



January 2015 Environmental Update for SLEMA Board

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January 31, 2015

Outline

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



Acronyms

- AANDC – Aboriginal Affairs and Northern Development Canada (previous INAC – India and Northern Affairs Canada)
- AEMP – Aquatic Effects Monitoring Program
- ARD – Acid Rock Drainage
- Cannor-NPMO – Northern Projects Management Office, Canadian North Economic Development Agency
- DFO – Fisheries and Oceans Canada
- EC – Environment Canada
- ENR – Department of Environment and Natural Resources, GNWT
- GNWT – Government of the Northwest Territories
- MVLWB – Mackenzie Valley Land and Water Board
- PK – Processed Kimberlite
- SLEMA – Snap Lake Environmental Monitoring Agency
- SNP – Surveillance Network Program
- TDS – Total Dissolved Solids
- WEMP – Wildlife Effects Monitoring Program
- WTP – Water Treatment Plant
- WMP – Water Management Pond



1.1 Mine Update – December 2014

- Production rate: 93.8% of its capacity (91,637 tonnes of kimberlite processed)
- 10,840 m³ of water withdrawn from Snap Lake
- 1,387,505 m³ of treated water discharged into Snap Lake
- 76,743 tonnes of coarse reject and 51,820 m³ of slimes deposited in the North Pile
- No reportable spills
- Water sampled in 6 monitoring stations
 - The monthly average for all parameters met compliance



1.2 Spill Reporting in January 2015

- No spill reports received in January 2015



1.3 Incinerator Stack Testing

- Incinerator stack testing summary provide on January 29, 2015
 - Two Keteck incinerators (model CY-100-CA) installed in 2013
 - Incineration stack testing conducted in 2014
 - Dioxin and furan emission above the CCME Canada Wide Standard (CWS) (80 pg/m^3)
 - Mercury emissions below CWS ($20 \text{ } \mu\text{g/m}^3$)



1.4 2014 Plume Characterization Study

- Submitted on January 29, 2015
 - The Plume Characterization Study was completed in 2014; it included documentation of the current configuration of the two diffusers and evaluation of their present and future mixing performance



2. Inspection Update

- Inspector – Jamie Steele
- Water Licence Inspection
 - December 11-12, 2014



2.1 Water Licence Inspection

- Dated December 11-12, 2014
- Inspected Fuel Storage and Distribution, Winter Road Access, North Pile Water Management Structures, Waste Management Yard, and Water Treatment Plant



One Concern Noted

- “A fresh water line was observed connected to the pH adjustment tank for the purpose of diluting mine effluent with raw lake water before it is measured for discharge criteria at SNP Station 02-17b. This is not an approved water use as per the Snap Lake Water Management Plan and infringes on Part F Item 6 of Water Licence MV2011L2-0004.
- As of 18:00 December 12, 2014 at the request of the inspector De Beers Canada confirmed that the dilution line had been dismantled pending a review of changes to the Water Management Plan submitted to the MVLWB.”



Water Treatment Plant – Raw water line drawing untreated water from Snap lake for the purpose of diluting minewater in the pH Adjustment Tank before being sent through SNP Monitoring Station 02-17b



WTP – Flow meter installed on the dilution line indicates that fresh water from Snap Lake was being introduced to the pH Adjustment Tank at a rate of 24.627 m³/hour



New Tank Farm Construction – Liner is being installed. This photo shows the enclosures around the liner seams being welded



12 Million Liter Fuel Tank – A leak in the fire suppression line caused a large amount of ice to accumulate in the containment berm. The ice build-up is substantial but does not appear to have a material impact on the capacity of the containment structure. Once the ice melts in the spring the water can be removed



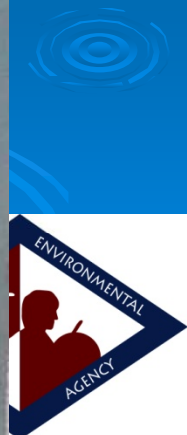
Winter Road Access Location – Waste Shotcrete bags used for bed material have been removed and disposed of in the Bulk Sample Pit



Temporary Sump 4 – Shows plenty of capacity with no issues of ice build-up



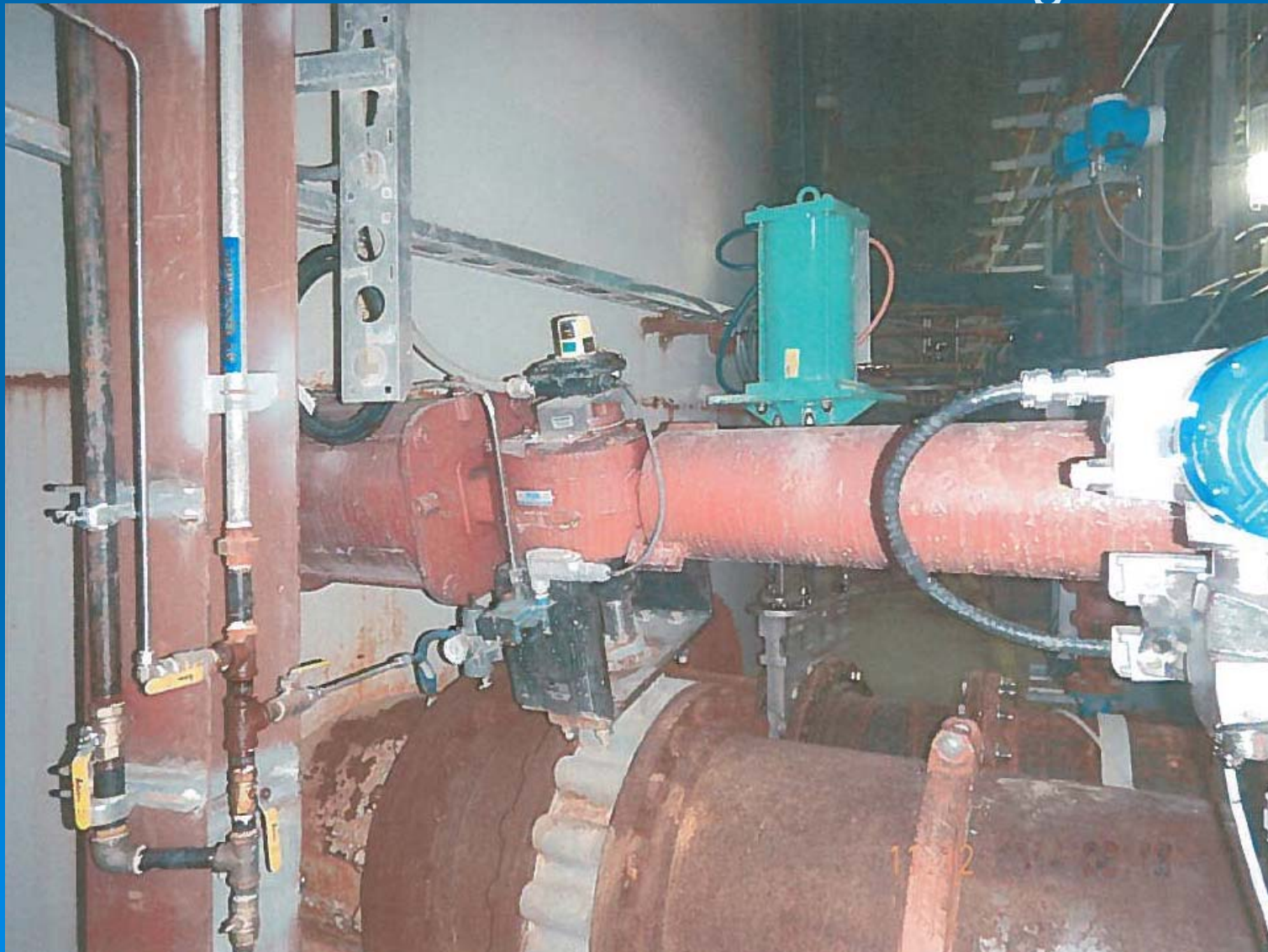
WTP – Water Clarifier/Thickener is the primary treatment for removing suspended solids



WTP – Mine effluent is analyzed through a series of inline meters of Dissolve Oxygen, Nitrate, Turbidity, Chloride, Conductivity, Temperature, and Ammonia



WTP – Automated shutoff valves divert the minewater back to the WTP or to the Water Management Pond if the minewater does not meet discharge criteria



Building 31 Fuel Farm Unloading Module – Fuel transfer area was clean with no evidence of spillage



Water Management Pond – Water level was low with approximately 70% remaining capacity



3. Regulators' Update

➤ MVLWB

- Extended deadline date for the review of the revised Water Management Plan on January 23, 2015
 - Comments due by January 28
 - Proponent comments due by February 5



4. Aboriginal Update

- No comments received in January 2015



5. Stakeholders' Update

- The Inspector commented on the revised Water Management Plan on January 12, 2015
- ENR, DFO, EC commented on the revised Water Management Plan on January 28



5.1 The Inspector Comments on the revised Water Management Plan (I)

- “Section 2.1.3 of the revised Snap Lake Mine Water Management Plan states that raw water will be used for water quality control; however, it does not state how and when the water will be used. As mentioned in the December 10th/11th 2014 Water Licence MV2011L2-0004 Inspection report, the proposed setup is a direct dilution line running from the raw water supply system to the mine effluent prior to being sampled at SNP Station 02-17b.”



5.1 The Inspector Comments on the revised Water Management Plan (II)

- “The inspector is concerned that dilution of mine effluent directly before it is being sampled for compliance will be compromising the integrity of SNP Station 02-17b. Direct dilution in the proposed manner would allow the freedom to adjust pumping rates in order to sample diluted mine effluent, then discharge pure mine effluent during the periods between samples. The possibility would exist to manipulate the SNP so that samples may not be representative of continuous mine effluent.”



5.1 The Inspector Comments on the revised Water Management Plan (III)

- **“If the use of fresh water to directly dilute mine effluent is approved, this will be setting a precedent for water quality management in the mining industry in the NWT.”**
- Recommendations
 - “Recommend De Beers Canada demonstrate how sample integrity at SNP Station 02-17b will be maintained with the proposed water use to ensure that samples taken will be representative of continuous mine effluent.”



Comments from the Environmental Analyst (I)

- There is a possibility of manipulating effluent quality at SNP 02-17B as pointed out by the Inspector
- The Environmental Analyst strongly supports the Inspector's recommendation – De Beers has to demonstrate the sample integrity at SNP 02-17B



Comments from the Environmental Analyst (II)

- The Environmental Analyst recommends that the MVLWB request De Beers to provide the detailed explanation for the abnormal monthly volume increase of raw water use since September 2014, before requesting the Inspector to initiate an investigation
 - The average fresh water volume pumped is 4127 cubic meters per month (January 2006 to August 2014), but from September 2014, the monthly volume jumped to more than 22000 cubic meters



5.2 ENR Comments on the revised Water Management Plan (I)

- The specific relationship between an increase in daily maximum water withdrawal from Snap Lake and water quality control is unclear. If De Beers is seeking approval to utilize freshwater for the direct dilution of effluent prior to discharge, ENR requests De Beers provide additional clarification on its request:
 - Is De Beers' proposing the injection of freshwater as a short-term measure to mitigate ongoing water quality issues or is this being proposed as a permanent addition to the WMP at Snap Lake?



5.2 ENR Comments on the revised Water Management Plan (II)

- If this process is a short-term measure, is it proposed to only be implemented if an exceedence is observed, or also if one is anticipated?
- If this request is not being proposed as a short-term measure to be implemented in the situations described above, what is the proposed duration that freshwater from Snap Lake will be used to dilute effluent prior to discharge? Will it be continuous throughout the year or intermittent during various times of the year?



5.3 DFO Comments on the revised Water Management Plan

- “Given that the maximum withdrawal of 800 m³/day would be less than 10% of the available under-ice water and would like not expose any of the near shore boulder/cobble habitat, and the commitment of DeBeers to not exceed the authorized yearly water withdrawal limit or exceed extraction velocities, no residual serious harm to fish and fish habitat is anticipated.”



5.4 EC Comments on the revised Water Management Plan

- “no comments to add at this time”



6. Agency's Activities

- Executive Meeting held on January 13, 2015
- Traditional Workshops on TDS issues held on January 29 to 30
 - Albert Boucher and Mdeline Drybones from LKDFN
 - Mike Francis from YKDFN
 - Eddie Jones and Wayne Langenham from NSMA



6.1 Design of Water Tasting

- Bottled water and Tap water in Yellowknife
 - 6 in total
- Three sets; two kinds of water each time of tasting; 10-20 minutes in between two water tasting
- What do you think about the taste of waters?
 - Very Good, Good, OK, Not Good, Terrible



Tap Water and Bottled Water

Type of Water	TDS, mg/L	Brand of Bottled Water	Store
Distilled Water	0 mg/L	Great Value	Walmart
Remineralized Water	<35 mg/L	Dasani	Independent
Tap Water	42 mg/L	Yellowknife	N/A
Natural Spring Water	290 mg/L	Real Canadian	Independent
Carbonated Natural Spring Water	480 mg/L	Perrier	Walmart
Carbonated Mineral Spring Water	915 mg/L	S. Pellegrino (Italy)	Independent



6.2 Traditional Workshops on TDS Issues on January 29

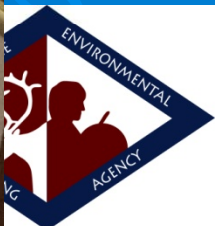


Results of Water Tasting on January 29, 2015

Type of Water	TDS, mg/L	Comments from Elder #1	Comments from Elder #2	Comments from Elder #3
Distilled Water	0 mg/L	OK	OK	OK
Remineralized Water	<35 mg/L	Good	Good	Good
Tap Water	42 mg/L	Very Good	Very Good	Very Good
Natural Spring Water	290 mg/L	Good	Good	Good
Carbonated Natural Spring Water	480 mg/L	Not Good	Not Good	OK
Carbonated Mineral Spring Water	915 mg/L	Terrible	Terrible	Terrible



Traditional Workshops on TDS Issues on January 30



Results of Water Tasting on January 30, 2015

Type of Water	TDS, mg/L	Comments from Elder #1	Comments from Elder #2
Distilled Water	0 mg/L	OK	OK
Remineralized Water	<35 mg/L	OK	OK
Tap Water	42 mg/L	OK	OK
Natural Spring Water	290 mg/L	OK	OK
Carbonated Natural Spring Water	480 mg/L	Not Good	Not Good
Carbonated Mineral Spring Water	915 mg/L	Not Good	Not Good



Comments from the Environmental Analyst

- Elders appeared to prefer low TDS water
- The TDS Aesthetic Objective of Health Canada's Drinking Water Guidelines appears to be reasonable



7. SLEMA Reviews

- Air Quality Action Level III Exceedance External Review and Action Plan
- Emergency Response Plan



7.1 Air Quality Action Level III Exceedance External Review and Action Plan

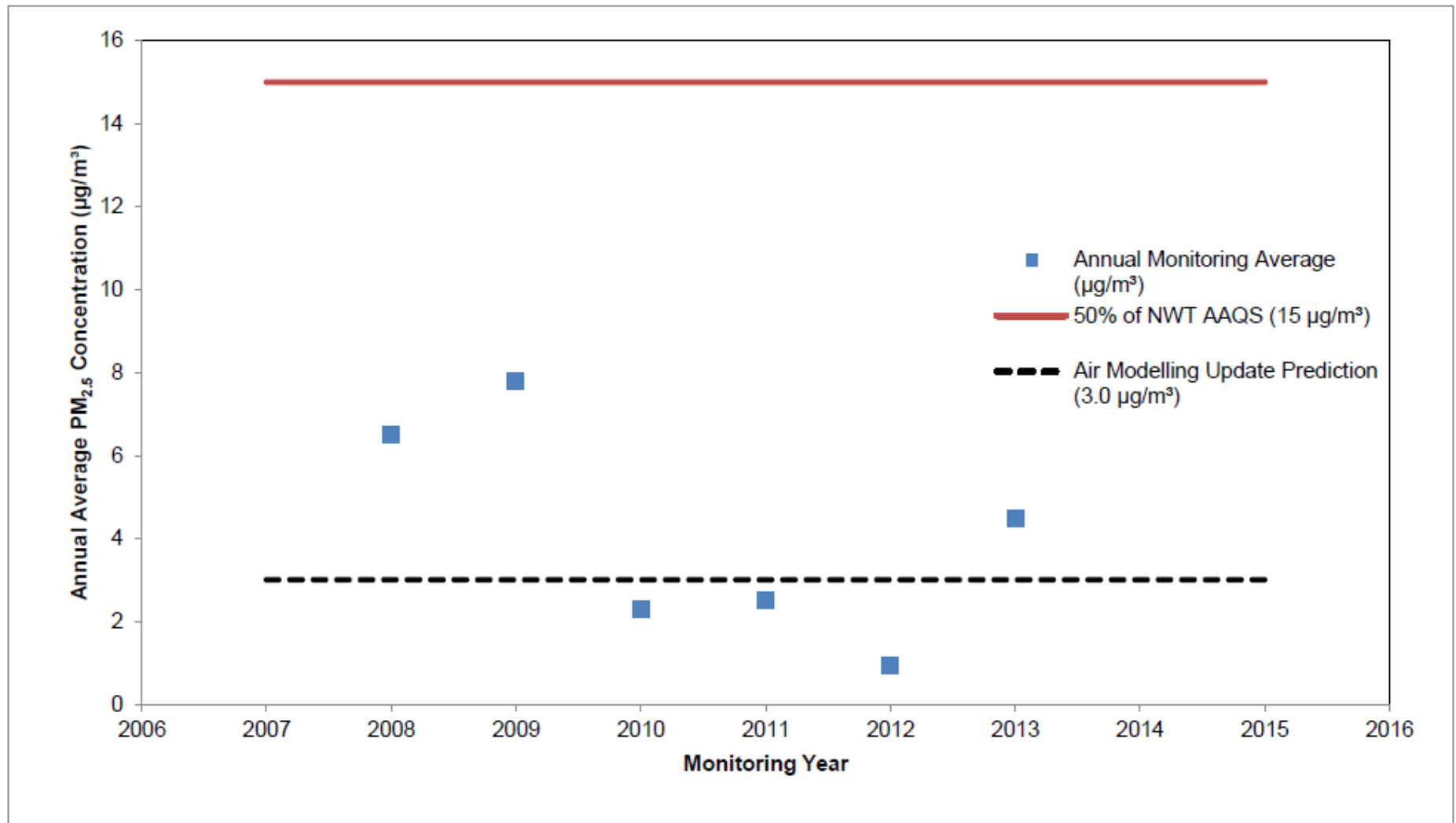
- The exceedances are not considered significant or of concern
 - The observed percent increase of SO₂, NO₂, PM₁₀ and PM_{2.5} exceeded the allowable year-to-year percent increase defined in the Air Quality and Emissions Monitoring and Management Plan (AQEMMP) in 2013
 - However, Northwest Territories Ambient Air Quality Standard (AAQS) were not exceeded for any of the compounds



Table 1: Snap Lake Triggers to Air Quality and Emissions Monitoring and Management Plan Level III Air Quality Action Levels in 2013

Compound	2012 Average Annual Concentration [µg/m ³]	2013 Average Annual Concentration [µg/m ³]	% Change			Territorial Guidelines			Action Level Triggered
			% Year-to-Year Change	Level III Action Level Year-to-Year % Change	Exceedance of Acceptable % Year-to-Year Change	NWT Annual AAQS ^(a) [µg/m ³]	NWT 24-hr AAQS ^(a) [µg/m ³]	Exceedance of NWT AAQS	
Sulphur Dioxide, SO ₂	0.3	0.5	+67	+20	Yes	30	—	No	III
Nitrogen Dioxide, NO ₂	2.0	2.3	+15	+10	Yes	60	—	No	III
Particulate Matter ≤ 10µm, PM ₁₀	2.3	6.8	+195	+20	Yes	—	50 ^(b)	No	III
Particulate Matter ≤ 2.5µm PM _{2.5}	0.9	4.5	+400	+20	Yes	—	30	No	III

Figure 1 Action Levels for Annual Ambient PM_{2.5} Concentrations, 2013



µg/m³ = micrograms per cubic metre; PM_{2.5} = particulate matter nominally less than or equal to 2.5 microns (µm) aerodynamic diameter; NWT AAQS = Northwest Territories Ambient Air Quality Standard.



Action Plan (I)

- Given that the differences in concentrations year-to-year that triggered the Action Levels III response in 2013 were minor and that ambient concentrations never reached 15% of the respective AAQS, no additional emissions mitigation measures beyond the existing air quality management protocols are recommended in response to the observed changes in 2013



Action Plan (II)

- One action that will continue to be taken is to conduct a temporal review in the 2014 report to verify that there is no pattern of increase that is not obvious in the year-to-year comparisons. A second action will be to a review of the Action Level criteria
 - A modification should be made to the AQEMMP to set an appropriate level of sensitivity in the Action Level criteria



Comments from the Environmental Analyst

- It is agreed that the proposed changes of Action Levels should only trigger when meaningful changes to air quality emissions are observed and there is potential for AAQS exceedance at the Mine
- No concerns are raised



7.2 Emergency Response Plan

- De Beers confirmed that the only changes made to the Emergency Response Plan were administrative based
- No concerns are raised



8. Water Licence Amendment Application (I)

- DKFN provided information requests on December 22, 2014
- De Beers submitted the responses to reviewers' information requests on January 8, 2015
 - Responded to ENR's further request on January 15
 - Responded to DKFN's request on January 16
- MVLWB distributed the Agenda for the Technical Session (January 22 to 23, 2015) on January 14



8. Water Licence Amendment Application (II)

- ENR responded to YKDFN's IR #15 on January 15, 2015
- Technical Session held on January 22 to 23
- The MVLWB distributed the Information Requests and Transcripts of the Technical Session on January 27
- The Government of Canada and GNWT responded to YKDFN's IR#17 (Duty to Consult) on January 28



8. Water Licence Amendment Application (III)

- ENR responded to Technical Session IR#8 – Public Hearing Format on January 30, 2015
 - “ENR recommends that a single intervention relevant to both amendment applications be presented as evidence to the Board in a single public hearing”
- Health Canada responded to YKDFN’s IR #16 on January 30
 - “Health Canada did not participate in reviewing the environmental assessment for the Snap Lake project, and is unable to undertake a full evaluation of the information presented to date within the timeframe that was requested”
- De Beers responded to the MVLWB January 2015 Technical Session Information Requests on January 30



8.1 Technical Session

- January 22 to 23, 2015
- Participants
 - Staff from the MVLWB, EcoMetrix
 - Staff from De Beers, Golder Associates
 - Staff from Cannor-NPMO, EC
 - Staff from ENR, Lands, ITI, Pacific Environmental Research Center
 - Staff from YKDFN, NSMA, DKFN, SLEMA, MVEIRB



Technical Session on January 23, 2015



8.2 TDS – Calculated vs. Measured

- De Beers has been using calculated TDS in its reports and Amendment Applications, and might improperly compare the proposed SSWQO with the guideline number (such as the Aesthetic Objective of Drinking Water Quality Guideline, 500 mg/L) which is believed to be “measure” number



Measurement of TDS in Snap Lake

- TDS is both measured and calculated in Snap Lake
 - TDS is measured gravimetrically
 - Calculated TDS is based on the major inorganic ions, measured in mg/L, which could measurably contribute to TDS values in Snap Lake

Source: AEMP 2012 Annual Report, Section 3.3.2.3

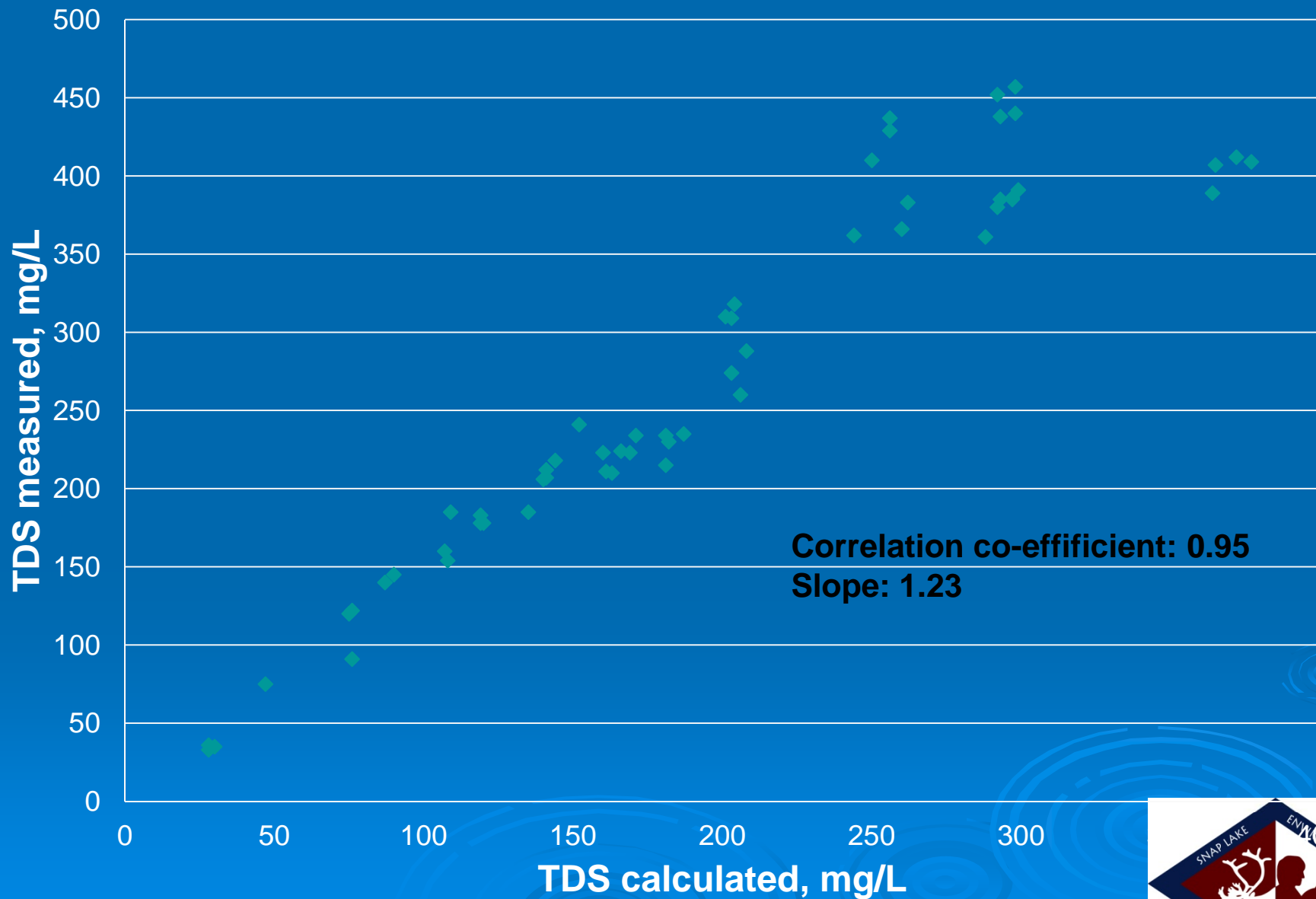


Correlation Between TDS Calculated and TDS Measured in Snap Lake

- Analysis was conducted with the data De Beers provided to ENR on January 15, 2015 (IR#4)
 - There appears to be linear correlation between TDS measured and TDS calculated with a slope of 1.23 and a correlation coefficient of 0.95, at SNP 02-20



TDS measured vs. TDS calculated at SNP 02-20



Measurement Methods in the Drinking Water Quality Guidelines

- The method most commonly used for the analysis of TDS in water supplies is the measurement of specific conductivity with a conductivity probe that detects the presence of ions in water. Conductivity measurements are converted to TDS values by a factor that varies with the type of water
- High TDS concentrations can also be measured gravimetrically, although this method excludes volatile organics
- The constituents of TDS can also be measured individually



Mineral Taste Study

- *“In an extensive, well-controlled mineral taste study conducted recently in California, the following relationship was developed between the perceived taste quality of a water supply and its TDS content: excellent, less than 300 mg/L; good, 301–600 mg/L; fair, 601–900 mg/L; poor, 901–1200 mg/L; and unacceptable, greater than 1200 mg/L.”*

Source: http://www.hc-sc.gc.ca/ewh-semt/alt_formats/hecs-sesc/pdf/pubs/water-eau/taste-gout/taste-gout-eng.pdf



Comments from the Environmental Analyst (I)

- The measured TDS may be 1230 mg/L
 - If the correlation between the measured TDS and calculated TDS could be extrapolated, and
 - If calculated TDS is 1000 mg/L in Snap Lake
- That will be in the range of unacceptable level, based on the Mineral Taste Study presented in the previous slide



Comments from the Environmental Analyst (II)

- The MVEIRB required that Snap Lake water be back to drinking water guideline (Aesthetic Objective, 500 mg/L) within 5 years
- De Beers predicted that it would be within 4 (lower bound) to 7 years (upper bound), based on calculated TDS
- The 500 mg/L of measured TDS is equivalent to 407 mg/L of calculated TDS, based on the linear correlation between them. Then that means the period of Snap Lake water quality back to the Aesthetic Objective will be a few more years than De Beers predicted



Comments from the Environmental Analyst (III)

- The comments on TDS calculated vs. measured have been distributed to related parties for consideration

