



**NORTHERN SASKATCHEWAN ENVIRONMENTAL
QUALITY COMMITTEE (NSEQC)
2018 REPORT TO COMMUNITIES**

FROM THE CO-CHAIRS

To Northern Saskatchewan Community Leaders and Residents

This report covers the calendar year 2018. The NSEQC was active throughout the year. For the first time, under a newly expanded mandate, we had some involvement in areas outside uranium mining.

The new NSEQC mandate reads: “To increase the level of communication among government, northern stakeholders and industry around uranium development and environmental issues in northern Saskatchewan”.

In 2018, NSEQC representatives:

- Attended a forestry public advisory group planning meeting in Prince Albert with Carrier Lumber.
- Held two general meetings in La Ronge, in February and November, and a general meeting in Saskatoon in July which was combined with a tour of SRC’s analytical laboratories.
- Took part in two field trips to decommissioned mines, to Beaverlodge in May and Cluff Lake in September.
- The three regional co-chairs held a separate planning meeting in December.

Member communities are encouraged to seek information on uranium mines and mining from their NSEQC reps. Representatives, for their part, are encouraged to report back to their communities on what they learn, both to the councils who appoint them and through personal communication with residents.

NSEQC management assisted in this communication by visiting several northern communities to speak directly with leaders about their requirements and preferred methods for reporting back to the communities.

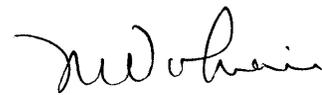
We look forward to an active 2019 operating year.



*Victor Fern, Co-Chair
Athabasca Subcommittee*



*Bruce Fidler, Co-Chair
South Central Subcommittee*



*Norman Wolverine, Co-Chair
West Side Subcommittee*

SUBCOMMITTEE CO-CHAIRS 2018

Athabasca: *Victor Fern, Fond du Lac Dene Nation*

South Central: *Darwin Roy, La Ronge/Bruce Fidler, Creighton*

West Side: *Norman Wolverine, English River First Nation*

Cover Photos: West side reps with Orano officials at a Cluff Lake location where a road has been removed to restore natural river flow.

THE BASIS OF THE NSEQC

Foundation: *The Northern Saskatchewan Environmental Quality Committee (NSEQC) was established in February 1995 by the Saskatchewan government in response to a recommendation of the Joint Federal-Provincial Panel on Uranium Development in Northern Saskatchewan. It operates under a provincial Order in Council, which is normally renewed every five years. A new Order in Council was signed in November 2017 for a five-year term.*

Purpose: *The NSEQC's job is to help transfer information and understanding between northern residents, government (including regulators) and the uranium mining industry regarding the development and operations of the uranium industry in northern Saskatchewan. By talking and learning together, all participants help ensure that uranium mining activity takes place in an environmentally responsible manner that considers the needs and aspirations of residents.*

Mandate: *The NSEQC's mandate allows us to look at environment, worker health and safety and socio-economic matters related to uranium mining and milling operations. The mandate includes uranium exploration activities and the decommissioning/reclamation of abandoned, historic and existing uranium mining and milling sites. We also hear about national efforts to plan for future long-term storage of spent reactor fuel.*

An expansion of the mandate in 2017 allows the NSEQC to look at other environmental issues in the north:

Mandate: *To increase the level of communication among government, northern stakeholders and industry around uranium development and environmental issues in northern Saskatchewan.*

Representatives: *Representatives are nominated to the NSEQC by 30, northern communities, and formally appointed by the Minister of Government Relations. This large membership helps carry out the communication and learning function as broadly as possible across the North.*

Meetings and Site Visits: *The NSEQC normally holds three general meetings of representatives each year. Fly-in mine site visits, usually in summer when we can see more on the ground, are attended by available representatives, with numbers usually determined by aircraft capacity. Representatives from three geographical areas - West Side, South Central and Athabasca - generally attend tours of mines located in their regions, although reps from other regions are sometimes included.*

Administration: *The NSEQC receives technical support from the Northern Mines Monitoring Secretariat (NMMS), which includes representatives from provincial ministries and from the federal Canadian Nuclear Safety Commission. The NMMS is chaired by the **Ministry of Government Relations**, with membership from the **Ministry of Environment** (Environmental Assessment & Stewardship, Environmental Protection, and Fish, Wildlife & Lands Branches); **Energy & Resources**; **Labour Relations and Workplace Safety**; and **Health** (Northern Regional Health Authorities). The program has a full-time manager, administrative support, and a contracted communications coordinator.*

Industry and Government Support: *The uranium mining industry supports the NSEQC by providing technical expertise, arranging and hosting mine site visits (including flights, meals and accommodations), and through provision of and participation in various workshops.*

The provincial government funds NSEQC operations through the Ministry of Government Relations, Northern Engagement office.

OUR ACTIVITIES IN BRIEF

2 018 was a year of renewal for the Northern Saskatchewan Environmental Quality Committee (NSEQC).

Not only was the group reconstituted by a new Minister's Order in late 2017 after a hiatus of almost two years, but about 50% of the reps nominated by their communities took part for the very first time.

The NSEQC mandate expanded too, to include environmental issues across the north relating to industries other than uranium mining.

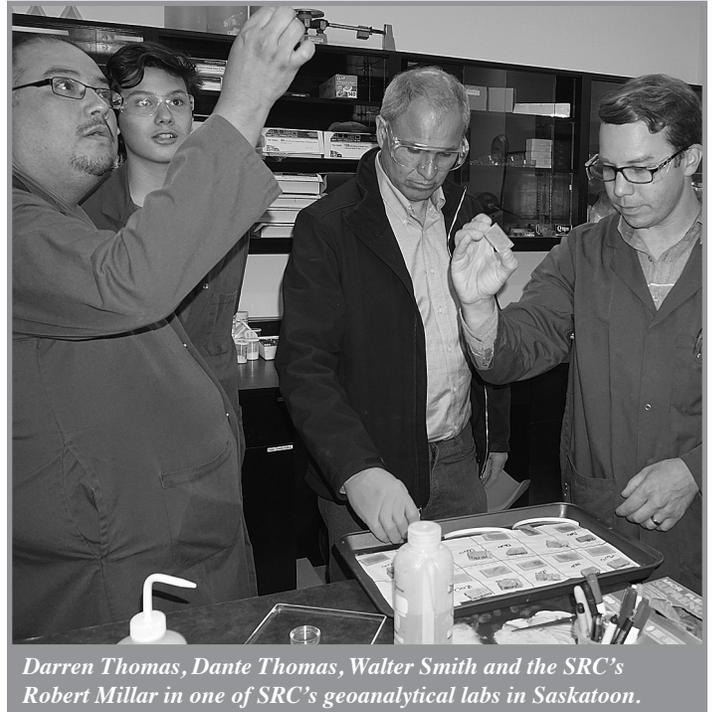
This led to discussions with one forestry company on their west side harvesting activities. NSEQC reps offered suggestions as to the composition of the company's Public Advisory Groups (PAGs).

New co-chairs were appointed at the February meeting: Bruce Fidler for the South Central subcommittee and Victor Fern for the Athabasca subcommittee. Norman Wolverine continued as co-chair of the West Side subcommittee.

Meetings and field trips

Throughout the year, representatives attended three general meetings, two in La Ronge and one in Saskatoon.

Topics covered in the meetings included the health effects of uranium, Institutional Control (long-term provincial care and maintenance of decommissioned sites), the proposed tailings facility expansion at McClean Lake, legacy site cleanup, Cluff Lake decommissioning, mine site updates, mineral rights, the Saskatchewan royalty and tax regime, exploration permitting, and herbicide use beneath power lines.



Darren Thomas, Dante Thomas, Walter Smith and the SRC's Robert Millar in one of SRC's geoanalytical labs in Saskatoon.

Special mini-workshops within meetings included **Radiation 101** and tailings management.

Special attention was paid to Cluff Lake, which was decommissioned starting in 2004 and is approaching the time when Orano will seek to transfer the site to the provincial Institutional Control Program (ICP).

The Saskatoon meeting offered an opportunity to visit the geoanalytical and environmental labs of the Saskatchewan Research Council to see the stringent conditions under which samples of rock, water, plants and other environmental components are tested for various elements.

The Athabasca and West Side subcommittees also had field trip opportunities. The Athabasca subcommittee visited the remediated properties at Beaverlodge near Uranium City in late May. In mid-September, west side reps had a chance to look closely at the decommissioned Cluff Lake site 15 years after closure.



NSEQC reps Joyce Bouvier, Carl Lentowicz, Bruce Fidler, Mervin McDonald, Adam Jobb and Randy Herman help Cameco's Mike Stoicescu (right) measure the radioactivity of various everyday objects at the February meeting.

NSEQC REPS 2018-2019

Athabasca Subcommittee

Co-Chair: Victor Fern

Black Lake First Nation: **George Catholic**

Fond du Lac First Nation: **Victor Fern,**
Felix McDonald

Stony Rapids: **Mervin McDonald,**
Keith Laprise

Uranium City: **Allen Augier,**
Margaret Powder

Wollaston Lake: **Emil Hansen,**
Glenda Mercredi

West Side Subcommittee

Co-Chair: Norman Wolverine

Beauval: **Mervin C. Morin,** Rosaire Alcrow

Buffalo Narrows: **Derek Petit,** Rodney McCallum

Canoe Lake Cree Nation: **Barry Opekokew,**
Peter Iron

Clearwater River Dené Nation: **Teddy Clarke,**
Brenda Janvier

English River First Nation: **Norman Wolverine,**
Lawrence McIntyre

Green Lake: **Joseph Gardiner,** Darwin Lafond

Ile a la Crosse: **Peter Durocher,** Philip J. Durocher

Jans Bay: **Joyce Bouvier,** Patricia Laliberte

La Loche: **Randy Herman,** Robert St, Pierre

Michel Village: **Chris LaPlante,** Keith Sylvestre

Patuanak (Hamlet): **Darcy Lariviere**

Pinehouse: **Walter Smith**

Turnor Lake (Hamlet): **Barbara Daigneault.**

South Central Subcommittee

Co-Chair: Bruce Fidler

Air Ronge: **John Schisler,** Julie Baschuk

Creighton: **Bruce Fidler,** Darren Grant

Cumberland House: **Ferlin McKay,**
Veronica Favel

Denare Beach: **Carl Lentowicz,**
Jean Champagne

La Ronge: **Warren Kelly**

Lac La Ronge Indian Band:

Gerald McKenzie, Naomi Carriere

Montreal Lake Cree Nation:

Dean A. Henderson, Simpson
Naytowhow

Sandy Bay (Village): **Laura McCallum**

Sandy Bay (PBCN): **Harvey Nateweyes,**
Nora Bear

Southend (PBCN): **Adam Jobb**

Weyakwin: **George Natomagan,**
Joshua Brown-Nelson

Bold type indicates primary representative.

GENERAL MEETINGS

The NSEQC representatives attended one special meeting in Prince Albert and three general meetings during 2018. They were held in La Ronge on Feb. 28-Mar. 1, in Saskatoon July 24 and 25, and again in La Ronge Nov. 28-29.

Meeting with Carrier Lumber, Feb. 13.

Seven West Side subcommittee reps travelled to Prince Albert Feb. 13 to meet with Carrier Lumber and its consultant, Foresite Consultants Ltd. Saskatchewan Environment's Forestry Branch was also present, along with representatives of the Saskatchewan Commission of Professional Outfitters and the Lac La Ronge Indian Band.

Carrier's Business Development Manager, **Derek Orr**, was looking for assistance in establishing a Public Advisory Group (PAG) from the west side to help formulate its harvesting plans. **Mark Doyle** of the Saskatchewan Forest Service explained the province's Forest Management Plan process, developed collaboratively between the company and the Ministry of Environment. Carrier's 20-year plan runs from 2018 to 2028, renewable every 10 years and with a 200-year outlook.

Foresite's **Darryl Sande** explained the role of a PAG, which meets about twice a year to review social indicators and the company's timber supply modelling. Although usually funded by the company, it does not belong to the company or the province, but has a life of its own. There was considerable discussion about the relative roles of each, and the question of indigenous rights.



Reps Carl Lentowicz and Emil Hansen look closely at a cloud chamber demonstrated by Mike Stoicescu

NEW EXPANDED MANDATE

The most recent Minister's Order establishing the NSEQC included an expansion to the mandate, which previously related exclusively to uranium mining.

The new mandate includes potential environmental impacts of any kind affecting the north.

The mandate now is:

"To increase the level of communications among government, northern stakeholders and industry around uranium development and environmental issues in northern Saskatchewan".

General Meeting Feb. 28-March 1

Health Effects of Uranium Mining

Dr. James Irvine discussed the causes of cancer in the north, saying smoking is the most common cause, followed by radon. Uranium mining does not increase the risk of cancer.

Dr. Rachel Lane of CNSC (Canadian Nuclear Safety Commission, the federal regulator of nuclear operations in Canada) explained the results of two studies done to determine which cancers are caused by radon.

Eldorado uranium miners between 1932 and 1982 had a high incidence of lung cancer because of radon exposure. However, heart disease was still the leading cause of death, followed by cancer and respiratory diseases. Better

ventilation and radiation protection measures were implemented in modern mines once the connection between radon and lung cancer was known.

The second study was a preliminary one to find out if a full study of modern uranium miners was feasible. It found the risk was now so low that a full study was not possible until more miners had worked many more years.

CNSC role in regulation

The CNSC's **Richard Snider** outlined the work of the commission and its role in regulating uranium mines. He said all Saskatchewan uranium mining operations are meeting expectations in the areas of health and safety, radiation protection and protection of the environment. CNSC and the province take independent samples to make sure the companies are reporting accurately.

THE NSEQC AND FORESTRY

To date, the expanded mandate has taken the NSEQC on one small involvement with forestry.

In late 2017 and early 2018, Carrier Lumber approached the group for help in establishing Public Advisory Groups in west side communities.

While NSEQC reps will not serve as PAG members, their knowledge of the communities was considered valuable in suggesting potential candidates.

The group also asked for an overview of forestry operations currently active in the province. This will be presented in 2019.

What is radiation?

Michael Stoicescu, a health physicist with Cameco, gave a hands-on demonstration of what radiation is and how it is detected. Reps formed a human “atom” and some were removed from the group to illustrate the decay process. Flashlights represented the “shine” or radiation from a uranium atom. Using a scintillometer, reps also measured the radioactivity of different objects, including a clock, a cup, glassware and even snow!

Environmental sampling

Daley McIntyre of Cameco, manager of SHEQ (Safety, Health, Environment and Quality) at Key Lake and McArthur River, explained how environmental sampling programs are designed and what they measure.

Cluff Lake

Dr. Kebbi Hughes discussed how Orano’s decommissioned

Cluff Lake site is recovering naturally. Because it is performing as predicted, monitoring was reduced from quarterly to annually in 2018. Orano will apply for a new five-year licence in 2019, and hopes to transfer the site to the provincial Institutional Control Program (ICP) by 2023.

Institutional Control

The ICP program was described by **Tim Moulding**, Saskatchewan Environment’s Manager of Uranium and Northern Operations. Decommissioned sites, once they are shown to be stable, may be transferred to provincial control. The transfer will include money paid into two funds, one to cover the cost of monitoring the site “in perpetuity” (usually interpreted as 100 years) and the other to cover the cost of unforeseen events. *More on page 18*

Bruce Fidler was named co-chair of the South Central subcommittee, replacing Darwin Roy who had left the community.

General Meeting July 24-25, 2018

20 NSEQC reps gathered in Saskatoon in late July for a two-day meeting. The first day and a half was taken up with presentations and discussion, while the last afternoon saw reps visit the various laboratories of the Saskatchewan Research Council (SRC).

The meeting focused on the regulatory regime, tailings management and decommissioned/legacy sites.

Waste Management

The CNSC’s **Devon Brown** described waste management practices at Saskatchewan uranium mines. He outlined the CNSC’s regulatory function from construction of a mine through decommissioning, and discussed what the waste



Reps tour the environmental lab at SRC in Saskatoon. From left: Scott Boyes, Chris LaPlante, ??, Barry Opekokew, Darren Thomas and son Dante; Adam Jobb. At right is tour guide Jeff Zimmer.

products from a mill are and how they are assessed and managed.

Tim Moulding of Saskatchewan Environment talked about his ministry's involvement in regulating uranium mining. Saskatchewan regulates the industry from exploration right through to decommissioning, and afterwards once a site has been accepted into the ICP.

Tailings workshop

The principles of tailings management were described hands-on by engineer **Carmen Melis** and environmental specialist **Rob VanStone** of Cameco. They brought models of tailings facilities to illustrate the concept of pervious surround, which helps the tailings consolidate.

They likened the leaching process in a uranium mill to making coffee - solids are mixed with liquids, dissolving the coffee (or uranium). The remaining solids become garbage (or tailings) while the dissolved elements become coffee (which is then drunk) or uranium-rich solution, which is precipitated into a yellow powder called yellowcake.

Cluff Lake decommissioning

Orano's **Diane Martens** updated the NSEQC on the status of the Cluff Lake decommissioned site, saying regulatory decommissioning objectives have been met. Information was distributed from northern community member Rod Gardiner, who, as a former employee of the site, has indicated concerns with the thickness of the cover on the tailings (a minimum of one metre of clean glacial till. All scientific indications are

WHAT IS PERVIOUS SURROUND?

When tailings are stored on surface in mined-out pits which have been prepared as tailings management facilities (TMFs) they are usually placed at about a 50% solid concentration. As more and more tailings are placed and add weight, the tailings consolidate and the contained (or pore) water drains out. To allow proper drainage, is desirable that the surrounding rock is pervious, meaning it can pass water through it for collection and treatment.

Some pits have this naturally, like the sandstone walls at McClean Lake. At others, like Rabbit Lake and Key Lake, where the pit walls are solid bedrock, a pervious layer of sand and gravel is added between the tailings and the pit wall to collect the pore water. The water drains through the pervious layer to an underdrain, from where it can be pumped and treated.

that this cover is sufficient to keep the consolidated tailings isolated from the environment. The decommissioning plan and its results have been approved by regulators.

Project CLEANS

The last item on the agenda was Project CLEANS, operated by the Saskatchewan Research Council (SRC) and tasked with cleaning up Gunnar, Lorado and 32 small satellite mine sites in the Beaverlodge complex, all near Uranium City.

SRC's **Mark Calette** described the project, which is funded 65% by the federal government. Ten satellite sites



EQC reps hard at work at the Saskatoon meeting.



Athabasca subcommittee reps with CNSC and Cameco personnel check out the remediated Zora Creek drainage near Uranium City.

Cory Hughes of the Ministry of Economy (since broken into three ministries including Energy and Mines, which Cory remains a part of) explained mineral rights in the province and how the uranium royalty and tax systems work.

Advanced exploration projects

Both **Denison Mines** and **NexGen Energy** were present to explain their projects, which could become the next uranium mines.

Denison’s VP Operations **Peter Longo** explained that Denison has two deposits at Wheeler River: Gryphon and Phoenix. At Phoenix, where geological conditions are favourable, the company is

have so far been remediated; eight will apply for transfer to ICP soon. Remediation of the Gunnar tailings is expected to take until 2021.

General Meeting Nov. 28-30, 2018

The agenda for this meeting was designed to help new reps better understand the scope of the group’s work. A number of government agencies, notably Government Relations, presented their work, indicating how it relates to uranium mining.

The topics of socio-economic benefits, terms of surface lease agreements and exploration permitting were all discussed, along with the composition and role of the Northern Mines Monitoring Secretariat.

Representatives of Cameco and Orano presented mine site updates, including the operating McClean Lake mill and Cigar Lake mine and the three sites currently in care and maintenance - McArthur River, Key Lake and Rabbit Lake.

proposing an innovative in-situ recovery mining method, which would recover uranium by pumping an acid solution through the orebody from surface, dissolving the uranium. The uranium-rich solution would be pumped to surface and stripped of its uranium before being returned underground to pick up another load.

The lower-grade Gryphon would be mined later using traditional stope mining.

NexGen is working towards developing a mine on its Rook 1 project north of La Loche. The company’s **Adam Engdahl**, **Troy Boisjoli** and **Shawn Harriman** explained the project, which is also innovative in that the plan is to return all tailings back underground. *More details page 16.*

Environmental monitoring

Ryan Froess of CanNorth Environmental presented on the Eastern Athabasca Regional Monitoring Program (EARMP), which has both technical and community components.



Public meeting in Uranium City to discuss the Beaverlodge project.

Forestry

Derek Orr of Carrier Lumber explained the company's plan to harvest its Northwest Term Supply Licence (TSL) area in the Pinehouse-Patuanak-Beauval area. He and consultant **Darryl Sande** of Foresite Consultants also talked about Public Advisory Groups (PAGs) and how a Forest Management Plan is developed between the company and the province.

Herbicide use under power lines

Dr. Katherine Stewart of the University of Saskatchewan explained her study, done on behalf of SaskPower, into herbicide use on power rights-of-way. The study was initiated after the Lac La Ronge Indian Band banned herbicide use on their reserves.

Two of Dr. Stewart's graduate students also presented on their work, one to do with sampling methods and the other with public consultation.

No mine site visits in 2018

The NSEQC was not able to visit any of the current mine sites, operating or otherwise, in 2018. Only one mine and one mill were in operation; two mines and one mill were in care and maintenance.



Philip Durocher and Chris LaPlante check out the Cluff Lake tailings management area with a Geiger counter.



Cameco's Mike Webster checks out the custom-built solid stainless steel covers now securing former mine shaft openings on the Beaverlodge property. The covers are bolted to the bedrock, and include ports where a small camera can be inserted for inspection.

CIGAR LAKE

The only one of Cameco's Saskatchewan production facilities currently in operation, Cigar Lake produced 18M lbs of U₃O₈ in 2018. Cameco's portion totalled 9.2 million pounds.

The ore is mined from underground by a jet boring system that was developed by Cameco. Water jets are used to removed the ore from a cavity; it is transported to an underground mill in a closed circuit, then pumped to surface. It is transported 70 km to the JEB mill at McClean Lake as a slurry in special containers for processing into yellowcake.

DID YOU KNOW

Cameco expects to require 28-30 million pounds of uranium to fulfil its market demand for 2019. About one-third, or nine million pounds, will come from new production at Cigar Lake. Another 18-20 million pounds will be purchased. The remainder will be drawn from inventory.

Since the mine was commissioned in 2014, Cigar Lake has produced 64.9 million pounds of U₃O₈. It is licenced to produce 18 million pounds annually; 2019 production will hold steady at this rate.

In February, CNSC reported that water treatment at the site has been improved to remove more arsenic. The site is meeting all effluent discharge criteria. The updated decommissioning plan was under review by CNSC.

As of December 2018, Cigar Lake still has 88.3 million pounds of proven and probable reserves with an average grade of 14.48% U₃O₈. 515 people were employed at the site, of whom about 49% were northerners.

Cameco owns 50.25% of Cigar Lake and is the operator. Partners are Orano (37.1%), Idemitsu Canada Resources (7.875%) and TEPCO Resources (5%).

Cigar Lake is licenced until 2021. The NSEQC last visited the site in 2014.

Current financial assurance for Cigar Lake (the amount on deposit with the government to cover site cleanup in the event the company cannot complete it) is \$49,284,200.



The Cigar Lake site, with a frozen Waterbury Lake in the background. Cameco photo

McCCLEAN LAKE

McClean Lake was one of only two Saskatchewan uranium operations still active in 2018. Although there is currently no mining at the site, the upgraded JEB mill was processing ore slurry from Cigar Lake. Current rate of processing is 18 million pounds annually; the mill can handle up to 24 million pounds.

A planned expansion to the JEB Tailings Management Facility (TMF) was under way in 2018; the expansion still keeps all tailings below ground level. The proposal was reduced from the initial application, meaning the proposed retaining berm will be only nine metres high on the low side of the facility, compared to the originally-proposed 18 metres.

This will expand tailings capacity from 2.6 million cubic metres to 4.8 million cubic metres.

The CNSC carried out independent environmental monitoring in August 2016. Results verified Orano's own results and showed the site operations pose no risk to humans or the environment.

McCClean Lake's operating licence expires June 30, 2027.

The NSEQC's last visit to McCClean Lake was in 2013.

Current financial assurance for McCClean Lake (the amount on deposit with the government to cover site cleanup in the event the company cannot complete it) is \$107,049,791.40.

The nearby Midwest Project, still undeveloped pending market improvements, carried a financial assurance of \$248,541.78 as of December 2018.

The McCClean Lake operation is owned by Orano Resources Canada (70%, operator), Denison Mines (22.5%) and OURD Canada Co.Ltd. (7.5%).



Top: Water sampling at McCClean lake. Bottom: The JEB area of the McCClean Lake site. Orano photos.

RABBIT LAKE

The Rabbit Lake mine and mill were placed in care and maintenance in early 2016, and the operation remained closed through 2018. About 50 people per shift remain on the payroll, about half of whom are Residents of Saskatchewan's North (RSNs). The mill is being maintained in a condition to restart should the operation decide to do so.

Cameco's *Anne Gent* and *Kevin Nagy* reported at the NSEQC's November meeting that Cameco is working on the economics of allowing the Eagle Point underground mine to flood on a temporary basis, to save about 10% of the annual \$30-\$35 million annual cost of care and maintenance.

The savings would be in pumping and water treatment costs, as well as ventilation and heating of the underground workings. The water treatment volume would be reduced by about 60%, Gent said.

Equipment and electrical installations would be removed first, and it would take a year or two for the mine to flood from the bottom up. The access portal would be sealed with an engineered cover. Surface structures at Eagle Point would remain.

This will not be considered decommissioning, although flooding was part of the original decommissioning plan, and no equipment will be left underground. There may be

an impact on employment.

Regulatory approval would be required for this option, and Cameco anticipates making application to the CNSC and the Ministry of Environment in spring 2019, with approvals expected later in the year. There will also be conversations with stakeholders.

There are still 39 million pounds of indicated reserves in the mine, at an average grade of about 1%, which is not economically mineable at present uranium prices.

The NSEQC last visited the site in 2015. The site is licenced until October 31, 2023. Cameco is the 100% owner of Rabbit Lake.

Current Financial Assurance for Rabbit Lake (the amount on deposit with the government to cover site cleanup in the event the company cannot complete it) is \$202,700,000.



Top: Underground drilling using a jumbo at Rabbit Lake. Cameco photo. The Eagle Point mine portal at Rabbit Lake would be sealed with an engineered cover if the mine is flooded.

McARTHUR RIVER/KEY LAKE

After an announcement in late 2017, Cameco ceased operations at its McArthur River mine and Key Lake mill in February 2018, ostensibly for 10 months. Many felt the shutdown could be longer given the depressed state of the uranium market, and later in the year Cameco announced an indefinite shutdown for the McArthur River mine and the Key Lake mill which processes McArthur River ore.

During the shutdown period, regulatory inspections are continuing at the same frequency as in previous years. The main focus for staff is equipment maintenance, water treatment and environmental protection and compliance.

In February, Cameco's *Daley McIntyre*, manager of Safety, Health, Environment & Quality (SHEQ) at both sites, described Key Lake's onsite upstream and downstream water, vegetation and wildlife monitoring programs. The company also monitors air and groundwater, and produces an Environmental Performance Report every five years. More than 40 years of environmental data has now been gathered about the area.

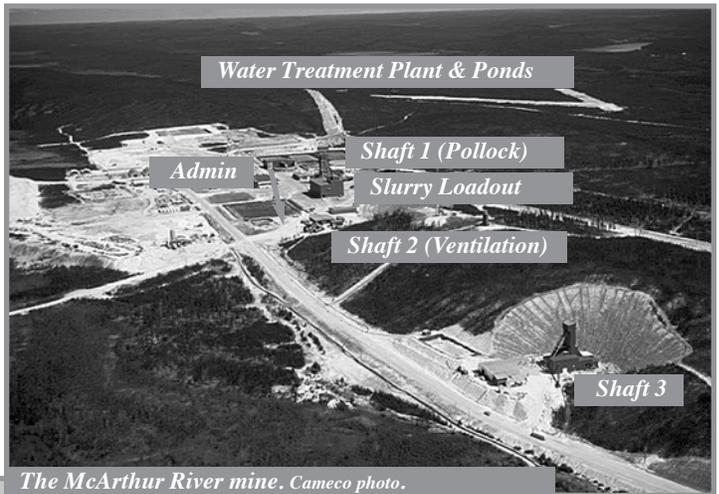
An updated decommissioning plan was submitted for Key Lake in September 2018. Both sites are licenced until

Oct. 31, 2023.

The NSEQC last visited McArthur River in 2015.

Current Financial Assurance for McArthur River (the amount on deposit with the province to cover site cleanup in the event the company cannot complete it) is \$48,400,000.

For Key Lake, the figure is \$218,300,000.



CLUFF LAKE

The mine operated from 1980-2002, with underground and open pit operations, producing a total of 62 million pounds U3O8. Employment was 52% northern, 80% of whom were from the west side. In 2004-2006 most infrastructure was removed.

The first pit mined, D Pit, yielded ore grading 30% uranium; it was allowed to flood naturally and has reached a stable state.

Post-decommissioning monitoring has been ongoing since 2006 - monthly until 2012, then quarterly until 2017. From 2018 on it will be yearly until transfer to the provincial Institutional Control Program (ICP), when it will be every 5-10 years to capture long-term changes. This will be the first modern uranium mine to enter the program.

At the February meeting, Orano's *Dr. Kebbi Hughes* (a geoenvironmental scientist) explained the decommissioning activities to date. Environmental and human health risk analyses indicate no risk to the environment or to people. Despite the fact that Cluff Lake uranium values will remain above surface water quality guidelines for some

time, the predicted peak will still be below the site decommissioning objectives.

In July, *Diane Martens* of Orano gave a further update on the site. She mentioned community involvement in the decommissioning planning, including participation by the NSEQC and the Athabasca Cree First Nation (ACFN).

The tailings area, constructed in 1979, was managed by depositing a thick (50% solids) slurry, using berms and dikes to manage solids and liquids. As the tailings consolidated, **pore water** was collected in ponds and treated. A minimum of one metre of clean glacial till was added as a cover during decommissioning, graded to allow rain and snow melt to run off in designated channels. Water quality downstream is indistinguishable from upstream.

The NSEQC has become aware that some northerners are unhappy with the amount of cover added to the tailings. They do not accept the science-based answers from Orano, the province or the CNSC, and want more cover added. In September, west side reps visited the site to see the areas in question for themselves. They saw nothing to cause them concern. The CNSC will hear Orano's five-year licence extension application in Ottawa May 15, 2019.

Current Financial Assurance for Cluff Lake (the amount on deposit with the province to cover site cleanup in the event the company cannot complete it) was reduced from \$33,600,000 to \$26,800,000 in December 2018.

WHAT IS PORE WATER?

When tailings are placed in a management facility, they are pumped with about a 50% water content. This is called pore water, since it occupies the pores or small spaces between the solid particles. As more tailings are placed, the lower layers consolidate and the pore water squeezes out.



NSEQC with Orano personnel at Cluff Lake, September 2018

FIELD TRIPS 2018

The NSEQC was not as active in the field in 2018, mostly because three of the mine sites were in care and maintenance mode. Neither Cameco nor Orano hosted tours of producing sites this year.

Beaverlodge

Members of the Athabasca subcommittee gathered in Uranium City May 29 to hear an update from Cameco on the progress of remediation at the former Beaverlodge mine and its satellite operations. They took part in a community meeting at the school before heading out to see some of the work first-hand, with Cameco's **Shawn Hiller** describing work to date.

The Beaverlodge mill and its collection of underground and small satellite mines operated between 1952 and 1982, producing 20 million pounds of yellowcake. It was decommissioned and reclaimed to the standards of the day between 1982 and 1985. Routine monitoring and inspections have continued, and since 2007 work has progressed to ready the properties for eventual transfer to the province's Institutional Control Program (ICP). Five properties were transferred in 2009, and the proposal was for 20 more to be transferred in 2018.

Once all the properties are transferred, planned by 2023, the CNSC will no longer licence the sites and the province will assume sole responsibility for them .

Cameco is remediating the Beaverlodge properties on behalf of owner Canada Eldor, a federal Crown corporation.

The site tour included a look at the new stainless steel caps now installed over old shaft openings, and a visit to Zora Creek, where the creek bed was amended so drainage no longer flows through uranium-bearing rock.



From left: NSEQC reps Philip Durocher, Barry Opekokew, Joyce Bouvier and Orano's Diane Martens at the Cluff Lake site.

Cluff Lake

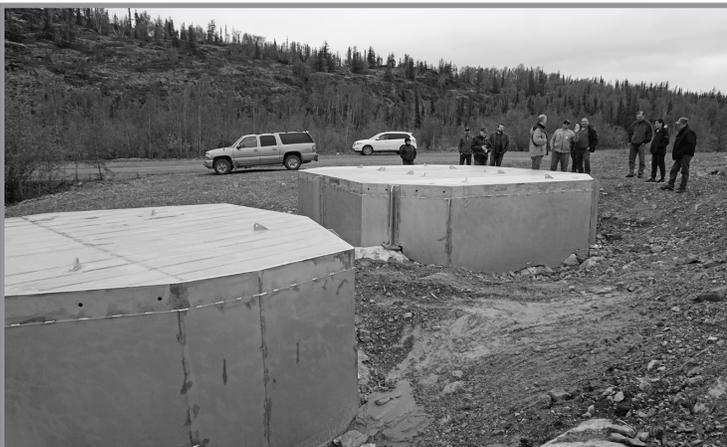
On Sept. 19, west side reps travelled to Cluff Lake to see for themselves the remediation work that has been done as part of decommissioning activities.

Orano's **Diane Martens** guided the tour, along with Darrel McCallum who has a lot of experience with the site.

Since the NSEQC had been approached by a northern resident and former employee who has concerns with some aspects of the decommissioning, the tour paid special attention to the areas he has concerns with.

Prime among these is the tailings management area (TMA), where he feels the one-metre clean cover is insufficient to protect people and animals. This cover depth was proposed in 1993 and since then there has been no scientific indication it should be thicker since the tailings are well consolidated. In fact, adding more cover would cause more environmental destruction, says Orano.

The reps looked at each area of the site. They carried geiger counters to check for radioactivity, and found nothing unusual that concerned them.



Stainless steel caps were placed on shaft openings and raises.



The newly established drainage channel of Zora Creek.

ADVANCED EXPLORATION PROJECTS

For the first time, this year the NSEQC was visited by two advanced exploration companies who wanted to explain their projects.

Both **Denison Mines** and **NexGen Energy** have projects which are undergoing feasibility studies to develop as new-generation uranium mines once the world market for uranium improves.



The Phoenix and Gryphon deposits at the Wheeler River Project

Denison's Wheeler River Project

This project is about six km west of the road between the Key Lake mill and the McArthur River mine. It consists of two deposits, Phoenix and Gryphon.

The high-grade **Phoenix deposit** lies in fractured ground just above the unconformity between the Athabasca sandstone and hard basement rocks. It contains indicated resources of 59.9 million pounds U₃O₈ at a grade of 19.1%.

Because of the geology, it cannot be mined by traditional means. Instead, Denison is testing the feasibility of In-Situ Recovery (ISR) mining, which involved pumping an acid solution from surface through the orebody to dissolve the uranium. The uranium-bearing solution would be pumped back to surface, stripped of the uranium and returned underground to pick up more uranium, forming a closed loop. The uranium would be precipitated as yellowcake and shipped out.

The ore would be frozen before mining to protect the environment and allow for controlled decommissioning.

The NSEQC was excited by the potential advantages of a mine with no mill, no trucking, no waste rock and no tailings!

The lower-grade **Gryphon deposit** lies in basement rock and would be mined later, using traditional stope mining techniques for low-cost production. Gryphon contains 49.7 million pounds grading 1.8%.

Ore from Gryphon would be trucked to the McClean



Exploration camp on NexGen Energy's Rook 1 Project

Lake mill for processing.

Denison anticipates a production start in the mid-2020s, if uranium prices increase as expected.

NexGen's Rook 1 Project

NexGen Energy's Rook 1 Project lies about 155 km north of La Loche on Highway 155, about 70 km south of the site of the former Cluff Lake mine. Drilling has been ongoing since 2014.

The project includes the **Arrow deposit**, with an indicated mineral resource of 256.6 million pounds U₃O₈. Unlike some deposits, Arrow is completely land-based. The deposit occurs in solid bedrock.

A prefeasibility study was completed in November 2018, and a technical report issued in December. NexGen is anticipating three years of construction and a 15-year mine life.

This proposed mine is also ground-breaking in that it proposes to place all tailings back underground as a paste.

Environmental baseline studies are under way by an independent contractor, including air quality, hydrogeology, aquatics, terrestrial studies, heritage resource surveys, a land use study and a socio-economic analysis.

The company has employed summer students from La Loche and area.

DID YOU KNOW

It can take 10 years or more from the time an economic uranium deposit is identified until a mine starts operating.

First comes a preliminary economic assessment, followed by a pre-feasibility study (PFS). If the PFS is positive, a full feasibility study will follow, along with environmental studies and licencing applications. Provincial and federal approval must be granted before construction can start; construction might take three years.

Only then would production start.

WHAT'S CHANGED IN URANIUM MINING??

As we look at expensive cleanups happening at old mine sites around Uranium City, many worry what legacy the current mines are leaving and what they will cost to eventually remediate.

The Uranium City mines were the last in the generation that operated with little understanding of radiation or environmental protection.

The largest mine was **Eldorado**, which operated for 30 years between 1952 and 1982. Eldorado Mining & Refining was a federal Crown corporation, since uranium was then a strategic metal and used for military purposes. Only the government could explore for, or mine, uranium until a rule change in 1947, which then generated a staking rush. The Crown corporation was renamed Eldorado Nuclear Ltd.

By 1956, the privately-owned **Gunnar** mine was the largest uranium mine in the world. After 1961, the original open pit was extended downwards into underground workings. Grades were in the region of 0.18%. About 17.6 million pounds, or less than a year's production from Cigar Lake or McArthur River, were produced over its life.

As private exploration expanded and Saskatchewan's geology became better understood, uranium was discovered near Collins Bay on the west shore of Wollaston Lake.

The next generation

In 1975 **Rabbit Lake** opened as an open pit mine, owned by Gulf Minerals. This heralded the next generation of uranium mining. The ore was much richer, and health hazards from radiation were much better understood. The province introduced stricter environmental regulations to govern uranium mining.

Rabbit Lake is the oldest mine to fall under current federal and provincial rules for decommissioning and financial assurance. It was the first mine to run a weekly shift change on a fly-in schedule. Four pits were mined out before the Eagle Point underground mine began production in 1992 and the Rabbit Lake pit was converted to a pervious surround tailings management facility. Operations were suspended from 1998 to 2002, and again in 2016, both times because of depressed uranium prices. The mine produced 186.2 million pounds of U3O8 between 1975 and

2011.

Cluff Lake, which opened in 1980, is the first for which a decommissioning plan was required by regulators from the start. It is currently decommissioned and almost ready for transfer to the ICP program (*see next page*).

Higher technology

The following year saw the first production from **Key Lake**. The mine produced 208 million pounds of uranium oxide from two open pits at an average grade of 2%. The Gaertner pit was mined out in 1987, and the larger Deilmann pit in 1997. Deilmann was then converted to a tailings management facility for the mill, to accommodate McArthur River ore, and no more tailings were added to the original purpose-built above-ground tailings facility.

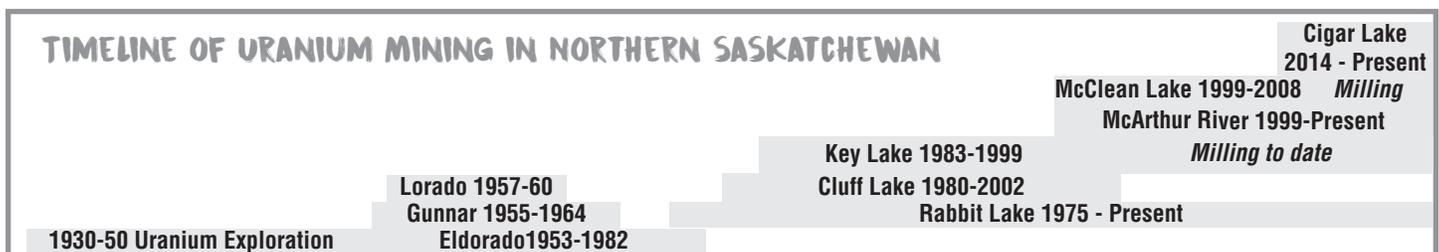
The Key Lake mill was upgraded to handle the richer ore from McArthur River, 78 km north. The rich ore is blended with Key Lake special waste for a head grade of about 4%. A high-quality haul road was built as an extension of Highway 914 to carry the ore slurry between the two sites.

In 1999, both McClean Lake and McArthur River saw their first production. **McClean Lake** mined out five open pits until 2008. The mill was placed in care and maintenance from 2010 to 2014, when upgrades and expansion were begun to facilitate receiving richer ore from Cigar Lake. The mill currently has the capacity to process 24 pounds of U3O8 annually.

McArthur River, the richest uranium mine in the world, has always milled its ore slurry at Key Lake.

The most recent mine to open was **Cigar Lake** in 2014, after 35 years of exploration and technical development. This site has no mill, and trucks its ore slurry to McClean Lake, 70 m away. It has produced almost 65 million pounds of ore since 2014, using a jet bore technique developed at the site.

While we have had uranium mining in our province for almost 70 years, health and safety is very much improved. Today, health authorities say there is no perceived extra risk of cancers among uranium miners over the general population. Smoking is by far the greater hazard, say



WHAT HAPPENS TO DECOMMISSIONED MINES?

THE PROVINCE'S INSTITUTIONAL CONTROL PROGRAM

Development of Saskatchewan's Institutional Control Program (ICP) started in 2005, and the program has been in place since 2009. The program was created to provide long-term management for decommissioned mine and mill sites on provincial Crown land, which have previously been monitored for many years by the proponent.

The ICP, which falls under the Reclaimed Industrial Sites Act, ensures that there will be no more legacy sites in Saskatchewan, like Gunnar or Lorado, that need to be cleaned up at public expense.

The program has two parts: a Registry, and two associated funds: the Institutional Control Monitoring Fund and the Institutional Control Unforeseen Events Fund.

The Registry will maintain records of the location of a closed site, details of its former operator, a site description and historical records of activities, site maintenance, monitoring and inspection, and future allowable land use for the site.

The Monitoring and Maintenance Fund will pay for long-term monitoring and maintenance of any sites transferred to the ICP. The Unforeseen Events Fund will

pay for unforeseen future events. The Funds are managed by the Ministry of Energy and Resources, and reports are published annually (*available online*).

These funds are provided up front by the former operating company upon transfer of the property to the ICP. A fund advisory committee consisting of industry stakeholders directs investment of the money.

Properties currently held in the ICP program include the Contact Lake gold mine north of La Ronge (Cameco), the Beaverlodge K260, 11 Zone, 46 Zone, 32 Zone, 42 Zone, Eagle Shaft, Eagle 4 & 7 claims and the 02 Zone (formerly Cameco/Canada Eldor).

Next to be transferred, when regulators deem them ready, will be the former Cluff Lake mine site and several more Beaverlodge satellite properties.

The sites held in the ICP program are inspected by provincial officials every five years. The inspections are paid for by the Monitoring and Maintenance Fund.

Should any unpredicted conditions become apparent, remediation would be paid for from the Unforeseen Events Fund.

WHAT IS FINANCIAL ASSURANCE?

In today's world, no new mine opens in Saskatchewan without posting financial assurance. This is an amount of money that is deposited with a bank in the form of cash or an irrevocable letter of credit, that is actually insurance against the demise of the operating company.

If such a company was to disappear for whatever reason, the money would be available to the province to use in properly remediating whatever was left at the site.

In this way, present-day governments are making sure that never again will a legacy site be left for cleanup at public expense.

In 1963 when the privately-owned Gunnar mine closed, staff and management simply climbed aboard planes and flew away, leaving the site as it was the day it was last worked. Fifty-plus years later, with no owner traceable, provincial and federal governments are still dealing with the cleanup, at an ever-increasing price tag.

Uranium City's Eldorado mine and mill closed suddenly in 1982, and while the main facilities were demolished over the next three years, many of the satellite mines (many of them small mom and pop operations) were abandoned as

they were.

Beaverlodge was owned by a federal Crown corporation, Eldorado Nuclear, which became part of Cameco in 1988. Cameco is handling final cleanup on the federal government's behalf.

Today, every mining company is required to post financial assurance before it begins operations. The amount varies according to an estimate of the cost of cleanup at any given time, and is reviewed every five years.

Current Financial Assurance for Uranium Mines (as of late 2018):

Cigar Lake	\$ 49.28 million
Cluff Lake	\$ 26.8 million
Key Lake	\$218.3 million
McArthur River	\$ 48.4 million
McClellan Lake	\$107.0 million
Midwest (undeveloped)	\$248.8 million
Rabbit Lake	\$202.7 million.

COMPANY & REGULATOR CONTACTS

URANIUM COMPANIES

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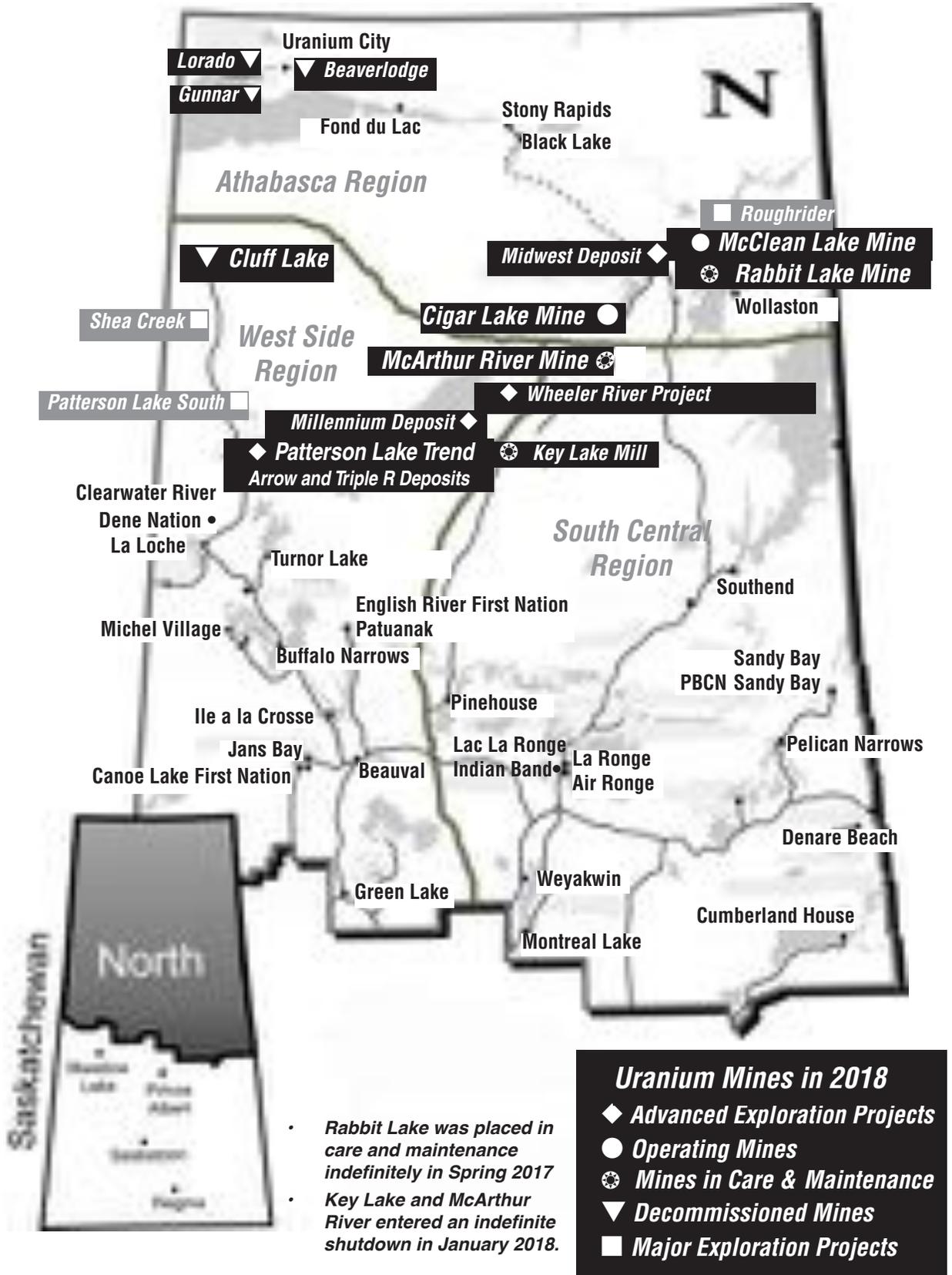
Troy Boisjoli, VP Operations & Project Development

Adam Engdahl, Senior Project Manager

Shawn Harriman, Sr. Mgr, Permitting, Evt. & Regulatory Affairs

Karina Tyne, Corporate Manager.

NSEQC MEMBER COMMUNITIES



NSEQC VISION STATEMENT

An Environmental Quality Committee, composed of trusted and knowledgeable people each nominated by his/her community, is a bridge between northerners, government and the uranium Mining industry - a bridge built on a solid foundation of mutual trust and respect.

An Environmental Quality Committee is not vested with regulatory responsibilities, but rather is structured to provide a forum which will ensure consideration of the concerns and recommendations of northerners on the way in which uranium development occurs in northern Saskatchewan.

Through informed dialogue and communication, government, the uranium mining industry and the people of the north, together, will strive to ensure that all uranium mining activity takes place in a manner which considers the needs and aspirations of those people directly affected, the people of northern Saskatchewan.