernmost lens.

Compositing was carried out for the variables using a length-weighted averaging method. Each composite was assigned a rock code associated with its corresponding mineralized lens for later use in estimation. Any composites at the edge of the lenses that were less than 0.25 metre were combined with the preceding, full-length composite. Histograms and summary statistics of uranium grade and density for the 12,723 composites from CL Main and the 1,168 composites from CLEXT are presented in *Figure 14-7* and *Figure 14-8*.

## FIGURE 14-7: HISTOGRAM AND SUMMARY STATISTICS OF ALL CL MAIN $\%U_3O_8$ AND DENSITY COMPOSITES

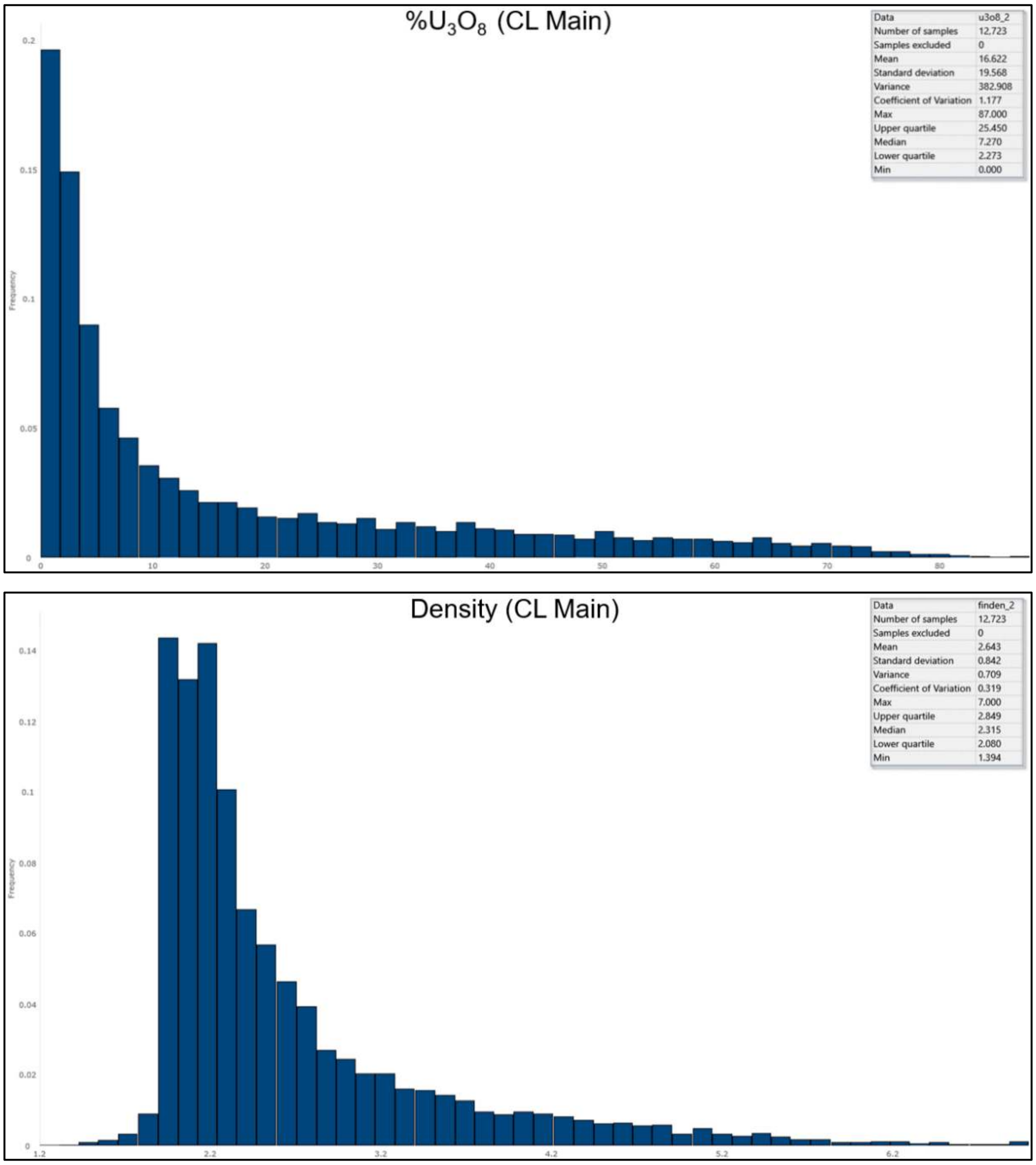
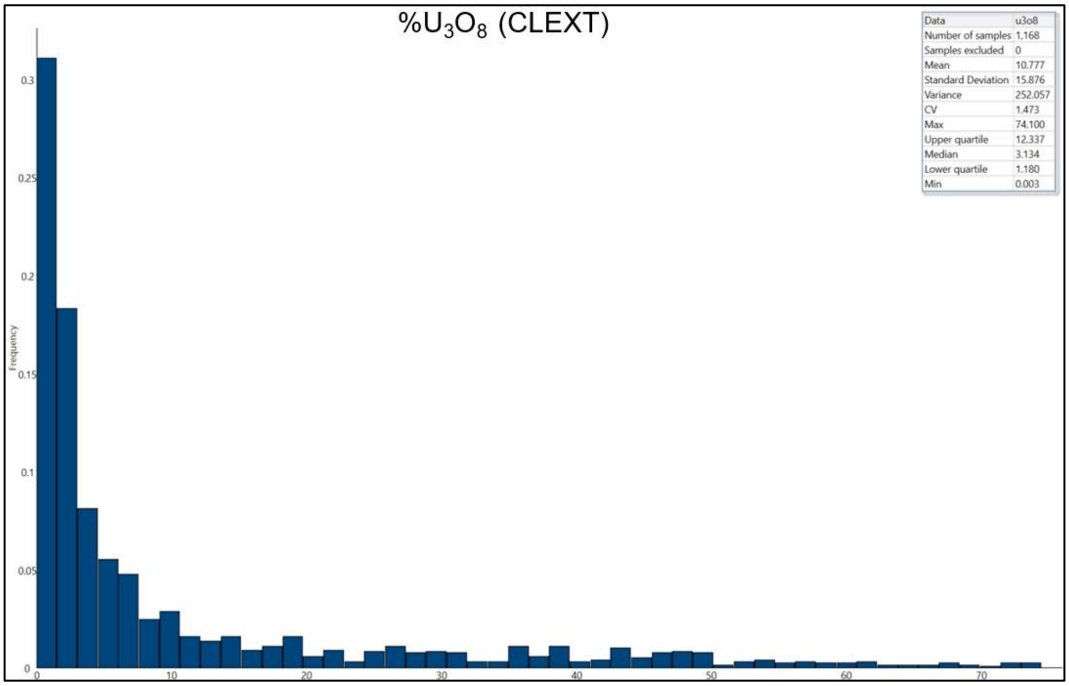
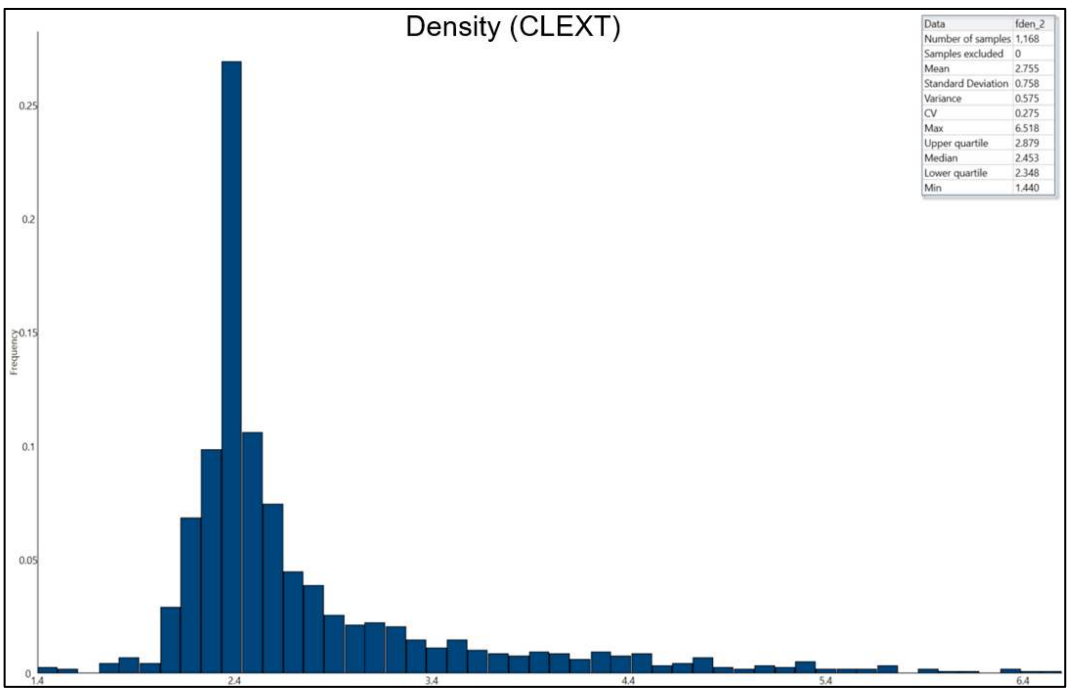


FIGURE 14-8: HISTOGRAM AND SUMMARY STATISTICS OF ALL CLEXT $\%U_3O_8$ AND DENSITY COMPOSITES



## 14.5 Block modelling

**CL MAIN**

The 3D mineralization wireframes created for CL Main were used to assign numeric code values to the block model and limit the composite influences to their respective lenses and internal high-grade domains. Variogram analysis of $U_3O_8$ grade and density was performed on all primary mineralized lenses in CL Main. A multi-variable density regression curve, which was developed from measured drill core density values from the CL Main zone, was used to calculate the density for each sample in the estimation when measured data was unavailable.

A block model comprised of 4 x 4 x 2 metre sized parent blocks with 1 x 1 x 0.5 metre sub-blocking was developed to accurately reflect the interpreted limits and volumes of the mineralization. Drillhole spacing and selective mining unit considerations were also taken into account when selecting the block size.

Ordinary kriging was used to estimate $U_3O_8$ grade and density for the primary lenses while secondary lenses with a sparser dataset utilized the inverse distance squared method. The final grade for each block was calculated by dividing the estimated density x grade (DG) by the estimated density (D) to account for the impact of density in high-grade mineralization. The grade was also estimated for comparative purposes.

For all lenses, elements of concern, including arsenic, nickel, molybdenum, selenium, aluminum oxide, iron oxide, and total clay contents were estimated using the ordinary kriging method.

A general summary of the $U_3O_8$ and density estimation parameters for East Pod and West Pod is shown in *Table 14-1* below.

TABLE 14-1: GENERAL SUMMARY OF CL MAIN SEARCH PARAMETERS FOR ORDINARY KRIGING MODEL ($U_3O_8$ AND DENSITY)

| | West Pod low grade | | West Pod high grade | | East Pod low grade | | East Pod high grade | |
|---|---|---|---|---|---|---|---|---|
| | $U_3O_8$ | Density | $U_3O_8$ | Density | $U_3O_8$ | Density | $U_3O_8$ | Density |
| Bearing | 080 | 080 | 080 | 080 | 100 | 100 | 100 | 100 |
| Dip | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Plunge | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Major axis (m) | 35 | 40 | 35 | 40 | 65 | 60 | 100 | 90 |
| Semi-major axis (m) | 20 | 15 | 20 | 15 | 20 | 20 | 35 | 35 |
| Minor axis (m) | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |

**CLEXT**

The 3D mineralization wireframes created for CLEXT were used to assign numeric code values to the block model and limit the composite influences to their respective lenses and internal domains. Variogram analysis was completed for grade and density within the main unconformity lenses. A high-grade domain was added to the main unconformity lenses with a separate set of variograms generated for the domain. A multi-variable density regression curve, which was developed from measured drill core density values from the CLEXT zone, was used to calculate the density for each sample in the estimation when measured data was unavailable.

A block model comprised of 8 x 4 x 2 metre parent blocks and 1 x 1 x 0.5 metre sub-blocks was developed to accurately reflect the interpreted limits and volumes of the mineralization. Drillhole spacing and selective mining unit considerations were also taken into account when selecting the block size.

Ordinary kriging was used to estimate $U_3O_8$ grade and density for the primary lenses while secondary lenses with a sparser dataset utilized the inverse distance squared method. The final grade for each block was calculated by dividing the estimated DG by the estimated D to account for the impact of density in high-grade mineralization. G was also estimated for comparative purposes. *Table 14-2* shows the search parameters utilized in the final block estimation.

Elements of potential concern, including arsenic, nickel, cobalt, molybdenum, selenium, sulphur, aluminum oxide, iron oxide, calcium oxide, zirconium and total clay contents were estimated using the ordinary kriging method.

### TABLE 14-2: GENERAL SUMMARY OF CLEXT SEARCH PARAMETERS

| | Lower Unconformity lens low grade | | Lower Unconformity lens high grade | | Upper Unconformity lens low grade | |
|---|---|---|---|---|---|---|
| | $U_3O_8$ | Density | $U_3O_8$ | Density | $U_3O_8$ | Density |
| Bearing | 090 | 090 | 090 | 090 | 090 | 090 |
| Dip | 0 | 0 | 0 | 0 | 0 | 0 |
| Plunge | 0 | 0 | 0 | 0 | 0 | 0 |
| Major axis (m) | 40-60 | 40-60 | 22-23 | 22-23 | 60 | 60 |
| Semi-major axis (m) | 12-15 | 12-15 | 17-22 | 17-22 | 20 | 20 |
| Minor axis (m) | 4-6 | 4-6 | 3-4 | 3-4 | 6 | 6 |

## 14.6 Validation

Block models were validated as per Cameco standard procedures involving several methods, including but not limited to: visual review, statistical checks, spatial distribution plots, peer reviews and estimation via alternative methods. Further supporting the mineral resource estimate parameters and methodologies is the fact that actual production reconciles generally well on a tonnage and pounds basis to model expectations (*Table 14-3*). The cause behind the 2022 model overperformance has been identified as a local issue with the model and Cameco does not expect further impacts going forward.

### TABLE 14-3: RECONCILIATION OF PRODUCTION AND MODEL

| Actual versus Estimated (% difference) | | |
|---|---|---|
| **Year** | **Tonnes** | **Lbs $U_3O_8$** |
| 2014-2015 | 6.7 | 1.8 |
| 2016 | 2.3 | -3.6 |
| 2017 | -0.5 | -2.1 |
| 2018 | 2.1 | -6.5 |
| 2019 | 8.4 | 1.6 |
| 2020 | -0.2 | -4.7 |
| 2021 | 4.3 | 6.7 |
| 2022 | 10.5 | 18.6 |
| 2023 | 14.7 | -4.7 |
| **Total** | **6.0%** | **0.6%** |

## 14.7 Mineral resource classification

The criteria for classification of mineral resources are predicated on the confidence within the geological interpretation and continuity of uranium mineralization between sample locations determined through variographic analysis, the estimation confidence and the drilling density. The general criteria for each mineral resource category are as follows:

***Measured mineral resources***: detailed drillhole spacing (<10 metres on average between drillholes with assay or probing results) supported by surface freeze hole drilling and have demonstrated both geological and grade continuity between drillholes (i.e. high level of confidence in, and understanding of, the geology and controls of the mineral deposit and no significant geological uncertainties remain that could greatly alter the current interpretation).

***Indicated mineral resources***: good drillhole spacing (10 to 35 metres on average between drillholes), demonstrate good geological continuity (i.e. some geological questions remain that could alter the current interpretation but to a lesser degree) and moderate grade variability between drillhole intercepts.

***Inferred mineral resources***: sparse drillhole spacing (>35 metres on average between drillholes or a pod defined by limited drillhole intercepts) with uncertain geological continuity (i.e. geological questions remain that could lead to large changes in the current interpretation) and a high degree of grade variability between drillhole intercepts.

#### CL MAIN ZONE

The mineral resource classification for CL Main is shown in *Figure 14-9*.

- There are two main (East and West) pods and 35 secondary lenses comprising the mineral resource model. The mineral resource is contained within 15 lenses. Twenty-two lenses with low geological confidence are excluded from mineral resources and are referred to as mineralized potential. They represent a very minor amount of uranium mineralization and are located higher up in the sandstone.

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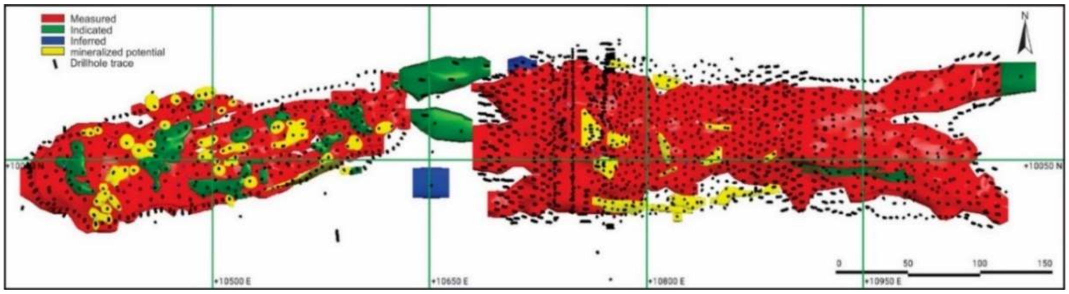
### FIGURE 14-9: CL MAIN MINERAL RESOURCE CLASSIFICATION INCLUDING MINERALIZED POTENTIAL

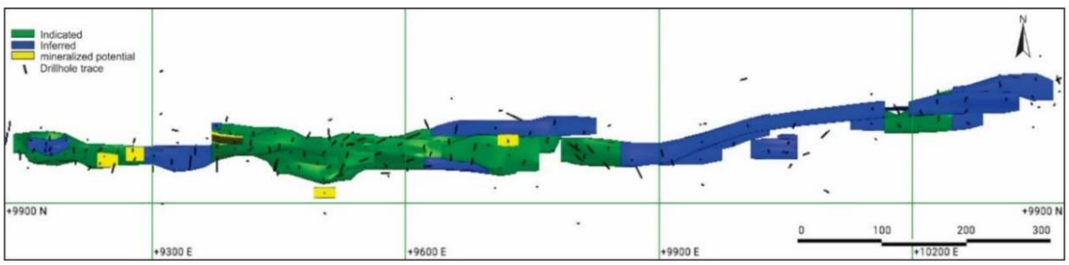



### CLEXT AREA

The mineral resource classification for CLEXT is shown in *Figure 14-10*.

There are 25 lenses comprising the mineral resource model for the CLEXT zone; however, seven of these have low geological confidence. These are excluded from mineral resources and are referred to as mineralized potential. They represent a very minor amount of mineralization and represent lenses located higher up into the sandstone. The final mineral resource is contained within 18 lenses.

### FIGURE 14-10: CLEXT MINERAL RESOURCE CLASSIFICATION INCLUDING MINERALIZED POTENTIAL




The Cigar Lake mineral resources, exclusive of mineral reserves, with an effective date of December 31, 2023, are presented in *Table 14-4*. Al Renaud, P. Geo. with Cameco, is the qualified person within the meaning of NI 43-101 for the purpose of the mineral resource estimates.

TABLE 14-4: CIGAR LAKE MINERAL RESOURCES – DECEMBER 31, 2023

| Category | Area | Total tonnes (x 1,000) | Grade % $U_3O_8$ | Total M lbs $U_3O_8$ | Cameco's share M lbs $U_3O_8$ |
|---|---|---|---|---|---|
| **Measured and Indicated** | | | | | |
| Measured | CL Main | 86.3 | 5.32 | 10.1 | 5.5 |
| Indicated | CL Main | 30.6 | 6.61 | 4.5 | 2.4 |
| Indicated | CLEXT | 113.0 | 4.98 | 12.4 | 6.8 |
| **Total Measured and Indicated** | | **229.9** | **5.32** | **27.0** | **14.7** |
| **Inferred** | | | | | |
| Inferred | CL Main | 6.2 | 4.41 | 0.6 | 0.3 |
| Inferred | CLEXT | 157.1 | 5.60 | 19.4 | 10.6 |
| **Total Inferred** | | **163.4** | **5.55** | **20.0** | **10.9** |

Notes:
(1) Cameco reports mineral reserves and mineral resources separately. Reported mineral resources do not include amounts identified as mineral reserves. Totals may not add up due to rounding.

(2) Mineral resources that are not mineral reserves do not have demonstrated economic viability.

(3) Cameco's share is 54.547% of total mineral resources.

(4) Inferred mineral resources are estimated using limited geological evidence and sampling information. We do not have enough confidence to evaluate their economic viability in a meaningful way. You should not assume that all or any part of an inferred mineral resource will be upgraded to an indicated or measured mineral resource, but it is reasonably expected that the majority of inferred mineral resources could be upgraded to indicated mineral resources with continued exploration.

(5) Reasonable expectation for eventual economic extraction of the mineral resources is based on a constant dollar average uranium price of $62.00 (US) per pound $U_3O_8$ with a $1.00 US = $1.26 Cdn fixed exchange rate, mining and process recoveries, production costs, royalties and mineralized area tonnage, grade, and spatial continuity considerations.

(6) Mineral resources have been estimated with a minimum mineralization thickness of 1 metre and a cut-off grade of 1.0% $U_3O_8$ for CL Main and 0.8% $U_3O_8$ for CLEXT based on the use of the JBS method combined with bulk freezing of the orebody.

(7) The mineralized lenses have been interpreted from drillhole information on vertical cross-sections or with 3D implicit modelling and validated on plan views and in 3D.

(8) Mineral resources have been estimated with no allowance for mining dilution and mining recovery.

(9) Mineral resources were estimated using 3D block models.

(10) There are no known environmental, permitting, legal, title, taxation, socio-economic, political, marketing or other relevant factors that could materially affect the above estimate of mineral resources.

## 14.8 Factors that could materially affect the mineral resource estimate

For most of the eastern portion of the CLEXT zone, there is still relatively sparse drilling density, weaker apparent geological continuity, and a high degree of uranium grade variability. Drilling to date is not sufficient to represent this part of the deposit well enough to permit the classification of indicated or measured mineral resources. Future drilling in this area has the potential to result in a change in the CLEXT mineral resources, given the relatively limited amount of drillhole information informing the geological model.

The Cigar Lake drillhole database is considered to be reliable. Any potential errors which may be present are not expected to cause any significant changes to the mineral resource model.

As is the case for most mining projects, the extent to which the estimate of mineral resources may be affected by environmental, permitting, legal, title, taxation, socio-economic, political, marketing or other relevant factors could vary from material gains to material losses. The qualified person responsible for the mineral resource estimate is not aware of relevant factors that could materially affect the mineral resource estimate.

# 15 Mineral reserve estimates

The Cigar Lake mineral reserve estimate has been updated and reviewed by Cameco. Internal peer reviews have been conducted. No independent verification of the current mineral reserve estimate was performed; however, an independent review of the mineral reserve estimation process was conducted by an external consultant in 2023. There were no findings from this review which could materially impact the accuracy or reliability of the mineral reserve estimate.

The mineral reserves include allowances for dilution and mining recovery. Stated mineral reserves are derived from estimated quantities of mineral resources recoverable by the JBS mining method. Mineral reserves include material in place and stored on surface and underground. Only the indicated and measured mineral resources from both CL Main and CLEXT were considered for conversion to mineral reserves.

## 15.1 Definitions

The classification of mineral reserves and the subcategories of each conform to the definitions adopted by the Canadian Institute of Mining, Metallurgy and Petroleum (CIM) Council (as amended), which are incorporated by reference in NI 43-101.

## 15.2 Key assumptions, parameters and methods

Mineral reserves are based on estimated quantities of uranium recoverable by the jet boring mining method combined with bulk freezing of the orebody. Jet boring produces an ore slurry, with initial processing consisting of crushing and grinding underground at Cigar Lake followed by leaching and yellowcake production at the McClean Lake mill.

The economic cut-off criteria used to define the mineral reserve is based on whether the revenue generated by each cavity exceeds the cost of mining and mill processing to produce $U_3O_8$. The mine operating costs include jet boring costs, backfilling, underground crushing and grinding, ore slurry hoisting and trucking costs from Cigar Lake to the McClean Lake mill plus all mine operating fixed costs. The McClean Lake mill operating costs to process the ore slurry to $U_3O_8$ (yellowcake) include leaching, solvent extraction, calcination, yellowcake packaging and tailings preparation, plus all mill operating fixed costs and toll milling fees. Royalties applicable to the cut-off calculation are described under *Key parameters*. Provincial Profit Royalties are excluded from the cut-off calculation.

The value of the ore for the purposes of calculating cut-off value represents the value from uranium only. Other metals present in the ore such as nickel, copper, cobalt and molybdenum are considered to have no economic value.

The cut-off calculation process is the same for both CL Main and CLEXT. Operating costs, toll milling fees and mill recovery input values slightly differ.

The key assumptions, parameters and methods used to estimate the mineral reserves are as follows:

**Key assumptions**

- mining rates are assumed to vary between 115 and 160 tonnes per day, and a full mill production rate is assumed to be approximately 18 million pounds $U_3O_8$ per year
- operating costs used in the cut-off calculation are based on mine and mill life of asset forecasts

**Key parameters**

- mineral reserves have been estimated with an average allowance of 34% dilution at 0% $U_3O_8$, inclusive of dilution material above and below the planned cavity, and dilution contributions from pilot holes and adjacent backfill
- mineral reserves have been estimated based on 86% mining recovery, with a mill recovery factor of 98.8% for CL Main and 98.5% for CLEXT
- an average uranium price of $54.00 (US) per pound less royalties with a $1.00 US = $1.26 Cdn fixed exchange rate was used to estimate the mineral reserves
- the Basic Royalty (5% of revenue) plus Saskatchewan Resource Surcharge (3% of sales) less Saskatchewan Resource Credit (0.75% of revenue) is applied to the uranium price
- the reference point at which mineral reserves are defined is when the ore is delivered to the McClean Lake mill

**Key methods**

The process for converting mineral resources to mineral reserves involved the following:

- JBS cavities are designed over the full extent of the indicated and measured mineral resources
- dilution and mining recovery parameters are assigned to each cavity to determine diluted and recovered ore tonnes and metal content for each cavity
- revenue from each cavity is based on recovered (packaged) uranium multiplied by the metal price less royalties
- costs of mining and processing each cavity (including toll milling fees) are subtracted from revenues
- cavities with a positive profit are aggregated by production panel. Panels with insufficient operating profit to cover development and ground freezing capital costs are excluded from the mineral reserves.
- cavities that are not profitable based on the cut-off calculation are removed from the mineral reserves

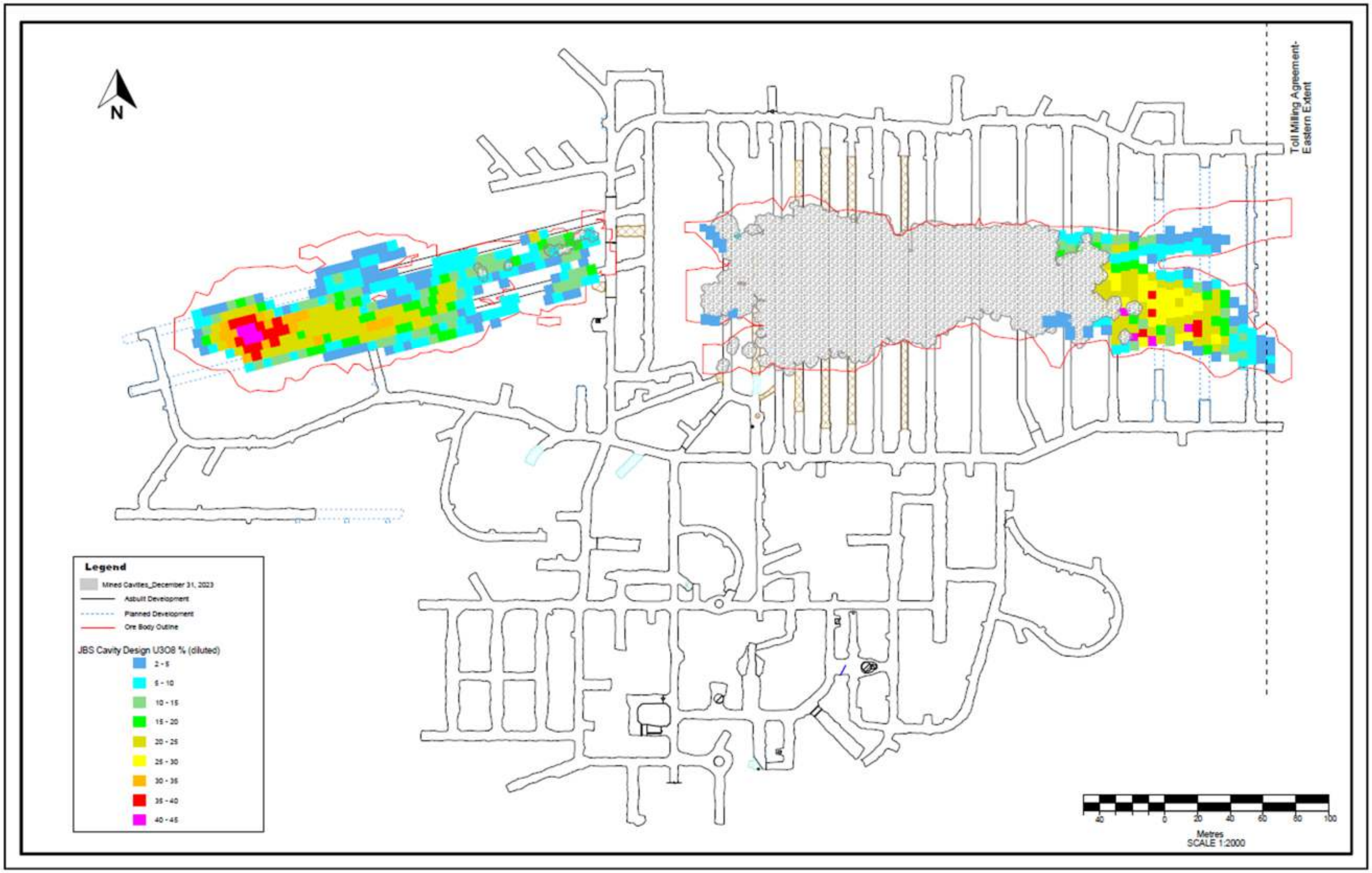
The mining applications used were Maptek Vulcan and Leapfrog Geo.

*Figure 15-1* shows the diluted grade distribution of the JBS cavities for the remaining CL Main portion of the deposit after application of the cut-off criteria. *Figure 15-2* shows the diluted grade distribution of the JBS cavities for the CLEXT portion of the deposit after application of the cut-off criteria.

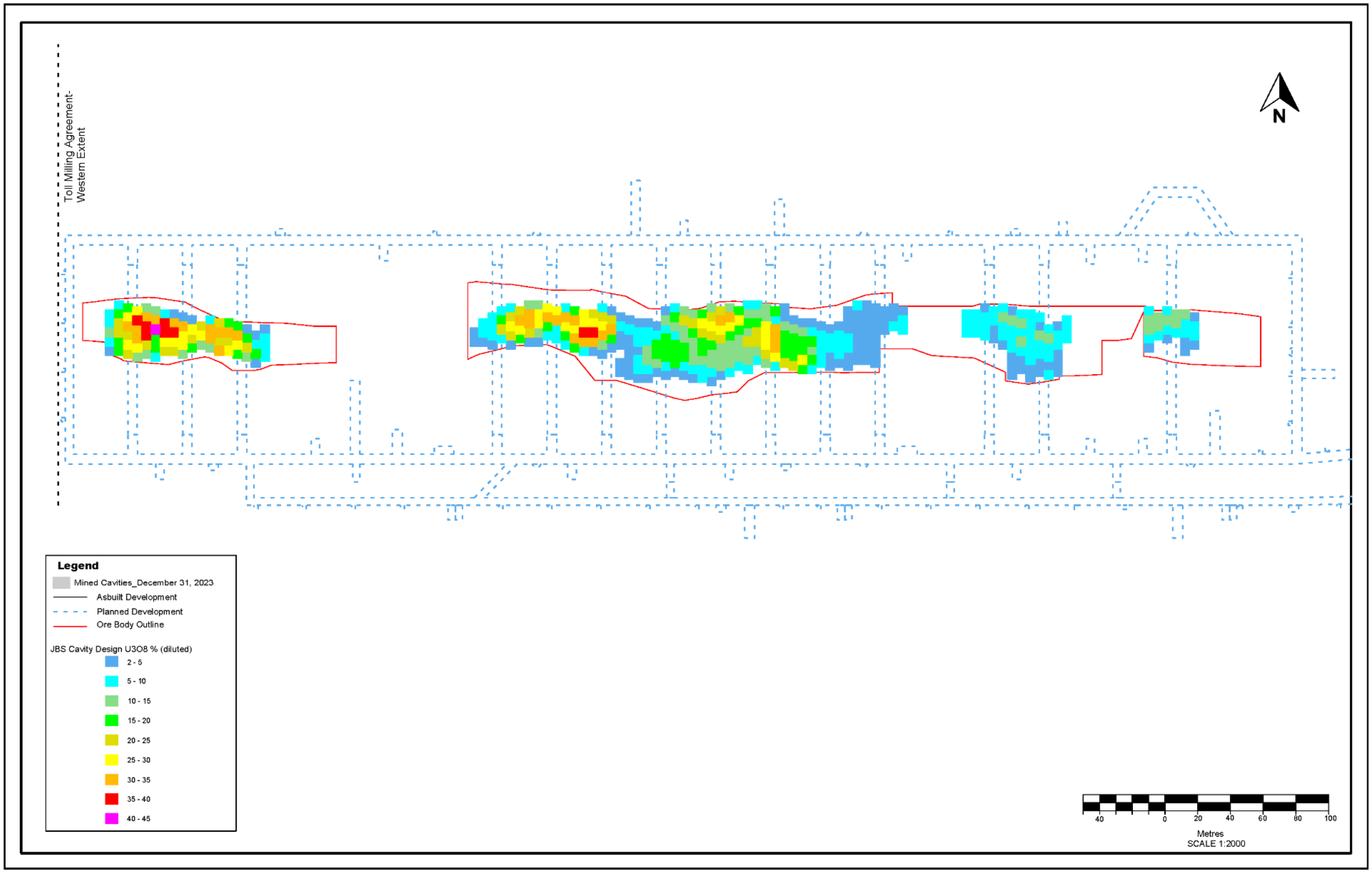
A small portion of the mineral reserves are situated east of the boundary identifying the Cigar Lake ores covered by the JEB Toll Milling Agreement. Our assumption is that the JEB Toll Milling Agreement will apply to this portion. This assumption has been applied in the economic analysis (*Section 22*).

See *Section 19.2* for information regarding the JEB Toll Milling Agreement.

FIGURE 15-1: CL MAIN MINERAL RESERVES - ESTIMATED JBS CAVITY GRADE DISTRIBUTION – PLAN VIEW



## FIGURE 15-2: CLEXT MINERAL RESERVES - ESTIMATED JBS CAVITY GRADE DISTRIBUTION – PLAN VIEW



## 15.3 Mineral reserves estimation and classification

In order to convert mineral resources to mineral reserves, a viable mine layout and realistic allowances for recovery and dilution are applied. The current mining plan has been designed to extract the mineral reserves from both CL Main and CLEXT. Additional drilling and mining studies are required to properly assess the remaining CLEXT mineral resources.

The mineral reserves classification follows CIM definitions, where economically mineable measured and indicated mineral resources can be converted to proven and probable mineral reserves, but inferred mineral resources cannot be reported as mineral reserves. The Cigar Lake mineral reserves are defined by applying factors for mining recovery and dilution to the indicated and measured mineral resources. Mill recovery of 98.8% has been applied in the economic model for CL Main and 98.5% applied to the model for CLEXT.

The Cigar Lake mineral reserves estimates, with an effective date of December 31, 2023, are shown in *Table 15-1*. B. Bharadwaj, P. Eng, C. Scott Bishop, P. Eng., Al Renaud , P. Geo., and Lloyd Rowson, P. Eng., each with Cameco, are the qualified persons within the meaning of NI 43-101 for the purpose of the mineral reserve estimates.

### TABLE 15-1: CIGAR LAKE MINERAL RESERVES – DECEMBER 31, 2023

| Category | Area | Total tonnes (x 1,000) | Grade % $U_3O_8$ | Total M lbs $U_3O_8$ | Cameco's share M lbs $U_3O_8$ |
|---|---|---|---|---|---|
| Proven | Broken | 1.1 | 27.55 | 0.7 | 0.4 |
| | CL Main | 337.0 | 18.07 | 134.3 | 73.3 |
| **Total proven** | | **338.1** | **18.11** | **135.0** | **73.6** |
| | | | | | |
| Probable | CL Main | 1.7 | 7.17 | 0.3 | 0.1 |
| | CLEXT | 215.8 | 15.42 | 73.4 | 40.0 |
| **Total probable** | | **217.5** | **15.36** | **73.7** | **40.2** |
| | | | | | |
| **Total mineral reserves** | | **555.6** | **17.03** | **208.6** | **113.8** |

Notes: (1) Cameco reports mineral reserves and mineral resources separately. Totals may not add up due to rounding.

(2) Total pounds $U_3O_8$ are those contained in mineral reserves and are not adjusted for the estimated mill recovery of 98.8% for CL Main and 98.5% for CLEXT.

(3) Cameco's share is 54.547% of total mineral reserves.

(4) Mineral reserves have been estimated on the basis of designed JBS cavities having greater revenue than the cost to mine and process.

(5) Mineral reserves have been estimated with an average allowance of 34% dilution at 0% $U_3O_8$, inclusive of dilution material above and below the planned cavity and include dilution from the JBS pilot hole and from adjacent backfill.

(6) Mineral reserves have been estimated based on 86% mining recovery.

(7) Mineral reserves were estimated based on the use of the JBS mining method combined with bulk freezing of the orebody. Jet boring produces an ore slurry with initial processing consisting of crushing and grinding underground at Cigar Lake followed by leaching and yellowcake production at the McClean Lake mill. Mining rate assumed to vary between 115 and 160 tonnes per day, and

a full mill production rate of approximately 18 million pounds $U_3O_8$ per year. The reference point at which mineral reserves are defined is when the ore is delivered to the McClean Lake mill.

(8) An average uranium price of $54.00 (US) per pound $U_3O_8$ with a $1.00 US = $1.26 Cdn fixed exchange rate was used to estimate the mineral reserves.

(9) Broken ore is defined as ore that has been mined with the JBS but not yet processed at McClean Lake. This includes all in-circuit inventory at Cigar Lake plus the ore slurry stored in the ore storage pachucas at McClean Lake.

(10) Other than the challenges related to water inflows, jet boring and geotechnical issues described in *Section 15.4*, there are no known mining, metallurgical, infrastructure, permitting, or other relevant factors that could materially affect the above estimate of mineral reserves.

## 15.4 Factors that could materially affect the mineral reserves estimate

There are no relevant factors known to the authors of this section that could materially affect the mineral reserve estimate, except those listed below. The extent to which mineral reserves may be affected by these issues could vary from material gains to material losses.

**WATER INFLOWS**

A significant risk to development and production is from water inflows. The sandstone overlying the basement rock at Cigar Lake contains large volumes of water at significant pressure. Despite the important mitigation measures Cameco has put in place, there remains a possibility of a water inflow during mine development and JBS mining. The consequences of another water inflow will depend upon the magnitude, location and timing of any such event, but could include a significant delay in Cigar Lake's development or production, a material increase in costs, a loss of mineral reserves, or require Cameco to give notice to many of its customers that it is declaring an interruption in planned uranium supply. Such consequences could have a material adverse impact on Cameco. Water inflows are generally not insurable.

**MODIFYING FACTORS ASSOCIATED WITH JET BORING**

The jet boring mining method and the overall mining and freezing plans for Cigar Lake have been developed specifically to mitigate the mining challenges, such as the low strength of the rock formation, the groundwater and the high-level radiation, and to mine the deposit in a safe and economic manner. Unexpected geological or hydrological conditions or adverse mining conditions in CL Main or CLEXT could lead to losses of mineral reserves, lower recovery or increased dilution. These issues could also delay production and increase costs.

Jet bore mining activities in CLEXT will be taking place up to 2,000 metres away from the process area. A series of booster pumps will be utilized to move the ore slurry over this distance. Failure of the booster pumps to operate as expected could result in a lower production rate coming from portions of the CLEXT mining zone.

**GEOTECHNICAL CHALLENGES**

Challenging geotechnical conditions combined with additional ground stress induced by artificial ground freezing and proximal development has resulted in unplanned rehabilitation work on the production tunnel liners, which results in a production interruption from the affected tunnel. Rehabilitation-induced production interruptions of a moderate nature are factored into the overall production plan. However, there is a risk that more extensive work may be required should deterioration trends worsen compared to historic levels. The requirement for extensive rehabilitation work on the NATM tunnel liners could result in production deferral, and potentially the partial loss of mineral reserves.

The knowledge of the geotechnical conditions specific to CLEXT is limited to information derived from drill core. This information is similar to that observed in the CL Main portion of the orebody, so conditions are assumed to be analogous. However, local conditions may be encountered that require changes to development plans, which may result in increased costs, delays to production or partial loss of mineral reserves from CLEXT.

### ECONOMIC SENSITIVITY OF THE MINERAL RESERVES

The easternmost five panels of the CLEXT mineral reserves are lower grade than the average. An increase in costs or decrease in uranium price may make mining of these panels unprofitable, removing them from the mineral reserves.

The portion of CLEXT deposit between West Pod and the CLEXT mineral reserves has relatively sparse drilling density, weaker apparent geological continuity, and a high degree of uranium grade variability. Drilling to date is not sufficient at this time to permit the classification of indicated or measured mineral resources for conversion to mineral reserves. Future drilling in this area may result in a change in the CLEXT mineral resources and reserves, given the relatively limited amount of drillhole information informing the geological model.

# 16 Mining methods

## 16.1 Design parameters

This section describes the technical aspects of the planned underground mine, including geotechnical and hydrogeological parameters, test mining activities, selection of mining method, mine design, mine development requirements, mine production, backfilling and mine equipment requirements.

**GEOTECHNICAL CHARACTERISTICS OF THE DEPOSIT**

Two of the primary geotechnical challenges in constructing and operating the mine are control of groundwater and ground support in areas of weak rock. These challenges occur in proximity to the deposit within the altered overlying sandstone and underlying basement lithology, particularly in areas where fault zones and/or major fracture zones are located.

Based on drilling and mapping of the mine development completed to the end of 2023, a geotechnical rock mass interpretation has been developed for both the CL Main and CLEXT zones of the Cigar Lake deposit. Three main geotechnical domains have been defined using Bieniawski's Rock Mass Rating (RMR89) System, which Cigar Lake staff have further divided the RM2 domain into high and low subcategories. Representations of the geotechnical domains are illustrated in *Figure 16-1* (CL Main) and *Figure 16-2* (CLEXT). These domains consist of the following categories:

- RM1 Domain: RMR rating between 0 and 20, a very weak rock mass associated with intense to strong clay alteration of the host lithology
- RM2 Low Domain: RMR rating between 20 and 30, locally weak to moderately competent rock mass associated with moderate to locally strong clay alteration and moderate to strong fracturing of the host lithology
- RM2 High Domain: RMR rating between 30 and 45, locally weak to moderately competent rock mass associated with moderate to locally strong clay alteration and moderate to strong fracturing of the host lithology
- RM3 Domain: RMR rating > 45, a competent rock mass consisting of little to no clay alteration and weak to moderate fracturing

Clay alteration, a defining criterion of the RMR domains, is closely associated with major fault zones located within the deposit area. Four major fault orientations, all steeply dipping, have been delineated within the Cigar Lake deposit area, consisting of:

- east-west trending structures, including:
  - shears zones (protomylonites)
  - semi-brittle faults zones
  - graphitic fault (breccia) zones
  - non-graphitic fault zones
- northwest fracture/dissolution zone
- northeast trending faults
- north-trending faults

The CL Main east-west fault zones consist of graphitic breccia zones that are up to several metres wide and coincide with the basement high along which the deposit is located. The northwest and northeast trending fault zones intersect the main east-west structural corridor in the central portion of the CL Main zone, and this intersection locally controls the most extensive clay alteration observed at the ore horizon and the main mining horizon. A schematic geological vertical section depicting the clay alteration profile of CL Main is provided in *Figure 16-3*.

CLEXT mineralization is not as extensively developed in both the vertical and across strike directions as CL Main. The basement high associated with mineralization is less pronounced than that observed at CL Main. Along strike, CLEXT has been segmented into a series of smaller lenses. The primary economic zones are generally vertically separated into two (locally three), relatively flat-lying, stratified zones as opposed to a single, continuous zone which is generally noted at CL Main East Pod. CLEXT exhibits less clay alteration both in the basement and the sandstone.

A schematic geological vertical section depicting the clay alteration profile of CLEXT is provided in *Figure 16-4*.

Anticipated ground conditions for CLEXT were assessed by means of a Rock Mass Rating (RMR) spatial distribution based on drill core information. Comparison of this information against that from CL Main indicates that ground conditions at the development horizon should be slightly better than experienced in CL Main. However, the available information from CLEXT is quite sparse. To manage this potential risk, geotechnical drilling programs will be conducted ahead of the advancing access and production tunnels. This will allow for collection of information to alter excavation and ground support plans if required.

FIGURE 16-1: GEOTECHNICAL DOMAINS OF THE 480L OF CL MAIN WITH INTERPRETED FAULT ZONES

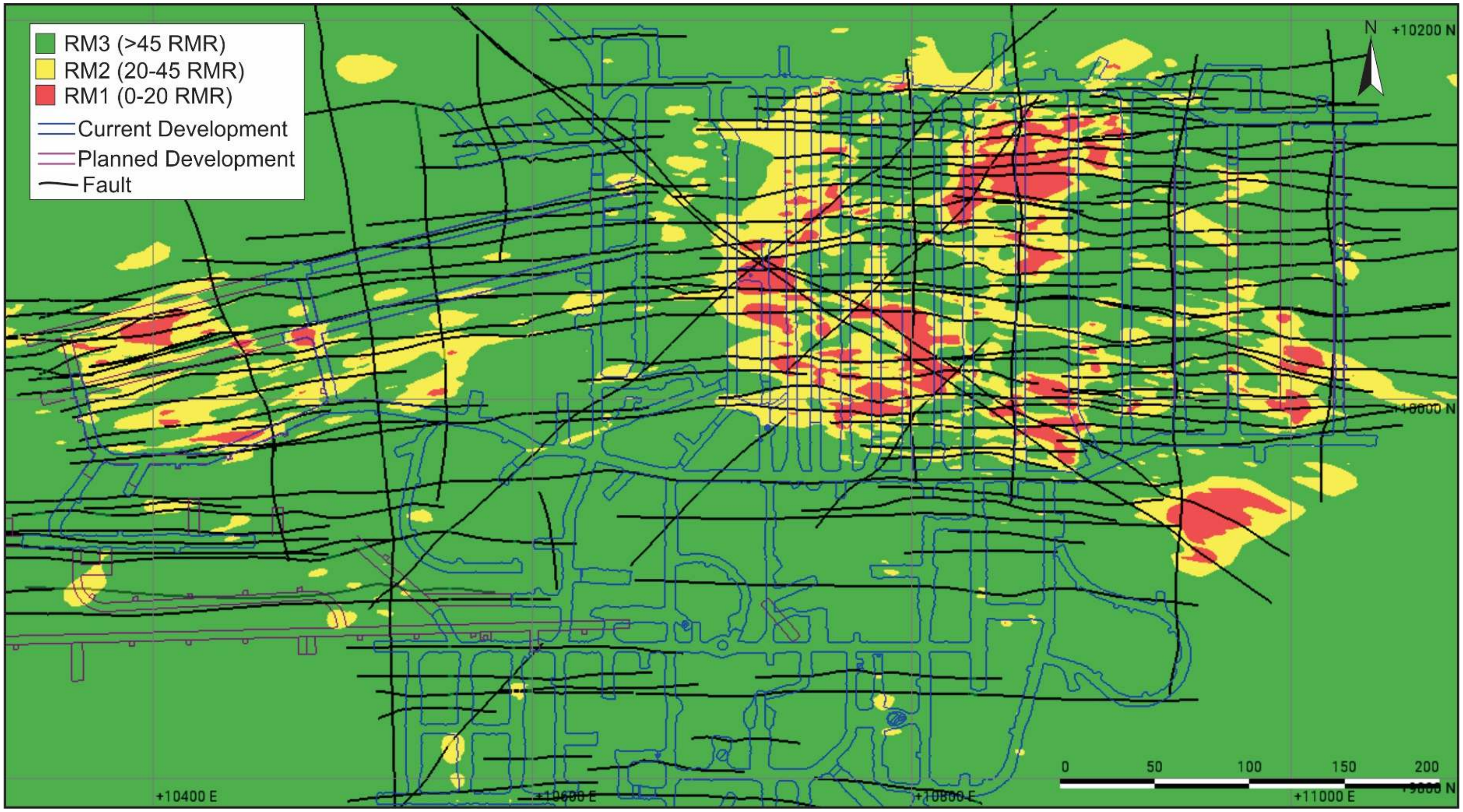


FIGURE 16-2: GEOTECHNICAL DOMAINS OF THE 480L OF CLEXT WITH INTERPRETED FAULT ZONES

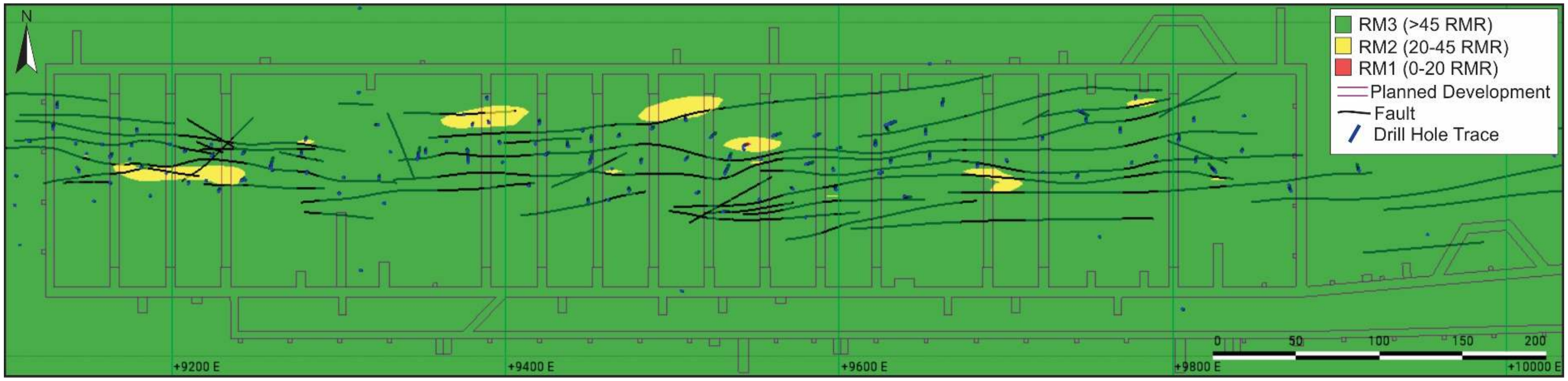


FIGURE 16-3: CL MAIN GEOTECHNICAL SCHEMATIC CROSS SECTION AT 10783E – LOOKING WEST

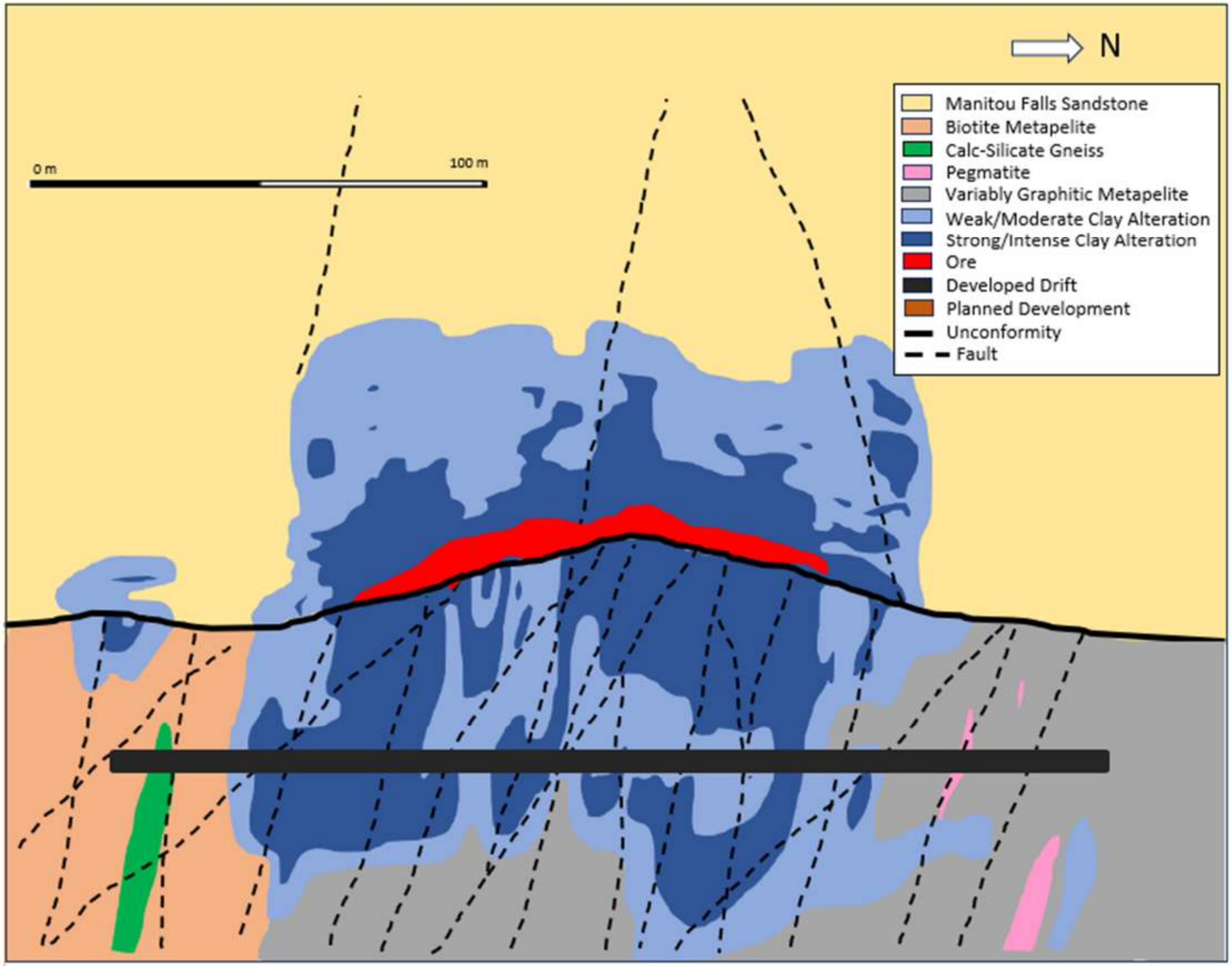
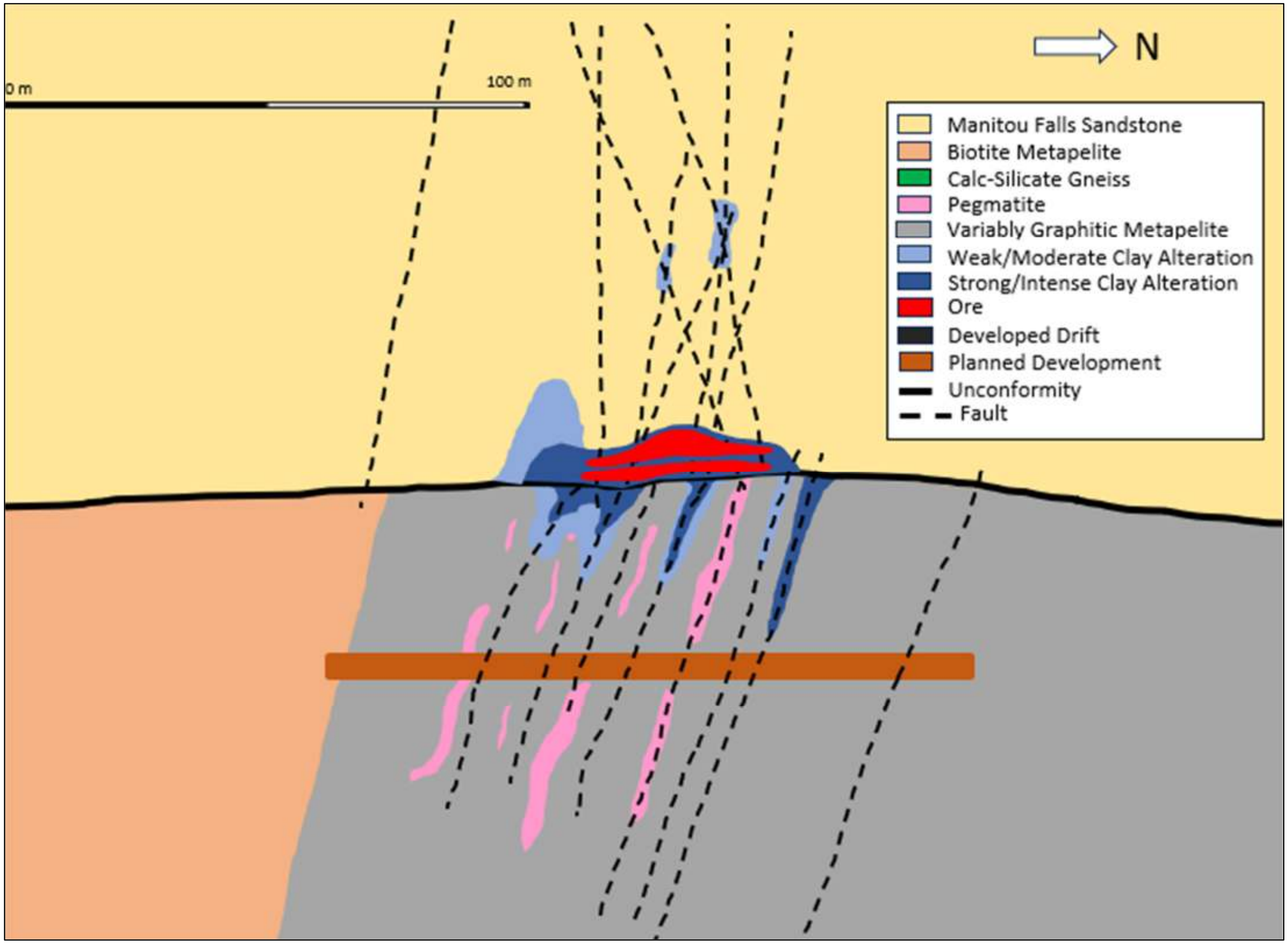


FIGURE 16-4: CLEXT GEOTECHNICAL SCHEMATIC CROSS SECTION AT 9580E – LOOKING WEST



### HYDROGEOLOGY

The deposit and sandstone are highly fractured. Post-mineralization fracturing is the dominant control of hydraulic conductivity and, where it transects the deposit, potentially acts as a conduit for water. The basement rocks are much tighter, with very minimal groundwater flow, although there are localized areas of poor ground conditions that are susceptible to higher rates.

The most permeable zones occur in the fractured sandstones surrounding the deposit. Within the basement rock mass, the hydraulic conductivity is entirely fracture controlled and two to three orders of magnitude below that of sandstone, typically due to the tightness of the fracturing and the clay and chlorite alteration of fracture surfaces.

The primary risk associated with the highly fractured rock mass surrounding the deposit is the potential for high and uncontrolled groundwater inflow into the underground workings arising from mining activities, particularly:

- falls of ground that make connection with the overlying water-bearing zones
- holes drilled from the basement rocks that connect with the water-bearing zones
- intersections of faults or areas of weak (highly permeable) ground connecting to the water-bearing zones

Three water inflows, including the October 2006 inflow on the 465-metre level (465L) and the August 2008 inflow on the 420-metre level (420L), which resulted in the flooding of the mine, resulted in a re-evaluation and revision of the mine design and practices to minimize water inflow risk. The mine water management system is described in *Section 16.2*.

Hydrogeological studies have since been completed in conjunction with geotechnical investigations. A 3D groundwater flow model was developed in 2013 based on an interpreted geological model developed from data collected from diamond drill core, mine development and geophysical investigations available at the time.

The structural framework and hydrogeological characteristics between CL Main and CLEXT show them to be similar, supported by packer testing data from two holes that were drilled on CLEXT in 2019. Based on these similarities, the rate of inflow of background seepage and non-routine inflows in CLEXT are expected to be similar to what has been experienced in CL Main.

### TEST MINING ACTIVITIES

The boxhole boring and the jet boring mining methods were both successfully field tested at Cigar Lake during the initial test mining program. Both methods were able to utilize a non-entry approach, as mining was conducted from headings located below the orebody. The ore was collected at the bottom of the access drillholes and contained within a cuttings collection system. Ground freezing stabilized the water saturated weak rock mass in which the orebody occurs, and effectively prevented any possible inrush of groundwater. Through the application of non-entry mining methods, the containment of the ore cuttings within cuttings collection systems, and the application of ground freezing, the levels of radiation exposure to workers were acceptable and below regulatory limits.

Following the completion of the test mining programs, the jet boring method was selected over boxhole boring as the safest and most viable economic method of mining in the CL Main zone of the orebody. Overall, the test mining programs were considered successful, with the initial objectives achieved. An estimated total of 767 tonnes of mineralized material with an average grade of 17.4% $U_3O_8$ was mined during the various mining tests.

Today, mining rates and cycle time repeatability has been demonstrated for the JBS mining method. Cameco continues to assess the full potential of the mining method and seeks to improve upon current performance levels. Additional information about the JBS mining method is described in *Section 16.3.*

## 16.2 Mine design

**OVERVIEW**

Facilities and services required for the mine generally include:

- two service shafts for mine access and ventilation
- access drifts and production crosscuts
- ore processing facilities
- support facilities, including maintenance shop, electrical substations, sumps, pump stations and storage areas
- ground freezing infrastructure and equipment (surface)

The CL Main orebody is being mined using a series of crosscuts and access drifts on the 480L. A strategy of bulk freezing the orebody was adopted to minimize the risk of large water inflows, control radiation resulting from radon being released from flowing water and increase the strength of the rock to be mined. Freezing has historically been undertaken from both the 480L and from surface. After an extensive freeze study conducted by Cameco and peer reviewed by external freezing consultants, the CLJV decided in 2015 to continue exclusively with surface freezing for the entire extent of the CL Main orebody. All production mining is planned to occur from the 480L using the jet boring mining method.

Mined ore from the jet bore units is pumped to the ROM ore receiving facility on the 480L. From there, the ore goes through an underground crushing, grinding and clarification circuit before being pumped to surface through one of two ore slurry pipelines installed in Shaft No. 2. More detail about ore processing can be found in *Section 17*.

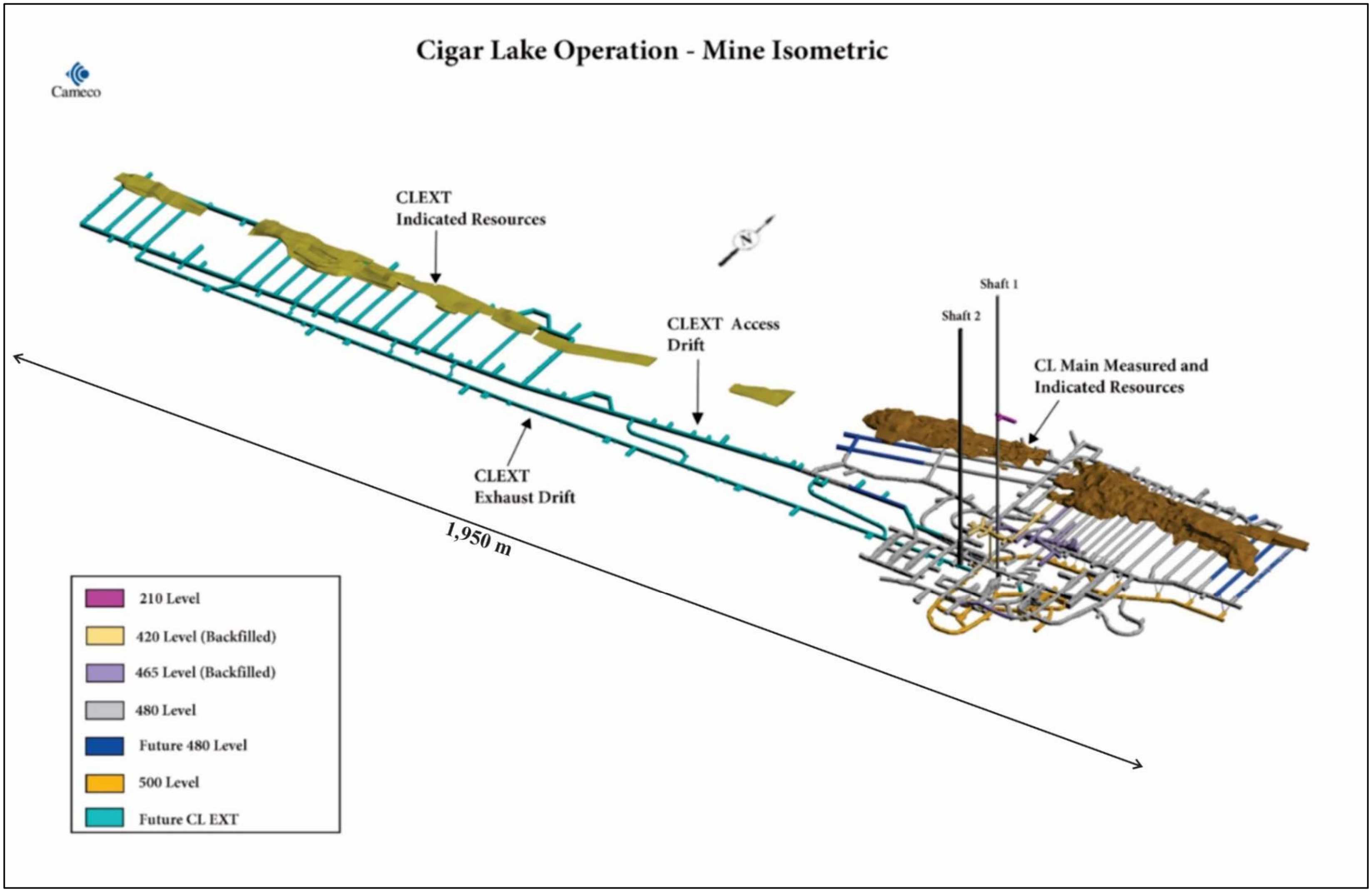
The CLEXT orebody is planned to be mined utilizing the same methods and approach as CL Main. Ground freezing will be completed from surface. Access drifts will be developed on the 480L out to the CLEXT orebody with a return air drift running parallel on the 500L. A series of production crosscuts will be used to accommodate the jet bore mining units. Production from the JBS mining units will be pumped from CLEXT back to the ore processing facilities in CL Main.

CLEXT development and jet bore mining will utilize existing CL Main infrastructure for mine access, ventilation, mine dewatering, processing and jet bore mining support activities.

*Figure 16-5* provides a 3D view of the existing and planned development for the Cigar Lake mine. The layout is a function of the jet boring method and the need to freeze the orebody due to ground conditions, groundwater and radon control issues. The layout is also a function of overall ventilation, radiation protection and support services requirements.

The following subsections describe in more detail the infrastructure and development activities planned as part of the life-of-mine plan.

FIGURE 16-5: THREE-DIMENSIONAL GENERAL MINE LAYOUT OF CL MAIN AND CLEXT– LOOKING NORTHWEST



## MINE ACCESS

There are two shafts that access the Cigar Lake mine.

### *Shaft No. 1*

The No. 1 Shaft is a circular, concrete lined shaft with an internal diameter of 4.9 metres. This shaft was constructed with a hydrostatic concrete liner to mitigate the amount of water inflow to the mine. The shaft extends from surface to a depth of 500 metres and provides direct access to the 480L and 500L. A drift connecting the shaft bottom and 500L facilitates maintenance and removal of spillage from waste rock hoisting. There are also shaft stations at the 210-metre level (210L) and 420L.

The No. 1 Shaft is the primary means of access and egress from the mine and is equipped with a dual-purpose cage/skip conveyance designed to transport personnel and material and to hoist waste rock to surface for disposal. The conveyance operates in counterbalance with a counterweight. The cage/skip conveyance and counterweight both travel on rope guides within the shaft and fixed steel guides in the headframe, shaft collar area and below the 410 metre depth. The shaft is serviced by a double-drum mine hoist.

A portion of the fresh ventilation air for the mine travels in No. 1 Shaft. A number of the service lines (water, dewatering, electrical, etc.) utilized for mine operations are installed in No. 1 Shaft.

### *Shaft No. 2*

The No. 2 Shaft is located approximately 90 metres south of the No. 1 Shaft. The shaft extends from the surface to a depth of 500 metres. It is utilized for underground ventilation and acts as a secondary means of egress from the mine.

The No. 2 Shaft is a circular shaft with an internal diameter of 6.1 metres. This shaft has been constructed with a non-hydrostatic concrete liner to an approximate depth of 368 metres. A hydrostatic cast iron liner is in place from the 368 to the 467 metre depths, the latter being the top of the No. 2 Shaft station on the 480L. The shaft is constructed with a non-hydrostatic liner from the 480L to the 500L.

In order to provide sufficient fresh intake air to the underground workings, the No. 2 shaft contains a permanent, cast-in-place, concrete partition extending the full length of the shaft. This partition separates the shaft into two compartments; this allows the east half of the shaft to function as an intake airway to carry fresh air to the mine workings, while the west half serves as an exhaust airway from the mine. The fresh air compartment of the shaft contains various mine service lines (water, dewatering, ore slurry, concrete slick lines, electrical, etc.) and a cage conveyance for personnel travel and material handling purposes. The exhaust air compartment of the shaft is left empty.

## MINE DEVELOPMENT

There are two main levels in the mine: the 480L and 500L. Both levels are located in the basement rocks below the unconformity. The 420L, located in the sandstone above the basement rock, no longer has a use in the updated mine plan and has been backfilled to reduce the likelihood of another inflow event similar to that of August 2008. The 465L is also no longer required as part of the mine plan and has been backfilled to reduce the likelihood of further ground failure or inflow on that horizon.

### *480L (south)*

The southern portion of 480L includes the mine access and process areas. The mine infrastructure on this level is primarily associated with ore processing and mine servicing activities. No. 2 Shaft is also accessed through this area of the mine. The primary existing facilities on the southern portion of 480L currently include:

- No. 1 Shaft station, grizzly, loading pocket and waste rock handling system
- No. 2 Shaft station
- access ramp to 500L
- access drifts and crosscuts, including access crosscuts to the north end of the mine
- ore processing area
- control room and laboratory areas
- electrical rooms and mine electrical distribution systems
- fuel bay and wash bay
- high pressure pumps and associated electrical switchgear
- maintenance facilities
- contingency mine dewatering systems

***480L (north)***

The northern portion of 480L is the production area of the mine; this area consists of north and south production drifts with numerous production crosscuts for jet boring system (JBS) mining. The primary existing facilities on the northern portion of the 480L currently include:

- production access developments
- production crosscuts developed using NATM
- powder and cap magazines
- backfilling station
- ore slurry booster station

There will be two primary means of access to the CLEXT future mine extension from both the 480L north and 480L south. Planned facilities for CLEXT include:

- access drift and crosscut development
- ventilation ramps and raises to the return air drift
- services delivering high pressure water to the production area from the processing facilities
- services delivering ore from the production area to the processing facilities
- additional services, such as fresh water, compressed air supply and concrete delivery lines
- electrical rooms and mine electrical distribution systems
- mine water and production water sumps

***500L***

The 500L is the lower extension of the processing facilities developed on the 480L and include the main exhaust drifts for the mine that tie into No.2 Shaft. Primary access to this level is provided by a decline originating from 480L south of the No. 1 Shaft. Ore is crushed on the 480L at the water flush crusher and ground on the 500L at the ball mill, with the ore slurry being conditioned and pumped to surface in pipes installed in the No. 2 Shaft. Facilities on 500L currently include:

- ore slurry hoisting pump room
- access to No. 1 Shaft and No. 2 Shaft bottoms
- clean and dirty mine water sumps and pumps
- ventilation exhaust drifts
- ball mill area

CLEXT will connect to 500L via a return air drift. This drift will connect to the existing exhaust circuit to provide the needed ventilation for mining in CLEXT. This return air drift will also grade to the existing dewatering infrastructure on the 500L for water handling purposes.

### DEVELOPMENT REQUIREMENTS DURING OPERATION

Excavations still required to be completed to support production during the remainder of the mine life:

- three production crosscuts for East Pod of CL Main
- two longitudinal production drifts for West Pod of CL Main
- three decline ramps to the 500L to connect 480L CLEXT development with the 500L return air drift
- two exhaust ventilation boreholes between 480L and 500L in the East Pod of CL Main
- three exhaust ventilation raises between 480L and 500L for CLEXT

In total, approximately 7,000 metres of lateral and vertical excavation is planned to be developed over the life of the mine for CLEXT while approximately 700 metres is remaining for CL Main. All the remaining development will occur on the 480L and 500L. Remaining development will be executed using a combination of conventional drill/blast and NATM techniques.

### EXCAVATION AND GROUND SUPPORT METHODS

Mine development for construction and operation uses two basic development approaches:

- drill and blast with conventional ground support
- NATM: this development method replaces the Mine Development System (MDS) method previously used. The NATM method includes a 5.6 metre diameter full face mechanical or drill and blast excavation, with a 150-300 millimetre thick sprayed shotcrete liner with embedded engineered yielding elements and lattice girders for ground support

With the exception of the NATM headings, the infrastructure excavations and the access drifts are being developed using conventional drill and blast mining methods. Geotechnical drilling and analysis of ground conditions is completed prior to confirming permanent infrastructure locations.

Cameco plans its mine development to take place away from known groundwater sources whenever possible. In addition, Cameco assesses all planned mine development for relative risk and applies extensive additional technical and operating controls for all higher risk development.

#### *Conventional drill and blast development*

A drill and blast method, utilizing full face advance, is being applied in the competent ground, primarily for access drifts surrounding the orebody and for infrastructure excavations. Grouted rebar and shotcrete are used as the primary support system. Wire mesh and straps are used locally, as required. Rockbolt spacing and shotcrete thickness vary with localized ground conditions. Spiling installed ahead of the excavation is used locally in poor ground. Cable bolts or secondary hollow core bolts (HCB), typically five to eight metres in length, are also being installed in the back of large excavations as well as at most intersections. Modified excavation techniques or additional secondary ground support will be applied in areas of poor ground conditions in the access drifts. For the planned CLEXT access and return air development, conventional drill and blast techniques will be utilized for approximately 5,560 metres of the planned development.

#### *NATM*

Since 2010, when the mine was dewatered, Cameco identified significant spalling, cracking and deterioration of the tunnel segments in all four crosscuts excavated with the former MDS tunnel boring technique. Based on geotechnical consultant recommendations, Cameco adopted a tunnel development technique known as the New Austrian Tunnelling Method (NATM).

The NATM excavation and ground support technique currently used at Cigar Lake consists of the mechanical excavation of a 5.6 metre diameter full face tunnel, which is lined with a 150-300 millimetre thick flexible shotcrete liner incorporating engineered yielding elements, rockbolts and lattice girders. This method is used primarily in production tunnels and in areas of poor ground in conventional headings. The advantage of this excavation technique is that deformations due to ground loading around the opening can be accommodated and controlled. The rehabilitation of these tunnels is faster and more practical in case the deformations cause clearance issues for the JBS mining unit.

Mechanical excavation is being executed using two tunnel heading excavators and one roadheader.

Cameco has successfully excavated nine NATM production tunnels on the east side of CL Main and two production tunnels on the west side of CL Main. All production tunnels are backfilled with low strength backfill after ore is depleted above these tunnels. NATM excavation techniques are expected to be used in 14 CLEXT production tunnels as well as in conventional headings in areas where poor ground conditions are expected.

## ARTIFICIAL GROUND FREEZING (AGF)

The current method of mining the Cigar Lake orebody uses progressive block freezing of portions of the mineralized zone and adjacent host rock. Freezing the orebody reduces the risk of potential inflow of groundwater and release of radon gas into the workplace, while increasing cavity stability and standup time during mining. The freezing strategy is to bulk freeze the ore zone and the surrounding area prior to start of mining in a given area. Frozen cavity criteria are applied to each cavity prior to mining to ensure it meets the minimum standard prior to excavation.

### *Freeze system*

The orebody is currently frozen utilizing surface freeze infrastructure (ammonia refrigeration plants, freeze holes and brine distribution systems). The freeze plants reduce the temperature in the calcium chloride brine mixture and the chilled brine is pumped at high pressure through a brine distribution system to the surface freeze pads. This chilled brine is circulated through freeze piping to remove heat from the surrounding rock to freeze the ground. The slightly warmer brine returns to the surface freeze plant where it is re-chilled and returned to the loop. Temperature measuring devices are installed in drilled holes to monitor the progress of the ground freezing.

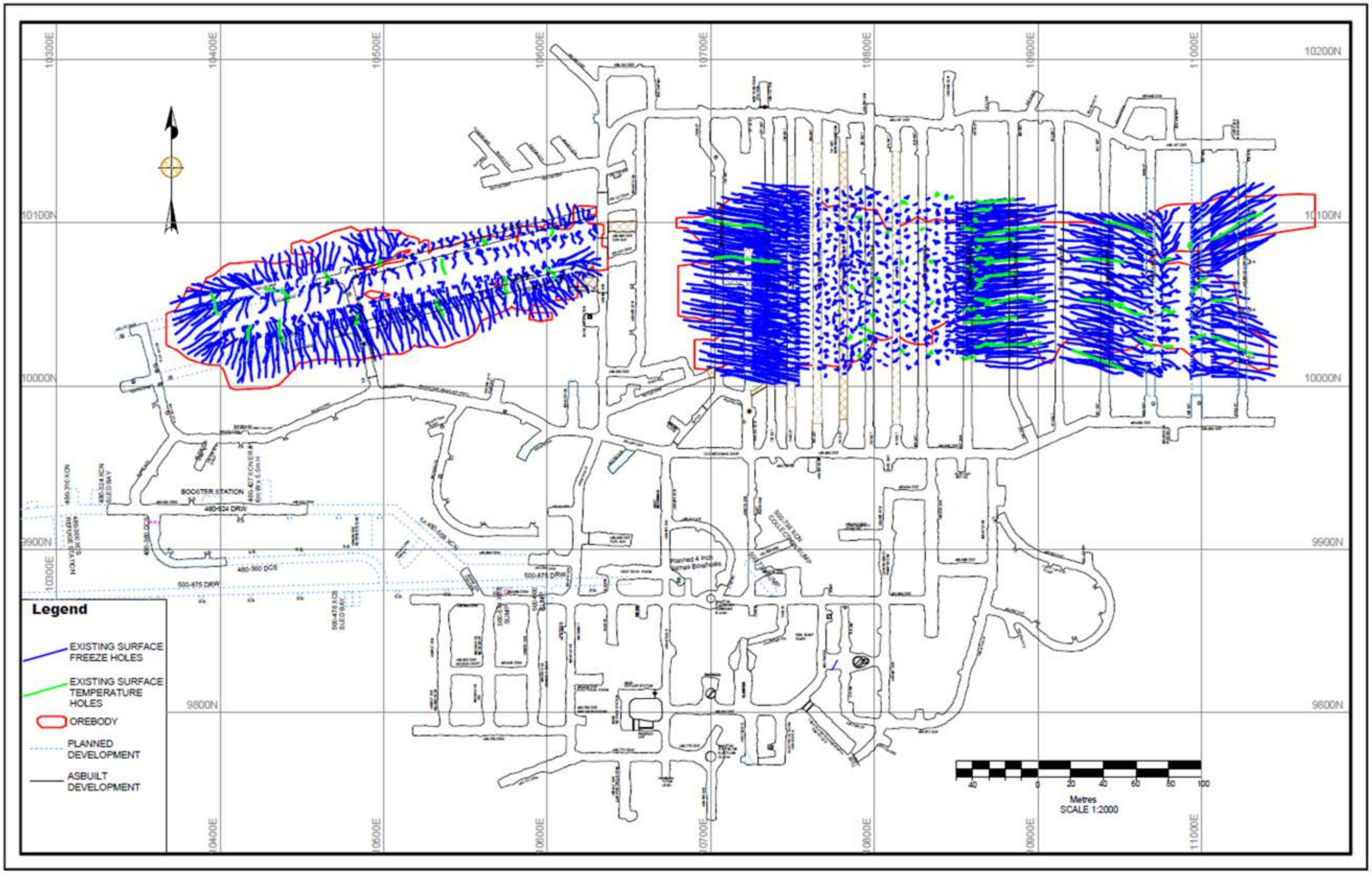
This AGF system freezes the deposit and surrounding rock to between -5°C and -25°C in two to four years, depending on freeze pipe geometry and ground properties such as water content and thermal conductivity. Parameters such as volumetric water content, rock type and timing to production are the main drivers in determining freeze pipe spacing at the ore horizon. Temperature holes installed in the area to be frozen are used to determine when the ground has reached its required temperature in conjunction with the freeze models used for predictive forecasting of ground temperatures. Where required, the ground above the planned production tunnels may be frozen prior to development as there is a potential risk of inflow from historical unsecured surface diamond drillholes.

To facilitate ground freezing prior to development or production activities, onsite freeze plants currently deliver approximately 3,100 tonnes of freeze field refrigeration (TR) at -30ºC to the CL Main freeze pads. With the addition of CLEXT, it is modelled that only one additional skid will be required to meet the estimated 3,420 TR freeze loading requirements. The freeze plants contain the necessary compressors, chillers, tanks, pumps and other associated equipment to chill brine. Brine is circulated through insulated high-pressure pipelines to heat exchangers prior to being pumped to the surface freeze pads through insulated brine distribution lines.

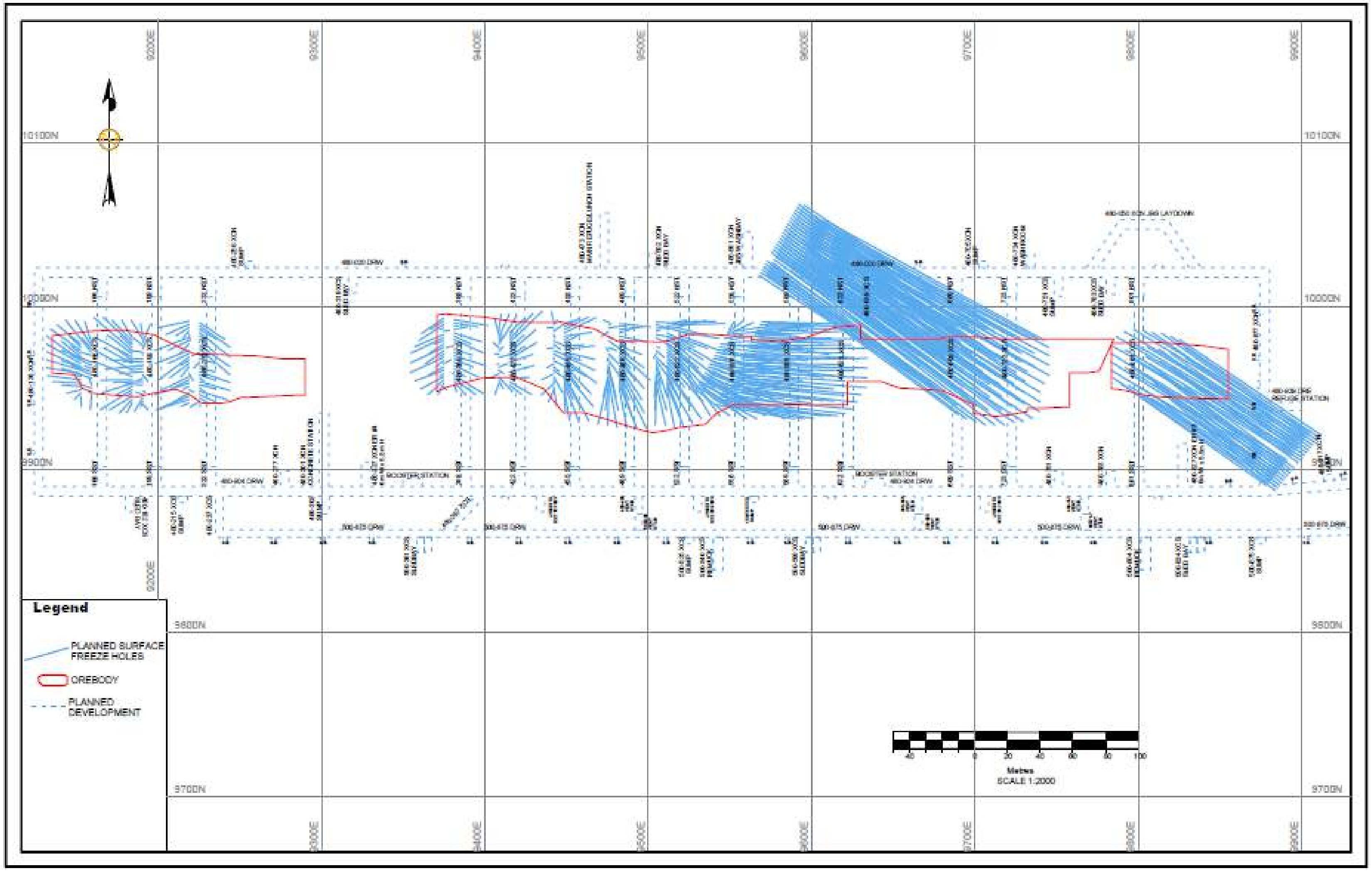
***Freeze drilling from surface***

A surface freezing system has been installed to freeze the orebody to an approximate depth of 455 - 465 metres (roughly 15-20 metres above the mine workings and approximately 15 meters below the bottom of the mineral horizon). The freeze holes are drilled at a five to six metre spacing around the perimeter of the orebody, with infill freezing ranging between a 6 x 6 metre pattern up to 10 x 10 metres, depending on the geological conditions and timing to production. The system currently includes three surface drill pads over the production tunnels. CLEXT is planned to have three additional distinct freeze pads to allow surface freeze drilling to be executed. In May of 2023, the CL Main freeze program came to completion with a total of 1,265 freeze and 75 temperature monitoring holes installed as shown in *Figure 16-6*. CLEXT is estimated to add an additional 560 freeze holes and 28 temperature monitoring holes. *Figure 16-7* shows the extent of the freeze holes planned for CLEXT.

FIGURE 16-6: CL MAIN FREEZE HOLE LAYOUT



## FIGURE 16-7: CLEXT FREEZE HOLE LAYOUT



## VENTILATION

The mine ventilation system has been designed to supply fresh air to the working areas, remove contaminated air from the mine and reduce the potential for radon gas build-up. The designed mine ventilation volume of up to 240 $m^3$/s provides sufficient airflow through the mine for use of diesel equipment and radiation protection at a sustained production rate of approximately 18 million pounds per year $U_3O_8$.

Ventilation modeling was completed for CLEXT to establish staged plans to the existing circuit in order to reduce diesel particulate matter (DPM) and radon gas as future development progresses.

### *Primary system*

- supplies 220 - 240 $m^3$/s fresh air to the mine
- Shaft No. 1:
  - fresh air intake equipped with two mine air heaters with four burners and two 250-hp fans
- Shaft No. 2:
  - three 800-hp fans on surface draw contaminated mine air up through the exhaust compartment (two operating, one standby spare)
  - three 200-hp fans (with mine air heaters) supply fresh air to the mine via the conveyance/service compartment
- the mine air heaters are used during the winter months to heat the ventilating air to approximately 5°C. The heaters are direct-fired propane heaters installed at the ventilation intake locations at both Shaft No. 1 and Shaft No. 2.

### *Auxiliary system*

- draws air from the primary circuit
- uses fans and ducting to provide appropriate ventilation to the production and development headings, as well as other work areas and facilities
- local air extraction systems to remove potentially contaminated air installed at a number of locations
- once captured inside a duct, the radon contaminated air is discharged directly into a dedicated exhaust drift or raise, or ducted directly into Shaft No. 2 and discharged to surface

## MINING EQUIPMENT

The mining equipment list reflects the current and planned mining equipment requirements for mine operation and production. All of the mine equipment for mine operation is owned by Cameco, with the exception of diamond drilling equipment.

Production-related mining equipment includes three JBS units supported with two concrete pumps for backfilling purposes. A grout pump is also required for grouting casing after reaming. Ongoing mine development is completed using conventional drilling and blasting equipment for access drifts, and NATM tunneling equipment for development beneath the ore zone. Specialized tunneling equipment consists of tunnel heading excavators, HCB compatible jumbos/bolters, higher performance shotcrete machines and a roadheader. Cross compatibility between conventional and tunneling equipment is required due to the variability of ground conditions throughout the development areas.

During mine operation, all freeze drilling is planned to occur from surface. A fleet of up to five freeze drills will be required to ensure freeze drilling and ground freezing is completed sufficiently ahead of planned mining activities.

Other mining equipment, such as scissor lifts, telehandlers, excavators, skid steers, and grout pumps are used to support the mine development and production activities.

*Table 16-1* shows a list of the key underground mining equipment required for development and production.

## TABLE 16-1: UNDERGROUND MINING EQUIPMENT

| Description | Existing Fleet | Future Additional |
|---|---|---|
| Jet boring units | 3 | |
| JBS grout pump | 1 | |
| Tunnel heading excavators | 2 | |
| Batch plant for shotcrete | 1 | |
| Scooptrams (various sizes) | 4 | 2 |
| Electric hydraulic jumbo drill | 3 | |
| Bolter | 1 | |
| MAI grout pumps | 3 | |
| Scissor lift truck | 2 | |
| Concrete pump – for backfill | 3 | |
| Various shotcrete/concrete sprayers | 3 | |
| Concrete transmixer trucks | 2 | |
| Skid steers | 3 | |
| Telehandlers / forklifts | 9 | |
| Small excavators | 2 | |
| ANFO loader | 1 | |
| Roadheader | 1 | |
| Personnel carriers | 0 | 3 |
| Service truck / utility deck truck | 0 | 2 |
| Crane | 1 | |

Two additional pieces of major mobile equipment, in addition to some smaller pieces of ancillary equipment, need to be added to the existing equipment fleet to mine the remaining mineral reserves at Cigar Lake. However, much of the existing fleet is scheduled to be replaced or overhauled during the remaining mine life. Costs for this additional and replacement equipment are included in the life-of-mine capital plan noted in *Section 21.1*.

### MINE WATER MANAGEMENT

A mine water handling strategy was developed that included increasing the mine's water-handling capabilities for routine and potential non-routine inflows above the existing capability previously assessed by Cameco (2004) in the Cigar Lake Project Environmental Assessment Study Report. In addition to treating all routine water inflows (both seepage and process water) prior to releasing to the environment, water from any non-routine inflow will also be treated prior to releasing to the environment until such time as the inflow can be mitigated at the source.

Cameco submitted a screening level environmental assessment to discharge all treated effluent (except sewage) through two pipelines directly to a single location in Seru Bay of Waterbury Lake, and a positive decision was received in 2011. Construction and commissioning of this facility was completed in 2012.

In order to be able to respond quickly and efficiently to any potential future mine inflow, staff at Cigar Lake have prepared a comprehensive document containing a number of water inflow planning scenarios. The document contains information on equipment, material and personnel required to deal with various inflow scenarios, as well as suggested sequences of activities to deal with different inflow scenarios in different locations of the mine.

***Hydrogeological model***

Hydrogeological flow modelling of the Cigar Lake deposit area was commissioned after the initial flooding of the mine in October 2006, when it was recognized that a better understanding of the complex hydrogeology was required for managing non-routine inflows. It was completed by an independent consultant in 2008. Further updates were made to the model in 2010 and 2013, based on the updated mine plan and revisions to the geological model and piezometer readings from the August 2008 inflow, which were used to calibrate the model.

As part of the CLEXT prefeasibility study, Cameco reviewed the new hydrogeological information collected since the calibration of the 2013 model. Cameco determined that the new information fit the range of assumptions and parameters used in the 2013 hydrogeological model and that no update to the hydrogeological model was required.

In the case of a non-routine inflow, the 2013 hydrogeological flow model predicted an instantaneous inflow rate of up to 1,150 $m^3$/h, falling to a sustained rate of up to 700 $m^3$/h after approximately three days. Natural water seepage into the mine workings is expected to be up to 30 $m^3$/h over the life of the mine.

***Mine dewatering & treatment system***

The mine dewatering system was designed and constructed to handle both routine and non-routine inflows. Cigar Lake has set a minimum required capacity of the dewatering system (based on the maximum estimated non-routine inflow) of 1,740 $m^3$/hr. Currently, Cigar Lake has a maximum available installed dewatering capacity of 2,500 $m^3$/hr; however, actual available dewatering capacity is dynamic based on various maintenance or operating requirements. The current capacity is managed at all times to ensure the minimum required capacity is available or corrective actions are undertaken.

The mine dewatering system is comprised of three main pumping systems:

- the primary system has a designed capacity of 700 $m^3$/h and handles the daily routine dewatering requirements. It will also be used in the event of a non-routine inflow
- the contingency mine dewatering system has installed pumping capacity of 800 $m^3$/h provided by high-speed multistage centrifugal pumps located in a pump room on the 480L
- the third system is comprised of four borehole pumps, installed and controlled from surface, with a designed pumping capacity of 1,000 $m^3$/h

All three pumping systems draw water from collection sumps on 500L, the lowest working level in the mine. All of the systems are routinely tested to ensure they are operating within their required capacities.

Mine water from CLEXT will report to the existing 500L mine water collection sumps area, via a new central collection sump adjacent to the existing collection sumps.

The water treatment system has design capacity to treat and release mine effluent at a rate 2,550 $m^3$/hr, which exceeds the 1,740 $m^3$/hr required minimum operational capacity. With this infrastructure in place, Cameco believes it has sufficient pumping, water treatment and surface storage capacity to handle the estimated maximum non routine inflow rates.

The Cigar Lake orebody contains elements of concern with respect to water quality and the receiving environment. The distribution of elements such as arsenic, molybdenum, selenium and others is non-uniform throughout the orebody, and this can present challenges in attaining and maintaining the effluent concentrations included in the licensing basis.

## 16.3 Mine production

### MINING METHOD SELECTION

Jet boring had never been used as a primary extraction method at a mining operation for any commodity, so the JBS had to be developed and adapted specifically for the Cigar Lake deposit. Selection and optimization of a mining method capable of extracting the ore efficiently and economically required addressing several geotechnical and hydrogeological challenges such as:

- the low strength of the rock formations encompassing and underlying the orebody, and the necessary ground support required to stabilize these formations
- the presence of large volumes of groundwater expected to be encountered while mining the ore or drilling in the overlying sandstone rock formation (including for freeze hole drilling) and the potential for a water inflow
- the high level of radiation build-up from the ore and the associated radon gas from the water in contact with the ore, necessitating containment and isolation to protect the workers

The JBS mining method and overall mining plan for Cigar Lake have been developed specifically to mitigate these challenges and mine the deposit in a safe and economic manner. The JBS tools, equipment and methods continue to be improved and refined as more experience is gained with this mining method.

A description of the test mining activities undertaken to develop the JBS mining method can be found in *Section 16.1.*

### JET BORING MINING METHOD

The JBS mining method consists of cutting cavities out of frozen ore using a high-pressure water jet. Access to the orebody is achieved by drilling boreholes upwards from the production crosscuts below and then inserting specialized jetting tools to the ore horizon. Jetting begins at the top of a cavity and retreats vertically downward in thin slices, resulting in a cylindrical void with a height corresponding to the thickness of the orebody and a diameter of 4.5 to 6 metres, which may vary based on geology and system performance. The resulting void is tightly backfilled with concrete, and the cycle is repeated to recover adjacent ore. The advantages of jet boring as a mining method at Cigar Lake are:

- It is a non-entry mining method. Personnel do not enter the ore zone and operators can control the equipment remotely. These are two essential requirements for radiation control during mining of the high-grade deposit
- The cutting of ore with high-pressure water produces a slurry which is pumped in slurry pipelines. This provides the complete containment necessary for minimizing radiation exposure to workers while utilizing a relatively simple and cost-effective method for pumping the slurry away from the mining area
- The generation of airborne dust is eliminated since the cutting and material transport are both wet and contained processes. This is a significant advantage for radiation control of the mining of high-grade uranium ore
- Water jets provide the opportunity to excavate ore next to a backfilled cavity without incurring significant dilution from concrete with careful control

Jet boring uses a fan pattern for drilling the jet bore holes from the production crosscuts, resulting in a design with a spacing for these crosscuts that take into consideration geotechnical stability and economics. The jet boring mining method is illustrated in *Figure 16-8*.

## FIGURE 16-8: SCHEMATIC VERTICAL SECTION OF THE JBS MINING METHOD

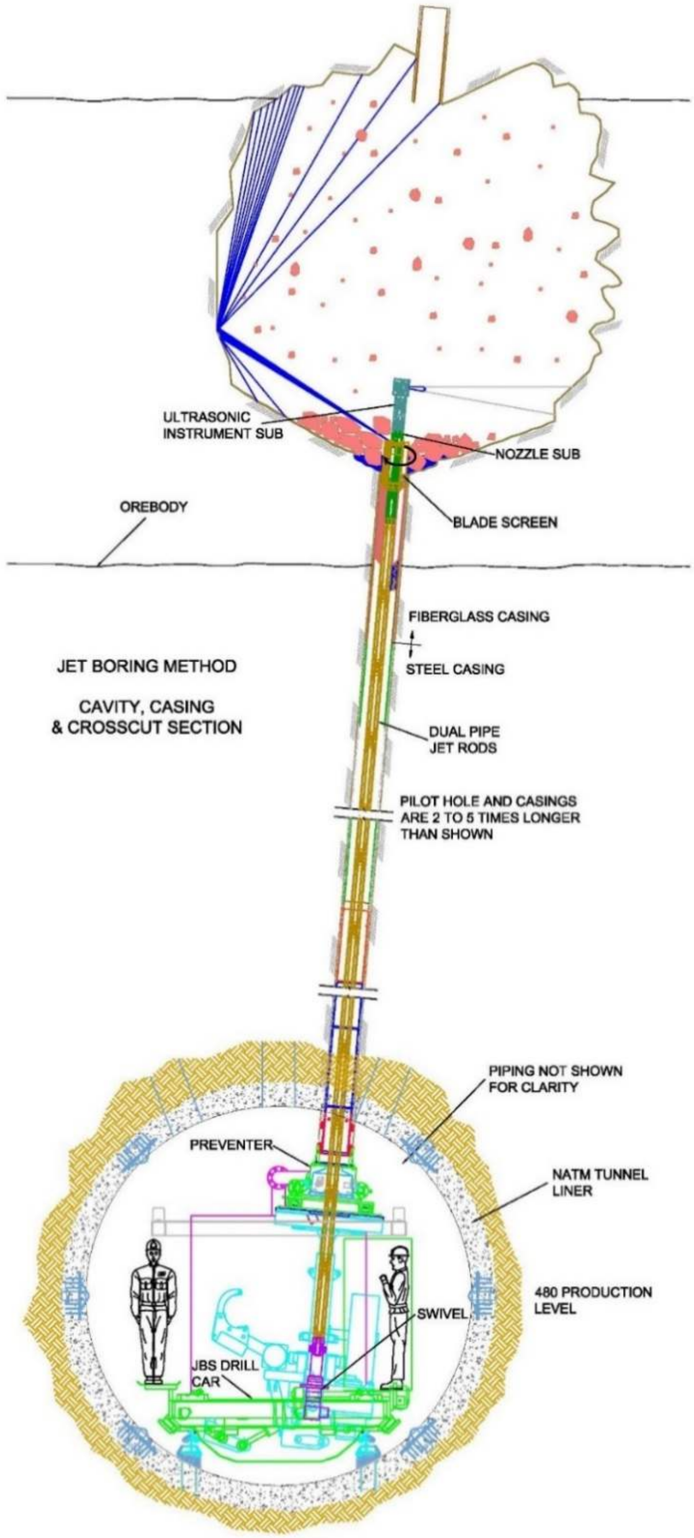



*Figure not to scale*

Mine recovery is based on current operational data from mining of the CL Main ore body. Each mined JBS cavity is surveyed using a 3D laser scanner which is then used to determined mined recovery and is compared against the mineral reserves model. An overall mine recovery of 86% has been estimated based on ten years of production data covering 572 completed cavity excavations.

Planned production rates are based on operational data collected to date for CL Main. The cavity cycle time has a fixed duration that includes drill mobilization, pilot hole drilling, casing install and grouting, pre and post jetting activities, cavity backfill and other operational delays with a variable jetting rate of approximately 71 $m^3$/day. The overall mine production schedule includes allowances for moving the JBS between production crosscuts, major maintenance and scheduled shutdowns while ensuring production of 18 million pounds $U_3O_8$ per year.

Cavity dilution is based on the CL Main orebody design methodology and verified against operational data. Cavity by cavity dilution varies depending on its geometry and location within the orebody. The average dilution breakdown is shown in *Table 16-2*, although cavity by cavity dilution can be highly variable depending on its geometry and location within the orebody. Historical dilution for each cavity has ranged from 7% to as high as 70%, resulting in an overall average of 34%.

### TABLE 16-2: CAVITY DILUTION FACTORS

| Dilution Type | avg% |
|---|---|
| Hanging wall/Footwall Dilution | 26.2 |
| Pilot Hole Dilution | 1.8 |
| Adjacent Backfill Dilution | 6 |
| **Total Dilution** | **34** |

#### BACKFILL SYSTEM

The JBS cavity backfill system and the concrete mix design were tested during the test mining phase. The concrete mix is designed to achieve high early strength in frozen ground. During the ten years of production at Cigar Lake, it has been demonstrated that the concrete backfill remains intact while jetting an adjacent cavity, with little measurable dilution from the concrete.

Concrete is prepared on surface in a concrete batch plant and delivered underground through a concrete slickline to a receiving pump. It is pumped from the receiving pump to the production crosscut via concrete backfill lines. From there, concrete is pumped directly into each mined-out JBS cavity using a conventional concrete pump. Every JBS cavity is filled with concrete backfill to enhance ground stability and prevent orebody erosion while mining an adjacent cavity.

A concrete batch plant and two slicklines in Shaft No. 2 are currently in place. Cameco has upgraded the batch plant with a new high shear wet mixer to improve reliability, ensure sufficient future capacity and to enable use of PAG waste rock into the concrete backfill mix.

The JBS cavity backfill strategy for CLEXT will remain the same as CL Main utilizing the same execution method and equipment as listed above.

#### PRODUCTION SCHEDULE

The current design criteria and scheduling assumptions for jet boring have been developed based on actual operational experience.

Cameco has divided the orebody into production panels, and at least three production panels need to be frozen at one time to achieve the full annual production rate of 18 million pounds $U_3O_8$. One JBS machine is located in each frozen panel and the three JBS machines required are currently in operation. Due to limitations on the availability of high-pressure water, two machines can be actively mining at any given time while the third is moving, setting up, piloting, casing, backfilling or undergoing maintenance.

The remaining mine life based on current mineral reserves will be approximately 13 years, with an estimated full annual production of 18 million pounds $U_3O_8$ recovered from the mill for 11 years followed by a two-year ramp down until depletion.

The following is a general summary of the production schedule based on the current mineral reserves (January 1, 2024 to end of mine life):

- total mill production of 205.9 million pounds $U_3O_8$, based on overall milling recovery of 98.8% for CL Main and 98.5% for CLEXT
- total remaining mine production of 554,500 tonnes of ore (excluding mineral reserves already mined)
- average mill feed grade of 17.0% $U_3O_8$
- remaining mine operating life of approximately 13 years
- variable mining rate to achieve a constant production level of $U_3O_8$ (the average mine production varies annually from 115 to 160 tonnes per day during peak production, depending on the grade of ore being mined)

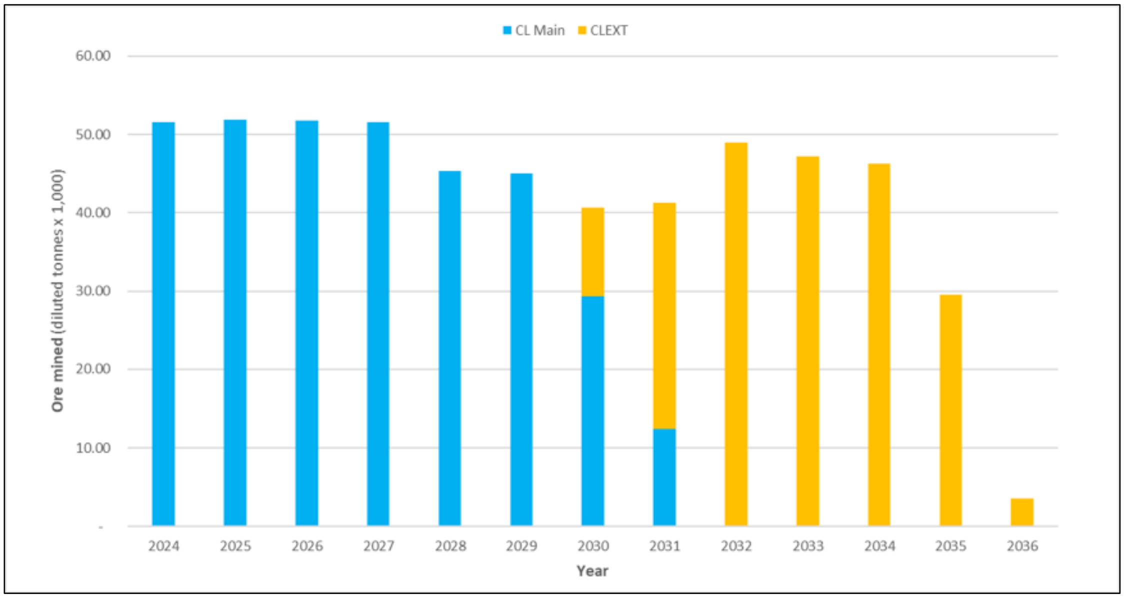
The mine and mill production schedules are shown in *Table 16-3, Figure 16-9* and *Figure 16-10*, respectively.

## TABLE 16-3: CIGAR LAKE 2024 – 2036 PLANNED PRODUCTION SCHEDULE SUMMARY

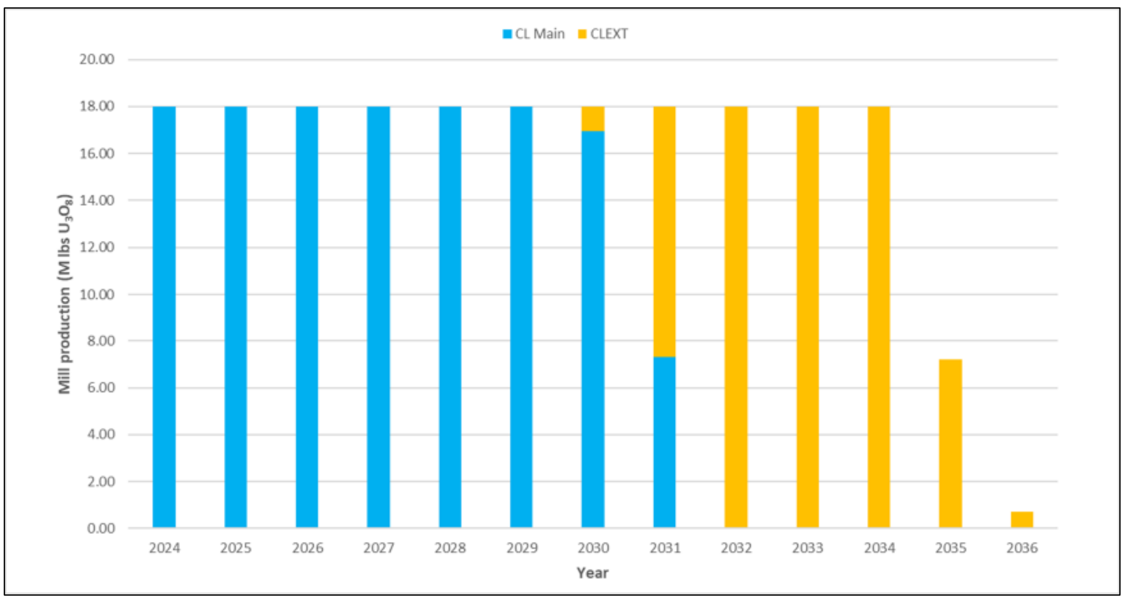
| Description | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | Total or Mean |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Mill packaged production (M lbs $U_3O_8$)** | 18.0 | 18.0 | 18.0 | 18.0 | 18.0 | 18.0 | 18.0 | 18.0 | 18.0 | 18.0 | 18.0 | 7.2 | 0.7 | **205.9** |
| **Mine production (t x 1,000)** | 51.6 | 51.8 | 51.7 | 51.6 | 45.3 | 45.0 | 40.7 | 41.3 | 49.0 | 47.2 | 46.3 | 29.5 | 3.6 | **554.5** |
| **Mill feed grade (% $U_3O_8$)** | 16.7 | 16.0 | 15.9 | 16.5 | 17.7 | 18.1 | 21.3 | 19.8 | 17.0 | 17.8 | 18.0 | 10.6 | 8.8 | **17.0** |

Note: Totals may not add up due to rounding.

## FIGURE 16-9: MINE PRODUCTION




## FIGURE 16-10: MILL PRODUCTION



# 17 Recovery methods

## 17.1 Overview

Cigar Lake ore from the JBS mining method is processed at two locations. Size reduction is conducted underground at Cigar Lake, while leaching, purification, concentration and final yellowcake production and packaging occurs at the McClean Lake mill. The ore is trucked as a slurry from Cigar Lake to the McClean Lake mill in purpose-built containers identical to those used to transport McArthur River ore slurry to the Key Lake mill.

## 17.2 Cigar Lake flowsheet

Broken ore and pilot hole drill cuttings from the JBS units report to ROM ore storage sumps. Ore solids either settle in the ROM or report in the ROM overflow (fine solids) hydraulically to the underground thickeners, depending on particle size and settling velocity. Coarse ore is recovered by an overhead crane mounted clamshell and is fed by a screw feeder into a water flush cone crusher. Crusher discharge reports to a ball mill operating in closed circuit with classification hydrocyclones. Grinding circuit product reports to an underground thickener and the thickened slurry is pumped to an underground ore slurry storage pachuca tank. From there, the ore slurry is pumped by one of the positive displacement pumps through slurry pipelines up Shaft No. 2 to ore storage pachucas located on surface. The ore reports to a thickener and then is loaded into 5 $m^3$ containers (four containers per truck) for shipment by road to the McClean Lake mill.

Other than the addition of booster pumps to assist in moving jetted ore from the CLEXT portion of the mine back to the process area (described in *Section 13.1*), no significant changes to the process circuit are anticipated to process CLEXT ore.

**PROCESS WATER MANAGEMENT**

As much as reasonably possible, process water (water that has been in contact with the ore during JBS mining and ore processing) is recirculated in the underground process circuit. Minor flows of fresh water used for washdowns in process sump areas ultimately report to a collection pond for treatment.

Process water not recycled in the process circuit is pumped to surface, collected in a surge pond and ultimately treated in a conventional two-stage water treatment plant.

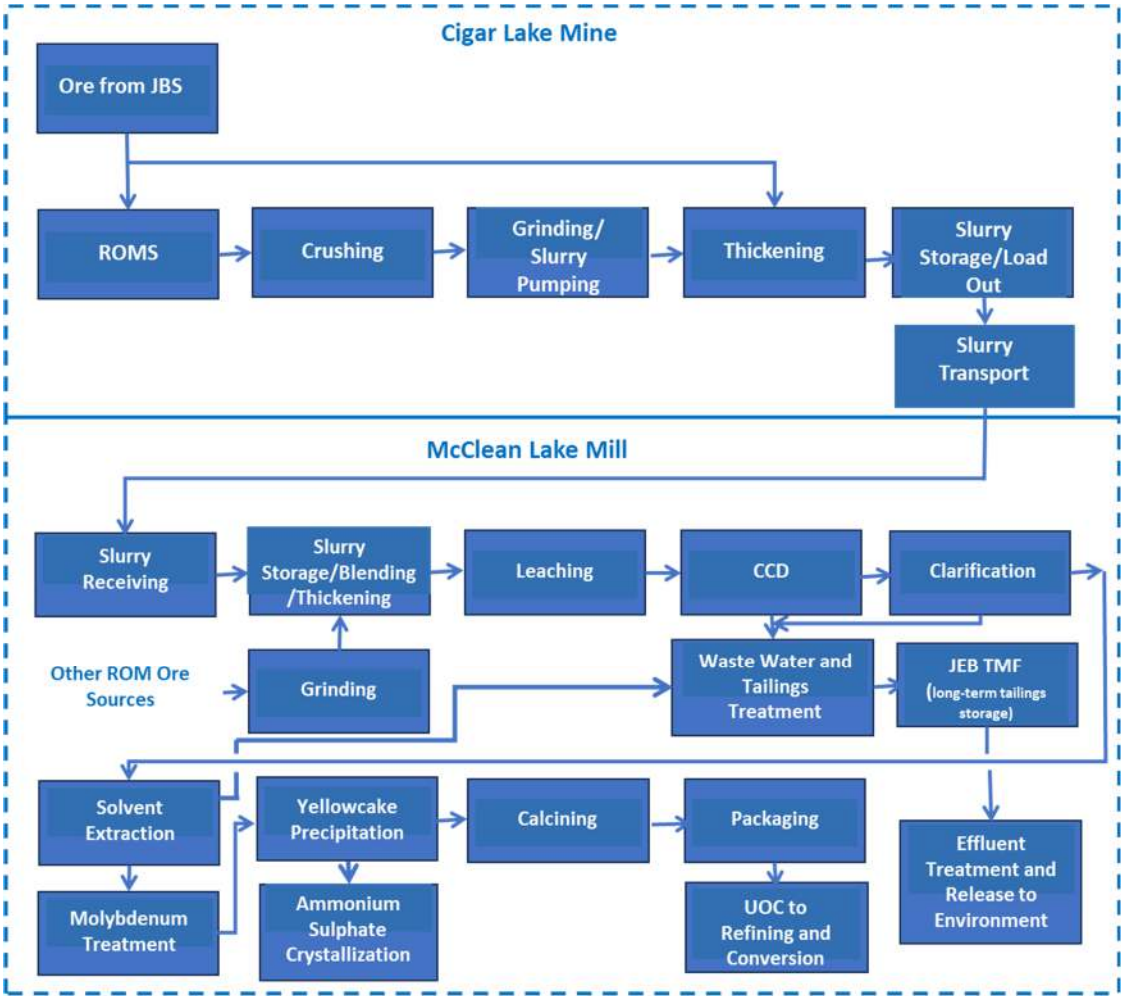
Water generated from the mining operations is collected in a separate system and pumped from underground to a storage pond on surface. The mine water is treated separately from the process water in batches through the water treatment circuit.

A portion of the treated water is recycled into the mining and processing circuits where required. The remaining treated water is released to the environment via a monitoring pond batch release system similar to that used at other facilities such as McArthur River and Key Lake. Precipitated solids from the water treatment process are dewatered and stored on-site for underground disposal.

Additional details about the water treatment circuit can be found in *Section 16.2.*

A high-level operation block diagram of the ore processing activities is shown in *Figure 17-1*.

FIGURE 17-1: CIGAR LAKE ORE PROCESSING ACTIVITIES – BLOCK DIAGRAM




## 17.3 Processing at McClean Lake

In accordance with the JEB Toll Milling Agreement, the McClean Lake mill was expanded to process and package all of Cigar Lake's mineral reserves. Originally, the mill had a production capacity of 12 million pounds $U_3O_8$ per year. In order to process all of Cigar Lake's mineral reserves and other ores at McClean Lake, projects were identified to increase the total production capacity at the mill to 24 million pounds $U_3O_8$ per year. Construction of the expanded facility began in 2012 and was completed in 2016. Further changes were completed in 2021 to increase the capacity in the front-end circuits (leaching, CCD) from a nominal 45 kt ore/year to 59 kt ore/year. No additional changes are required to the McClean Lake circuit to process ore from the CLEXT mineral reserves.

All of the 18 million pounds $U_3O_8$ annual output from Cigar Lake will be converted to yellowcake at the McClean Lake mill. For further discussion of the McClean Lake mill and the JEB Toll Milling Agreement, see *Sections 18* and *19.2*, respectively.

## 17.4 McClean Lake mill flowsheet

Finely ground ore slurry is trucked from Cigar Lake by B-trains carrying four 5 $m^3$ slurry containers to the receiving facility located at McClean Lake. The receiving facility was based on the design of the Key Lake ore slurry receiving facility, inclusive of some revisions. The slurry is off-loaded by vacuum, thickened and pumped to storage pachuca tanks.

The previous two-stage near-atmospheric pressure leach circuit was reconfigured to a one-stage atmospheric leach circuit to allow ore to be leached to the target leach extraction of 99.5%. Leach cooling and hydrogen gas concentration control have been added to address exothermic leaching reactions and the potential for hydrogen to be released from leaching Cigar Lake high-grade ore.

The leached slurry is fed to the CCD circuit, where it is washed with acidified wash water. Clarification and storage capacity is provided for the pregnant leach solution.

The clarified uranium solution is fed to two parallel SX plants. The original 12 million pound $U_3O_8$ per year SX circuit capacity is supplemented by a new 14 million pound $U_3O_8$ per year circuit to provide a total nominal capacity of 26 million pounds $U_3O_8$ per year.

The loaded strip solution from the SX circuits is fed to two parallel molybdenum removal carbon column circuits. Two precipitation reaction tanks are used to precipitate yellowcake with ammonia. Barren strip sand filters clarify the barren strip solution. A centrifuge provides yellowcake dewatering requirements prior to calcination of the yellowcake precipitate. The calcined product is directed to the packaging facilities where it is packaged in 210L steel drums for shipment. A new packaging system was installed in 2013 to accommodate increased production rates and enhance fugitive dust control.

A third ammonia reagent supply tank was added for solvent extraction and precipitation in 2014, and additional ferric sulphate production capacity was added in 2022. An additional ammonium sulphate crystallization plant similar in size to the original plant was installed as well. A new tailings neutralisation circuit was constructed to provide the retention times required for full production rates.

Cameco believes the McClean Lake mill will have access to sufficient water, power and process supplies necessary to process all of Cigar Lake's annual production. Cameco is not aware of any limitations to water, power and process supplies that would limit processing of Cigar Lake ore in situations where McClean Lake is co-milling ore from other sources. For further discussion of the McClean Lake mill infrastructure, see *Section 18*.

# 18 Project infrastructure

## 18.1 Cigar Lake infrastructure

Current site infrastructure at Cigar Lake is listed in *Section 5.5.* A site plan of the existing and planned surface facilities is shown in *Figure 5-2.*

Proposed infrastructure, primarily for CLEXT, will be constructed within the boundaries of the current Cigar Lake surface lease. In general, the proposed activities consist of:

- site preparation, including tree clearing and grading
- access road and adjacent pipe bench construction
- construction of surface freeze pads to the west and east of Cigar Lake, including runoff ponds for each pad
- freeze hole drilling, outfitting, activation and ongoing operation to facilitate ongoing bulk freezing of the orebody from surface
- construction of a new brine booster station and routing of additional brine supply/return and distribution piping for the freeze systems on the freeze pads
- routing of other required services to support surface freeze hole drilling and ongoing freeze system operation (e.g., drill fresh water supply, runoff pond water return, electrical and instrumentation)
- expansion of the waste rock crushing pad

## 18.2 McClean Lake infrastructure

The McClean Lake operation is a milling facility that has been operating for more than 20 years. Its infrastructure includes mine, mill and camp complexes, as well as a TMF. Specific to processing the Cigar Lake ore slurry, the following relevant infrastructure currently includes:

- ore slurry offloading facility to receive ore slurry containers from Cigar Lake mine
- reconfigured leach circuits with leach coolers and hydrogen gas concentration monitoring and control
- an oxygen plant with two 20 tonnes per day vapour pressure swing adsorption units
- miscellaneous additional equipment and tankage in the mill to process the Cigar Lake slurry
- a second SX circuit to accommodate the increased uranium throughput
- ammonium sulphate crystallization (CX) plant
- a powerhouse with six 2,250-kilowatt diesel generators to provide emergency power in the event of a loss of electricity from SaskPower
- a tailings neutralization circuit, expanded in 2017
- ferrous sulphate addition system in the JEB water treatment plant
- TMF, including engineered embankment to 457.5 MASL and bentonite amended liner to 452.5 MASL

Infrastructure still to be completed at McClean Lake consists of expansion of the downstream circuits. The main items are:

- upgrades to the existing Sue site water treatment plant to accommodate potentially reactive waste rock deposition (expect completion in 2036)
- upgrades to the tailings deposition system to improve tailings placement in the JEB TMF (expected completion in 2025)
- staged expansion of the existing TMF to a maximum liner crest height of 468 MASL

For a discussion concerning the management of tailings at the McClean Lake mill, see *Section 20.4*.

# 19 Market studies and contracts

## 19.1 Markets

**OVERVIEW**

Nuclear plants around the world use uranium to generate electricity. The following is an overview of the uranium market.

***Uranium demand***

The demand for $U_3O_8$ is directly linked to the level of electricity generated by nuclear power plants and to a lesser degree, interest from financial funds. In 2023, world annual uranium requirements were about 160 million pounds according to UxC, while cumulative uncovered requirements were about 2.2 billion pounds to the end of 2040. Additionally, total uranium placed under long-term contracts by utilities was also about 160 million pounds in 2023.

***Uranium supply***

There are two sources of uranium supply: *primary production* is production from mines that are currently in commercial operation; and *secondary supply* includes other sources such as excess inventories, uranium made available from defence stockpiles and the decommissioning of nuclear weapons, re-enriched depleted uranium tails, and used reactor fuel that has been reprocessed.

***Mine production***

While uranium production is international in scope, there are only a small number of companies operating in relatively few countries. In 2023, world mine production was estimated at 140 million pounds $U_3O_8$.

- Over 80% of estimated world production was sourced from four countries: Kazakhstan (39%), Canada (21%), Namibia (11%) and Australia (9%)
- About 80% of estimated world production was attributable to five producers. Cameco accounted for approximately 16% (22 million pounds) of estimated world production

***Uranium markets***

Uranium is not traded in meaningful quantities on a commodity exchange. Utilities buy the majority of their uranium products under long-term contracts with suppliers and meet the rest of their needs on the spot market.

***Uranium spot and long-term prices***

The industry average spot price (TradeTech and UxC) on December 31, 2023 was $91.00 (US) per pound $U_3O_8$, up 91% from $47.68 (US) per pound $U_3O_8$ on December 31, 2022.

The industry average long-term price (TradeTech and UxC) on December 31, 2023 was $68.00 (US) per pound $U_3O_8$, up 31% from $52.00 (US) per pound $U_3O_8$ on December 31, 2022.

**CAMECO MARKET STUDIES AND ANALYSES**

Cameco prepares a uranium supply and demand forecast which reflects its view of supply from all known sources as well as demand from all of the existing and planned reactors in the world. Cameco maintains detailed models tracking supplies by source—production as well as secondary supplies—and demand by reactor. In the preparation of this forecast, Cameco reviews detailed supply and demand models published by industry, such as the World Nuclear Association, tracks public announcements about supplies and reactors, then applies its own expertise and develops a forecast.

The qualified persons for *Sections 14, 15, 21* and *22* have reviewed the studies and analyses underlying Cameco's uranium supply and demand forecast and confirm that the results of these studies and analyses support the assumptions used for the portions of the technical report such qualified persons are responsible for.

## 19.2 Material contracts for property development

There are no contracts material to Cameco that are required for development and operation of Cigar Lake other than:

- the CLJV Agreement
- the JEB Toll Milling Agreement
- the Potentially Reactive Waste Rock disposal agreement

The sections below contain descriptions of these agreements, as well as Cameco's uranium sales contract portfolio.

### CLJV AGREEMENT

The CLJV Agreement provides for the exploration, development and production activities related to CL Main and CLEXT. The CLJV Agreement refers to milling of the ore the JEB mill owned by the MLJV. Cameco believes the terms and conditions of the CLJV Agreement are consistent with industry norms.

### JEB TOLL MILLING AGREEMENT

Ore from the Cigar Lake mine is processed at the mill located at Orano's McClean Lake operation, 69 kilometres to the northeast. The MLJV owns the McClean Lake operation, including the mill, and Orano is the operator of the MLJV. The milling arrangements are subject to the terms and conditions of the JEB Toll Milling Agreement described below.

The JEB Toll Milling Agreement sets out the terms and conditions by which the MLJV will process Cigar Lake ore delivered to the McClean Lake mill into uranium concentrates.

The JEB Toll Milling Agreement provides that:

(a) all Cigar Lake ore will be processed at the McClean Lake mill and the MLJV will dedicate a maximum mill capacity sufficient to process 18 million pounds per annum;

(b) the CLJV will be responsible to pay certain costs to modify the mill to receive and process CL Main ore and to pay all costs to modify the mill to receive and process CLEXT ore; and

(c) the MLJV, CLJV and other interested persons shall negotiate a fair allocation of capital costs for any required JEB TMF expansion.

For the toll milling and related services, the CLJV pays the MLJV a toll milling charge comprising the CLJV's share of mill expenses and a toll milling fee.

Modifications to the JEB mill were completed in 2016 to allow for the processing of all current Cigar Lake mineral reserves, with further changes completed in 2022. See *Sections 17.3* and *18* for discussion on McClean Lake mill modifications and expansion. See *Section 20.4* for discussion of the additional work required for the McClean JEB TMF.

#### *Co-Milling at McClean Lake*

The JEB Toll Milling Agreement allows the MLJV to process ores from other sources while providing a maximum dedicated capacity for the processing of ores from the CLJV. Cameco has reviewed the metallurgical accounting and sampling processes for co-milling of McClean Lake ore at the McClean Lake mill and has identified that additional sampling equipment would be required in order to ensure reliable reconciliation to the different ore sources.

The MLJV is responsible for all costs related to processing of the McClean Lake ore at the McClean Lake mill and the costs of decommissioning the mill.

Cameco believes the terms and conditions of the JEB Toll Milling Agreement are consistent with industry norms.

**POTENTIALLY REACTIVE WASTE ROCK DISPOSAL AGREEMENT**

The potentially reactive waste rock disposal agreement entered into between the MLJV owners and CLJV owners provides that the PAG waste rock at the Cigar Lake mine site will be transported to and disposed of at the McClean Lake facility. Cameco believes the terms and conditions of this agreement are consistent with industry norms.

**URANIUM SALES CONTRACTS**

***Uranium sales contracts portfolio***

Cameco has a long-term uranium sales contract portfolio where it commits to supply uranium to its customers. This uranium is projected to come from Cameco's operating mines, mines under development and from its spot and long-term uranium purchasing activities. The commercial terms under these contracts are confidential.

As of December 31, 2023, Cameco has commitments to supply approximately 205 million pounds $U_3O_8$ under long-term contracts with 37 customers worldwide. This includes commitments requiring delivery of an average of about 27 million pounds per year from 2024 through 2028, with commitment levels in 2024 and 2025 higher than the average and in 2026 through 2028 lower than the average. As the market improves, Cameco expects to continue to layer in volumes capturing greater upside using market-related pricing mechanisms.

Cameco's portfolio of long-term sales contracts has a mix of base-escalated and market-related pricing mechanisms. Base-escalated contracts use a pricing mechanism based on an industry term price indicator at the time the contract is accepted and escalated to the time of each delivery over the term of the contract. Market-related contracts are different from fixed-price contracts in that they may be based on either the spot price or the long-term price, and that price is generally set a month or more prior to delivery rather than at the time the contract is accepted. These contracts sometimes provide for small discounts, often include floor prices, and some include ceiling prices, which are established at the time of contract acceptance and usually escalate over the term of the contract.

After a contract is accepted, deliveries under a long-term contract generally do not begin for several years. As a result of the structure of its long-term contract portfolio, Cameco's average realized price will generally lag changes in market prices in both rising and falling price conditions. The magnitude and direction of the deviation can vary based on the degree of market price volatility between the time the contract is accepted, and the time the product is delivered under the contract. Cameco believes the terms of its long-term uranium sales contracts generally reflect industry norms.

As a result of Cameco's contracting strategy Cameco's average realized price for uranium sales in 2023 was $49.76 (US) per pound $U_3O_8$. The industry average spot price (TradeTech and UxC) during 2023 was $62.51 (US) per pound $U_3O_8$. The industry average long-term uranium price (TradeTech and UxC) during 2023 was $58.20 (US) per pound $U_3O_8$.

## 19.3 Uranium price assumptions used for economic analysis

Cameco has committed a significant quantity of its future production and purchased material to be delivered through its existing portfolio of long-term sales contracts. Cameco expects to sell the remaining future uncommitted production and purchases under yet-to-be-negotiated arrangements.

The uranium average price projection used for the economic analysis is derived, in-part, from the pricing established under base-escalated contracts in Cameco's current contract portfolio of commitments. In addition, for committed contracts with a market-related pricing mechanism or for targeted but uncommitted production and purchases, a sales price forecast is used that gives equal weighting to the long-term average historic spot price and an independent third-party spot price projection, with sensitivities applied, taking into account any floors and ceilings contained in specific contracts.

*Table 19-1* outlines the projected average realized prices used for the economic analysis, including the cash flow analysis, based on the methodology described above.

## TABLE 19-1: EXPECTED AVERAGE REALIZED URANIUM PRICES BY YEAR

| Price assumptions | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Cigar Lake average price $US/lb** | 49 | 52 | 55 | 57 | 58 | 60 | 61 | 62 | 62 | 63 | 63 | 63 | 63 |
| **Cigar Lake average price $Cdn/lb** | **64** | **66** | **69** | **71** | **73** | **75** | **76** | **78** | **78** | **79** | **79** | **79** | **79** |
| **Exchange rate $1.00 US = $Cdn** | **1.30** | **1.27** | **1.25** | **1.25** | **1.25** | **1.25** | **1.25** | **1.25** | **1.25** | **1.25** | **1.25** | **1.25** | **1.25** |

Notes:
(1) Average realized price methodology is described in S*ection 19.3*.
(2) Average prices included in this table have been rounded.
(3) Cameco's sales volume targets assume no interruption in the company's supply from its production or third-party sources.
(4) The projections are stated in constant 2023 dollars.

# 20 Environmental studies, permitting and social or community impact

## 20.1 Regulatory framework

The Cigar Lake mine has regulatory obligations to both the federal and provincial governments. Being a nuclear facility, primary regulatory authority resides with the federal government and its agency, the CNSC. Provincial regulatory authority is generally described in the approval to operate pollutant control facilities as well as the surface lease agreement between the Province of Saskatchewan and the CLJV.

In many cases, there is coordination amongst the federal and provincial regulatory authorities, but each agency retains responsibility for administering its own regulations, approvals, licences and permits where required. The main regulatory agencies that issue permits / approvals and inspect Cigar Lake are: the CNSC (federal), Fisheries and Oceans Canada (federal), Environment and Climate Change Canada (federal), Transport Canada (federal), Saskatchewan Ministry of Labour Relations and Workplace Safety (provincial), Saskatchewan Water Security Agency (provincial) and the SMOE (provincial). Environment and Climate Change Canada, specifically, is responsible for administering the federal MDMER and approves environmental effects monitoring (EEM) programs required under the MDMER.

## 20.2 Licences and permits

There are three key permits that are required to operate the mine. Cigar Lake holds a “Uranium Mine Licence” from the CNSC, an “Approval to Operate Pollutant Control Facilities” from the SMOE, and a “Water Rights Licence to Use Surface Water and Approval to Operate Works” from the Saskatchewan Water Security Agency. These permits are current.

The CNSC licence was issued for a ten -year term in June 2021, authorizing Cameco to mine, process and ship uranium ore to McClean Lake. Valid until June 30, 2031, this licence and associated LCH, authorizes an average annual production rate up to 18 million pounds $U_3O_8$.

The SMOE Approval to Operate Pollutant Control Facilities was renewed in January 2024 and expires on October 31, 2030. The SWA water rights licence was amended in 2023 and expires November 30, 2028. The SWA Approval to Operate Works was issued in January 2020 and is valid for an indefinite period of time.

The CNSC licence and LCH for the McClean Lake operation, issued by the CNSC in 2017, authorizes the production of up to 24 million pounds $U_3O_8$ annually. The licence and LCH were amended in 2022 to authorize the expansion of the JEB TMF.

Approvals, issued by SMOE pursuant to the Saskatchewan *Environmental Assessment Act*, for Cigar Lake are based on estimated annual production rates of 18 million pounds $U_3O_8$ for CL Main and 6 million pounds $U_3O_8$ for CLEXT. As such, it is anticipated that the planned annual production rate of 18 million pounds $U_3O_8$ for CLEXT represents a change to the approved development that will require Ministerial Approval. Cameco plans to submit the information required to obtain this approval in 2025.

In 2022, Cameco applied to the SMOE for a revision to its surface lease agreement boundaries. Undeveloped areas not anticipated to be required for future mining activities were proposed for release and new areas were added to more closely align the surface lease with current mineral claims. The Cigar Lake surface lease was amended, accordingly, by the SMOE, effective April 1, 2023.

Proposed infrastructure primarily related CLEXT is detailed in Section 18.1. The associated applications for regulatory approval to construct and operate this infrastructure were submitted to the CNSC and SMOE, in March 2024.

## 20.3 Environmental assessment

Cigar Lake was assessed for regulatory approval purposes, including the Cigar Lake mine and associated mine site infrastructure, the processing of the recovered ore at the McClean Lake mill, and the road infrastructure that connects Cigar Lake to the existing road network. Construction, operation and decommissioning of the Cigar Lake mine have been evaluated as part of several environmental assessments going back to 1987. All aspects of Cigar Lake have undergone the required environmental assessment and regulatory approval to allow for the current licensing of the Cigar Lake mine. In 2008, Cameco completed an environmental assessment process that included consideration of the processing of Cigar Lake pregnant aqueous solution at the Rabbit Lake mill. However, for commercial reasons the CLJV owners have since agreed to process all Cigar Lake ore at the McClean Lake mill. A brief summary of these assessments and approvals follows.

In 1995, the Cigar Lake project Environmental Impact Statement (1995 EIS) was submitted to the Joint Federal-Provincial review panel on Uranium Mining Developments in Northern Saskatchewan (the Panel). The 1995 EIS evaluated the operation of a high-grade uranium mine at Cigar Lake, producing ore over a 40-year period, with ore being transported by truck to the nearby McClean Lake mill for processing. In 1997, the Panel recommended that pending identification of a suitable waste rock disposal location, the project should proceed. The Canadian and Saskatchewan governments both accepted the Panel’s recommendation and, in 1998, both government bodies approved the project in principle.

A 1999 review of the waste rock disposal options concluded that the Sue C pit at McClean Lake operation was the best waste rock disposal option. The Disposal of Cigar Lake Waste Rock Environmental Impact Statement (2001 EIS) was submitted in August 2001, under the harmonized federal-provincial environmental assessment process. This 2001 EIS also assessed the future construction of a permanent access road to the Cigar Lake site and the future transportation of waste rock over that access road. In August 2003, the CNSC concluded that the 2001 EIS and associated documents met the requirements of the *Canadian Environmental Assessment Act* (CEAA) and that the licensing/permitting processes for the Sue C pit as a waste rock disposal site and construction of the permanent access road could proceed (Cameco EASR, 2004).

In January 2003, the CNSC informed Cameco that due to a perceived uncertainty regarding the use of the transitional provisions of CEAA, the CNSC would require a new environmental assessment of the Cigar Lake mine portion of the project to support construction and operation licence decisions. However, Saskatchewan Environment (now referred to as the Saskatchewan Ministry of Environment) indicated that the assessment requirements under the *Saskatchewan Environmental Assessment Act* had been fully met by the 1995 EIS and 2001 EIS submission and approval processes.

In February 2004, Cameco submitted an environmental assessment study report (2004 EASR) for the Cigar Lake mine portion of the project under CEAA to meet the above requirement. In the 2004 EASR, the CNSC was identified as the sole “Responsible Authority.” The 2004 EASR assessed the potential effects from the construction, operation and decommissioning of the Cigar Lake mine. The 2004 EASR did not reassess the transportation of the ore to the McClean Lake mill, milling of the ore, or the management of tailings. The 2004 EASR was accepted by the CNSC as meeting the requirements of CEAA and, therefore, the licensing/permitting processes for the Cigar Lake project could proceed.

Orano is the operator of the McClean Lake mill on behalf of the MLJV. The processing of all the ore slurry from the Cigar Lake mine occurs at the McClean Lake mill. This was assessed and approved as part of the 1995 EIS. The Licence Conditions Handbook for the McClean Lake operation, issued by the CNSC in 2017, authorizes the processing of Cigar Lake ore in the mill.

In December 2008, Cameco submitted to the CNSC a project description for implementing measures intended to better manage the increased quantities of water inflow that could potentially be experienced during the construction and operation of Cigar Lake. Specifically, this project involved establishing infrastructure to allow for the discharge of treated water directly to Seru Bay of Waterbury Lake. A positive decision on this screening level environmental assessment was received in 2011, with construction and commissioning of the associated infrastructure completed in 2012. Discharge of treated water to Seru Bay has been operating continuously since it began operation in the summer of 2013.

## 20.4 Environmental aspects

**ORE PROCESSING AND TAILINGS MANAGEMENT**

The McClean Lake mill processes the Cigar Lake ore slurry in a dedicated leach circuit separate from other ores that may be concurrently processed. The combined residue from both ores is treated in the McClean Lake mill tailings neutralisation area. Construction of an upgraded tailings neutralization circuit was completed in 2016. Neutralised tailings are pumped to the TMF. See *Sections 17.2* and *17.4* for additional information about ore processing and at both Cigar Lake and McClean Lake.

In 2010, Orano received regulatory approval for the TMF optimization project, which involved improving slope stability and the placement of a bentonite amended liner. Further approvals were received in 2017 and 2018 for continued expansion of the lined JEB TMF embankment to increase tailings capacity.

Most recently, in 2022, Orano received regulatory approval for the continued expansion of the JEB TMF to allow the disposal of tailings up to a consolidated tailings elevation of 462 MASL, which is the approximate high point of the natural ground elevation. The expansion will be achieved by the continued construction of an engineered embankment and placement of the bentonite amended liner to an elevation of 468 MASL.

With these extensions, the JEB TMF will have the capacity to receive tailings from processing all of Cigar Lake's current mineral reserves.

During the processing of Cigar Lake ore, tailings are generated at the McClean Lake mill. The JEB Toll Milling Agreement manages the financial liabilities associated with these tailings. For discussion of the JEB Toll Milling Agreement, refer to *Section 19.2*.

**WASTE ROCK MANAGEMENT**

Waste rock generated at the Cigar Lake mine site is currently stored on-site in one of three types of waste rock piles, depending on the nature of the waste rock. The first is clean waste, which will remain at the mine site. The second is mineralized waste (>0.03% $U_3O_8$) contained on a lined pad, which is planned to be disposed of underground at the Cigar Lake mine. The third is PAG waste rock, which will be temporarily stored at site on lined pads and will be transported to the Sue C pit at the McClean Lake facility for permanent disposal. The costs of the eventual disposal of Cigar Lake's PAG waste rock in Sue C pit, as described in the Waste Rock EIS noted above, is covered by the Potentially Reactive Waste Rock Disposal Agreement between the MLJV and CLJV dated January 1, 2002. The cost of this disposal is included in the Cigar Lake mine operating cost estimate.

In 2022, Cigar Lake received regulatory approval to process and consume PAG waste rock as aggregate material in the production of mine backfill. Construction of a crushing pad to support this activity was completed in 2023, with an expansion planned for 2024. This is expected to reduce the amount of PAG waste rock that will require temporary storage on-site and disposal at the end of operations.

Slimes generated from the drilling of surface freeze holes are collected and stored in lined storage areas. Slimes material generated from mine development activity is brought to surface and stored within one of five lined slimes ponds, mixed with waste rock and stored on a lined pad, or bagged and stored within lined storage areas. An assessment is ongoing whether a sixth slimes pond will be required prior to end of mine life. The current plan is to have slimes material from all storage ponds slurried and pumped underground for disposal upon final decommissioning of the facility.

**WATER TREATMENT AND EFFLUENT DISCHARGE**

The water treatment/effluent discharge system employed at Cigar Lake has been designed based both on the results of metallurgical test work programs and Cameco's experience at other facilities. The design is intended for both routine and non-routine water treatment and effluent discharge scenarios. The current system, as described below, is approved and licensed by the CNSC and SMOE.

The Cigar Lake orebody contains elements of concern with respect to water quality and the receiving environment. The distribution of elements such as arsenic, molybdenum, selenium and others is non-uniform throughout the orebody, and this can present challenges in attaining and maintaining the required effluent concentrations. There have been ongoing efforts to optimize the current water treatment process and water handling systems to ensure acceptable environmental performance.

Retained surface water and recovered groundwater from the mine are pumped to the water treatment plant (WTP). The WTP uses a two-stage treatment process. Both stages involve chemical addition, precipitation and filtration.

Under normal operating conditions, treated water from the WTP is designed to be discharged to the environment on a batch discharge basis. In accordance with the design, treated water from the WTP is discharged to one of four lined ponds. The water in these ponds is tested prior to release to the environment. Results from these tests are reviewed to confirm if the water meets requirements for discharge, or if it is necessary to recycle back to the WTP. All water that fails to meet licence/operating approval requirements is returned to the WTP for re-treatment. Two ponds are located adjacent to the WTP to allow for the safe storage of excess water.

The WTP is designed to treat water up to 550 $m^3/h$. Based on current operating conditions, average flows are approximately 40 $m^3/h$. The contingency WTP is designed to treat and release 2,550 $m^3/hr$, under non-routine conditions.

As a result of the October 2006 and August 2008 water inflows, Cameco reviewed the emergency mine dewatering strategy. It was determined that one of the safest ways to mitigate the impact of potential future mine inflows is to increase the mine's dewatering capacity. Doing so required an enhancement to the mine's ability to treat and release effluent to the environment. Cameco, therefore, re-evaluated options to address potential mine effluent discharge restrictions in the event of any future inflow scenarios. Specifically, the risk of erosion in the Aline Creek system was evaluated. In December 2008, an application was made to move the discharge point and to discharge treated effluent directly to Seru Bay of Waterbury Lake. This is where the Aline Creek system currently enters Waterbury Lake. This application triggered under CEAA a joint federal-provincial screening level environmental assessment, which was accepted in 2011, after which approval to proceed with construction was received. Construction and commissioning of the new pipeline and associated infrastructure was completed in 2012 and discharge of treated water to Seru Bay commenced in the summer of 2013.

Cameco believes that it has sufficient capacity to handle an estimated maximum inflow and, as noted in this report, has installed additional capacity to assure the long-term success of the project.

For a further discussion on the mine water management, see *Section 16.2.*

In respect of the McClean Lake mill, all water must be treated before it is released to the environment. All water that fails to meet licensing/operating approval requirements is returned to the water treatment plant for re-treatment.

An upgrade to the JEB water treatment plant was completed in 2022 to allow the addition of ferrous sulphate for enhanced selenium removal. The circuit was commissioned in 2023 and is available to operate when needed to manage selenium to meet environmental objectives.

**ENVIRONMENTAL EFFECTS MONITORING**

Comprehensive EEM programs are in place at Cigar Lake to determine the full extent and nature of any environmental effects taking place within the sphere of influence of these facilities. The most significant component of this monitoring is the EEM program that Cameco performs and is required under its operating licences. The EEM includes the monitoring of water, fish health, benthic invertebrate monitoring, sediment, fish tissue, plants and animals. It is designed to incorporate the requirements of Environment and Climate Change Canada's MDMER, CNSC requirements, and SMOE requirements. In general terms, the environmental monitoring programs have shown that the environmental effects are generally in line with the predictions contained within the previously completed environmental assessments.

**ENVIRONMENTAL RISK ASSESSMENTS**

Environmental Risk Assessments (ERAs) are reviewed or updated every five years and are completed in accordance with the Canadian Standards Association N288.6 standard for conducting risk assessments at nuclear facilities and uranium mines and mills. The current version of the standard was published in 2022.

The most recent ERA was completed for Cigar Lake in 2021. Results from routine monitoring conducted at the operation were incorporated into the assessment, which considered the operational, decommissioning, and post-decommissioning periods. The 2021 Cigar Lake ERA confirmed that human health and the environment in the vicinity of the operation remain protected.

## 20.5 Decommissioning and reclamation

The current Cigar Lake Preliminary Decommissioning Plan (PDP) and Preliminary Decommissioning Costs Estimate (PDCE) were submitted in 2017. The PDP discusses the approach to addressing the liabilities that are associated with mining. The future liabilities will be addressed in subsequent revisions to the PDP. This systematic update and review of previous PDPs and PDCEs is designed to capture all changes to known liabilities and improvements in decommissioning as an operation matures.

Periodic reviews of the PDP and PDCE are required at least every five years as per provincial requirements. The current PDP considers the anticipated state of the facility, including the management of ore and any associated wastes estimated to the end of 2022. This PDP was approved by both federal and provincial regulatory agencies and is supported by a financial assurance based on the current PDCE of $61.8 million. The financial assurance, approved by the SMOE in 2019 and the CNSC in 2020, is posted with the SMOE in the form of irrevocable standby letters of credit and security bonds.

Updated PDP and PDCE documents were submitted to the CNSC and SMOE in 2022. The updated decommissioning cost estimated provided in the PDCE was $73.8 million, however these documents are currently under regulatory review. When regulatory comments are received, the PDP and PDCE will be updated to incorporate allowances for CLEXT infrastructure. Once approved, an updated financial assurance will be posted with the SMOE.

The updated documents were developed as per the CNSC and SMOE guide documents (REGDOC-2.11.2 *Decommissioning*, 2021; REGDOC-3.3.1 *Financial Guarantees for*

*Decommissioning of Nuclear Facilities and Termination of Licensed Activities*, 2021; CSA N294:19, *Decommissioning of facilities containing nuclear substances*, 2019; EPB 381, Guidelines for Northern Mine Decommissioning and Reclamation, 2008). Any changes from prior versions reflect changes to the facilities, potential increases in costs associated with current market conditions in western Canada and the allowance for an escalation factor over the next five-year review period.

The reclamation and remediation activities associated with Cigar Lake waste rock and/or tailings disposal at the McClean Lake facility are covered by the related PDP and PDCE.

## 20.6 Known environmental liabilities

The estimates and assumptions made in mill and mine site decommissioning plans which are considered to have the greatest impact on cost to complete the work are as follows:

- correct understanding of the geochemical and geotechnical properties of waste materials—these properties are used to provide long-term performance modelling estimates of the wastes, and are key to regulatory acceptance of the final decommissioning plans
- quantity and degree of required isolation of waste rock piles from leaching by precipitation and groundwater transport
- quantity and degree of required isolation of tailings from leaching by precipitation and groundwater transport
- negotiated contaminant loading and concentration limits, along with locations where these criteria apply
- costs associated with maintaining the site in a state of safe care and maintenance throughout the active decommissioning period
- cost of “deconstruction” of surface facilities
- magnitude of potential groundwater contamination generated underneath surface facilities during the operating phase that require remediation prior to site release
- ongoing licensing costs and timelines along with post-release performance verification monitoring costs
- regulatory acceptance of assumptions of inflation and discount rates used in the PDCE over the decommissioning period
- correct assumptions regarding the degree of environmental monitoring required during decommissioning prior to release from licensing and acceptance into Provincial institutional control

Listed below is a description of site-specific assumptions built into the PDPs and PDCEs which are the subject of this technical report. All known environmental liabilities associated with Cigar Lake are discussed in the current PDP and are accounted for within the PDCE. The PDP and PDCE are conceptual in design and detail. They are developed to address known environmental liabilities of the facility at that time in a ‘decommission tomorrow’ scenario, such that reasonable financial assurance requirements for the benefit of the Crown can be defined. This does not preclude formal regulatory processes which are followed prior to implementing actual decommissioning. Therefore, it is possible that following such final approval processes, the liabilities understood in the PDP and PDCE may vary from the final approved decommissioning. This uncertainty is addressed through the conservatism built into the documents and the regulatory acceptance process. In general, the significant liabilities associated with Cigar Lake are accounted for in the PDP and PDCE as follows:

***Underground facilities and surface shaft installation*:** The main long-term liabilities are primarily from a safety perspective. These are addressed by the capping of the shaft collars. Environmentally, there are limited liabilities associated with potential soil contamination, addressed with removal and disposal underground.

***Ancillary facilities such as the shop/office complex, slurry loadout, water treatment plant and residence:*** Environmental liabilities are associated with potential soil and groundwater contamination. These are addressed by removal of contaminated materials and disposal underground or, if appropriate, at another approved facility.

***Mineralized waste and PAG waste rock piles*:** The long-term environmental liability associated with these piles is potential groundwater contamination. This would be mitigated during decommissioning through underground disposal of mineralized waste and disposal of PAG waste rock at the Sue C pit at the McClean Lake facility.

***Slimes currently stored on surface within slimes ponds:*** The long-term environmental liability associated with slimes is potential groundwater contamination. This would be mitigated during decommissioning through underground disposal of these materials.

***Clean waste rock piles:*** The long-term environmental liability associated with these piles is potential erosion impacting surface waters in the immediate area. This is addressed by contouring and stabilizing these piles with natural vegetation. A portion of these piles may also be utilized as a source of fill to promote the establishment of stable drainage courses on the reclaimed development footprint.

***Haul road to McClean Lake***: As this is a good, all-weather road, it is not expected that, should the Cigar Lake mine cease to operate, the Province would expect the road to be decommissioned. However, for completeness, this liability is carried in the PDP and PDCE. The primary environmental liability would be associated with erosion of the roadway, resulting in impacts being realized at various stream crossings along its corridor. Mitigation involves re-vegetation to stabilize these areas and removal of stream crossings (bridges, abutments and culverts).

## 20.7 Social and community factors

Cameco is committed to building long-lasting and trusting relationships with the local Indigenous communities within the area it operates. Today, this commitment is advanced through a five-pillar approach, which aims to develop and maintain long-term relationships, provide communities with employment and business opportunities, and build capacity. The five pillars include workforce development, business development, community investment, environmental stewardship, and community engagement. To strengthen relationships and shape them into mutually beneficial partnerships, Cameco has collaboration agreements in place with the northern First Nation and Métis communities in closest proximity to our operations. These agreements allow Cameco and the communities to collaboratively determine focus areas based on a community's unique needs, optimizing benefits to the community, and providing greater certainty around community investment and local business opportunities.

The surface lease agreements with the Saskatchewan government requires Cameco to fulfil certain socio-economic obligations. Cameco has adapted and enhanced the focus to be much more, as a result of the value-added benefits Cameco has seen from ensuring strong support among local communities where it operates.

The rights-bearing First Nation and Métis communities and municipalities of the Athabasca Basin that are located in the vicinity of Cigar Lake are:

- Black Lake Denesuline First Nation
- Fond du Lac Denesuline First Nation
- Hatchet Lake Denesuline First Nation
- Northern Settlement of Camsell Portage
- Northern Hamlet of Stony Rapids
- Northern Settlement of Uranium City

- Northern Settlement of Wollaston Lake

Cameco signed an Impact Management Agreement (IMA) in 1999 with these communities. As part of that agreement, an environmental program was established which saw community members, as part of the Athabasca Working Group, participating in environmental monitoring. This was one of the first environmental programs of its kind established in Canada.

In 2016, Cameco and Orano signed a confidential collaboration agreement with these communities. This agreement builds on the original IMA and is the primary agreement with the Athabasca Basin Communities associated with Cigar Lake. The agreement is structured on the pillars of workforce development, business development, community investment, community engagement and environmental stewardship.

As part of this agreement, employees are recruited with first preference being given to residents within the Athabasca Dene and Métis communities, then secondly to residents of northern Saskatchewan. Cameco has also established a northern preferred supplier program, which provides preference to majority-owned Indigenous companies and helps establish long-term relationships between northern contractors and Cameco, in addition to local employment and training.

# 21 Capital and operating costs

## 21.1 Capital and other costs

The cost estimates in this section are on a 100% basis.

The Cigar Lake 2016 Technical Report estimated the capital costs required to mine and mill the CL Main mineral reserves with a ramp-down beginning in 2024 and concluding in 2028. With the addition of the CLEXT mining area to the mineral reserves, capital expenditures are expected to continue through 2036 with a ramp-down beginning in 2032.

The CLJV's remaining estimated capital cost is approximately $1.2 billion (Cameco's share – $680 million) and includes sustaining capital for the Cigar Lake mine and McClean Lake mill, as well as underground development at Cigar Lake to bring the remaining mineral reserves into production.

The total remaining estimated life-of-mine capital cost at Cigar Lake is $967 million with the addition of CLEXT. The additional mine development will continue to utilize the NATM system to access the ore, and ground freezing will continue to be executed from surface. Mobile equipment fleets will need to be refreshed and ground freezing capacity will need to be expanded with the extended mine life; however, only sustaining capital is expected to be required for site infrastructure as the existing infrastructure and facilities can be maintained and utilized to end of the mining activities.

The capital expenditures required to mine and process the additional ore from CLEXT include mobile equipment, ground freezing infrastructure, and underground development at the mine along with tailings expansion at the mill. Total mine development and capital expenditures for CLEXT for the remaining life of mine are expected to be approximately $895 million (Cameco's share – $487 million). Of that capital, approximately $520 million (Cameco's share – $284 million) is required in advance of first ore from CLEXT in 2030.

At the McClean Lake mill, remaining capital costs are estimated to be $280 million. Most of the capital expenditures are sustaining in nature. Capacity replacement expenditures are expected to increase the size of the tailings facility to accommodate the additional production from CLEXT.

The total capital cost estimate as of December 31, 2023 for the CLJV is summarized in *Table 21-1*. The capital and other cost projections are stated in constant 2023 dollars.

## TABLE 21-1: CLJV CAPITAL AND OTHER COSTS FORECAST BY YEAR

| Capital Costs ($Cdn M) | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cigar Lake Mine Development | $ 34.0 | $ 36.1 | $ 60.9 | $ 51.8 | $ 46.9 | $ 48.7 | $ 38.9 | $ 36.6 | $ 16.5 | $ 1.9 | $ 1.4 | $ 2.0 | $ 3.1 | $ 378.7 |
| | | | | | | | | | | | | | | |
| *Cigar Lake Mine Capital* | | | | | | | | | | | | | | |
| Production Tunnel Outfitting | 18.0 | 7.0 | 13.9 | 0.1 | 2.0 | 11.0 | 9.7 | 17.8 | 22.9 | 14.1 | 20.3 | 1.7 | - | 138.5 |
| Ground Freezing System | 9.9 | 51.6 | 41.0 | 11.4 | 6.6 | 3.3 | 1.9 | 2.7 | 1.6 | - | - | - | - | 129.9 |
| Other Mine Capital | 41.4 | 38.4 | 21.6 | 37.3 | 39.0 | 36.9 | 37.7 | 24.7 | 18.5 | 12.6 | 8.1 | 3.6 | - | 319.9 |
| Total Mine Capital | 69.3 | 96.9 | 76.5 | 48.8 | 47.7 | 51.2 | 49.3 | 45.2 | 43.0 | 26.7 | 28.4 | 5.4 | - | 588.3 |
| | | | | | | | | | | | | | | |
| *McClean Lake Mill Capital* | | | | | | | | | | | | | | |
| Tailings Expansion | - | - | - | 15.2 | - | 0.8 | 10.7 | 13.3 | 12.4 | - | - | - | - | 52.6 |
| Other Mill Capital | 43.9 | 36.9 | 16.3 | 15.6 | 15.5 | 15.8 | 15.7 | 16.3 | 19.8 | 18.3 | 9.1 | 4.6 | - | 227.7 |
| Total Mill Capital | 43.9 | 36.9 | 16.3 | 30.8 | 15.5 | 16.6 | 26.4 | 29.6 | 32.2 | 18.3 | 9.1 | 4.6 | - | 280.3 |
| | | | | | | | | | | | | | | |
| **Total Capital Costs** | **$ 147.2** | **$ 169.9** | **$ 153.7** | **$ 131.4** | **$ 110.1** | **$ 116.5** | **$ 114.6** | **$ 111.4** | **$ 91.7** | **$ 46.9** | **$ 39.0** | **$ 12.0** | **$ 3.1** | **$ 1,247.3** |

***** presented as total cost to the Cigar Lake Joint Venture***

**Note: Totals may not add up due to rounding**

## 21.2 Operating cost estimates

Estimated operating expenditures for the underground mining operation and for toll milling charges and fees are presented in *Table 21-2*.

Operating costs consist of annual expenditures at Cigar Lake to mine the ore and treat it underground, including crushing, grinding and density control, followed by pumping the resulting slurry to surface for transportation to McClean Lake.

Operating costs at McClean Lake consist of the cost of offloading and leaching of the Cigar Lake ore slurry into uranium solution and further processing into calcined $U_3O_8$ product.

To the extent that the McClean Lake mill is co-processing ore from other mine sites, the JEB Toll Milling Agreement has provisions addressing the sharing of operating costs with the CLJV. Co-processing of ore from other mine sites has not been reflected in operating cost estimates.

Operating costs for the Cigar Lake operation are estimated to be $20.58 per pound $U_3O_8$ over the remaining life of the current mineral reserves. The 2016 Technical Report showed estimated operating costs to be $18.75 per pound $U_3O_8$. The current operating cost projections have incorporated increases based on operational experience gained since the 2016 Technical Report. Major contributors to the increased operating costs are inflationary pressures on labour and materials costs, increased maintenance requirements for aging facilities, and increased costs for utilities and property taxes. The operating cost projections are stated in constant 2023 dollars and assume the throughput outlined in the production schedule in *Section 16.3.*

## TABLE 21-2: CLJV OPERATING COST FORECAST BY YEAR

| Operating Costs ($Cdn M) | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Cigar Lake Mining* | | | | | | | | | | | | | | |
| Site Administration | $ 56.2 | $ 55.8 | $ 54.0 | $ 55.4 | $ 55.5 | $ 55.3 | $ 55.4 | $ 55.2 | $ 55.1 | $ 53.2 | $ 53.1 | $ 52.6 | $ 8.8 | $ 665.5 |
| Mining Costs | 100.7 | 96.6 | 90.8 | 86.8 | 86.6 | 86.7 | 87.5 | 86.2 | 80.5 | 80.7 | 73.9 | 56.0 | 3.5 | 1,016.5 |
| Process | 32.6 | 31.9 | 31.6 | 28.7 | 30.0 | 31.1 | 32.7 | 32.8 | 27.8 | 29.1 | 27.8 | 23.0 | 0.8 | 359.8 |
| Corporate Overhead | 17.1 | 17.6 | 17.5 | 13.6 | 13.5 | 13.6 | 13.4 | 13.1 | 12.1 | 11.2 | 10.3 | 8.6 | 1.3 | 163.0 |
| Total Mining Costs | 206.5 | 201.9 | 193.9 | 184.5 | 185.5 | 186.8 | 189.0 | 187.3 | 175.5 | 174.2 | 165.2 | 140.3 | 14.4 | 2,204.8 |
| | | | | | | | | | | | | | | |
| *McClean Lake Milling* | | | | | | | | | | | | | | |
| Administration | 56.6 | 54.6 | 52.4 | 51.8 | 51.6 | 52.3 | 51.9 | 53.3 | 52.8 | 52.5 | 52.3 | 35.0 | 6.7 | 623.8 |
| Milling Costs | 100.7 | 97.0 | 93.2 | 92.1 | 91.7 | 93.0 | 92.3 | 94.7 | 93.8 | 93.3 | 93.0 | 62.2 | 12.0 | 1,109.1 |
| Corporate Overhead | 9.3 | 9.0 | 8.6 | 8.5 | 8.5 | 8.6 | 8.6 | 8.8 | 8.7 | 8.6 | 8.6 | 5.8 | 1.1 | 102.8 |
| Toll Milling | 29.3 | 19.8 | 17.4 | 17.2 | 17.3 | 16.3 | 16.5 | 15.2 | 13.7 | 13.7 | 13.7 | 5.5 | 0.5 | 196.1 |
| Total Milling Costs | 196.0 | 180.4 | 171.7 | 169.7 | 169.0 | 170.2 | 169.3 | 172.0 | 168.9 | 168.1 | 167.7 | 108.4 | 20.4 | 2,031.8 |
| | | | | | | | | | | | | | | |
| **Total Operating Costs** | **$ 402.5** | **$ 382.2** | **$ 365.6** | **$ 354.1** | **$ 354.5** | **$ 357.0** | **$ 358.3** | **$ 359.4** | **$ 344.5** | **$ 342.3** | **$ 332.8** | **$ 248.6** | **$ 34.8** | **$ 4,236.6** |
| **Total Operating Cost per lb U3O8** | **$ 22.36** | **$ 21.23** | **$ 20.31** | **$ 19.67** | **$ 19.70** | **$ 19.83** | **$ 19.90** | **$ 19.96** | **$ 19.14** | **$ 19.02** | **$ 18.49** | **$ 34.53** | **$ 49.67** | **$ 20.58** |

**** presented as total cost to the Cigar Lake Joint Venture**
**Note: Totals may not add up due to rounding**

# 22 Economic analysis

## 22.1 Economic analysis

The following economic analysis as shown in *Table 22-1* for the Cigar Lake operation is based on the current mine plan, which contemplates the mining and milling of all of the current estimated mineral reserves. The analysis does not contain any estimates involving the potential mining and milling of mineral resources. Expenditures required to bring any of the mineral resources into production or to identify additional mineral reserves and mineral resources have not been included. Mineral resources that are not mineral reserves have no demonstrated economic viability.

The analysis provided is from the point of view of Cameco, which owns 54.547% of the CLJV, and incorporates Cameco’s projected sales revenue from its proportionate share of the related production, less its share of the related operating and capital costs of the CLJV, as well as all royalties and resource surcharges that will be payable on the sale of the concentrates.

The economic analysis results in an estimated pre-tax NPV (at a discount rate of 8%) to Cameco, for net cash flows from January 1, 2024 forward, of $2.5 billion for its share of the Cigar Lake mineral reserves. Using the total capital invested to date, along with the operating and capital cost estimates for the remainder of mineral reserves, the pre-tax IRR has been estimated to be 8.3%.

## TABLE 22-1: CLJV ECONOMIC ANALYSIS – CAMECO'S SHARE

| Economic Analysis ($Cdn M) | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Production volume (000's lbs U3O8) | 9,818 | 9,818 | 9,818 | 9,818 | 9,818 | 9,818 | 9,818 | 9,818 | 9,818 | 9,818 | 9,818 | 3,927 | 382 | 112,312 |
| Sales revenue | $ 628.4 | $ 653.1 | $ 677.5 | $ 697.1 | $ 716.7 | $ 736.4 | $ 746.2 | $ 765.8 | $ 765.8 | $ 775.7 | $ 775.7 | $ 310.3 | $ 30.2 | $ 8,278.8 |
| Operating costs | 219.1 | 226.7 | 207.7 | 201.1 | 201.3 | 203.1 | 203.7 | 205.0 | 189.3 | 194.2 | 189.0 | 135.5 | 18.6 | 2,394.4 |
| Capital costs | 80.3 | 92.7 | 83.8 | 71.7 | 60.0 | 63.6 | 62.5 | 60.8 | 50.0 | 25.6 | 21.3 | 6.5 | 1.7 | 680.4 |
| Basic royalty | 26.7 | 27.8 | 28.8 | 29.6 | 30.5 | 31.3 | 31.7 | 32.5 | 32.5 | 33.0 | 33.0 | 13.2 | 1.3 | 351.9 |
| Resource surcharge | 18.9 | 19.6 | 20.3 | 20.9 | 21.5 | 22.1 | 22.4 | 23.0 | 23.0 | 23.3 | 23.3 | 9.3 | 0.9 | 248.4 |
| Profit royalty | 16.1 | 16.1 | 33.6 | 55.6 | 60.3 | 62.4 | 64.0 | 67.0 | 70.9 | 75.4 | 76.8 | 22.0 | 1.2 | 621.2 |
| Net pre-tax cash flow | $ 267.4 | $ 270.3 | $ 303.3 | $ 318.2 | $ 343.2 | $ 353.9 | $ 361.9 | $ 377.5 | $ 400.0 | $ 424.3 | $ 432.4 | $ 123.7 | $ 6.5 | $ 3,982.6 |
| Pre-tax NPV (8%) to January 1, 2024 | $ 2,459.3 | | | | | | | | | | | | | |
| Pre-tax IRR (%) | 8.3% | | | | | | | | | | | | | |

Notes:

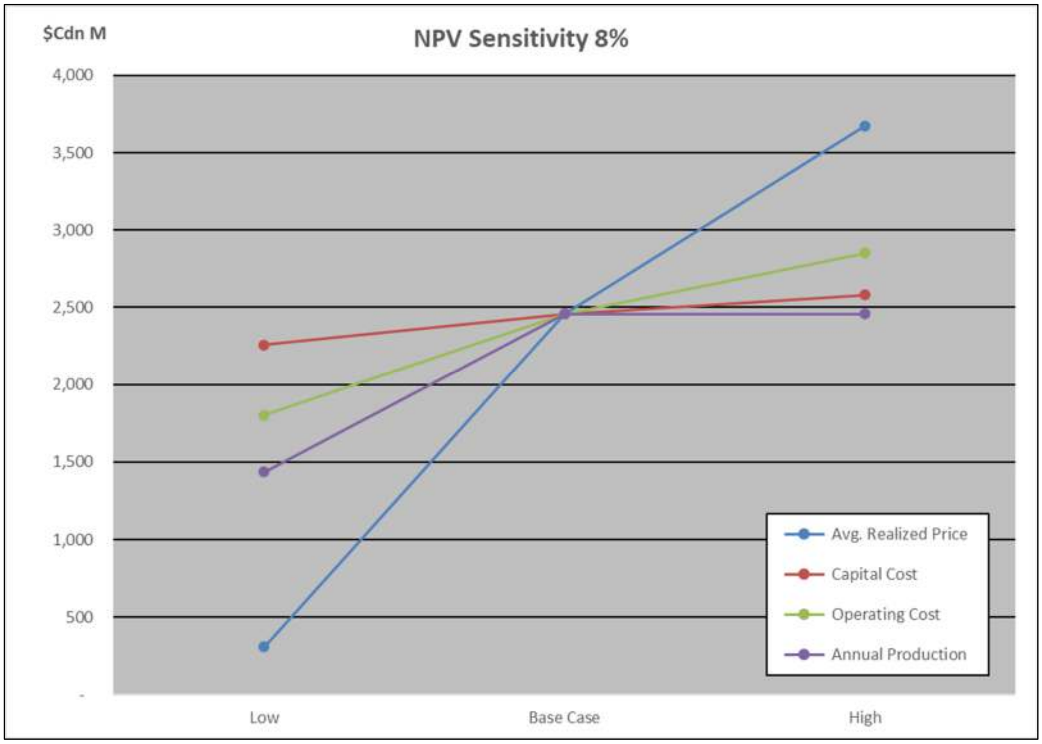
(1) Expected royalties and annual resource surcharge in this table are on Cameco's share of production only. Cameco reports on a pre-tax basis since it is not practical to allocate a resulting income tax cost to Cameco's portion of Cigar Lake as Cameco's tax expense is a function of several variables, most of which are independent of the investment in Cigar Lake.

(2) Totals may not add up due to rounding.

## 22.2 Sensitivities

The graph in *Figure 22-1* illustrates the operation's sensitivity to changes in annual production output, capital cost, operating cost, and average realized price. The graph illustrates the variability around the base case pre-tax (see *Section 22.1*) net present value of $2.5 billion, using sensitivities of minus 25% on annual production output, plus 50% and minus 30% on capital and operating costs, and plus 30% and minus 50% on the average realized price projections incorporated in the base case realized prices as shown in *Table 19-1*.

FIGURE 22-1: CIGAR LAKE OPERATION SENSITIVITY ANALYSIS




The analysis shows relatively low sensitivity to changes in its operating or capital cost projections. The relative sensitivity to changes in uranium price and production are significantly higher due in part to the price estimates being used, which is a reflection of the current $U_3O_8$ market environment, and the high-grade nature of the deposit.

## 22.3 Payback

On an undiscounted pre-tax basis, payback for Cameco, including total capital invested to date, is expected to be achieved in 2024. All future capital expenditures are forecasted to be covered by operating cash flow.

## 22.4 Mine life

The remaining mine life for Cigar Lake is based on current mineral reserves, which are expected to produce 205.9 million pounds $U_3O_8$ from the McClean Lake mill. The expected life of current estimated mineral reserves is approximately 13 years of sustained production based on planned annual production of approximately 18 million pounds of $U_3O_8$. As part of the mine plan, Cigar Lake is expected to produce less than the full annual production in the latter years of the mine life.

If mineral resources are upgraded and converted to mineral reserves through a positive prefeasibility or feasibility study, this could extend the mine life. Mineral resources that are not mineral reserves have no demonstrated economic viability.

## 22.5 Taxes

Cigar Lake operates as an unincorporated joint venture and is, therefore, not subject to direct income taxation at the joint venture level. Cameco, as the mine operator, operates the mine on behalf of the CLJV and distributes the resulting $U_3O_8$ production to the CLJV owners in proportion to their joint venture interests.

Cameco is subject to federal and provincial (Saskatchewan and Ontario) income tax in Canada. Royalties are fully deductible for income tax purposes.

For the purposes of the economic analysis, the projected impact of income taxes has been excluded due to the nature of the required calculations. Taxable income for Cameco is comprised of results from several discrete operations, which are combined to determine Cameco's taxable income and its related tax liabilities. It is not practical to allocate a resulting income tax cost to Cameco's portion of Cigar Lake as Cameco's tax expense is a function of several variables, most of which are independent of the investment in Cigar Lake.

## 22.6 Royalties

Cameco pays royalties on the sale of all uranium extracted at our mines in the province of Saskatchewan. Two types of royalties are paid:

- basic royalty: this royalty is calculated as 5% of gross sales of uranium, less the Saskatchewan resource credit of 0.75%
- profit royalty: a 10% royalty is charged on profit up to and including $28.182 per kilogram $U_3O_8$ ($12.78 per pound), and a 15% royalty is charged on profit in excess of $28.182 per kilogram $U_3O_8$. Profit is determined as revenue less certain operating, exploration, reclamation and capital costs. Both exploration and capital costs are deductible at the discretion of the producer

As a resource corporation in Saskatchewan, Cameco also pays a corporate resource surcharge of 3.0% of the value of resource sales. The projected future impact of the Saskatchewan corporate resource surcharge is included in the economic analysis.

Capital expenditures in excess of those required to reduce the 15% royalty to zero are banked and can be used in future years to reduce the 15% royalty until the bank has been depleted. Cameco utilizes its capital bank to reduce royalties as it becomes available. Cameco's available bank as of December 31, 2023 has been allocated proportionately to Cigar Lake for the purposes of the economic analysis.

Both the basic and profit royalties have been included in the economic analysis.

*Table 22-1* sets out the royalties and annual resource surcharge that Cameco expects to incur on its share of production from Cigar Lake. The projected royalties and annual resource surcharge are based on the realized prices set out in *Table 19-1* and are quoted in constant 2023 dollars.

# 23 Adjacent properties

Information on adjacent properties is not applicable to this technical report since there are no adjacent properties with exploration results of note.

# 24 Other relevant data and information

## 24.1 Cigar Lake water inflow incidents

Over the period 2006 through 2008, the project had setbacks as a result of three water inflow incidents.

The first occurred in April of 2006, resulting in the flooding of the then partially completed Shaft No. 2. The two subsequent incidents involved inflows in the mine workings connected to Shaft No. 1, and resulted in flooding of the mine workings completed to that point in time.

Cameco developed and successfully executed recovery and remediation plans for all three inflows. This culminated in the resumption of sinking of Shaft No. 2 in the first half of 2011 and the successful break through to the 480L of the main mine workings in early 2012, as well as the commencement and completion of underground remediation and restoration of the Shaft No. 1 workings in 2010 and 2011.

Throughout the water inflow remediation and rehabilitation that successfully addressed all three incidents, Cameco identified and incorporated the lessons learned into all facets of the project. This was specifically done to help ensure the implications not only to short-term project design, construction and startup were understood and addressed, but also to help ensure the long-term success of operation. These lessons included changes to the water management strategy, mine design, operational procedures and work management, project and operational leadership.

## 24.2 Mining and milling risks

Cigar Lake is a challenging deposit to develop and mine. These challenges include control of groundwater, weak rock formations, deployment of the JBS mining method, radiation protection, environmental protection, water inflow, performance of the water treatment system, equipment reliability and other mining-related challenges. Additionally, the realization of risks associated with processing the ore at Orano's McClean Lake mill would adversely affect production at Cigar Lake.

**MITIGATION**

Cameco has undertaken a number of initiatives to mitigate the risks associated with mining the Cigar Lake deposit and to mine the deposit in a safe and economic manner, including, but not limited to, using the JBS mining method, bulk freezing the orebody and surrounding ground, lowering the production horizon further away from the water-bearing formation and increasing mine dewatering and treatment capacity. Cameco applies its operational experience and the lessons learned about water inflows at McArthur River and Cigar Lake to reduce risk.

**WATER INFLOWS**

A significant risk to development and production is from water inflows. The sandstone overlying the basement rock at Cigar Lake contains large volumes of water at significant pressure. Despite the important mitigation measures Cameco has put in place, there remains a possibility of a water inflow during mine development and JBS mining. The consequences of another water inflow will depend upon the magnitude, location and timing of any such event, but could include a significant delay in Cigar Lake's development or production, a material increase in costs, a loss of mineral reserves, or require Cameco to give notice to many of its customers that it is declaring an interruption in planned uranium supply. Such consequences could have a material adverse impact on Cameco. Water inflows are generally not insurable.

**GROUND FREEZING**

Freezing the orebody and the surrounding ground results in several reductions to the mining risk profile, including: (1) minimizing the risk of water inflows from saturated rock above the unconformity; (2) reducing radiation exposure from radon dissolved in the groundwater; and (3) increasing rock stability. However, freezing only reduces, it does not eliminate, these challenges.

To manage the risks and meet the production schedule, the areas being mined must meet specific ground freezing requirements before jet boring begins. Cameco has identified greater variation of the freeze rates of different geological formations encountered in the mine, based on information obtained through surface freeze drilling. To the extent that we encounter further variations as mining progresses, there is a risk that the freeze rate could differ from the model. To mitigate the risk. Cameco has increased the site freeze capacity in order to facilitate the extraction of ore cavities as planned, and has introduced a strategy of ensuring sufficient frozen ground is available ahead of mining to allow for ore blending and to minimize any effects of variable freeze times. Cameco has also strategically installed temperature measuring instrumentation that monitors real time ground temperatures to calibrate the freeze models.

**GEOTECHNICAL CHALLENGES**

As development takes place on the 480L and 500L, and toward CLEXT, it is expected that localized areas of challenging ground conditions may be encountered which require modifications to the mine plan and development schedules. During 10 years of operation, Cameco has built a diverse inventory of tools and techniques intended to address a wide range of potential geotechnical challenges. Challenging geotechnical conditions combined with additional ground stress induced by artificial ground freezing and proximal development has resulted in unplanned rehabilitation work on the production tunnel liners which has previously resulted in production disruptions. Rehabilitation-induced production interruptions of a moderate nature are factored into the overall production plan, however, the requirement for extensive rehabilitation work on the NATM tunnel liners could result in production deferral, and potentially the partial loss of mineral reserves.

**JBS MINING EQUIPMENT**

The mine equipment fleet includes three JBS units with sufficient capacity to meet the production planned for the remaining life of asset. During the production transition between CL Main and CLEXT orebodies a rebuild is planned for each JBS unit in order to meet the remaining production demand. There is a risk to the current production plan if the rebuilds do not take place as scheduled.

Jet bore mining activities in CLEXT will be taking place up to 2,000 metres away from the process area. A series of booster pumps will be utilized to move the ore slurry over this distance. There is a risk that failure of the booster pumps to operate as expected could result in a lower production rate coming from portions of the CLEXT mining zone.

**ENVIRONMENTAL PERMITTING AND PERFORMANCE**

It is anticipated that the planned annual production rate of 18 million pounds $U_3O_8$ for CLEXT represents a change to the approved development that will require Ministerial Approval by SMOE. Engagement with SMOE on this aspect has commenced and Cameco plans to submit the information required to obtain this approval in 2025.

The Cigar Lake orebody contains elements of concern with respect to water quality and the receiving environment. The distributions of elements such as arsenic, molybdenum, selenium and others are non-uniform throughout the orebody, which requires ongoing monitoring and adjustments to water treatment to ensure that effluent concentrations remain within the licensing basis. Cameco continues to optimize this process to achieve effluent quality consistent with the licensing basis.

### ORE PROCESSING AT McCLEAN LAKE

Metallurgical test work has been used to design the McClean Lake mill circuits and associated modifications relevant to Cigar Lake ore. Samples used for metallurgical test work may not have been representative of the deposit as a whole. In order to manage variability within the mined ore, blending of mill feed is achieved via the ore slurry receiving pachucas. In times of prolonged ore induced metallurgical process limitations, upstream adjustment of the mining cavity schedule to assist the mill in processing within the mill design limits may be required. Specific ore induced risks include:

- Elevated arsenic concentration in the mill feed may result in increased leaching circuit solution temperatures. This could result in a reduction in mill feed rates, increased operating costs, and/or additional capital expense to modify the leaching process.
- Hydrogen evolution rates in leaching may exceed the design capacity of the hydrogen gas control system resulting in reduced leach feed rates. Additional capital expense may be required to increase the capacity of the hydrogen gas control system.

### LABOUR

The current collective agreement between Orano and unionized employees at the McClean Lake mill expires in 2025. There is a risk to the production plan if Orano is unable to reach an agreement and there is a labour dispute.

### COSTS

*Section 21* of this report contains estimates of capital and operating costs. Actual costs may vary from estimates for a variety of reasons and there can be no assurance that cost estimates included in this report will be achieved. *Section 22* of this report contains the economic sensitivities associated with increases and decreases in capital and operating costs.

### PRODUCTION FROM CLEXT

Delays in obtaining the necessary regulatory approvals could delay construction and planned production schedules, potentially affecting the smooth transition into CLEXT production from CL Main.

Development advance rates are based on current geotechnical information available to date, some of which is quite limited. To manage this potential risk, geotechnical drilling will be conducted ahead of the two main access drifts for CLEXT. This will allow for collection of information to alter excavation and ground support plans if required. However, identification of extreme adverse conditions may require significant changes to the mine plan, which may result in increased costs or delays to production.

The ventilation system for CLEXT has been modelled by both a third-party consultant and Cameco radiological specialists. Modelling indicates that the ventilation volumes are adequate to meet regulatory requirements for management of diesel particulate, diesel exhaust and radiological conditions. However, there is a risk that radon emanation rates may be higher than those modelled, which could result in increased costs and schedule delays.

The easternmost five panels of the CLEXT mineral reserves are lower grade than the average. An increase in costs or decrease in uranium price may make mining of these panels unprofitable, removing them from the mineral reserve.

### BACKFILL AGGREGATE

Aggregates for cavity backfill have thus far been sourced from nearby aggregate quarries. There is insufficient suitable material in the established quarries to support the backfill operation for the remainder of the mine life. This necessitates a transition from natural quarry aggregate to aggregate derived from PAG waste rock. Laboratory test work and field trials support the viability of

PAG as an aggregate source, and a new lined crushing pad was constructed in 2023. There is a risk that unforeseen technical or operational challenges could impede a smooth and timely transition to PAG based aggregate. A significant disruption in aggregate supply would negatively impact production.

## 24.3 Caution about forward-looking information

This technical report includes statements and information about expectations for the future that are not historical facts. When we discuss Cameco's strategy, plans and future financial and operating performance, or other things that have not yet taken place, we are making statements considered to be forward-looking information or forward-looking statements under Canadian and US securities laws. We refer to them in this technical report as forward-looking information.

Key things to understand about the forward-looking information in this technical report:

- It typically includes words and phrases about the future, such as *believe, estimate, anticipate, expect, plan, intend, goal, target, forecast, project, scheduled, potential, strategy and proposed* or variations (including negative variations) of such words and phrases or may be identified by statements to the effect that certain actions, events or results, *may, could, should, would, will be or shall be taken, occur or be achieved*
- It is based on a number of material assumptions, including those we have listed below, which may prove to be incorrect
- Actual results and events may be significantly different from what is currently expected because of the risks associated with the project and Cameco's business. We list a number of these material risks below. We recommend you also review other parts of this document, including *Section 24.2*, which outlines a number of mining and milling risks, Cameco's Annual Information Form for the year ended December 31, 2023 under the headings "Caution about forward-looking information" and "Risks that can affect our business" and Cameco's annual Management's Discussion and Analysis for the year ended 2023 under the headings "Caution about forward-looking information" and "Uranium Tier-one operations – Cigar Lake – Managing our risks," which include a discussion of other material risks that could cause actual results to differ from current expectations

Forward-looking information is designed to help you understand current views of the qualified persons and management of Cameco. It may not be appropriate for other purposes. Cameco and the qualified persons will not necessarily update this forward-looking information unless required to by securities laws.

***Examples of forward-looking information in this technical report***

- Cameco's plans and expectations for the Cigar Lake mine and McClean Lake mill
- results of the economic analysis, including but not limited to forecasts of uranium price, net present value, internal rate of return, cash flows and sensitivity analysis
- estimates of capital, operating, sustaining and mine reclamation and closure costs
- mineral resource and mineral reserve estimates
- forecasts relating to mining, development and other activities including but not limited to mine life, and mine and mill production
- Cameco's expectation that all necessary regulatory permits and approvals will be obtained to meet its future annual production targets
- future royalty and tax payments and rates
- timing for completion of the McClean Lake mill expansion and modifications

***Material assumptions***

- there is no material delay or disruption in Cameco's plans as a result of ground movements, cave-ins, additional water inflows, a failure of seals or plugs used for previous water inflows, natural phenomena, delay in acquiring critical equipment, equipment failure or other causes
- there are no labour disputes or shortages
- all necessary contractors, equipment, operating parts, supplies, regulatory permits and approvals are obtained when they are needed
- McClean Lake processing plants are available and function reliably as designed and sufficient tailings capacity is available
- Cameco's mineral resource and mineral reserve estimates and the assumptions they are based on are reliable (see *Sections 14.2 and 15.2*)
- Cigar Lake development, mining and production plans succeed and the deposit freezes as planned
- equipment required for mining, slurry preparation and shipment to the mill operate reliably at required rates of production
- Cameco's expectation that the jet boring mining method will continue to be successful at required productivity rates
- the mill is able to process Cigar Lake ore at rates expected
- tailings expansion at McClean Lake is completed as planned

***Material risks***

- an unexpected geological, hydrological, underground condition or an additional water inflow delays or disrupts production
- ground movements and cave-ins
- the necessary regulatory permits or approvals cannot be obtained or maintained
- natural phenomena, labour disputes, equipment failure, delay in obtaining the required contractors, equipment, operating parts and supplies or other reasons cause a material delay or disruption in production
- processing plants are not available or do not function as designed and sufficient tailings facility capacity is not available
- mineral resource and mineral reserve estimates are not reliable
- Cameco's development, mining or production plans for Cigar Lake are delayed or do not succeed for any reason, including as a result of any difficulties with freezing the deposit to meet production targets, or any difficulties with the McClean Lake mill modifications or expansion, or milling of Cigar Lake ore
- the current collective agreement between Orano and unionized employees at the McClean Lake operation expires May 31, 2025. There is risk to the production plan for Cigar Lake if Orano is unable to reach an agreement and there is a labour dispute

# 25 Interpretation and conclusions

The Cigar Lake operation outlined in this report represents a significant economic source of feed material for the McClean Lake mill. With an estimated remaining operating mine life of 13 years, Cigar Lake is expected to produce approximately 205.9 million pounds $U_3O_8$. At the forecast average realized uranium price over this 13-year period, it is estimated that Cameco will receive substantial positive net cash flows from its share of Cigar Lake production.

Since the previous technical report was issued, the following has been achieved:

- commissioned all circuits, demonstrating acceptable performance at both the mine and the mill
- achieved mine production rampup to full nameplate capacity of 18 million pounds $U_3O_8$ per year and produced 138.4 million pounds $U_3O_8$ to December 31, 2023
- completed JBS production from seven crosscuts excavated using the NATM technique
- completed the surface drilling program for bulk ground freezing of CL Main
- received 10-year Cigar Lake licence renewal from CNSC in 2021
- regulatory approval for the continued expansion of Orano's JEB TMF to allow the disposal of tailings up to a consolidated tailings elevation of 462 MASL
- finalized a prefeasibility study for the CLEXT portion of the deposit, leading to a production decision and declaration of mineral reserves
- increased Cameco's ownership interest in the CLJV to 54.547% with the 2023 acquisition of a 4.522% interest from Idemitsu Canada Resources Ltd.
- constructed a waste rock crushing pad to enable processing of waste rock into backfill aggregate

**ECONOMIC ANALYSIS AND COSTS**

The economic analysis results in an estimated pre-tax NPV (at a discount rate of 8%) to Cameco, for net cash flows from January 1, 2024 forward, of $2.5 billion for its share of the Cigar Lake mineral reserves. Using the total capital invested to date, along with the operating and capital cost estimates for the remaining mineral reserves, the pre-tax IRR has been estimated to be 8.3%.

Sensitivity analysis shows changes in uranium price and production can have a significant impact on the size of the positive NPV. On an undiscounted pre-tax basis, payback for Cameco, including total capital invested to date, is expected to be achieved in 2024. All future capital expenditures are forecasted to be covered by operating cash flow.

The CLJV's estimated capital cost to bring the remaining mineral reserves into production is approximately $1.2 billion and includes sustaining capital for the Cigar Lake mine and McClean Lake mill, as well as underground development at Cigar Lake.

Operating costs for the Cigar Lake operation are estimated to be $20.58 per pound $U_3O_8$ over the remaining life of the current mineral reserves. The current operating cost projections are based on operational experience to date and assumes the throughput described in *Section 1.13* and in more detail in *Section 16.3*.

Cameco's estimated pre-tax NPV for its share of the Cigar Lake mineral reserves supports the decision to extend the mine life to 2036. Economic sensitivity to factors such as average realized price, production rates and annual costs show that the mineral reserves present a robust economic outlook in several scenarios.

### MINE PLAN

Mine design changes and refinements since 2012 achieved their objective. Application of the NATM tunnel excavation technique has proven to be effective and reliable in reducing tunnel rehabilitation requirements. Lateral mine development is largely complete at CL Main.

The ground freezing system has seen a number of improvements, including optimizing of freezing capacity, drilling patterns and freeze hole installations.

The CLEXT mine plan is largely based on the design criteria, processes and experience gained during mining of the CL Main portion of the deposit. Application of the same mining methods and techniques are expected to continue to increase the reliability of development, production and cost forecasts.

### JBS MINING METHOD

Since 2012, comprehensive JBS testing and commissioning was completed to advance three JBS units to full production. This mining method has been successfully demonstrated through the mining of 572 cavities and extraction of 358,000 tonnes of ore.

### MINE WATER TREATMENT

Adjustments to our circuits have been successful in reducing the amount of water requiring treatment and release and increasing the amount of water that can be recycled.

### McCLEAN LAKE MILL

The McClean Lake mill was successfully restarted in 2014, and modifications to the mill were implemented to achieve required production rates.

With Orano’s receipt of regulatory approval for the continued expansion of the JEB TMF, Cigar Lake has access to sufficient tailings capacity to allow mining of the current Cigar Lake mineral reserves.

### MINERAL RESOURCES AND MINERAL RESERVES

The mineral resource and reserve estimates are based upon data from 1,284 surface drillholes on a nominal 7 x 7 metre pattern in CL Main and by 135 surface drillholes in CLEXT.

The CL Main zone is now fully delineated and CL Main mineral reserves are largely in the proven category.

Additional surface delineation drilling programs at CLEXT since 2016 were conducted in order to better define the mineral resource, plus gather metallurgical, hydrogeological and geotechnical information used to support the prefeasibility study for CLEXT. Mineral reserves in CLEXT are entirely in the probable category due to the sparser drilling density and are located in its western portion. The eastern portion of CLEXT is mostly in the inferred mineral resource category.

As of December 31$^{st}$, 2023, total proven and probable mineral reserves at Cigar Lake amount to 555,600 tonnes at a grade of 17.03% $U_3O_8$ and 208.6 million pounds. Mineral resources total 132,900 tonnes at a grade of 2.65% $U_3O_8$ and 7.8 million pounds in the measured and indicated category. Inferred mineral resources total 80,500 tonnes at a grade of 2.25% $U_3O_8$ for 4.0 million pounds.

Other than the challenges related to water inflows, jet boring and geotechnical issues described in *Section 15.4*, there are no known issues with respect to mining, metallurgical, infrastructure, permitting, or other relevant factors that could materially affect the mineral resource or reserve estimates.

# 26 Recommendations

The Cigar Lake operation outlined in this report represents a significant economic source of feed material for the McClean Lake mill. To realize the economic benefits from this operation and to mitigate risk, the authors of this technical report make the following recommendations:

**OPERATIONAL EXCELLENCE/RELIABILITY**

- continue process and equipment optimization initiatives related to tooling, leveraging instrumentation and operational technology for improved cavity excavation control to increase recovery and reduce dilution
- continue to advance industry best practices related to asset management to improve equipment reliability for the life of mine
- investigate options for sustainable life of mine aggregate sources
- continue investigation of opportunities to optimize the leach circuit at McClean Lake to manage a wider range of arsenic to uranium slurry feed ratios to reduce potential throughput limitations in leaching while also providing positive effects in downstream unit operations

**ENVIRONMENTAL PERFORMANCE**

- continue to monitor and review the process water balance related to effluent generation and effluent concentrations that form part of the licensing basis
- investigate opportunities to reduce environmental liabilities during operations and decrease decommissioning costs associated with waste rock management

**FREEZE INFRASTRUCTURE OPTIMIZATION**

- complete trade-off studies to determine optimal capital spending on freeze projects to sustain production for the life of the mine

**GEOTECHNICAL DRILLING**

- undertake geotechnical drilling ahead of the two main access drifts for CLEXT to allow for the collection of information to support excavation and ground support plans

**MINERAL RESOURCES AND RESERVES**

- focus exploration efforts mainly on the relatively sparsely drilled, eastern portion of CLEXT, given the current proven and probable mineral reserve inventory, the forecast rate of production and the 13-year mine life
- continue to invest in further exploration on the Waterbury Lake lands, subject to annual reviews of ongoing exploration results, to allow for the extended timelines associated with exploring, designing, permitting and developing new uranium deposits
- continue monitoring the reliability of the arsenic block model to improve short-term forecasting

**REPORT AUTHORS**

The authors of this technical report recommend that the CLJV proceed with the recommendations above, as the expenditures to do so are not material.

In order to execute the Cigar Lake life-of-mine plans while mitigating risks, the proposed expenditures set out in *Tables 21-1*, *21-2* and *22-1* of this report are necessary and endorsed by the authors of this technical report.

The authors of this technical report concur with, and recommend that Cameco proceed with, the foregoing plans and actions.

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# 28 Date and signature page

This technical report titled “Cigar Lake Operation, Northern Saskatchewan, Canada” dated March 22, 2024, with an effective date of December 31, 2023, has been prepared by or under the supervision of the undersigned qualified persons within the meaning of NI 43-101.

Signed,

*“signed and sealed”* March 22, 2024

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