October 2018 Environmental Update for SLEMA Board

October 31, 2018

Outline

1. Mine Update
2. Inspection Update
3. Regulators' Update
4. Aboriginal Update
5. Stakeholders' Update
6. Agency's Activities
7. SLEMA Reviews
8. SLEMA Update

Acronyms

- AEMP – Aquatic Effects Monitoring Program
- ARD – Acid Rock Drainage
- DFO – Fisheries and Oceans Canada
- ECCC – Environment and Climate Change Canada
- ECM – Extended Care and Maintenance
- ENR – Department of Environment and Natural Resources, GNWT
- EQC – Effluent Quality Criterion
- GNWT – Government of the Northwest Territories
- INAC – Indigenous and Northern Affairs Canada (formerly Aboriginal Affairs and Northern Development Canada [AANDC])
- MVEIRB – Mackenzie Valley Environmental Impact Review Board
- MVLWB – Mackenzie Valley Land and Water Board
- PK – Processed Kimberlite
- SLEMA – Snap Lake Environmental Monitoring Agency
- SNP – Surveillance Network Program
- SSWQO – Site-Specific Water Quality Objective
- TDS – Total Dissolved Solids
- WEMP – Wildlife Effects Monitoring Program
- WTP – Water Treatment Plant
- WMP – Water Management Pond

1.1 Mine Update – October 2018

- The Snap Lake Mine remained in suspended operations (Extended Care and Maintenance)
  - 0 m^3 of water withdrawn from Snap Lake
  - No treated water discharged into Snap Lake
- reportable spill
- Water sampled in monitoring stations

1.2 Snap Lake Mine Air Quality Monitoring Frequency Adjustment for ECM

- Submitted on October 3, 2018
  - Requested a reduction in the frequency of air quality monitoring during the Extended Care and Maintenance (ECM) phase of Snap Lake Mine
  - Attached a technical memo articulating proposed adjustments to the air quality program
    - During periods of zero occupancy, De Beers monitors the site through remote instrumentation and monthly site visits

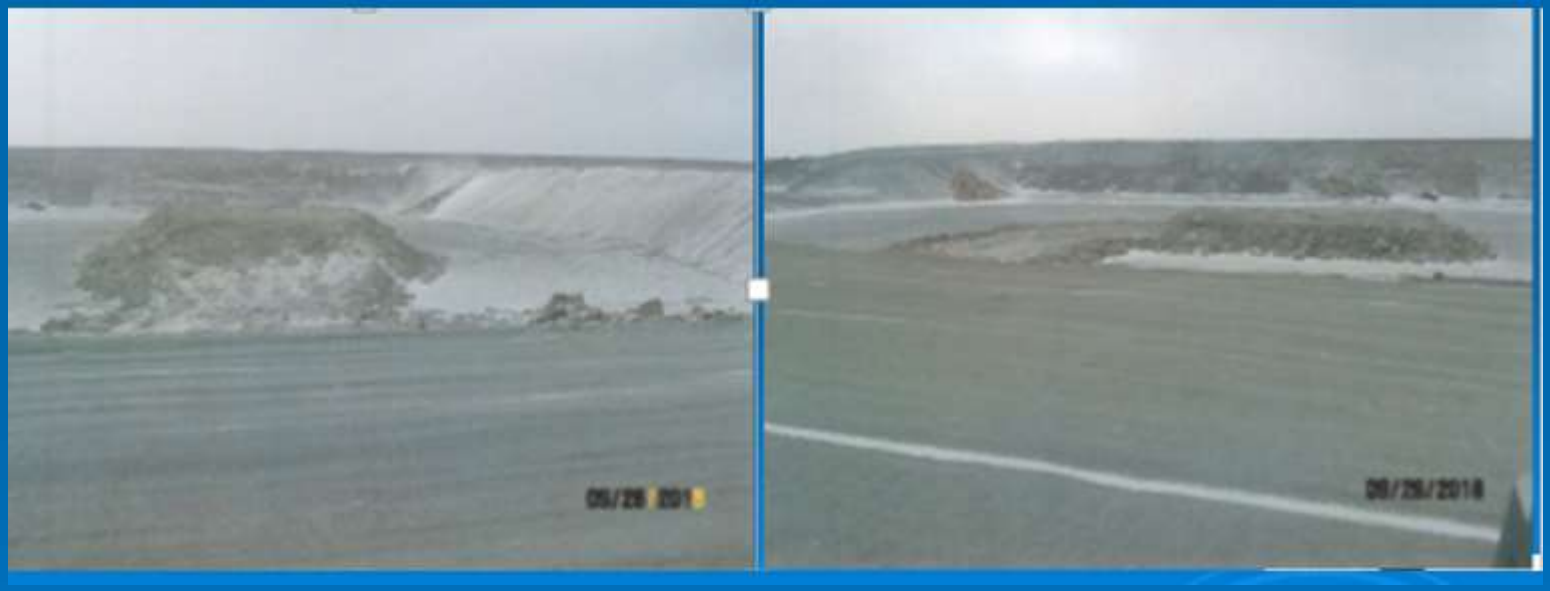
2. Inspection Update

- Inspector – Tracy Covey
- Water Licence Inspections
  - Inspected the Mine on September 26, 2018, and reported on October 9

2.1 Water Licence Inspection on September 26, 2018

- Reported on October 9, 2018
  - Inspected the North Pile, Sumps and ditches, Dam 1 of the Water Management Pond, Bulk Fuel Storage Tank Farms, and investigation of NWT Spill #17-440 spill site status
  - No environmental risks noted
  - Documentation requirements and field work requirements are summarized to determine/confirm compliance under the new Zero Occupancy Care and Maintenance period

Construction of two Cover Test-Pads (5 m thick) in Cell 4, East Cell, is complete. A similar pad was also completed in Cell D of the Starter Cell



The landfill had been recently covered. No new material is expected to be added during the Zero Occupancy Care and Maintenance period (i.e. until March 2019)

The water level in the Water Management Pond is very low

Close up view of one of the new remote cameras

Sample remote camera images, overview and close-up view focusing on the staff gauge of Sump 4

A trench was dug out to determine the extent of water seeping from the lined berm of the 10 Million Liter tank farm past the outside of the berm (Snap Lake side). The investigation found that water in the trench area above contained no hydrocarbons (it was just water)

3. Regulators' Update – MVLWB (I)

- Snap Lake Working Group 8th meeting (or Closure Workshop) to discuss the upcoming Final Closure and Reclamation Plan submission was rescheduled to November 6, 2018, as requested by De Beers

4. Aboriginal Update

- No comments received in October 2018
- SLEMA is assisting the Tlicho Government with a TK workshop on November 7, 2018

5. Stakeholders' Update

- No comments received in October 2018

6. Agency's Activities

- Staff are preparing for the MVLWB Working group meeting for Final Closure on November 6

7. SLEMA Review:

Snap Lake Mine Air Quality Monitoring Frequency Adjustment for ECM

7.1 Snap Lake Mine Air Quality Monitoring Frequency Adjustment for ECM

- De Beers requested on October 3, 2018
  - A reduction in the frequency of air quality monitoring during the Extended Care and Maintenance (ECM) phase of Snap Lake Mine, under the scenario of Zero Occupance at the mine site
  - Attached a Technical Memorandum articulating proposed adjustments to the air quality program
    - Arktis Solutions prepared the Technical Memorandum for De Beers

7.2 Proposed Change

Parameter	Reason for Monitoring	Proposed Monitoring Program		
		Number of Stations	Yearly Number of Samples	Frequency of Monitoring
Meteorological (various)	Monitoring of environmental conditions at the Mine.	2 meteorological stations	Continuous during periods of occupancy 6 downloads/year x 2 stations = 12	Continuously, with data downloads completed monthly between April and September. No monitoring during periods of zero occupancy
TSP	Monitoring of suspended particulate matter (dust) emissions from various Mine sources. TSP monitoring was discontinued at the end of 2015. [1]			
PM_{10}	There is evidence linking inhalable particles (PM_{10}) to health concerns. PM_{10} monitoring was discontinued in July 2014 for $PM_{2.5}$ measurements address health considerations. [2]			
$PM_{2.5}$	Scientific studies have indicated that there are health effects associated with $PM_{2.5}$.	Option A – None Option B – 1 suspended particulate matter station (Communications Building)	Option A – None Option B – Continuous 6 downloads/year	Option A – None Option B – Continuously, with real-time measurements downloaded monthly between April and September. No monitoring during periods of zero occupancy
Dustfall	To evaluate the effects of dust deposition on the surrounding vegetation.	2 dustfall stations (onsite)	6 samples/year x 2 stations = 12	Dustfall canisters are exposed for a nominal period of 30 days at each station between April and September. No monitoring during periods of zero occupancy
NO_2	To demonstrate compliance with the NWT standards (GNWT, 2014) and NAAQOs (Environment and Climate Change Canada, 2011).	Program terminated since source emissions significantly reduced, with air dispersion modeling and historical monitoring data indicating negligible risk for exceedance of ambient air quality benchmarks.		
SO_2	To demonstrate compliance with the NWT standards (GNWT, 2014) and NAAQOs (Environment and Climate Change Canada, 2011).	Program terminated since source emissions significantly reduced, with air dispersion modeling and historical monitoring data indicating negligible risk for exceedance of ambient air quality benchmarks.		

7.3 Justifications

- ECM activities primarily consist of maintaining infrastructure, monitoring, and preparation for final closure
  - Emission sources during ECM are anticipated to be significantly lower in type and magnitude than experienced during operation
  - The on-site activities during the ECM phase are limited to a small crew between April and September, with zero site presence during the winter except for brief monthly visits

Emission Source Type	Mine Operation	ECM – Seasonal Occupancy (April-Sept)	ECM – Zero Occupancy (Oct-March)
Movement of vehicles/ equipment	Active	Active, reduced rate compared to operations	Monthly visits may require use of vehicles and equipment
Airstrip operations	Active	Active, reduced rate compared to operations	Monthly visits only. Airstrip will not be maintained
Underground mining	Active	Not active. Underground mine flooded and closed	None
Construction/ demolition activities	Active	Active, reduced rate compared to operations	None
Combustion sources	Active	Active, reduced rate compared to operations	Generators to heat essential buildings/equipment
Wind erosion	Active	Active	Active

7.4 Comments from the Environmental Analyst

- In SLEMA's comment letter on Air Quality Monitoring Update for Care and Maintenance, dated September 1, 2017, SLEMA requested De Beers update the Air Modeling
- There is a reference in the Technical Memorandum, titled "ARKTIS, 2018. Snap Lake Mine, Air Dispersion Modelling for Care and Maintenance Phase - DRAFT. February"
- It is requested De Beers submit the referenced Air Dispersion Modelling for Care and Maintenance Phase for review

7.4 Comments from the Environmental Analyst

- Based on Table 3, the annual mass loadings for $PM_{2.5}$, NO_2 and SO_2 during ECM are still above the Federal Thresholds, SLEMA supports the monitoring for NO_2 and SO_2 during ECM continue for the summer months
- SLEMA supports the monitoring for NO_2 and SO_2 discontinue in the winter months (Zero Occupancy) because for the past ten years concentrations for NO2 and SO2 were well below the GNWT AAQS

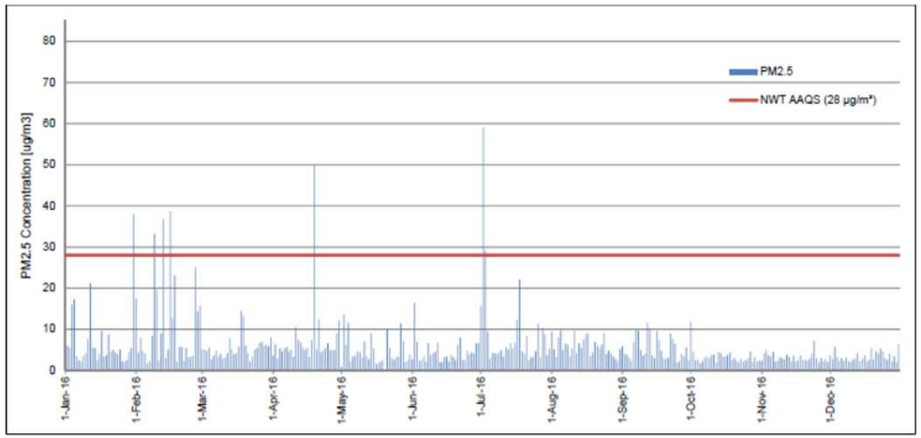
Table 3. Summary of the predicted annual mass loadings for various air quality species during active mining and ECM and comparison to federal thresholds.

Species	Threshold [1] (tonnes)	Active Mining [2] (tonnes)	ECM [3] (tonnes)
$PM_{2.5}$ [4]	0.3	60.6	21.5
PM_{10}	0.5	91.6	N/A[5]
TSP	20	182.9	N/A[5]
NO_2	20	3,152	543.3
SO_2	20	111	40.1

7.4 Comments from the Environmental Analyst

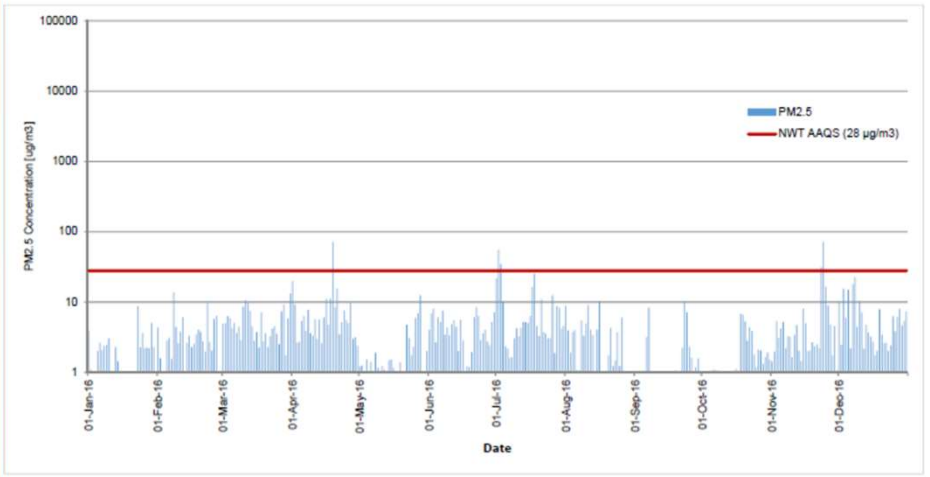
- Because the annual mass loadings for $PM_{2.5}$ during ECM are still above the Federal Threshold, SLEMA does not support De Deers' request to terminate $PM_{2.5}$ monitoring (Option A)
- SLEMA pointed out in the comment letter dated September 1, 2017 that
  - "Particulate matter concentrations (Total Suspended Particulate and $PM_{2.5}$) could be elevated in both summer and winter (Table 18, 20 and 21of the 2016 Air Quality Report)"
- As a result, SLEMA does not support De Deers' Option B either. $PM_{2.5}$ Monitoring should be continue for both summer and winter months

Figure 20 2016 $PM_{2.5}$ Concentrations at 5030 SHARP PM001 Station



$PM_{2.5}$= particulate matter less than 2.5 microns diameter; µg/m³ = micrograms per cubic metre; NWT AAQS = Northwest Territories Ambient Air Quality Standard.

Figure 21 2016 $PM_{2.5}$ Concentrations at 5030 SHARP PM002 Station



7.4 Comments from the Environmental Analyst

- SLEMA does not support De Beers' request to discontinue offsite Dustfall monitoring in the summer months. It is acceptable to discontinue Dustfall monitoring in the winter months (Zero Occupancy)
  - In 2016, total dustfall data for off-site locations show eight exceedances for residential and recreational areas (53 mg/dm2/30d), and seven out of eight exceedances occurred in the summer months
  - Wind erosion, compared to significantly reduced mining activities, may be the main reason for t[illegible] exceedances. The disturbed areas, such as the North Pile may be the major contributor of dustfall

7.4 2016 Vegetation Monitoring Program Annual Report, Page 26

Table 4-1 Dustfall Results from Monitoring Stations, 2016

Month[a]	Dustfall	Detection Limit	DF007	DF008	DF009	DF011	DF012	DF013	DF006 (Reference)
Dec-Jan	Total	8	M	31.5	M	35.3	68.4	44.7	M
	Fixed	5	M	18.2	M	16.9	36.5	22.8	M
Jan-Feb	Total	8	34.2	<8.0	<8.0	11.2	<8.0	8.5	9.4
	Fixed	5	15.6	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Feb-Mar	Total	8	<8.0	<8.0	60.3	<8.0	<8.0	<8.0	37.0
	Fixed	5	<5.0	<5.0	35.2	<5.0	<5.0	<5.0	25.7
Mar-April	Total	8	<8.0	23.3	<8.0	<8.0	<8.0	<8.0	<8.0
	Fixed	5	<5.0	8.0	<5.0	<5.0	<5.0	<5.0	<5.0
April-May	Total	8	M	8.6	14.1	16.6	12.1	23.2	M
	Fixed	5	M	5.6	7.0	9.0	8.2	<5.0	M
May-June	Total	8	35.4[b]	25.1	64.4	24.3	29.8	53.9	<8.0[b]
	Fixed	5	11.4[b]	9.3	16.1	5.6	5.4	27.2	<5.0[b]
June-July	Total	8	55.4	56.7	51.4	62.6	38.7	55.0	49.7
	Fixed	5	29.4	27.9	34.1	24.5	25.0	21.3	31.2
July-Aug	Total	8	42.9	52.3	122	42.8	79.2	48.0	41.2
	Fixed	5	24.8	32.9	44.1	23.2	52.3	29.0	23.2
Aug-Sept	Total	8	42.4	71.5	50.4	71.2	33.9	M	39.9
	Fixed	5	35.8	44.5	42.0	55.4	27.7	M	31.9
Sept-Oct	Total	8	M	45.0	35.7	37.3	49.8	M	M
	Fixed	5	M	33.3	24.5	26.3	36.2	M	M
Oct-Nov	Total	8	M	10.2	8.0	8.4	37.6	M	M
	Fixed	5	M	<5.0	<5.0	<5.0	26.1	M	M
Nov-Dec	Total	8	11.1[c]	<8.0	<8.0	<8.0	<8.0	<8.0	10.3[c]
	Fixed	5	5.6[c]	<5.0	<5.0	<5.0	<5.0	<5.0	5.5[c]

Notes: Results presented in mg/dm²/30d.

7.5 Snap Lake Mine Air Quality Monitoring Frequency Adjustment for ECM - Update

- **On October 30, in order to discuss De Beers' request for the amendment to the Air Quality Monitoring Plan (the Plan), a meeting was held between SLEMA Environmental Analyst and Loretta Ransom and LeeAnn Malley from Department of Environment and Natural Resources, GNWT (ENR).**

- **ENR representatives expressed their concern regarding the De Beers proposed amendment to the the Plan.**

7.5 Snap Lake Mine Air Quality Monitoring Frequency Adjustment for ECM - Update

- **Main concern expressed by ENR was with respect to De Beers approach.**
- **ENR position is that an amendment to the Plan cannot be decided without a proper review process that includes all stakeholders and interested parties, that is a public review (as per the Agreement).**
- **The amendment to the Plan cannot be the result of a decision taken by one Office.**

7.5 Snap Lake Mine Air Quality Monitoring Frequency Adjustment for ECM - Update

- **For example, the monitoring of TSP (total suspended particle matter) was discontinued at the end of 2015 based just on ENR approval. They would like to revert this decision.**
- **Finally, SLEMA Analyst and ENR Rep agreed to postpone the submission of their comments on this topic until the time air quality ENR technical experts finalize their review.**
- **More meetings are expected between SLEMA and ENR to discuss further this topic.**

8. SLEMA Review:

Review of the Additional Security Deposit

8. SLEMA Review:

- On August 14, 2018 De Beers requested a review of the Additional Security Deposit (ASD) held under the Snap Lake Environmental Agreement (the Agreement)

- On August 30, 2018, the department of Environment and Natural Resources (ENR) informed the commencement of a ADS' review

8. SLEMA Review:

- On October 19, 2018 ENR submitted the results of its review.

- The ENR's *review* provides an estimate of the ASD based on the obligations established on the Agreement and not included in either the Land Use Permit or the Water Licence.

8. SLEMA Review:

- The review estimates an amount of $16 million (rounded) for all De Beers' ASD related responsibilities

- And demonstrates that "*Snap Lake mine is over secured, which would result in return of ASD funds and no requirement for the final installment of $3.5 million in 2019*".

8. SLEMA Review:

- On October 31, SLEMA wrote to ENR that it has reviewed the documents and has no issues at this time with ENR's assessment.

SLEMA News

- **On October 15, Sonia Aredes started working for SLEMA as Environmental Analyst.**

- **She is based in Yellowknife. Sonia's contact information is below:**

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