2018-2019 ANNUAL REPORT

Plain Language

INDEPENDENT ENVIRONMENTAL MONITORING AGENCY

A public watchdog for environmental management at EKATI DIAMOND MINE

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Front and back cover photos: courtesy of Dominion Diamond Mines, ULC

MESSAGE FROM THE CHAIR

I am pleased to present the 2018-19 annual report of the Independent Environmental Monitoring Agency (Agency). The report summarizes the Agency's activities and offers recommendations for Dominion Diamond Mines ULC (Dominion) and for regulators.

2018 marked 20 years of production at the Ekati mine and the company commemorated with a celebration in August at the mine site and in Yellowknife. The Agency congratulates Dominion on this significant achievement.

The major focus for the Agency over the past year has been participating in the review of Interim Closure and Reclamation Plan (ICRP) v3.0. This document has not been revised since 2011, and recognizing the importance of closure of the mine to our Aboriginal Society Members, the Agency travelled to five communities to host Information Sessions where we presented a summary of the ICRP. These sessions not only informed the community members about what is in the document and the Agency's concerns, but also provided an opportunity for open discussion and for the Agency to hear community concerns. As part of the review process the Agency also participated in the WLWB-sponsored technical workshop and provided comments and recommendations to the WLWB including a recommendation that the ICRP v3.0 should not be approved in its current form as the plan lacks detail in many important areas.

This past year the Agency also participated in the review and evaluation of a number of important documents providing comments on the 2017 Air Quality Monitoring Program Report, Dust Suppressant Pilot Study Report (2016/17), Sable Waste Rock Storage Area Design Plan, Waste Water Processed Kimberlite Management Plan and Waste Rock and Ore Management Plan Version 9.0 and 10.0. Our main concerns and recommendations focused on seepage, risk mitigation for potentially acid generating waste rock, the use of the term "non-acid generating", and the use of diabase as a construction material on site.

Over the next year the Agency will continue to review and provide recommendations on Dominion's environmental management and monitoring plans and activities to ensure that there is good environmental performance at the mine site. Please feel free to contact the Agency at any time with your comments and concerns, or if you wish for us to visit your community.

Jaida Ohokannoak
www.monitoringagency.net

MINING AT EKATI

Dominion Diamond Mines ULC is mining diamonds using large open pits and underground tunnels to remove the kimberlite rock that contains the diamonds.

1 Long Lake Containment Facility

The Long Lake Containment Facility is a tailings pond, and is the final destination for the crushed, wet kimberlite that remains after the diamonds are remove. The LLCF was once a lake that is now divided into five sections (Cells A to E) by dykes (rock walls) so the processed kimberlite can settle. Water is eventually released into lakes downstream when it is clean and pollutants are below the amounts set in the water licence.

2 Main Camp

This area includes an accommodation building for hundreds of workers, a power plant, a truck shop and a processing plant where the diamonds are removed from the kimberlite.

3 Waste Rock Piles

Rock that does not contain diamonds is piled in layers totaling 50 to 70 metres high.

4 Waste Management Facility

The building where recycling, composting, and burning of waste happens. This waste facility deals with regular or domestic waste from offices, buildings and the cafeteria at the mine site.

5 Pigeon pit

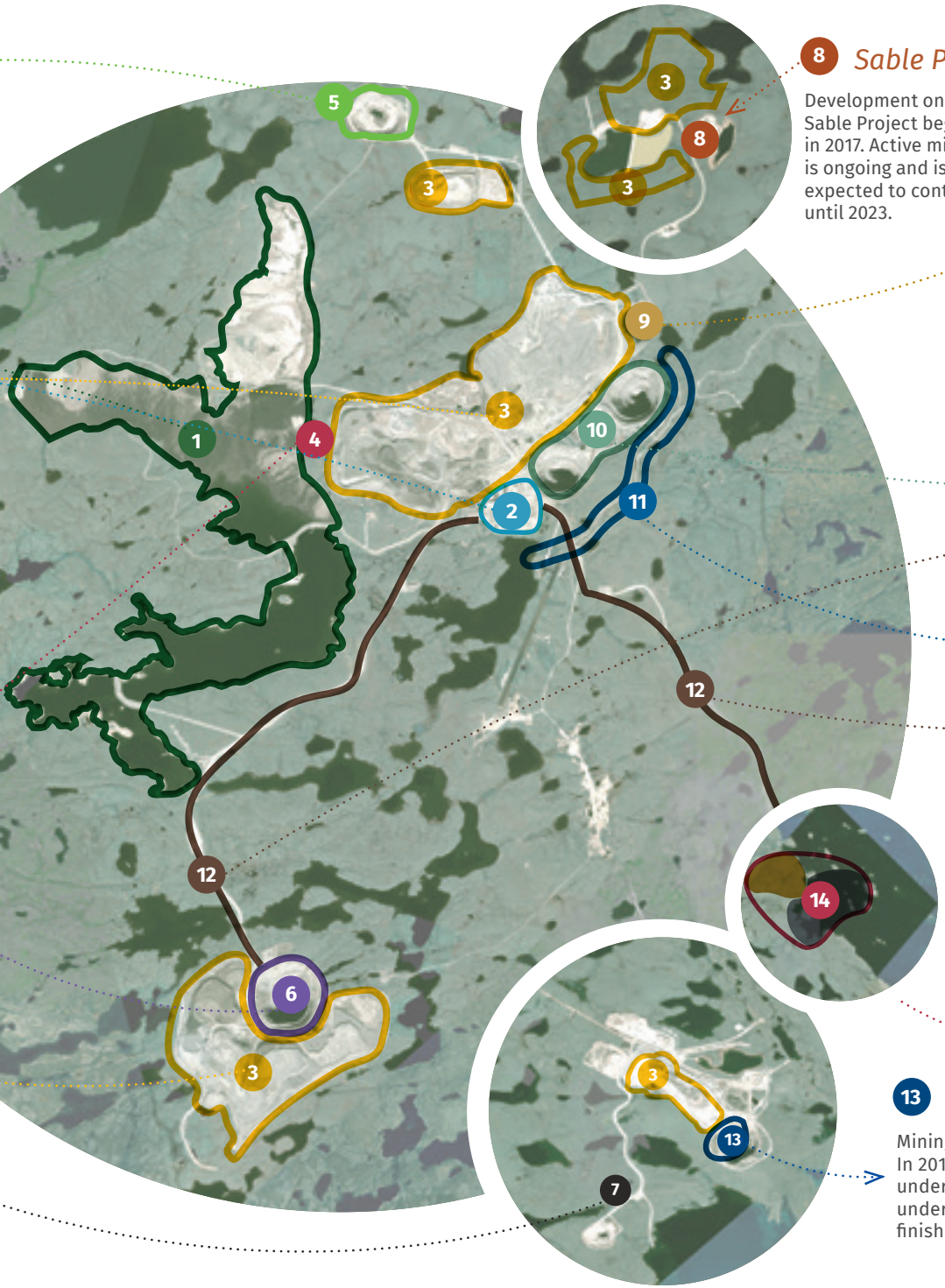
Pigeon Pit is a relatively small pit which began development in 2013. It is currently being actively mined and is expected to be active until 2022.

6 Fox Pit

This is the biggest pit at Ekati. Fox Pit began development in 2001. Mining of the pit was finished in early 2015.

7 Lynx Pit

The Lynx Project officially started development in 2013. The Pit has been actively mined since 2015 and the water licence it is approved under expires in 2021.



8 Sable Pit

Development on the Sable Project began in 2017. Active mining is ongoing and is expected to continue until 2023.

9 Beartooth Pit

Started in 2004, Dominion finished mining Beartooth Pit in 2009. The Beartooth Pit started being used for storing processed kimberlite in 2012.

10 Panda and Koala Pits

Starting with Panda in 1997, open pit mining of these two sites has finished. Underground mining started in Panda in 2003, and finished in 2011. Underground mining started in 2004 at Koala, and continued until 2019. Processed kimberlite is scheduled to be deposited in Panda Pit in 2019.

11 Panda Diversion Channel and Pigeon Stream Diversion

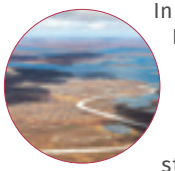
The Panda Diversion Channel and Pigeon Stream Diversion are man-made streams diverting water around pits that would otherwise flow into the pits. Fish, mostly grayling, use the new channels for travel and spawning. The Pigeon Stream Diversion was completed in 2014, and the Panda Diversion Channel was completed in 1998.

12 Haul Roads

Dominion has built all-weather roads to connect the pits to Main Camp. Dominion carefully applies chemical dust suppressants or water to reduce dust on the roads. Currently there are 141 km of road at the Ekati mine site.

13 Misery Pit

Mining stopped the Misery Pit in 2005. In 2019, work began on developing underground mining at the pit. The underground portion is expected to be finished in 2023.



14 Jay Project

In the spring of 2018 Dominion decided that work planned for the Jay Project would be put on hold for a year to complete an optimization study. If the Jay Project proceeds, it is expected to extend the life of the Ekati mine from to 2024 to 2034.

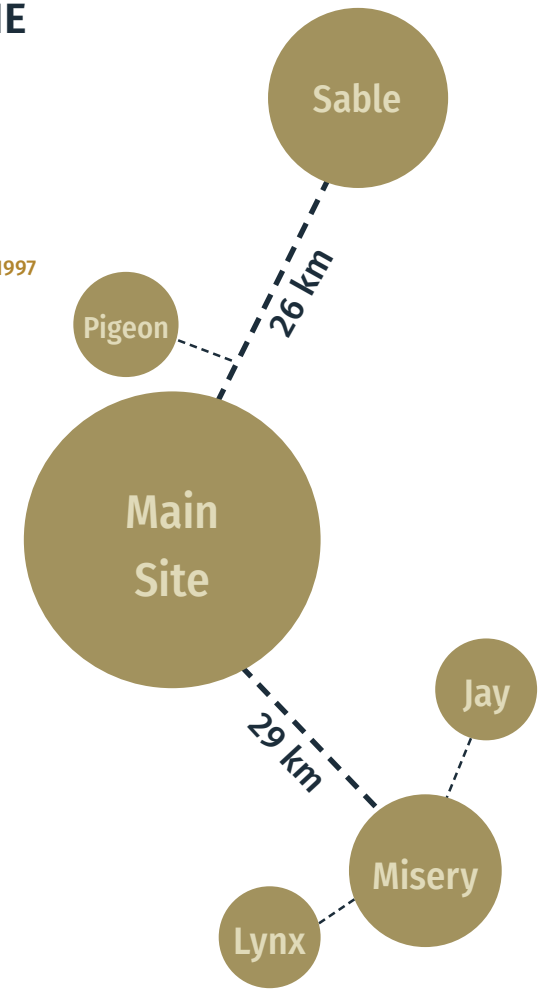
LAND DISTURBANCE AND ROAD LENGTH

LAND DISTURBANCE

EKATI MINE

Direct habitat loss caused by the Ekati mine project since 1997

38 km²



LAND DISTURBANCE

YELLOWKNIFE

City of Yellowknife estimated footprint (area shaded brown)

30 km²

Total roads at Ekati

141 km

LAND DISTURBANCE

BEHCHOKǪ̀

Behchokǫ̀ estimated footprint (area shaded brown)

2.4 km²

LAND DISTURBANCE

KUGLUKTUK

Town of Kugluktuk estimated footprint (area shaded brown)

2.5 km²

	Approx Land Disturbance	How much bigger is the Ekati mine?
YELLOWKNIFE	30 km²	x 1.3
KUGLUKTUK	2.5 km²	x 15
BEHCHOKO	2.4 km²	x 16
CAMBRIDGE BAY	1.6 km²	x 24
ŁUTSELK'E	1.3 km²	x 29
WHATI	0.8 km²	x 47
GAMETI	0.8 km²	x 47
WEKWEETI	0.5 km²	x 76

← Course Processed Kimberlite Rejects Pile

AGENCY RECOMMENDATIONS

Each year the Agency provides recommendations to Dominion Diamond Mines ULC, the Wek'èezhìi Land and Water Board, and applicable federal and territorial government departments based on the review of information and comments from the past 12 months.

This section includes Agency recommendations from the past year and the responses we received to those recommendations.

TO WEK'ÈEZHÌI LAND AND WATER BOARD RE: MANAGE WASTE ROCK

Waste Rock – Effective Neutralizing Potential

RECOMMENDATION

1

The Wek'èezhìi Land and Water Board do a review to find the best way to manage waste rock at Ekati and other northern mines: how to neutralize waste rock, and deal with acid rock drainage and metal leaching.

Wek'èezhìi Land and Water Board Response

The Wek'èezhìi Land and Water Board (WLWB or the Board) met on June 13, 2019 and considered the Independent Environmental Monitoring Agency (IEMA)'s May 27, 2019 e-mail (see attached). IEMA identified that its upcoming Environmental Agreement Annual Report will include a recommendation for the WLWB regarding effective neutralizing potential (NP) at the Ekati mine site, and requested the Board provide a response to be incorporated into its Annual Report.

The Board is aware that IEMA has raised similar concerns previously, including in its comments on the WROMP Version 9.0[1] and 10.0[2]. The Board has communicated that it agrees "additional discussion of effective NP for all waste rock at the Ekati mine site is warranted" and previously directed Dominion to discuss the use of effective NP in the interim Closure and Reclamation Plan (ICRP) Version 3.0[3]. In addition, the Board has stated that "given the ongoing review of the Effective NP [Memorandum] and the ICRP Version 3.0, it is most appropriate to consider any necessary actions (e.g., expert review, technical workshop, resulting WROMP revisions) in consideration of the ICRP Version 3.0."[4]

IEMA has referenced the technical memorandum submitted by Dominion as part of the ongoing ICRP Version 3.0 proceeding, however, the Board understands that IEMA's recommendation to the WLWB was not provided as part of a specific proceeding. As a matter of procedural fairness, the Board cannot respond to a recommendation on a proponent's submission outside of the proceeding for that submission.

Photo courtesy of Dominion Diamond Mines ULC

[1] See WLWB Online Registry for W2012L2-0001 - Ekati - WROMP - Version 10.0 - Review Summary and Attachments - Mar 22_19.pdf; IEMA comment 3 and 4

[2] See WLWB Online Registry for W2012L2-0001 - Ekati - WROMP V9 and Sable WRSA Design Report V2 - Review Summary and Attachments - Jun 4_18.pdf; IEMA comment 3

[3] See WLWB Online Registry for W2012L2-0001 - Ekati - WROMP - Version 9.0 - Board Directive and RFD - June 27 _18.pdf

[4] See WLWB Online Registry for W2012L2-0001 - Ekati - WROMP - Version 10.0 - Reasons for Decision - Apr 24_19.pdf

TO DOMINION: RE MANAGE SEEPAGE FROM WASTE ROCK

Waste Rock – Adaptive Management Strategy for Seepage

RECOMMENDATION

2

Dominion develop and apply a plan to manage seepage from waste rock storage areas. The plan needs to outline monitoring indicators, standards, and response actions.

Dominion Response

Dominion believes that adaptive management is an appropriate approach to managing WRSA seepage and have implemented adaptive management on a continuous basis. The current Waste Rock and Ore Management Plan (WROMP) V.10.0 contains the most recent iteration of the Waste Rock Storage Area (WRSA) Seepage adaptive management process, which was developed by Dominion in 2018. This process provides an appropriate and effective system that ensures continued protection of the Receiving Environment in a transparent manner and addresses the recommendations raised by IEMA.

Updated seepage quality screening criteria, as described in the Ekati mine's WROMP, are designed to prevent negative impacts on the Receiving Environment. The screening criteria are conservative, based on current information, and increase the transparency of seepage management at the Ekati mine. The screening criteria are conservative because they are applied where the sample is collected, which in most cases is at the toe of the WRSA (i.e., as compared to the point of entry to the Receiving Environment). This means that many factors that could mitigate the potential effects of seepage, such as attenuation, are not taken into account when considering the adaptive management of any particular seep. These criteria are used in conjunction with Seepage Monitoring Reports to verify or identify Seeps of Potential Concern, summarize response actions that are already underway, and identify appropriate additional response actions. Dominion anticipates that where appropriate, screening criteria may continue to be refined going forward, on the basis of new scientific research, continued data collection and professional judgement.

It should be noted that the implementation of screening and response programs for WRSA seepage is not new at the Ekati mine. Dominion has undertaken numerous actions in direct response to observed seepage quality and a number of response actions are actively being implemented by Dominion, which include:

- Silt curtains in seepage flow paths;
- Increased frequency of monitoring;
- Focused intensive flow monitoring programs;
- Monitoring of the local Receiving Environment;
- Refined identification of Receiving Environments;
- Mapping of seepage flowpaths; and
- Refinement of seepage data analysis, interpretation and screening.

TO DOMINION: LAKE TROUT IN KODIAK LAKE

Aquatics

RECOMMENDATION

3

Because mercury levels in lake trout in Kodiak Lake are higher than Health Canada guidelines, it is recommended that Dominion:

I. *In the next year, study and report on why these lake trout have these levels of mercury.*

II. *Monitor trout in Kodiak Lake more often, for non-lethal toxins.*

Dominion Response

As specified in the current Ekati mine Water Licence W2012L2-0001, Schedule 8, Condition 4c, the Response Plan (i.e., for fish) will include "a description of likely causes of the Action Level exceedance". The timeline for submission of the Fish Response Plan Version 1.3 is 31 October 2019, as approved by the Wek'èezhìi Land and Water Board (the Board). The Aquatic Response Framework and associated Aquatic Response Plans do allow for the implementation of special studies where and when applicable however, Dominion understands the appropriate place to address frequency of constituent monitoring in the Receiving Environment is the AEMP Re-evaluation, which is due to be finalized and submitted to the Board in December 2019.

TO DOMINION: WILDLIFE MONITORING

Wildlife

RECOMMENDATION

4

Dominion make more of an effort to record exact thresholds that trigger wildlife management activities (taking action), and to record follow-up monitoring to see if/how these activities are effective.

Dominion Response

Wildlife management activities undertaken at the Ekati Diamond Mine have evolved throughout the life of the mine, based on engagement, monitoring program results and the subsequent adaptive management decisions made over a number of years (See Adaptative Management Decision Tree for the Ekati Diamond Mine, Figure 2.2-1 in the approved Wildlife Effects Monitoring Plan, 2017).

In most cases, the trigger for wildlife management activities is the observation and/or reporting of wildlife to the Environment Department by site personnel (i.e., site wildlife notifications). The procedures (i.e., Wildlife Protection Fatal Risk Control Procedures), program work instructions, site-wide policies, and WEMP Plan that Dominion has in place dictate other management actions (i.e., short and long-term road closures required as per the Caribou Road Mitigation Plan, work stoppage procedures in work instructions, and training/ presentations for onboarding or to meet annual training requirements i.e., grizzly bear safety training). These controls are in place to ensure the safety of wildlife and site personnel alike.

The most appropriate way to measure the success of the management actions is to evaluate the number of management actions undertaken (i.e., 515 actions in 2018) relative to the number of mortalities (14) and incidents (25) that occurred for the same period. Arguably, for each occasion where wildlife were observed that did not result in a human-wildlife interaction or incident, the management action was successful. Understanding the cause and effect and extent to which controls and mitigation measures directly influence the outcome of each management action is not possible.

Wildlife

RECOMMENDATION

5

Dominion combine results of different ways to monitor caribou (e.g. incidental sightings, collar movements, road surveys) to see how effective each method is and if the combined methods produce more thorough results.

Dominion Response

Dominion agrees that it could be useful to combine the caribou collar locations (especially geo-fence collar data), road traffic data, road survey data and camera data into an integrated analysis. However, the actual practice of combining all of these different data in a way that produces ecologically relevant results is an extremely complicated process to undertake. Dominion is open to any suggestions from IEMA regarding processes by which all of this information could be integrated to provide results that would inform the assessments of the effectiveness of mitigations or provide ecologically meaningful results to inform onsite and range wide management of caribou.

Recommendation Themes + Recipients Overview

The Agency provides recommendations every year to relevant parties (Dominion Diamond Mines ULC, the Wek'èezhìi Land and Water Board, and applicable federal and territorial government departments) based on the review of information and comments from the past 12 months. Figure 1 provides an overview of the general themes and topics our annual recommendations have covered over the past 21 years.

RECIPIENTS	# OF RECOMMENDATIONS
Dominion Diamond Ekati ULC (DDEC - Previously BHPB)	102
Government (GNWT, Government of Nunavut, Government of Canada)	21
Water Boards (NWT Water Board, Mackenzie Valley Land and Water Board, and Wek'eezhìi Land and Water Board)	12
Environmental Agreement signatories	3
Aboriginal Society Members and Dominion Diamond	3
Aboriginal Society Members	1
All Agency Society Members	1
Total	134

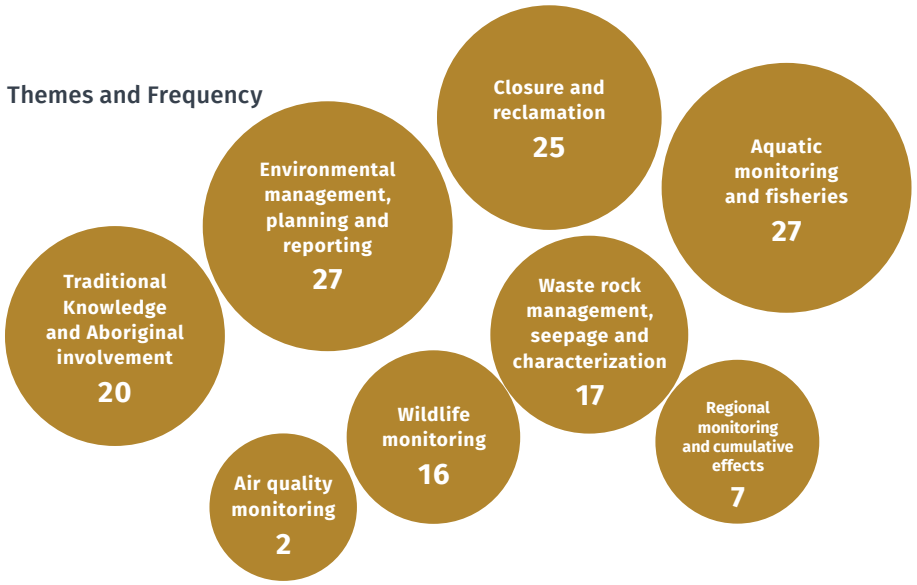


Figure 1: Agency Recommendation Themes 1997-2018

CURRENT CONDITIONS & EXPLORATION

HIGHLIGHTS

- The Jay Project is on hold until a study is done and the the costs and benefits are reported.
- Dominion keeps looking for more minerals. They are drilling on the main Ekati claim block, at Glowworm Lake and near Courageous Lake.

Photo courtesy of Dominion Diamond Mines, ULC →

JAY PROJECT

The Jay kimberlite pipe is on the west side of Lac du Sauvage, about 6 km northeast of Misery pit. To mine Jay pipe, Dominion needs to build a dyke in the lake to isolate the ore body. To get to the ore, they would pump water out of the dyked area into Lac du Sauvage and Misery pit, and remove the overburden—the rocks and soil on top.

In May 2018, Dominion stopped all work at the Jay Project until they see the results of a study. If the study says there are enough minerals to mine at the Jay Project, it will add about 10 years of mining at Ekati.

Misery Underground (UG)

In August 2017, Dominion applied to change their water license. They want to start underground mining of Misery pit. In August 2018, the GNWT approved the change.

In March 2018, Dominion finished mining Misery pit. In July 2018 they started to develop the underground mine. They expect to start underground mining in early 2020.

EXPLORATION FOR NEW ORE BODIES

During 2018-19, Dominion did more drilling on the main Ekati claim blocks—looking for more minerals.

- 6 holes near the main camp
- 10 large holes in Horseshoe Lake and Point Lake, near Misery pit
- 48 holes at other places

Dominion also explored for more minerals in the Glowworm Lake area, 65 km east of Ekati main camp and near Courageous Lake.

- From 2017 to 2022, they have permits for up to 200 diamond drill holes and 25 bulk ore samples per year near Glowworm Lake.
- Drilling at Courageous Lake has been approved for the period 2013 to 2020. In summer 2018, Dominion drilled 31 large diameter and 7 diamond drill holes. They plan to do more drilling in summer 2019 at various locations.

AGENCY ASSESSMENT

Developing kimberlite pipes in new areas increases the mine footprint—the amount of land it affects. The Agency monitors exploration activities to keep track of possible future developments.

MINE UPDATE

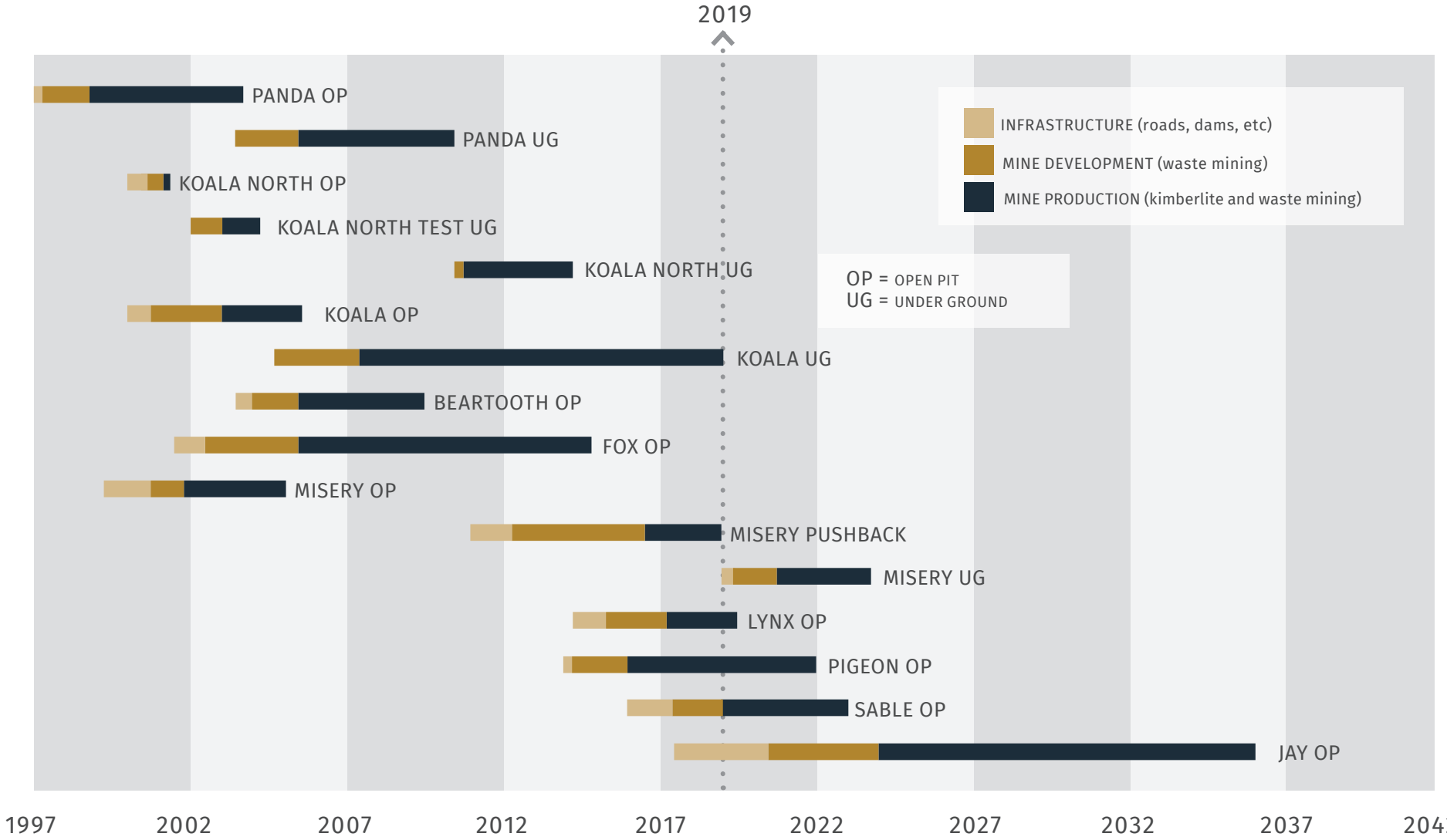


Figure 2: The Ekati Diamond Mine: Life of Mine Plan

AGENCY ACTIVITIES

HIGHLIGHTS

- Participated in 18 review processes with the Wek'èezhìi Land and Water Board.
- Held five community information sessions in four NWT communities and one Nunavut community to discuss Ekati's Interim Closure and Reclamation Plan Version 3.0.
- Conducted the annual IEMA site visit in September of 2018.

← Safety demonstration 2018 Ekati mine site visit

ACTIVITIES 2018-19

The Agency held three board meetings in Yellowknife and our Annual General Meeting (AGM). With no quorum at the AGM, the Agency had to organize a Special Meeting to meet quorum for official business and formal motions, including hiring a financial auditor.

During our 101st board meeting in September 2018, the Agency took our annual trip to Ekati. During this one-day visit we saw:

- Sable Road with caribou crossings, and Sable pit
- Waste facility, with recycling and composting
- Long Lake Containment Facility, with reclamation plots and the Panda Diversion Channel.

In June 2018, Łutselk'e invited IEMA to a community career fair, met and talked to both children and adults. During this visit, Director Tim Byers updated Łutselk'e First Nation Lands and Environment Committee. We presented the community with our video, now available in Chipewyan.

During January, we visited five society member communities: Whatì, Behchokǫ̀, Dettah, Łutselk'e, and Kugluktuk. The goal was to tell people about the latest version (version 3.0) of the Interim Closure and Reclamation Plan (ICRP). The ICRP is a long and complex document. We created and presented materials to help society members participate in the formal review process and technical workshop.

Agency site visit to the Ekati mine, September 2018.

TECHNICAL REVIEW AND INPUT

Over the last year, the Agency participated in 18 reviews with Wek'èezhìi Land and Water Board (WLWB). Here, we highlight some of the key documents and reports we participated in.

Waste Rock and Ore Management Plan versions 8.0, 9.0, and 10.0

We have some concerns about proposed updates to this plan:

- Quality of seepage (water that slowly escapes from waste rock)
- Mitigating risks from any acid generating waste rock
- Finding ways to decide if waste rock is acid generating
- Using diabase (an igneous rock) from Lynx pit as a construction material

Interim Closure and Reclamation Plan version 3.0

We suggest the WLWB not approve this version of the plan. It needs more details in many important areas:

- Water quality standards
- Hydrocarbon contaminated soil
- Seepage from Waste Rock Storage Areas
- Closure designs for wildlife
- Water quality predictions
- Edges/shores of open pits
- Monitoring water quality and thermal at Waste Rock Storage Areas

Studies and Reports

During 2018-19, the Agency commented on many other reports and plans.

- 2017 Wildlife Effects Monitoring Program (August 1, 2018)

- 2017 Aquatic Effects Monitoring Program (September 11, 2018)
- Dust Suppressant Pilot Study (September 14, 2018)
- Response Framework Version 3.0 (October 4, 2018)
- Wastewater and Processed Kimberlite Management Plan V 8.0 (November 29, 2018)
- Panda & Koala Deposition Study (November 29, 2018)
- Ekati - Cujo Lake Outflow Special Study Design - V 1.0 (March 26, 2019)

AGENCY COMMUNICATIONS

Website – Adding resources and changing the design, we continue to improve our website. For example, people can use drop-down menus to more easily find information.

The Ekati mine Timeline – This is a central feature on our website. With a re-design, the Ekati Timeline looks better and has a better format. We add to and change it based on community and public interests.

Social Media – On Facebook we see more interaction with followers and numbers are increasing. The next step is to increase our presence on Twitter.

The Ekati mine Monitor – This year we published one issue of the Agency newsletter called "The Ekati Monitor". We re-designed it so it looks better and is easier to read. Certain high schools in the north asked for more copies for science classes and reading activities. People who sign up for it on the website get the newsletter over e-mail.

Date and Location	Purpose	Main Issues
April 24-26, 2018 Yellowknife, NT	Slave Geological Province Regional Wildlife Monitoring Workshop	Hosted by GNWT's ENR – Wildlife Division, Marc Casas, Kim Poole, and Ron Allen attended this workshop. The workshop is part of a series of on-going workshops held annually or bi-annually since 2009 to discuss and set objectives for wildlife monitoring conducted primarily by the diamond mines and government. The focus is typically on sharing results of monitoring activities, harmonizing monitoring objectives and the development of monitoring protocols.
May 1-3, 2018 Yellowknife, NT	Annual Report Writing Session	Directors and staff gathered to review assigned chapters and discuss the content of our 2018-2019 Annual Report.
September 18, 2018 Ekati Diamond Mine	Site Visit to Ekati	Annual site visit to the mine site. Itinerary had to be prioritized, as the visit was reduced to a day trip. See "Activities 2018-2019" section for more details.
September 19-20, 2018 Yellowknife, NT	Agency Board Meeting	Following our annual Ekati site visit, the Agency held its 101st board meeting.
December 4-5, 2018 Yellowknife, NT	Agency Board Meeting	Leading up to the Annual General Meeting, the Agency held its 102nd board meeting.
December 5, 2018 Yellowknife, NT	Annual General Meeting	Quorum not met for motions or votes – deferred to Special Meeting of Society Members. Directors were acclaimed in their executive roles.

Date and Location	Purpose	Main Issues
December 13, 2018 Yellowknife, NT & conference call	Special Meeting of Society Members	Quorum met – required motions made and moved.
January 8, 2019 Whatì, NT	Whatì ICRP Info Session	34 people attended the session at the Community Hall in Whatì.
January 10, 2019 Yellowknife, NT	Informal ICRP Discussion with NSMA	Regulatory Analysts with the North Slave Metis Association met with IEMA staff to discuss Version 3.0 of the ICRP.
January 10, 2019 Dettah, NT	Dettah ICRP Info Session	15 people attended the session held at Chief Drygeese Centre in Dettah.
January 14, 2019 Behchokǫ̀, NT	Behchokǫ̀ ICRP Info Session	IEMA discussed the ICRP with 33 attendees at the Community Hall in Behchokǫ̀.
January 22-23, 2019 Yellowknife, NT	Ekati Interim Closure and Reclamation Plan – Version 3.0 Technical Workshop	This workshop was designed through the WLWB's hope that an open and collaborative discussion would increase each party's understanding of the issues and the perspectives of others as parties prepared to submit comments and responses on Version 3.0 of the ICRP.
January 28, 2019 Kugluktuk, NU	Kugluktuk ICRP Info Session	23 people joined the session at the Community Hall in Kugluktuk, NU.
February 5, 2019 Łutselk'e, NT	Łutselk'e ICRP Info Session	30 people attended the session at the Community Hall in Łutselk'e.
February 15, 2019 Yellowknife, NT	Requested Meeting with Tlicho Reps	Follow up from the ICRP Community Info Sessions
March 5-6, 2019 Yellowknife, NT	Agency Board Meeting	The 103rd board meeting was held in Yellowknife. The board discussed the upcoming annual report writing session.

Table 1. Main Agency Activities 2018-19

WILDLIFE EFFECTS

HIGHLIGHTS

- In 2018, people saw 3,347 caribou at the mine, mostly during spring migration and in winter. The caribou were from the Beverly/Ahiak herd and Bathurst herd.
- Dominion is responsible for monitoring wildlife using thresholds. Thresholds are levels on a scale that, once you go past them, could result in negative effects. If a condition with wildlife goes beyond the threshold, Dominion responds in a certain way (e.g., closing roads). IEMA recommends that Dominion learn more about how effective these responses are.
- To reduce risk to caribou, Dominion closed roads and delayed or cancelled blasting 20 times.

← Caribou, photo courtesy of Dominion Diamond Mines ULC

ACTIVITIES 2018-19

Dominion reports on wildlife at the Ekati mine and ways that they respond to the animals to lower any impacts mining activities may have on them. This year's report of the Wildlife Effects Monitoring Program (WEMP) has less detail about how effective the response is.

The 2018 WEMP is the 21st annual report. It focuses on wildlife habitat and caribou, grizzly bears, wolves, wolverines, foxes, raptors, and breeding birds. The report includes incident reports and surveys of roads, caribou behaviour, and birds nesting in pits. Dominion will not report on camera sightings until 2020. They make limited use of caribou collar information.

This is the second year Dominion has monitored the Misery Road power line. For the Caribou Road Management Plan, they did daily road surveys that led to closing roads to traffic.

The Ekati Mine Footprint

During 2018, the footprint of the mine got 183 ha bigger (1.8 km2). Dominion developed the Lynx, Pigeon, and Sable pits, and shifted Misery pit operations to underground. Since 1997, the total project footprint is now 3,819 ha (38 km2) with 141 km of roads.

Waste Management

Dominion keeps working to improve waste management (e.g., fewer things in landfills that attract wildlife). This helps keep wildlife away from the site and from dangerous places (e.g., airstrip, high traffic areas, active pits). Dominion trained their employees about how to deal with waste properly (e.g. food, food packaging, oil-related waste). This worked. In 2018 people saw less wildlife than ever before and put less waste in the wrong place or where it attracts wildlife.

Dominion shipped over 1,000,000 kg of solid waste off site and composted 200,000 kg of biodegradable material. Composting saved about 300,000 liters of diesel fuel.

Wildlife Incidents and Mortalities

Wildlife incidents involve direct contact between wildlife and humans, vehicles, or infrastructure. In 2018, Dominion reported 25 wildlife incidents—17 with grizzly bears, 10 that needed deterrents. This is an increase from the past. From 2011 to 2017, there were from one to nine incidents per year.

Reports of caribou near mine infrastructure caused more alerts. Fourteen incidents caused work to stop or roads to close. Six incidents of caribou within 1 km of infrastructure caused workers to delay or cancel blasting at pits.

In 2018, the number of vehicle-related wildlife deaths was lower than recent years. Mine activities caused no caribou deaths in recent years.

Grizzly, photo courtesy of Dominion Diamond Mines ULC

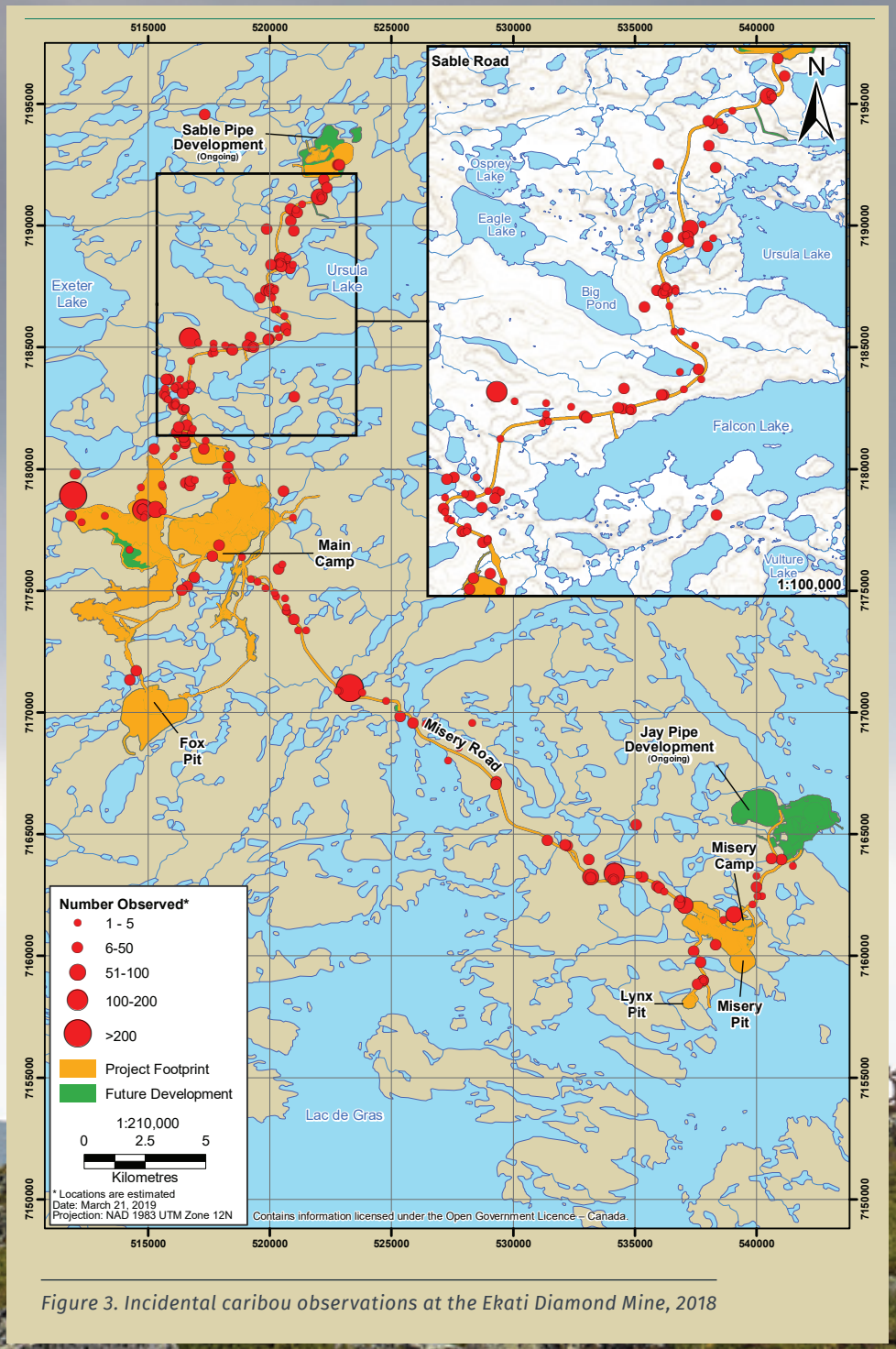


Figure 3. Incidental caribou observations at the Ekati Diamond Mine, 2018

Photo: courtesy of Dominion Diamond Mines ULC

Caribou Monitoring

In 2018, caribou monitoring information came from:

- Chance sightings
- Behaviour surveys
- Monitoring at Long Lake Containment Facility (LLCF)
- Road surveys
- GNWT collared cows

In 2018, people saw 3,347 caribou on 102 different days: half during spring migration and half in winter (Figure 3). Collar data shows caribou from both the Bathurst and Beverly/Ahiak herds at Ekati during winters 2017-18 and 2018-19. Compared with the past, this is unusual. People saw most of the caribou along the Sable Road (which is normal), with fewer in the Misery area.

In 2018, Dominion did 15 behaviour surveys and 19 scan surveys within 1.5 km of the mine. Behaviour surveys record individual behaviour; scan surveys record group behaviour (e.g., bedding, feeding, running). Dominion compared their results with 55 past surveys done at Diavik mine. Dominion concluded that caribou showed "some tolerance for areas" close to the mine.

2018 road traffic volume data are:

- 23,000 heavy and 3200 medium vehicle trips for Misery
- 900 heavy and 3300 medium vehicle trips for Sable
- No data for light vehicles

Dominion started camera monitoring in 2011. They use motion-triggered cameras to better understand how caribou respond to mine infrastructure and roads. In 2018, they had 89 cameras along Misery, Sable, and Jay roads and at the narrows between Lac du Sauvage and Lac de Gras. The 2018 report includes no information from camera monitoring. Dominion says they will produce a camera report in 2020.

In 2018, Dominion held a workshop to keep talking with communities about TK research to study what things affect the caribou zone of influence—the distance from a disturbance where caribou change their distribution and behaviour. No one has done any TK research on this yet.

In 2018, Dominion gave money to the GNWT for Bathurst caribou collars and in-kind support for the calving ground survey. They ended their support for Natural Resources Canada's on-going study about mining activities, noise, dust, soil pH, and vegetation cover.

Grizzly Bear Monitoring

Dominion monitored grizzly bears through chance sightings. People saw 210 bears on 145 occasions across the mine site, with more around Misery and the main camp. Thirty-seven sightings were a group of two or more bears. This is the second highest number since 2001. Numbers vary each year, but seem to increase over time.

In 2017, Dominion did a hair-snagging DNA study with Diavik. They copied a study from 2012-13. The study results suggest:

- Stable and maybe increasing bear population since 2012.
- Recent bear densities are 5.5 to 7.5 bears per 1,000 km^2.

Other Wildlife

People saw 139 wolves on 79 occasions at Ekati this year —also an increasing trend over time. In 2018, Dominion did not monitor wolf dens in the Ekati area. People saw wolf packs with pups five times in late summer. People saw wolves throughout the mine site, with a few more in the Misery area.

People saw wolverines 23 times through chance sightings. This is similar to the long-term average.

People saw foxes 146 times, a little lower than average. Most were red foxes (96%). In the first 10 years of mine operations, most were Arctic foxes. Foxes are an ongoing concern. They are attracted to human activity and can transmit rabies. During 2016-18, there were no suspected cases of rabies.

People saw moose eight times near mine infrastructure, likely the same one.

Raptors nested in three pits. Several produced nestlings (peregrine falcon, rough-legged hawk, raven). To reduce conflict with mining activities, Dominion prevented nesting in some active pits.

For the 16th year, people at Dominion did the North American Breeding Bird Survey. They saw 28 species and recorded 431 individual birds—usual numbers.

AGENCY ASSESSMENT

The Agency likes parts of the 2018 WEMP:

- Good details about waste management and wildlife incidents
- Tables and figures clearly show trends since 2001, though lack information from before 2001
- Separate and complete report on grizzly bear DNA

The Agency finds the 2018 WEMP lacking in many ways:

- Camera report delayed for two years
- Missing details about caribou movements
- No traffic data from daily road surveys; traffic data not compared to previous years
- No complete report on adaptive management
- Missing information to link specific thresholds that trigger an action, with follow-up to see how effective the action was
- No comparing with impact predictions; promised for the next 3-year reporting period

The 2018 WEMP confirms changes in caribou distribution.

- Caribou from the Beverly/Ahiak herd use Ekati
- A shift in the Bathurst herd from being at Ekati during summer and fall to being there in winter and spring migration

The WEMP does not show trends in caribou movement and distribution at the mine site, available from GNWT maps that track collared cows. Dominion seems to have trouble using these maps. The Agency believes that using the GNWT mapping information would give Dominion a chance to study how incidental sightings may better reflect caribou distribution and movement.

Monitoring at the Long Lake Containment Facility (LLCF) is an example of the need to bring data together. Incidental sightings recorded 13 caribou groups there, compared to two groups reported from road surveys. With the change from summer to winter distribution, how caribou use the LLCF may have changed. Dominion should show that instead of caribou maybe using the LLCF for insect relief in summer, they may also use it in winter to look for salt (the kimberlite from Fox pit introduced high sodium levels to the LLCF).

The WEMP concludes that monitoring and mitigation are working, despite having more caribou around in winter. The report also states that when caribou on the roads are hard to see during bad weather, they close the roads to non-emergency traffic.

Dominion states they will test infrared imagery more, to help see caribou during blizzards. The 2018 report did not say how often and for how long they closed roads for blizzards, compared to closing them for caribou. The report did not say how the closures affect managing stockpiles. This comment highlights the weakness of the 2018 report in combining different sets of data.

The report has a good summary that shows:

- Large increase in management actions to improve reporting
- More grizzly bear management actions
- More caribou near roads, 2016 to 2018
- Caribou management actions doubled between 2017 and 2018, to 183. But details are lacking.
    - For example, six times workers delayed or stopped blasting because caribou were within 1 km. The report shows the length of the delay, but not how often people saw caribou outside the 1 km threshold, how caribou behaved, or why the length of delay varied so much.

In 2018, the sample size for behaviour surveys was limited. This affects how much we can believe or rely on the ‘truth’ of survey results; e.g., a general statement that caribou “tolerate” disturbance. This raises the question: how do we keep monitoring and get good information that will lead to wise management decisions and actions?

AQUATIC EFFECTS

HIGHLIGHTS

- Land and Water Boards of the Mackenzie Valley and GNWT released new guidelines for Aquatic Effects Monitoring Program (AEMP).
- WLWB agreed to change Dominion's water licence, to increase levels of potassium enough to meet the mine's needs and still protect aquatic life. The GNWT approved the change in July 2018.
- Selenium and mercury in harvestable fish have reached levels of concern in lakes downstream of the mine.

Culvert and Stream, photo courtesy of Dominion Diamond Mines ULC →

BACKGROUND

Every year Dominion studies the aquatic environment downstream of Ekati. They need to know if mining activities are causing any changes to water quality or things living in the water in the area.

- Ekati mining operations affect five watersheds:
- Koala-Lac de Gras
- King-Cujo
- Desperation-Carrie Pond
- Pigeon-Fay-Upper Exeter
- Horseshoe

The Aquatic Effects Monitoring Program (AEMP) and the water licence guide this work. Dominion samples lakes and streams in five watersheds. They also sample places outside the watersheds to compare lakes and streams affected by mining to those untouched by mining.

Dominion watches for changes in each part of theaquatic ecosystem:

- Water and sediment quality
- Fish population and health
- Phytoplankton and zooplankton
- Benthos (living things that live on the bottom of rivers, lakes, and ponds)

They monitor many variables for each part (e.g. mercury and selenium in fish, oxygen, metals and phosphorus in water).

WASTEWATER

Dominion releases fine processed kimberlite (FPK), treated sewage, and surface sump water into the Long Lake Containment Facility (LLCF). Once the solids (FPK, treated sewage) settle and separate from the liquid, they pump the wastewater back to Cell C of the LLCF.

Between June and October 2018, they pumped 1,463,000 cubic meters of surface minewater from Beartooth pit to Cell C. The plant recycled 4,665,000 cubic meters of water from Cell D of the LLCF. In 2018 they released no wastewater from the LLCF.

Wastewater from Misery and Lynx goes to the King Pond Settling Facility. In 2018, Dominion released 145,776 cubic meters of wastewater from the settling facility into Cujo Lake (King-Cujo watershed).

Wastewater from Sable goes to Two Rock Settlement Pond. During August and September 2018, Dominion released 339,154 cubic meters of wastewater from the settlement pond into Horseshoe Lake. This is the first time they put wastewater into the Horseshoe watershed.

AQUATIC EFFECTS MONITORING PROGRAM (AEMP)

In March 2019, Land and Water Boards of the Mackenzie Valley and the GNWT released new guidelines for AEMP. They outline:

- Role of AEMP in monitoring water
- How to design and run a program
- Adaptive management: a system of ongoing monitoring combined with taking action to mitigate impacts, so that if the first actions don't work, other actions are taken to keep the impact within acceptable levels

In 2019 the new guidelines apply to the Dominion monitoring program.

Aquatic Response Framework

An AEMP includes response frameworks. This is an early warning tool to alert Dominion and regulators to changes in the environment downstream of Ekati. A response framework applies to each variable they monitor (e.g. mercury in fish, dissolved oxygen in water). It shows they need to take action before change reaches a level that damages aquatic life.

A response framework has three levels of action.

- Low Action Levels (LAL): when the variable has reached than 50% of a standard
- Medium Action Levels (MAL): when the variable has reached than 70% of a standard
- High Action Levels (HAL): when the variable has reached than 100% of a standard

The new AEMP guidelines say that companies must state their possible actions for all three levels when they first define a response framework.

WATER QUALITY

The Agency reviews the AEMP data each year for any important changes in water quality. Overall, water quality has changed slightly since the years before mining started. Compared to the three previous years, 2018 has no important increases of harmful materials in the water.

Response Framework

In 2018, some water quality variables went over Action Levels. Dominion took certain actions to deal with each of these.

- Low levels of dissolved oxygen under ice in Cujo Lake (LAL)
- Dominion cleared snow off lake ice and pumped air into the water column to add oxygen. These actions appear effective, but it is too soon to tell if this solves the problem completely.
- Phosphorus in open water in Cujo Lake (LAL)
  Dominion updated the phosphate response plan to study the chances of going over MAL and HAL standards. This will make clear the reasons for MAL. In the past, Dominion stated that ecological impacts from going over phosphorus standards are unlikely, because phosphorus going over LAL standards happens under ice when phytoplankton doesn't grow and because phosphorus is not toxic to aquatic life.
- Chloride under ice in Leslie Lake (MAL) and Moose Lake (LAL)
- Dominion did a revised response plan to deal with chloride going over LAL and MAL standards in Leslie and Moose Lakes in 2017 and 2018.
- Potassium under ice (HAL) and in open water (LAL) in Leslie Lake; under ice in Moose Lake (MAL); under ice in Cujo Lake (LAL)
  To lower the potassium levels in these lakes Dominion delayed discharge from the LLCF during the 2018 open water season. Dominion also measured potassium more often under ice in Leslie and Moose Lakes during 2018-19 ice season. In the revised Response Plan V 2.1, Dominion plans to study potassium toxicity, to inform response planning.

Long Lake Containment Facility discharge point in Cell E

PLANKTON

As in years before, the mine caused changes to plankton in lakes downstream of the LLCF.

- Zooplankton changes in Leslie
- Zooplankton stabilizing in Moose and Nema lakes
- Phytoplankton (plant plankton) increasing in Kodiak Lake
- Increase in chlorophyll *a* (produced by phytoplankton) in Cujo Lake; linked to an increase in total phosphorus in the water, likely from King Pond

Response Framework

In Leslie, Moose, and Kodiak Lakes, phytoplankton and zooplankton went over LAL for the third year in a row. Dominion believes that macronutrients caused this, and that levels of macronutrients are now evening out, or have decreased. Dominion does not expect the change to go to MAL. They managed the problem with a plan to better control nutrients. This seems to be working.

FISH

The 2018 AEMP report includes results from the study of harvestable fish species that is run every 6 years. Results show increased levels of mercury and selenium in fish downstream of the mine.

Mercury

In Kodiak Lake, mercury levels in trout are higher than guidelines for eating fish. Both younger and older fish have these levels. If a lake has non-toxic levels of mercury, younger fish have not lived long enough to store this much mercury in their bodies. In the past, trout in Ekati lakes only reached these levels at 12 years old or more. Dominion does not know what the source of mercury is.

Selenium

In slimy sculpin, selenium levels were higher than guidelines for fish health. This is the first time that most of the sampled sculpin (69%) in an AEMP lake had selenium levels above the guideline.

In Leslie Lake, some whitefish samples had selenium levels higher than guidelines for fish

health; some samples had selenium levels higher than guidelines for eating fish. Selenium was higher in livers than muscle. Although people may not eat whitefish livers, they do eat burbot livers. The Agency is concerned whether burbot may have the same high levels of selenium that whitefish have. Dominion does not monitor burbot under the AEMP.

Liver selenium may also harm fish ovaries and eggs. Too much selenium can cause defects in fish larvae. High selenium in ovaries/eggs may be a bigger problem than in muscle. For now selenium levels do not seem to be a problem for eating whitefish. But we need to keep monitoring.

In Cujo Lake in 2018, selenium levels in whitefish livers were higher than the response plan LAL. Overall, selenium is increasing through time in whitefish livers in impacted lakes, while decreasing in reference lakes.

Uranium

Over years in Cujo Lake, Dominion found steadily increasing uranium levels in whitefish livers. Reference lakes do not show this trend. This mirrors a steady increase of uranium levels in lake water over the same time, without reaching levels that harm fish. The source appears to be King Pond wastewater.

EROD activity

EROD (Ethoxyresorufin-O-deethylase) is an enzyme in fish that is sensitive to certain toxins. EROD is active when fish are exposed to toxins such as petroleum, dioxins, furans, and PCBs. In 2018, EROD activity in round whitefish and slimy sculpin was much lower than in 2012 (whitefish and sculpin) and 2015 (sculpin).

Parasites

In Leslie and Moose Lakes, 2018 data show a decreasing rate of internal parasites in whitefish and slimy sculpin. 2018 results reported for all internal parasites, regardless of species. This makes it hard to compare with 2007 and 2012 results when they only looked at a single species of tapeworm. Parasites in Cujo Lake whitefish decreased from previous years. No monitored fish were infected, the same as reference lakes.

Response Plan

The WLWB asked Dominion to make a revised fish response plan.

- Propose MAL and HAL for all variables.
- Lay out the possible options to deal with going over MAL standards.
- Recommend changes to the current variables for organochlorines, including dioxin and furan.
- Set HAL and MAL for selenium in fish.
- Include mercury in fish tissue based on going over LAL standards in 2018 for mercury in whitefish.

MISSED SAMPLING EVENTS

AEMP Sampling

Taking samples from lakes and streams is important to keep us constantly informed of what changes are occurring in lakes downstream of the Ekati mine. In December 2018, WLWB asked Dominion to explain why they missed some AEMP sampling in 2017 and 2018. Dominion gave these reasons:

- Unsafe working conditions (e.g. wildlife danger, bad weather)
- Administration or operating errors; they did not explain operating errors

To not miss future sampling, Dominion plans to improve sample scheduling, field data sheets, and communication with field crews. They will have this in place for the 2019 sampling program.

Surveillance Network Program (SNP) Sampling

SNP monitors water quality; it is part of the Dominion water licence. The program looks at sources of water pollution to make sure wastewater meets certain standards.

In 2018, Dominion missed some scheduled sample events at Sable. They said the reason lies in the differences between their water licence SNP and certain regulations under the *Fisheries Act*.

To not miss future sampling, Dominion plans to:

- Combine requirements for sampling under both the water licenses and Fisheries Act into its sampling program at Sable and Two Rock Sedimentation Pond)
- Improve the computerized scheduling system
- Sample earlier in September to avoid early freeze-up
- Communicate better with field crews

Panda Diversion Channel

WATER LICENSE CHANGE FOR POTASSIUM

In July 2017, Dominion applied to increase the amount of potassium permitted in their water license. Higher levels of potassium in the LLCF and in discharge to downstream lakes made it hard to stay within the license limits. Dominion said that processing Misery ore caused the increase. After the review process, WLWB agreed to increase the permitted amount enough to meet the mine's needs but still protect aquatic life. The GNWT approved the change in July 2018.

Dominion plans to dump fine processed kimberlite into the empty Panda and Koala pits. This should reduce levels of potassium in the LLCF and downstream for a while. As those pits fill, the discharge will again go to the LLCF (and again increase potassium levels).

JAY PROJECT AEMP

Dominion developed an AEMP for the Jay project, which affects Lac du Sauvage. The Agency gave the WLWB some recommendations for this:

- Include the Tibbett-Contwoyto winter road in monitoring cumulative impacts. This road crosses Lac du Sauvage close to Jay AEMP sample stations.
- Use a sediment corer rather than Ekman dredge to sample lake sediments.
- Include a response framework for selenium in sediment and any other variables that show a link between sediment quality and fish tissue.
- Improve baseline data collection for fish including selenium in tissue of harvestable species and spatial trends for slimy sculpin.

In May 2019, the WLWB did not approve the proposed Jay AEMP. The Agency will follow up in 2020 on the next version.

Under their water license, Dominion must now use a sediment corer to sample the lake bottom. It defines lake bottom layers better, so contaminants in the most recently deposited material can be identified and measured.

In 2017 and 2018, Dominion used a sediment corer for Jay baseline sampling. Because the sediments were mostly dense clay, they found this more difficult than using the Ekman dredge that has always been used. Dominion asked the WLWB to allow them to use the dredge only. WLWB refused, but agreed with the Agency and other reviewers that there are ways to use a corer together with a dredge.

TWO-ROCK OUTFALL DESIGN REPORT AND SABLE DIFFUSER CONSTRUCTION PLAN

In April 2018, WLWB approved a plan to use a diffuser to discharge minewater from Two-Rock Sedimentation Pond into Horseshoe Lake. A diffuser works like the spray setting on a garden hose. A similar diffuser is used at Diavik. Dominion decided this was the best way to dilute the wastewater, out of the pipe, through the lake water, before it flows further into the lake.

The Agency had concerns about levels of total suspended solids (TSS) stirred up from the bottom of Horseshoe Lake when building the pipe and diffuser in the lake. WLWB directed Dominion to use a physical barrier (e.g. silt curtain) to keep lake water clean and clear.

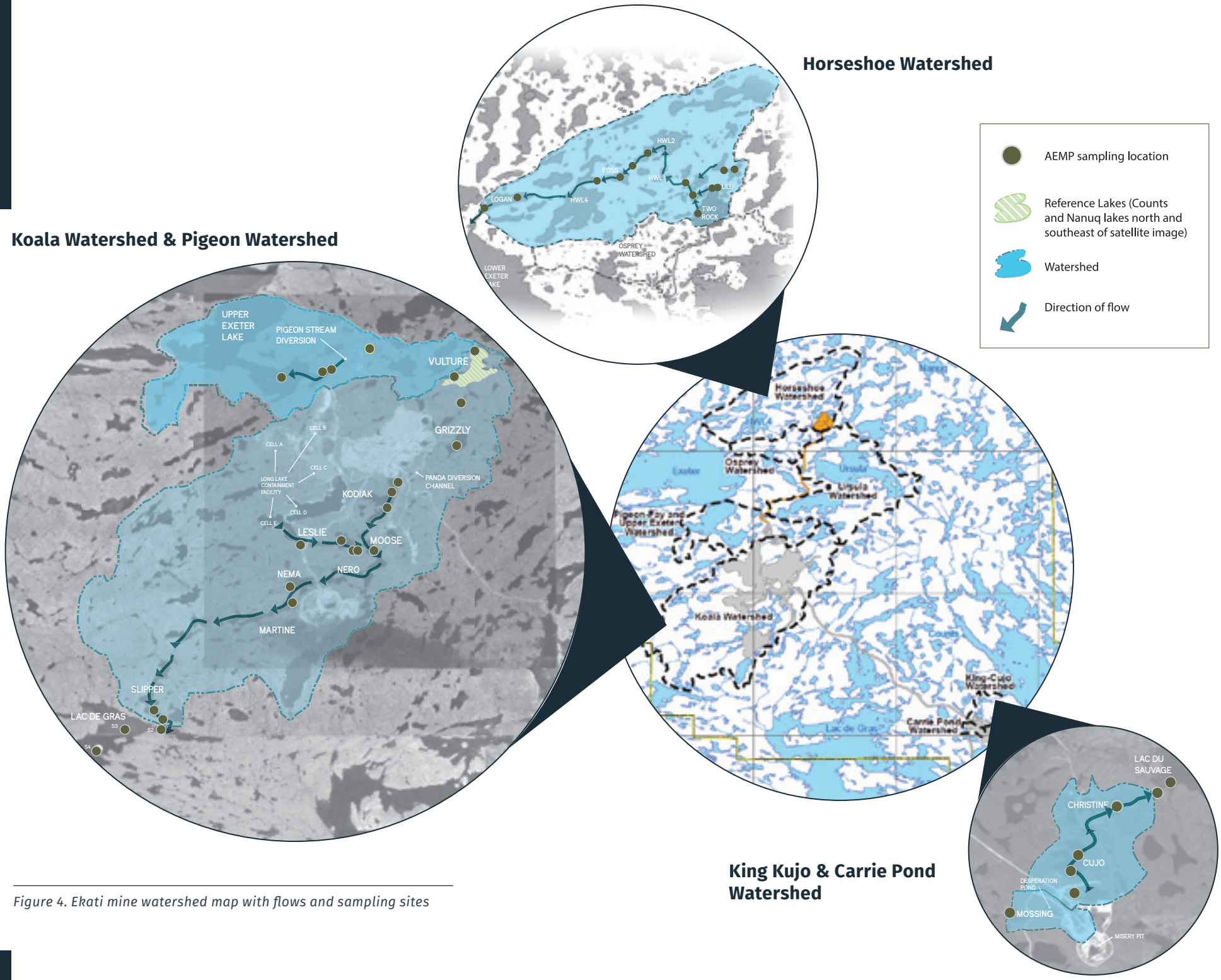


Figure 4. Ekati mine watershed map with flows and sampling sites

- → Flow from effluent source to ultimate receiving lake in watershed
- ● increased over time in comparison to reference lake/stream or different from a constant
- ○ elevated but not changing through time
- ◆ upper bound of 95% exceeded the SSWQO, water quality benchmark, or CCME guideline during ice-covered or open water season
- ★ indicates observed mean exceeded the SSWQO, water quality benchmark or CCME guideline during ice-covered or open water season

Parameters Monitored	Variables elevated in Koala watershed: Long Lake Containment Facility → Lac de Gras									Variables elevated in King-Cujo watershed: King Pond → Lac du Sauvage			
	Leslie	Leslie-Moose	Moose	Moose-Nero	Nema	Nema-Martine	Slipper	Slipper-Lac de Gras	Lac de Gras (S2)	Cujo	Cujo Outflow	Christine-Lac du Savage	Lac du Sauvage
pH	●	●	●	●	●	●	●	●	●	●	●	●	
Alkalinity	●	●	●	●	●	●	●	●	●	●	●	●	
Hardness	●		●	●	●	●	●	●	●	●	●	●	
Total Dissolved Solids	●	●	●	●	●	●	●	●	●	●	●	●	
Chloride	●	●	●	●	●	●	●	●	●	●	●	●	
Sulphate	●	●	●	●	●	●	●	●	●	●	●	●	
Potassium	● ★	●	● ★	●	●	●	●	●	●	●	●	●	
Total Ammonia	●		●	●	●		●			●	●		
Nitrite	●							●					
Nitrate	○	○	○	○	○	○	○				●		
Total Phosphate-P	● ◆	●	● ◆				● ★		● ★	◆	●		
Total Organic Carbon	●	●	●	●	●	●	●	○		●	○	○	●
Antimony	●	●	●	●	○	○							
Arsenic	●	●	●	●	●	●	●	●		●	○		
Barium	●	●	●	●	●	●	●	●	●	●	●	●	
Boron	●	●	●	●	●	●	●			●	●	○	
Molybdenum	●	●	●	●	●	●	●	●	●	●	●	●	
Nickel	●	●	●	●	●	●	●	●		●	●	●	
Selenium	●	●	●										
Strontium	●	●	●	●	●	●	●	●	●	●	●	●	●
Uranium	●	●	●	●	●	●	●	●		●	●		

Table 2: Mining effects on water quality flowing through the Koala and King-Cujo Watersheds

This table is adapted from the AEMP report with additions resulting from the Agency's review of the monitoring results.

AGENCY ASSESSMENT

The Agency is concerned that Kodiak Lake trout have mercury levels higher than guidelines for eating. Aboriginal Society members have expressed similar concerns in the past. They want to ensure that people can eat the fish once the mine closes. The Agency believes it is important for Dominion to find the source of mercury in the Kodiak Lake trout.

Dominion reports LLCF discharge affects selenium increases in sculpin and whitefish in Leslie Lake. Sediments are likely the source of selenium. All lakes in the Koala watershed show an increase, over time, in levels of selenium in sediments. Selenium levels in lake water are low, however the 2012 AEMP shows an important connection between fish tissue and contaminant levels in sediment.

The Agency believes Dominion should expand monitoring of selenium in fish, at least for round whitefish. Because of possible harm to developing baby fish, the company should measure selenium levels in female fish ovaries. Because people may eat burbot livers, the Agency recommends that Dominion include measuring selenium levels in burbot liver and muscle tissue in the AEMP.

The Agency believes Dominion may underestimate zooplankton diversity and density in AEMP lakes. Their collecting nets are good for collecting most species, but have too large of a mesh size, allowing smaller species to pass through. When Jay project starts, Dominion plans to use a finer mesh for sampling in Lac du Sauvage. The Agency recommends that Dominion use this finer net for AEMP sampling in all lakes.

The Agency commends Dominion for their updates to water quality and plankton response frameworks, as they improve with each new version they send to WLWB.

Pigeon Diversion Channel

Lemly, A.D. 1993. Teratogenic effects of selenium in natural populations of freshwater fish. Ecotoloxic. Environm. Safety. 26:181-204.;

Chapman, P., Adams, W.J, et al. 2010. Ecological Assessment of Selenium in the Aquatic Environment. 141 p. CRC Press.

TRADITIONAL KNOWLEDGE & COMMUNITY ENGAGEMENT

HIGHLIGHTS

- IEMA held community information sessions on the Interim Closure and Reclamation Plan (ICRP).
- The latest version of the Dominion Community Engagement Plan includes new ways to resolve disputes and answer community questions.
- With input from communities, Dominion developed a TK Management Framework that outlines how they collect, store, manage, and use TK, all with respect. TK elders group approved the framework.

Dettah engagement session →

ACTIVITIES 2018-19

Community Information Sessions

The Agency focused on sharing information about the draft Interim Closure and Reclamation Plan (ICRP) v3.0. Agency staff and directors went to five communities: Łutselk'e, Kugluktuk, Behchokǫ̀, Whatì, and Dettah. We presented a summary of ICRP, with maps and posters to explain plans for closing different parts of the mine.

The goals for community information sessions were to:

- Tell people what the company proposes
- Talk about Agency concerns with the plan
- Talk about community concerns
- Answer questions

Here is some general feedback we heard:

- Everyone is very concerned about declining caribou numbers. It is very important to plan for ongoing health and abundance of wildlife once the mine closes.
- Dominion should include TK and community knowledge, especially for wildlife, and for closing roads and waste rock storage areas. Aboriginal Society members made the same comments to the Wek'èezhìi Land and Water Board.
- The plan must maintain water quality downstream of the mine site, over the long term. Especially for Kugluktuk, located on the Coppermine River downstream of Lac de Gras.
- Dominion must remove garbage, buildings, vehicles, and other debris. People do not like the landfills in the waste rock piles; they want nothing left underground.
- People expressed concern over open pits filling with water, and how that affects fish. Several people suggested putting rock back in the pits.

Community Engagement Plan (Version 4.1)

In July, the Agency reviewed Dominion Community Engagement Plan v4.1. It:

- Guides their communication and outreach activities with affected parties.
- Outlines engagement during ongoing operations, with engagement techniques for individual projects, including TK.

This latest version includes new ways to resolve disputes and answer community questions.

Use of Traditional Knowledge in Operations

In their 2018 Annual Report, Dominion commits to include oral and recorded TK in decision-making at Ekati. With input from communities, they developed a TK Management Framework. It outlines how they collect, store, manage, and use TK, all with respect. The TK elders group approved the framework.

Traditional Knowledge Elders Group

Dominion set up the TK elders group to get input into Jay Project design and operations, including closure. Since then, the group's scope has grown and Dominion applies the group's knowledge to the whole site.

During 2018, the group held one meeting in September, at the Ekati mine. During their site visit, members watched caribou crossing the Sable road; they discussed these topics: waste management, air quality, dust suppression, culture camp, caribou mitigation plan, the Interim Closure and Reclamation Plan, and the Kugluktuk TK Project.

Kugluktuk Traditional Knowledge Project (Hamlet of Kugluktuk Reclamation Program)

In 2017, Kugluktuk elders visited the Long Lake Containment Facility (LLCF) Reclamation Research Area. They shared some TK about grasses, sedges, and shrubs that are common along the shores of the Arctic Ocean. Fine processed kimberlite in the LLCF is sort of like those shores—the ground is salty, some areas have coarse rocks and some have very fine silt. It is hard for plants to grow there.

In August 2018, people from Kugluktuk helped Dominion researchers find certain plants on the coast, near Kugluktuk. They collected local seeds for reclamation studies in salty soils at the LLCF. This program replaced the Student Seed Reclamation Program activities usually held each year at the Ekati Mine.

Environmental Monitors

From March to July 2018, community members helped Dominion to monitor cliff-nesting birds that try to build nests in and close to Misery, Lynx, Pigeon, and Sable pit walls.

TK in Sable AEMP Design Plan

From March to October 2018, community members helped to capture, sample, and release fish for the AEMP.

Culture Camp

Creating a culture camp was a condition of the Jay Project environmental assessment. It is a way for Indigenous people to help monitor the land and use their own ways to gather information.

Community closure and reclamaition Information Session in Behchoko January 2019

The first place Dominion chose for the camp was too swampy. During winter 2018-19 Dominion worked with the TK elders group to find a better place. Building the camp is delayed until a decision about the Jay Project.

COMMUNITY-BASED TRADITIONAL KNOWLEDGE PROJECTS

Tłı̨chǫ Boots-on-the-Ground Caribou Monitoring

Boots-on-the-Ground is a caribou monitoring program. Elders and harvesters use traditional methods and knowledge to assess conditions of the Bathurst herd summer range. The focus is caribou and their habitat, predators, and industrial disturbance.

ENGAGEMENT WORKSHOPS

From April to July 2018, Dominion held a community meeting in each community with an Impact Benefit Agreement (except Wekweètì). They talked about the Interim Closure and Reclamation Plan.

Dominion committed to provide grant funding for caribou research. In September 2108, they held a workshop where people talked about research objectives and the best way to choose proposals.

AGENCY ASSESSMENT

During our community information sessions, the Agency heard concerns about Dominion's community meetings about the Interim Closure and Reclamation Plan (ICRP).

- Dominion did not consult well with communities.
- People were not fully aware of the updated ICRP, especially changes to roads and waste rock storage areas based on caribou movement.

The Agency believes Traditional Knowledge input provides important information about the land (living and non-living), culture, and impacts on the environment. This information can help produce stronger mitigation actions, which means better closure decisions.

Year to year, Dominion has supported different TK and community programs, based on community requests and annual reviews. In 2018, Dominion did not stop any long-term programs.

In the past Dominion produced a quarterly newsletter. The goal was to keep in touch with communities and provide updates. They had a wide distribution and used some plain language. Dominion did not produce the newsletter this past year. The Agency encourages them to produce it again.

Part of IEMA's mandate is to share information about what we do. The Agency can also bring public concerns about Ekati to Dominion and regulators. To help do this, the Agency wants to meet with the TK elders group during one of their meetings with Dominion. We want to talk about closure, waste rock piles, caribou, and other topics. Several times we asked Dominion to have this meeting. Dominion said they would send our request to the TK elders group. We have not yet heard back.

AIR QUALITY

HIGHLIGHTS

- Dominion did not go over any standards levels for air quality or dustfall.
- Results from the 2016-17 dust suppressant study show EnviroKleen™ is good at reducing dust.

← Misery Road - Dust Suppressant, photo courtesy of Dominion Diamond Mines ULC

ACTIVITIES 2018-19

The Air Quality Monitoring Program (AQMP) started in 1998. Dominion reports the results every three years, together with the snow and lichen sampling program. The purpose of AQMP is to monitor local air quality and assess how effective management plans are to maintain air quality. The next full report is due in 2021.

AIR QUALITY MONITORING RESULTS 2018

The 2018 AQMP report presents results related to air quality, meteorology (atmosphere/weather), greenhouse gas (GHG) emissions, and air contaminants.

Air Emissions

At Ekati, sources of GHG emissions include:

- Burning diesel to generate power, heat buildings, operate mobile equipment, and blast rock
- Burning used oil to heat buildings
- Burning Jet A-1 fuel for on-site helicopters
- Emissions from waste and wastewater facilities

In 2018 Dominion used 1.8% less diesel fuel, likely because they needed less power. Every year Dominion reports air emissions results to a national program.

METEOROLOGY (ATMOSPHERE/WEATHER)

At Ekati, people collect meteorological data every day at the airport, when they are on duty. They also collect data at the Koala meteorological station year-round and at the Polar Lake station during open water season.

Temperature

Monitoring temperature is important. Day-to-day temperatures affect:

- Rates of chemical reactions that affect many air pollutants (e.g. ozone and nitrogen oxides)
- Thermal convection, which affect how pollutants spread. In basic terms, thermal convection is heat moving from one place to another through air, liquid, or some other way.

In 2018 the annual average temperature was -9.6°C, which is 0.7°C lower than the average from 1995 to 2018. June and July had warmer than average temperatures. Winter came early in 2018, starting mid-September. Freezing temperatures usually start early October.

Precipitation

In 2018, annual precipitation was 169 mm, the lowest on record. The historic average is 331 mm. The last few years have been drier than normal.

Wind

Wind speed and wind direction are important. They affect where air emissions spread to in the local area and surrounding region. Winds at the mine site are from all directions. The main one is northwest.

AIR QUALITY MONITORING

Dominion monitors local air quality at two sampling stations and at the Continuous Air Monitoring (CAM) station.

- Sampling stations operate for 24 hours, every six days. They sample for total suspended particulate matter (TSP) and fine particulate matter—$PM_{2.5}$ (< 2.5 µm or micrometer)
- CAM station measures, nonstop, levels of sulphur dioxide, nitrogen oxides, total suspended solids, $PM_{2.5}$, temperature, wind speed, and wind direction.

Total Suspended Particulate

In 2018, levels of TSP and fine particulates did not go over the 24-hour or annual standards. GNWT sets these standards.

Nitrogen Dioxide and Sulphur Dioxide

In 2018, hourly, daily, and annual levels of nitrogen dioxide and sulphur dioxide stayed below GNWT standards. Levels were higher in winter than summer, likely because of using heating fuel.

DUSTFALL MONITORING

Dustfall is particles that settle out of the air over a given area and time. Dominion monitored dustfall at 31 places, including two control sites. They sampled total dustfall, and deposits of acid and metal.

In 2018, levels of dustfall 300 m from the haul roads were below GNWT standards. In general, levels of acid deposits were highest close to the Misery haul road. Levels were also high along the Lynx haul road (July-August), the Jay road (August-September), and the Sable Road. All levels were below standards. Levels of metal deposits were highest close to the Lynx and Misery haul roads.

Dust Suppression

Dust suppression means to control dust on roads so it doesn't blow around. In the past Dominion mainly used DL-10 (a chemical dust suppressant) and road watering. Both these methods only work so well.

From 2015 to 2017, Dominion did a pilot study to use a product called EnviroKleen™ along the Misery road. Dominion had used EnviroKleen™ in underground operations since 2009.

The study objectives were to:

- Compare how effective EnviroKleen™ is compared to DL-10.
- See how far EnviroKleen™ drifts from the road to the surrounding environment.
- Find out if EnviroKleen™ is toxic to the land and water.

The Agency reviewed the results of the study. Dominion applied EnviroKleen™ along all of Misery road, except 15 m buffer areas around water bodies. They treated the buffer areas with water. They measured dustfall along the road as part of regular monitoring, plus with two special devices that collected real-time TSP data. This data showed different dustfall based road usage, road conditions, and weather such as rain and wind.

Dominion paired this data with real-time monitoring with cameras and staff observing actions that produced dustfall. Actions included types of equipment and traffic on the road (e.g. light vehicle, road train, haul max). These observations gave Dominion information about how much dustfall comes from different types of traffic.

The study showed that EnviroKleen™ controls dust well, with repeated applications over the year and proper road maintenance. EnviroKleen™ lasts longer than DL-10; it does not break down as quickly.

Dominion notes that each dust-suppressing product has limits.

- With water, people need to apply it often; the road surface loses fine particulates.
- Roads treated with DL-10 and EnviroKleen™ break down with heavy use and road grading.

Many factors affect how we compare these products:

- Changes in mine activity (e.g. amount and type of traffic)
- Natural factors (e.g. humidity, precipitation, wind speed and direction)

Soil sampling showed that EnviroKleen™ may spread up to 10 m off the road. But Dominion does not expect it to be a threat to humans, animals, plants, and water. It biodegrades in natural environments. Łutselk'e Dene had concerns. Dominion did tests that show it is not toxic to aquatic species.

In 2018 Dominion continued the study and applied EnviroKleen™ all along the Misery road, except 15 m buffer areas around water bodies. They used water there. 2018 results are not available yet.

AGENCY ASSESSMENT

In 2016, the Agency reviewed the Air Quality Emissions Monitoring and Mitigation Plan (AQEMMP) for the Jay Project. Dominion promised to combine that plan with the Ekati plan by 2017, to make a single plan for the whole site. To date the Agency has not received the site-wide plan.

We believe a site-wide plan is important to:

- Expand and combine air quality monitoring across the site.
- Apply thresholds and triggers across the site—for nitrogen oxides, fine particulate matter, and total suspended particles—as part of an adaptive management framework.

The Agency and many others often raise concerns about the effects of dust on plants and caribou, including links to caribou distribution and abundance. We encourage Dominion to produce the 2018 results of the dust suppression study as soon as possible. Based on the 2016-17 report, we encourage Dominion to apply EnviroKleen™ to all roads at Ekati, especially the Sable road where caribou are most abundant.

WASTE ROCK

HIGHLIGHTS

- Dominion redesigned the Sable waste rock storage area (WRSA).
- Important questions remain about using total neutralizing potential [see definition below] to evaluate how well waste rock can neutralize acid conditions.
- Eight seeps from waste rock storage areas present problems.

Misery Waste Rock Pile →

WASTE ROCK STORAGE AREAS

Waste rock storage areas (WRSA) contain large amounts of waste rock and overburden dug up when mining kimberlite ore. WRSAs:

- Are permanent. They stay in place after the mining is done.
- Are physically stable, during mine operations and in the long term.
- Help permafrost to form.
- Balance footprint area and height.

Right now Ekati has five WRSAs, with a sixth to come with the Jay project.

- Panda-Koala-Beartooth
- Fox
- Sable
- Pigeon
- Misery-Lynx

The coarse kimberlite rejects storage area (CKRSA) contains kimberlite ore discarded from the process plant. It is next to the Panda-Koala-Beartooth WRSA.

In 2018, Ekati put 29,000,000 tonnes of waste rock at the WRSAs.

Table 3 describes each WRSA and the CKRSA.

WRSA DESIGN, MANAGEMENT, AND STUDIES

Re-design of the Sable WRSA

The Sable project is about 20 km north of the main camp. In August 2017, Dominion started removing overburden and mining the open pit. They will operate the pit until 2022 and expect to put about 103,000,000 tonnes of waste rock into WRSAs.

The first WRSA design was for two separate piles next to the Two Rock Settlement Pond. In April 2018, Dominion did a redesign. The plan proposed building the West WRSA and a bigger South WRSA, and a new East WRSA. The South WRSA would have a 30 m setback from the settlement pond, rather than the standard 100 m. The purpose was to have more storage and reduce possible impacts on the Ulu Lake watershed.

In June 2018, the Wek'èezhìi Land and Water Board (WLWB) approved the redesign. They directed Dominion to not put any waste rock in the East WRSA until the South and West are full.

Use of Lynx Diabase Waste Rock as Construction Materials

In the past, Dominion told the WLWB about an unknown diabase (type of rock) in the Lynx pit. Dominion considers diabase waste rock to be non-acid generating. They wanted to use it as construction material in the same way they use granite.

Dominion uses 'total neutralizing potential' to test the acid generating/metal leaching traits of diabase and other waste rock. During the review, IEMA expressed concern over this.

Dominion tested diabase samples from the Lynx open pit for metal leaching. In most samples, levels of several metals were too high. And median levels

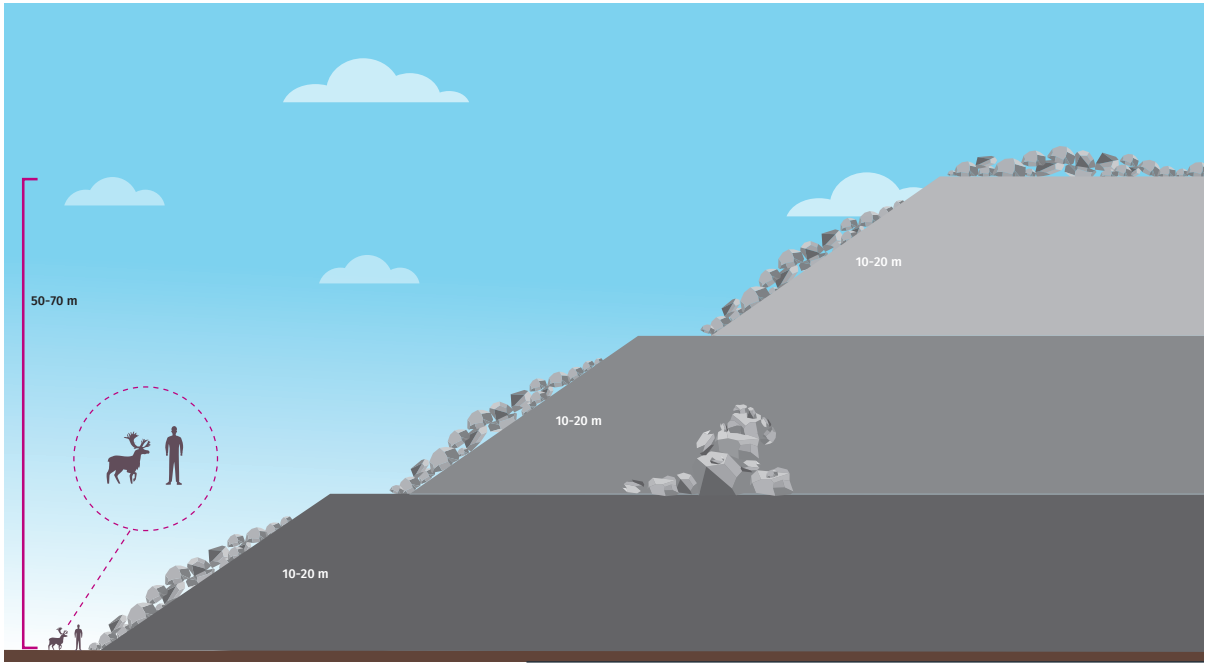


Diagram 1: Waste rock storage area illustration

of sulphur were five times more than in granite. These results suggest that using diabase as a construction material could cause acid drainage and metal leaching.

Jay WRSA Co-placement Study

In October 2017, Dominion proposed a study to the WLWB. They wanted to place possibly acid generating and non-acid generating waste rock together within the WRSA in a way to prevent acid rock drainage and metal leaching. The study proposed geochemical testing, waste rock placement, and a monitoring system along with a monitoring program on the similar Misery WRSA.

In September 2018, the WLWB rejected the study. The Board and IEMA agreed that the study would not fully assess:

- The 'effective neutralizing potential' of Jay waste rock
- How sensitive the pile is to flawed placement or mixing of possibly acid generating and non-acid generating materials.

WLWB directed Dominion to:

- Assess the need for and possible value of operating field-scale tests while building the Jay WRSA.
- Submit a revised study design.

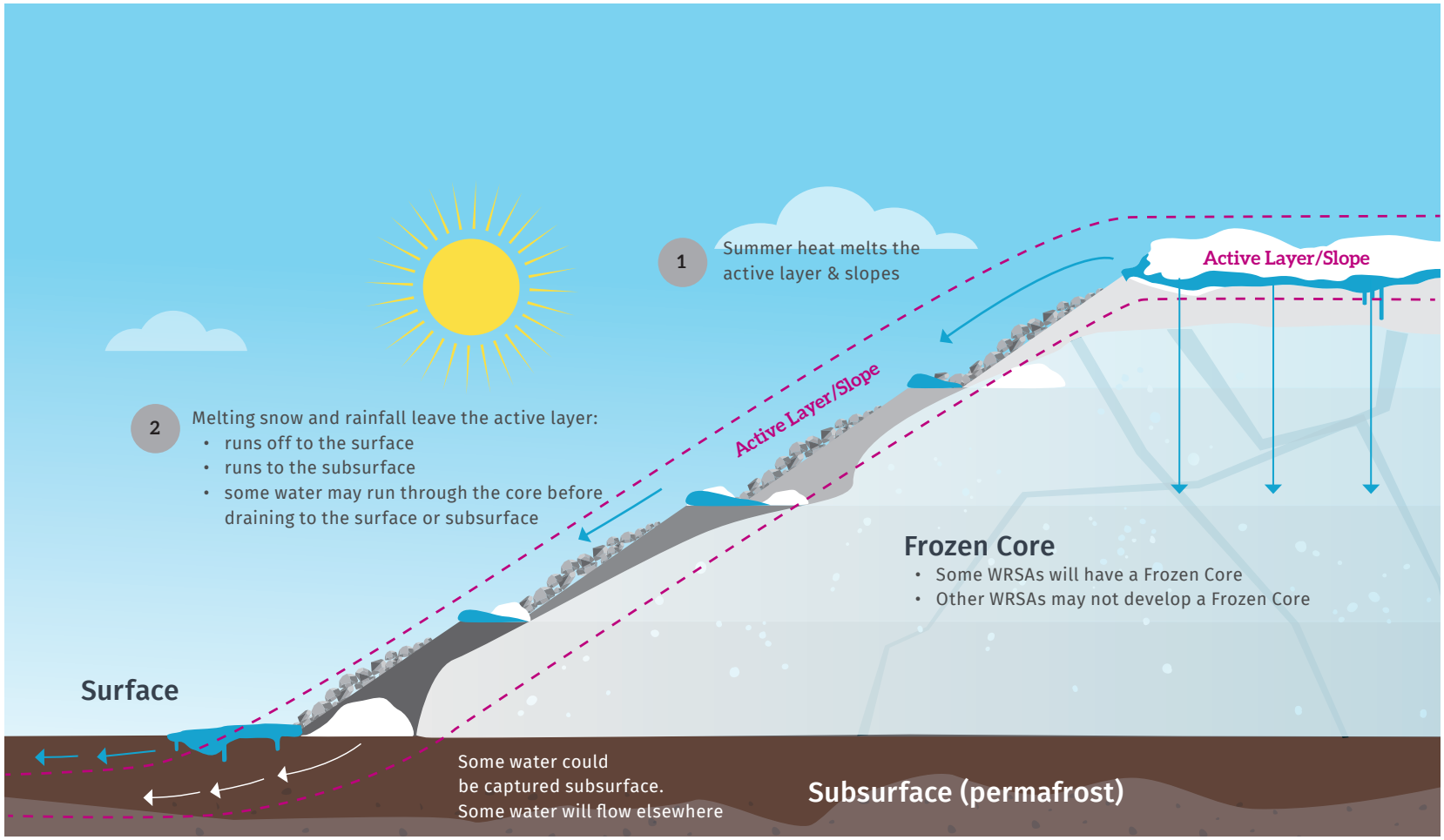


Diagram 2: Seepage

Misery WRSA Geotechnical Investigation

In February and March 2018, Dominion did the Misery WRSA geotechnical study. They drilled one borehole from the 515 m bench to 59 m deep. Although they planned to drill 75 m deep, Dominion believes they crossed all metasediment layers of the WRSA.

During drilling they collected, photographed, logged, and sampled nine granite and 16 metasediment samples. In the borehole they measured temperature, moisture, and groundwater. Because of some problems during backfilling, they did not measure temperature and water below 21 m deep.

Results to November 2018 suggest that near the borehole:

- The near-surface summer active layer is 4 m deep. This is within the 5 m thick cover of non-acid generating material.
- Speed of water flow shows water in the active layer may flush from the WRSA every two to four years.
- All waste rock between the 4 m active layer and 21 m deep stayed frozen for the monitoring period.
- Waste rock within the pile weathered only a bit. Frozen ground helped to slow the rate.

Seepage Monitoring

Dominion must monitor seepage (slow leak of water) coming from WRSAs and report each year. Every three years, they must also do a detailed study of seepage trends over time. The next detailed study is due in 2020.

Dominion gets seepage samples each year during spring freshet and in the fall from any seeps with a measurable flow. In 2018 they sampled 49 seeps; 26 were new. As before, seepage happened at some laydown areas, the CKRSA, and each WRSA, except the new Sable WRSA.

Most seeps had similar levels and trends as in the past, with some exceptions:

- Most Lynx seeps had higher levels of total suspended solids compared to other WRSAs.
- Seeps around the Lynx crusher pad had higher levels of all variables during the fall, compared to spring freshet.
- Seeps around the CKRSA show higher peaks in conductivity and total levels during freshet compared to fall; some above the maximum reported to date.

In 2018, Dominion noted eight problem seeps, compared to six the year before.

- Panda-Koala-Beartooth WRSA (flows into Bearclaw Lake and Pelzer Lake)
- Fox WRSA (flows into Three Hump Lake (2) and South Fox Lake)

	Operating status	Rock types	Final footprint area (ha)	Final height (m)	Current volume (million tonnes)	Other features
Panda, Koala, Koala North	Complete	Granite, diabase	341	50	169 (inactive)	Land farm, solid waste landfill
Fox	Complete	Granite, diabase, kimberlite	320	50	214 (inactive)	None
Sable	Active	Granite, diabase	182	65	19.4 (active)	None
Pigeon	Active	Granite, diabase, metasediment, till	66	70	7.4 (active)	None
Misery-Lynx	Active	Granite, diabase, metasediment	151	65	99 (active)	Solid waste landfill
Coarse kimberlite rejects	Active	Coarse processed kimberlite	115	50	38.2 (active)	None
Jay	Future	Granite, diabase, metasediment	227	65	155 (planned)	None

Table 3 – Waste Rock and Coarse Kimberlite Rejects Storage Areas at Ekati

- Lynx Crusher Pad (flows into Cujo Lake)
- Lynx WRSA (flows into Mossing Lake and an unnamed lake)

A problem seep is one that does not meet the standards in the water license for more than one year. Or one that shows poor water quality compared to what is typical at that place, for more than one year. Once they see a problem seep, Dominion must sample it more often. Depending on the results, they may need to take action to protect nearby lakes and streams.

In all reported cases, any higher levels within the seep tended to dilute quickly along the flow path. Levels at the shore where the seep entered a lake were lower than the levels in the seep and similar to, or only a bit higher than open-water levels.

AGENCY ASSESSMENT

Managing waste rock and processed kimberlite is one of the most important challenges for closure and reclamation of Ekati. We must carefully consider the short- and long-term features of waste rock as we design and operate WRSAs. We must 'get it right the first time'.

In 2018, the Agency focussed efforts on waste rock management and Dominion's ongoing use of 'total neutralizing potential' (TNP) to measure how well rocks can neutralize acid generating waste. We believe that Dominion should not be allowed to use only this test. The Agency believes 'effective neutralizing potential' (ENP) is a much better test. We recommended the WLWB do an expert review to study the best way to test neutralizing potential, acid rock drainage, and metal leaching in waste rock at Ekati and other northern mines.

The Misery-Lynx WRSA will grow to be 65 m high. Currently, Dominion cannot measure temperature and water quality below 21 m deep. The Agency encourages Dominion to drill another borehole in the future, to put in place the instruments they need to do this.

Cooling (winter) and heating (summer) affect everything that happens within a WRSA, especially next to exposed areas. The current borehole at Misery WRSA is close to the middle. Dominion may need to drill more boreholes closer to the edge, to monitor long-term conditions for the whole WRSA and closure cover.

To try to help the Ulu Lake watershed the Agency supported Dominion when they proposed to change the 100 m setback to 30 m when they redesigned the Sable WRSA. At the same time, the Agency does not give general support for a 30 m setback. We believe 100 m better protects lakes and streams, giving enough room to build any needed facilities.

Problems with seeps that do not meet water quality standards in the water licence may have long-term impacts on water quality in nearby lakes and streams. The Agency believes that Dominion should take action to deal with these seeps and mitigate impacts.

WASTEWATER AND PROCESSED KIMBERLITE MANAGEMENT

HIGHLIGHTS

- Dominion updated the Wastewater and Processed Kimberlite Management Plan (WPKMP). In the update, the Panda, Koala and Koala North pits will be the main place to put Fine Processed Kimberlite (FPK).
- Underground mining of Koala is done. This means Dominion can now deposit FPK in the Panda, Koala and Koala-North pits.
- Dominion needs to do more research to help decide how deep to make the freshwater cap over FPK in the pits.

← Coarse Kimberlite Rejects Pile, September 2018

WASTEWATER AND FINE PROCESSED KIMBERLITE

While operating the mine, Dominion manages several kinds of wastewater.

- Sewage.
- Water in contact with mine facilities and waste.
- Fine Processed Kimberlite (FPK): a mix of rock material and water left over after the process plant removes the diamonds.

FPK leaves the plant as a mix of fine ground up rock and water. FPK uses a lot of water.

Managing wastewater and FPK are closely linked.

Table 4 is a summary of Ekati wastewater and PK.

Category	Type	Description/Source
Minewater Runoff from facilities and water pumped from mines	Surface Minewater	Water that flows or is pumped from surface mine infrastructure, e.g., roads, waste storage areas, truck wash bays, collection sumps.
	Open Pit Minewater	Water that flows or is pumped from open pits.
	Underground Minewater	Water that flows or is pumped from underground workings.
Sewage Toilet waste and greywater	Sewage – Main Site	Sanitary sewage system at the main site.
	Sewage – Remote Sites	Sewage from remote work sites, e.g., Fox Pit, Misery Camp.
Processed Kimberlite Material rejected from the process plant	Coarse Processed Kimberlite	Coarse kimberlite (> 0.5 mm diameter particles) rejected from the process plant. Trucked to waste rock storage areas (See Waste Rock section of this report for more information).
	Fine Processed Kimberlite	Fine kimberlite (< 0.5 mm diameter particles) discharged from the process plant in a slurry mixture of FPK and water.

Table 4 - Ekati Mine Wastewater and Processed Kimberlite Types

WASTEWATER MANAGEMENT

The water licence sets out standards for wastewater. All wastewater must meet these standards before Dominion can discharge it into the environment. Right now Dominion has three main places where they collect water samples to make sure wastewater meets the standards.

- Two Rock Sedimentation Pond (TRSP): manages water from the Sable site, with discharge to Horseshoe Lake (Horseshoe watershed).
- Long Lake Containment Facility (LLCF): manages water from the main camp, Panda-Koala-Beartooth area, Ammonium Nitrate Storage Facility, Polar Explosive Building, Fox and Pigeon sites, with discharge to Leslie Lake (Koala watershed). Dominion sometimes stores wastewater for a short time in Beartooth pit before pumping it to LLCF.
- King Pond Settling Facility (KPSF): manages water from the Misery and Lynx sites, with discharge to Cujo Lake (King-Cujo watershed).

In future, Dominion plans to use the Misery pit to manage water from the Jay project, with discharge to Lac du Sauvage.

Surface Minewater

To manage most surface minewater, Dominion first collects it into sumps for a short time, then pumps or trucks it to one of the main facilities. They allow runoff from roads, laydowns, and waste rock storage areas to follow natural flow paths, or direct it onto the tundra. When they build roads and laydowns, Dominion must use non-acid generating materials.

Table 5 is a summary of minewater management in 2018.

Mine Area	Source	Water Management	2018 Volumes (m^3)
Panda, Koala, Koala North	Open Pit	Pumped to LLCF.	274,677
	Underground	Pumped to LLCF or Beartooth PKCA. Discontinued in early 2019 when mining and underground reclamation completed.	262,918 to LLCF 0 to Beartooth PKCA
Beartooth	Open Pit	Pumped to LLCF. Currently used for FPK storage and temporary storage of water from other sources.	1,462,770
Fox	Open Pit	Pumped to LLCF during operation. Currently accumulating in pit.	0
Pigeon	Open Pit	Pumped or trucked to LLCF or Beartooth PCKA.	15,760 to LLCF 19,520 to Beartooth PKCA
Lynx	Open Pit	Pumped or trucked to KPSF. Future storage of non-compliant water from KPSF	43,408 to KPSF
Sable	Open Pit	Pumped or trucked to TRSP.	44,507
Misery	Open Pit	Pumped to KPSF.	0
	Underground	Pumped to KPSF or Lynx Pit.	Not operational in 2018.
Jay	Open Pit	Pumped to Misery Pit.	Not operational in 2018.

Table 5 – 2018 Open Pit and Underground Water Management

Sewage

Dominion treats all sewage in the plant at the main camp. From across the site, they truck sewage from washrooms to the treatment plant.

Treated wastewater from the plant flows through a pipe to the process plant, where it is mixed with FPK and then discharged to one of the PKCAs.

In 2018, Dominion discharged 81,140 cubic meters of sewage wastewater to the LLCF with the FPK slurry.

Diagram 3: Wastewater and processed kimberlite at the Ekati mine site

FINE PROCESSED KIMBERLITE MANAGEMENT

In their current plan, Dominion uses the LLCF as the main place to store FPK. Beartooth PKCA is the next option. The FPK slurry is about 40% fine rock solids and 60% water.

- 2018—to LLCF: 1,082,087 cubic meters FPK; 5,995,091 cubic meters process plant liquids
- 2018—to PKCA: 0 cubic meters FPK and 0 cubic meters process plant liquids

Beartooth PKCA is also a place to hold minewater when water quality is too poor to go to LLCF. E.g., Dominion may direct wastewater with high levels of nitrate, chloride, and potassium to Beartooth PKCA where it mixes with other water before discharge to the LLCF.

PANDA-KOALA PROCESSED KIMBERLITE CONTAINMENT AREA

In February 2019, WLWB approved (with conditions) Dominion's plans to use the three pits (Panda-Koala) and underground as the main FPK storage area, starting in spring 2019. The LLCF and Beartooth PKCA will be secondary storage. As water levels rise in Beartooth and Panda-Koala PKCAs, Dominion will move the water to the LLCF.

To get approval, Dominion had to:

- Study how FPK behaves when put in mined out pits and how it affects water quality there.
- Update a model that predicts future water quality in these pits.

Dominion believes the Panda-Koala pits provide stable, long-term storage for lots of FPK, including post-closure. Dominion wants to put freshwater caps over the FPK to deal with long-term concerns about water quality.

During the review, the Agency had concerns about how deep a freshwater cap is needed to ensure good water quality. Dominion's predictions showed that a 30 m cap might not meet all water quality criteria in the long term. The Agency also noted that water quality standards allowed during mine operations may not be good enough for post-closure standards.

When WLWB approved the plans in February, they told Dominion to:

- Study and propose what is the best depth for a freshwater cap, to meet post-closure water quality standards.
- Describe and include closure and reclamation plans.

In March 2019, Dominion presented additional information about its plans to manage PK. Review is ongoing.

In 2018, Dominion stopped underground mining in Koala. A March 2019 GNWT inspection report states that Dominion has decommissioned the Panda-Koala underground—they followed the rules to stop mining and make it safe.

Haul Train, photo courtesy of Dominion Diamond Mines ULC

AGENCY ASSESSMENT

Using Panda-Koala PKCA as the main place to put FPK is an important change in the plan to manage FPK at Ekati. This change can affect long-term water quality in Panda, Koala, and Koala North pits and post-closure pit lakes. Water quality and levels at LLCF will change with no FPK discharge to the LLCF.

The Agency sees many issues with water quality models for pit lakes, for example:

- Lack data to support estimates of some inputs: e.g. runoff from disturbed areas like roads and laydowns.
- Assume current runoff and seepage conditions from WRSAs are the same as long-term conditions.
- Use average data to measure conditions when conditions will likely get worse at times.

Overall, we cannot be certain about what to expect in the long term for water quality in pit lakes. To support future modelling and good decisions, IEMA believes it is critical to have good information (monitor, research).

We also cannot be certain about how deep the freshwater cap above the FPK needs to be, to protect the environment. The Agency believes further research about this is a critical step in the closure planning process.

Misery Pit, camp and Waste Rock Storage Area, photo courtesy of Dominion Diamond Mines ULC

CLOSURE & RECLAMATION

HIGHLIGHTS

- The Interim Closure and Reclamation Plan v3.0 has several important flaws. Dominion needs to deal with them before the plan is approved.
- Dominion needs to do more research and community engagement to support its plans to make less effort to mitigate effects on wildlife during closure (e.g., from roads and WRSAs).
- There are some legal and administration issues with financial securities. These get in the way of properly managing public liability and risk for mine closure.

← Long Lake Containment Facility Reclamation Area, photo courtesy of Dominion Diamond Mines ULC

CLOSURE PLANNING STATUS

Dominion must have an Interim Closure and Reclamation Plan (ICRP) while the mine is active. They must report every year on any progress or changes to the plan. The Wek'èezhìı Land and Water Board (WLWB) approve the plan.

The goal of the plan is to:

> *"Return the Ekati mine site to viable, and wherever practicable, self-sustaining ecosystems that are compatible with a healthy environment, human activities, and the surrounding environment." (ICRP v2.4 and v3.0)*

In August 2018, Dominion presented v3.0, the first complete update since 2011. The WLWB started the review process. The Agency participated in a technical workshop in January 2019. We sent our comments to WLWB in March. As of the end of 2018, ICRP v2.4 is still the approved plan.

The Dominion 2018 annual report contained information about reclamation research and activities.

CLOSURE AND RECLAMATION PLANS

Most of the closure plans are the same as those in the previous version of the plan. But, ICRP v3.0 does include a few big changes to some proposed closure activities.

Open Pits

The plan proposes to flood open pits and connect underground mines with fresh water, to create new pit lakes. Dominion expects to connect the pit lakes with the nearby watersheds when water quality meets certain standards. For most pits, this involves inflow and outflow channels. But for Jay pit Dominion plans to break the dyke to reconnect with Lac du Sauvage. For pits that contain mine water, Dominion plans to layer fresh water on top of denser mine water, so the mine water stays at the bottom of the pit lake forever.

The plan is to build berms (raised banks) around all pits except Jay, to keep wildlife from entering the flooded pits.

Both versions of the ICRP propose to create good conditions around the shores of pit lakes to develop self-sustaining ecosystems. But ICRP v3.0 concludes this is practical only in small areas of the Panda, Koala, Koala North, and Beartooth pits.

Both versions plan to create ways for wildlife to safely escape from pits. But ICRP v3.0 proposes no specific actions to do this. It proposes that wildlife can escape through inflow and outflow channels, pit ramps, and the shoreline.

Underground Mines

Underground mines all have pits that will be filled with water or processed kimberlite (PK) as part of mine operations and pit closure. But underground mines need other reclamation and closure activities.

The closure and reclamation plan starts with removing all hazardous materials and equipment. Dominion plans to leave equipment underground if they cannot salvage it and it has no negative effects on water quality. Plugs and seals will keep animals and humans away from surface openings that are not under water or under PK.

Waste Rock and Coarse Kimberlite Storage Areas

All Waste Rock Storage Areas (WRSAs) will stay in place when mining ends. Dominion plans to cover areas of exposed potentially acid-generating rock with 5 m of non acid-generating waste rock. Based on research, Dominion expects that 5 m is thicker than the active layer that thaws in summer, so they expect the rock under it will stay frozen. The main method to control acid rock drainage and metal leaching is to keep waste rock frozen below the active layer.

The plan for the Pigeon WRSA is 3 m of till, covered with 1 m of non acid-generating waste rock. ICRP v3.0 proposes that a cover may not be needed, and includes plans for more research to see if the Pigeon waste rock may leach metals out into the surrounding land and water or be acid generating.

The plan is to not cover Panda/Koala/Beartooth, Fox (non-kimberlite part), Sable, or Lynx WRSAs. Dominion concluded that the surface rock would not leach metals or be acid generating. They consider these materials safe as part of the active layer.

After closure, Dominion plans to leave the WRSAs shaped like they are currently: steep slopes with a series of flat benches. Dominion expects the WRSAs to become frozen over the long term.

Dominion must protect the PK stored at the Fox WRSA and the Coarse Kimberlite Rejects Containment Area from erosion. The closure plan is a cover of non-acid generating waste rock or active re-vegetation.

One important difference between v2.4 and v3.0 is wildlife access to WRSAs. V2.4 proposed to build access ramps for all WRSAs. V3.0 plans to do a study to see if Dominion needs to provide safe access (e.g. recent and historic caribou movement patterns, nearby habitat types, how close is WRSA to caribou corridors). In v3.0, Dominion states that no WRSA has a high priority for access ramps, and Sable, Pigeon, Misery, and Lynx WRSAs have moderate priority.

Fine Processed Kimberlite Containment Areas

The ICRP plans a mix of vegetation and rocks to cover the surface of the Long Lake Containment Facility (LLCF). The purpose is to make it stable and protect it from erosion by water and wind. The plan is also to build new drainage channels and improve existing drainage. The purpose is to drain leftover ponds and safely move water off the LLCF. Dominion plans to build spillways through existing dykes and dams, to allow water to flow from one cell to the next through the LLCF. They are doing research to support decisions about the final design.

The mine plan includes storage of fine processed kimberlite (FPK) in the Beartooth Panda, Koala and Koala North pits. The ICRP plans to put freshwater caps over the FPK in these pits. The purpose is for water quality to meet certain standards. Dominion has not defined these yet. For the Panda/Koala PKCA, water quality modelling shows that even a 30 m-deep (100 feet) freshwater cap may not be enough to meet water quality standards. Dominion proposed a research plan to study how deep the freshwater cap needs to be to meet water quality objectives.

Roads

ICRP v2.4 and v3.0 differ a lot in their approach to roads. For all roads not needed for long-term monitoring, ICRP v2.4 plans to:

- Scarify the surface
- Remove culverts
- Flatten roadside safety berms

ICRP v3.0 plans to:

- Maybe leave some roads in place as travel corridors for caribou
- If needed, knock down road berms to give wildlife better access
- Scarify and vegetate select roads

Dominion hopes that roads left in place may help wildlife movement. They plan to do research and engage communities to support final decisions about which roads to leave in place or reclaim.

Surface Infrastructure

Dominion must remove, bury in a landfill, or ship off site: all buildings, storage tanks, power lines, water pipelines, and other physical structures. They may leave in place laydown pads and airstrips. These must be safe for humans and wildlife after the mine closes.

PROGRESSIVE CLOSURE AND RECLAMATION ACTIVITIES

In 2018, Dominion did ongoing reclamation activities at Old Camp and the Panda-Koala Underground. They also monitored past reclamation work, and noted any needs for maintenance.

Old Camp

Old Camp reclamation activities happened from 2014 to 2018.

- 2017: Hydrocarbons in some soils are higher than guidelines.
- 2018: Dominion moved 250 cubic meters of contaminated soil from the area to the active on-site land farm for remediation.
- 2018: Monitoring of soils shows hydrocarbons in all soil samples are lower than the guidelines.
- 2018: Monitoring of water shows arsenic levels are higher at some places than water licence standards. Dominion plans to keep monitoring. The company says that arsenic levels naturally get weaker and dilute along flow path, before the water enters Larry Lake.

Panda-Koala Underground

In July 2018, the GNWT approved Dominion to permanently leave equipment underground, including the whole conveyor system. Dominion must remove all hydraulic oil. All grease left on and in equipment must be biodegradable.

Underground mining activities at the Panda-Koala ended in November 2018. A GNWT inspection report (March 2019) states that the Panda-Koala underground is decommissioned. The portal is blocked with mesh to keep wildlife out. Dominion shut down all power, air, and communications February 26, 2019.

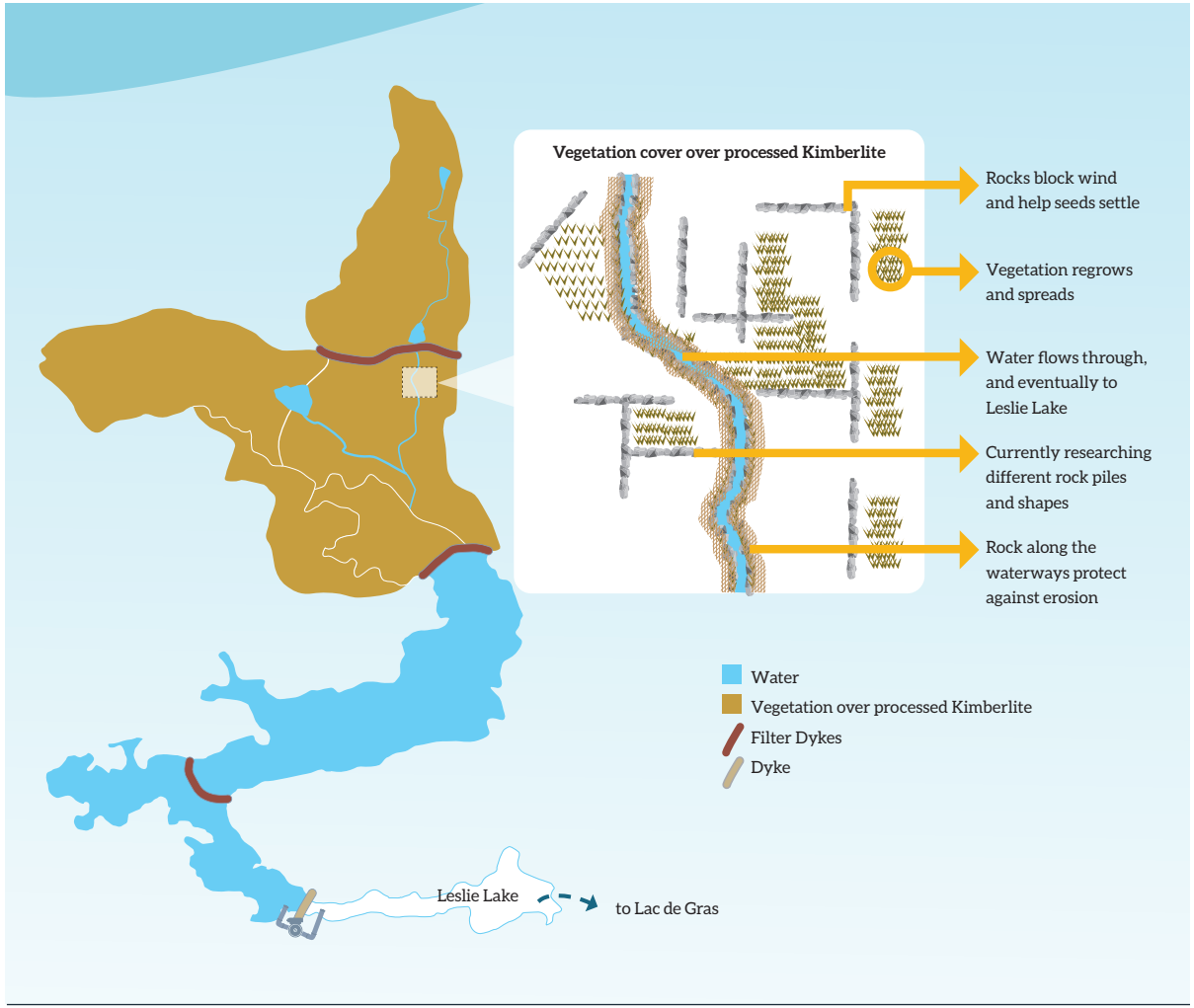


Diagram 4 : LLCF plan closure and reclamation

FINANCIAL SECURITY AND CLOSURE PLANNING

Financial Security

To manage public liability and risk, the GNWT needs to hold financial security that is equal to the total expected cost of closure and reclamation of Ekati. As of December 2018, the total security was $293 million—an increase of $8 million from 2017.

In January 2018, Dominion asked to adjust the security to deal with changes in liability.

- Increase of $735,000 for Pigeon pit. Enlarging the pit needs more water for flooding, as part of closure.
- Decrease of $7.9 million for Misery WRSA. Dominion covered most of the exposed metasediment.

In October 2018, the WLWB concluded:

- Deal with changes to security related to the Pigeon pit as part of the review of ICRP v3.0.
- Need more information before deciding about reducing the security for Misery WRSA.

On March 20, 2019 Dominion asked to adjust security to deal with the information request. Review is ongoing.

Panda Waste Rock Storage Area, photo Courtesy of Dominion Diamond Mines ULC

Split Between Land and Water Reclamation Security

This table shows that the GNWT holds reclamation security mostly under the water licence.

Security Item	Amount Held
Water Licence Security W2012L2-0001	$271,095,482
Ekati Environmental Agreement	$19,991,424
Jay Early Works Land Use Permit W2016F0007	$1,480,000
Pigeon Land Use Permit W2016D0005	$427,000
Total	$292,993,906

Table 6 - Ekati Mine Reclamation Security Held (December 31, 2018)

During the process to amend the water licences for Jay project and Misery Underground, GNWT raised some questions about securities. They said they want to hold separate securities:

1. Land-related liabilities under land use permits and leases
2. Water-related liabilities under the water licence

For both projects the WLWB decided to combine the security under the water licence.

In an October 2018, Dominion asked WLWB to approve splitting the security for the Misery Underground project. They said the GNWT refused to accept a combined security under the water licence. Until this issue is resolved, the GNWT does not hold security for the Misery Underground project.

AGENCY ASSESSMENT

Interim Closure and Reclamation Plan (ICRP) v3.0

For ICRP v3.0, the Agency:

- Reviewed the plan.
- Held five community information sessions to discuss the plan with Aboriginal Society members.
- Participated in the WLWB's technical workshop January 22-23, 2019.

The process for closure and reclamation involves repeated rounds of planning. Each round should come closer to the desired result. As mining progresses and moves towards closure, each version of the ICRP should:

- Grow and develop.
- Give more detail.
- Bring more certainty and understanding.

Although ICRP v3.0 included new mine activities, it does not give more details. In some areas it has less detail than v2.4. An ICRP should define standards we can measure at closure and post-closure for things such as water, soil, sediment, and air. V3.0 lacks these. The Agency considers this a major weakness.

In some cases, v3.0 relies on aquatic standards used during mine operations as closure standards. Dominion gives no reasons why. Some conditions and risks may be [somewhat] okay during mine operations. But these conditions and risks may be wrong for the upcoming hundreds or thousands of years. Operating standards may not apply during closure.

Defined closure standards also guide decisions about ongoing operations. Otherwise, these decisions could limit future options and make it difficult, expensive, or impossible to reach closure objectives.

WLWB expects Dominion to clearly define closure and post-closure conditions and outcomes. These affect how they design and implement closure and reclamation measures and activities including those already underway or starting soon.

The Agency is concerned that ICRP v3.0 gives no details about monitoring closure and post-closure conditions, and responding to changing and unexpected conditions. Monitoring and adaptive management are key parts of a plan. ICRP v3.0 identifies the need for these activities, but gives few details. It describes adaptive management, but not how it applies at Ekati. It removed the details about monitoring that were in v2.4.

The Agency is also concerned about changes in v3.0 that could have long-term effects on wildlife—changes for closure of roads, pits, and waste rock storage areas. V3.0 proposes a lot less effort to mitigate concerns about wildlife. Community members often raised concerns about the effects of the project on wildlife, especially caribou. We need more research and community engagement.

Overall, IEMA concluded that ICRP v3.0 has several critical flaws. For the present stage of mining at Ekati, it is not good enough. We do not support approving ICRP v3.0 in its current form.

About financial security and closure liabilities, the Agency believes:

- The posted security should always be as much as the liability; it should never be less.
- Holding land and water securities in one licence brings benefits, efficiencies, and reduced risk.
  - Splitting securities into two licences could create challenges to making timely changes and using security for closure activities, if needed.
  - GNWT said there is a legal barrier to holding security under one licence. If this is true, we believe we need to change this flaw in the current system.

ACRONYMS AND GLOSSARY

AEMP – Aquatic Effects Monitoring Program

AGM – Annual General Meeting

AQMP – Air Quality Monitoring Program

CAM – Continuous Air Monitoring

Dominion – Dominion Diamond Mines ULC

ECRP – Interim Closure and Reclamation Plan

ENP – Effective neutralizing potential

FPK – Fine processed kimberlite

GNWT – Government of the Northwest Territories

HAL – High action level

ICRP – Interim Closure and Reclamation Plan

IEMA – Independent Environmental Monitoring Agency (The Agency)

ICRP – Interim Closure and Reclamation Plan

KPSF – King Pond Settling Facility

LAL– Low action level

LLCF – Long Lake Containment Facility

MAL – Medium action level

NWT – Northwest Territories

PK – Processed Kimberlite

PKCA – Processed Kimberlite Containment Area

$PM_{2.5}$ – Fine particulate matter (< 2.5 µm or micrometer)

TK – Traditional Knowledge

TSP – Total Suspended Particulate

TRSP – Two Rock Sedimentation Pond

TNP – Total neutralizing potential

TSS – Total Suspended Solids

WEMP – Wildlife Effects Monitoring Program

WLWB – Wek'èezhìi Land and Water Board

WRSAs – Waste Rock Storage Areas

WPKMP – Wastewater and Processed Kimberlite Management Plan

ZOI – Zone of Influence

Action Levels – A predetermined change, to a monitored variable or other qualitative or quantitative measure that requires the Licensee to take appropriate actions that may include, but that are not limited to: further investigations, changes to operations, or enhanced mitigation measures.

Adaptive Management – A management system with continual monitoring so that if initial mitigation measures are ineffective, additional or alternative mitigation is applied to keep the impact within acceptable levels.

Benthos – The sediments and mud at the bottom of rivers, lakes and ponds that can contain living organisms. Benthic invertebrates such as fly larvae and clams are an important food source for small fish.

Chloride – Salt resulting from the combination of the gas chlorine with a metal. Fish and aquatic communities cannot survive in water with high levels of chlorides.

Cladocera – An order of small crustaceans (i.e., zooplankton) that live in water (commonly called water fleas).

Consultation – (i) The provision, to the party to be consulted, of notice of a matter to be decided in sufficient form and detail to allow that party to prepare its views on the matter;

(ii) The provision of a reasonable period of time in which the party to be consulted may prepare its views on the matter, and provision of an opportunity to present such views to the party obliged to consult; and (iii) Full and fair consideration by the party obliged to consult of any views presented.

Environmental Agreement – Created as a legally binding instrument to provide monitoring and input into management practices not covered by other authorizations. Parties include BHPB and the federal and territorial governments. Akaitcho Treaty 8 First Nations (LKDFN and YKDFN), Kitikmeot Inuit Association, North Slave Métis Alliance and Tłı̨chǫ Government were involved in the negotiations.

Hydrocarbons – Organic compounds which contain only hydrogen and carbon. This includes fossil fuels (i.e., coal, petroleum and natural gas) as well as their derivatives, such as plastics, solvents and oils.

Kimberlite – A rare, potentially diamond bearing iron and magnesium rich rock from deep in the earth's mantle. Kimberlites are generally found as vertical pipe-like structures.

Molybdenum – A metal that can affect trout just after they hatch.

Nitrate – A nutrient, like a fertilizer, derived from nitrogen. Nitrate can affect the growth of baby fish if it gets too high.

Phytoplankton – Microscopic plants (e.g., algae) found in freshwater and ocean environments. They are an important food source for zooplankton.

Processed Kimberlite – The waste material and water mixture that is left over after the mill removes the diamonds from the ore. Also referred to as "tailings".

Progressive Reclamation – Reclamation that can be carried out during the construction and operation phases of a mine prior to final closure (e.g., rock waste dumps).

Reclamation – The recovery to viable ecosystems of areas of land and water bodies that have been disturbed during mining.

Schist – A large group of coarse-grained metamorphic rocks which readily split into thin plates or slabs as a result of alignment of lamellar or prismatic minerals.

Slave Geological Province – Area between the City of Yellowknife and the Arctic coast.

Tailings – See "Processed Kimberlite".

Total Suspended Particulates – The fraction of airborne particulates that will remain airborne after their release in the atmosphere.

Valued Ecosystem Component – Environmental element of an ecosystem that is identified as having scientific, social, cultural, economic, historical, archaeological or aesthetic importance.

Waste Rock – Rock containing diamonds but too low in grade to be mined or processed economically. Also other rock that must be removed to access kimberlite pipes.

Waste Rock Seepage – Water that drains through the waste rock piles. This water may pick up contaminants as it touches the waste rock and may enter the receiving environment.

Wastewater – Water that contains wastes from the mining process, including sewage and chemicals from explosives.

Zone of Influence – Area of reduced caribou occupancy.

Zooplankton – The small, mostly microscopic animals that live suspended in freshwater (and ocean) environments. Zooplankton feed on phytoplankton and small particles in the water. They are an important food source for small fish.

2018-2019

ANNUAL REPORT

A PUBLIC WATCHDOG FOR ENVIRONMENTAL MANAGEMENT AT THE EKATI DIAMOND MINE

PLAIN LANGUAGE

INDEPENDENT ENVIRONMENTAL MONITORING AGENCY

How To Reach Us

IN PERSON
Suite 203
5006 Franklin Avenue
Yellowknife NT

BY MAIL
P.O. Box 1192
Yellowknife NT
X1A 2N8

BY TELEPHONE
(867) 669-9141

BY FAX
(867) 669-9145

BY E-MAIL
monitor1@monitoringagency.net

Office Staff

MARC CASAS
Executive Director

SHANNON MOORE
Communications and Administrative Specialist

WEBSITE:
www.monitoringagency.net

OFFICE HOURS
Monday to Friday
9:00 a.m.—12:00 p.m.
1:00 p.m.—5:00 p.m.