December 18, 2023

MEMO

Ambient Air Quality Monitoring – July to October, 2023

Introduction

Background and Objectives

In 2023, Baffinland submitted the Sustaining Operations Proposal (SOP) and upon review, Environment and Climate Change Canada (ECCC) provided a comment regarding the use of Capesize ore carriers and their emissions having potential impacts on air quality. In response, Baffinland and ECCC developed the following commitments:

ECCC-TRC-01 (1)	Baffinland will confirm for ECCC in November 2023 the actual dates the Capesize vessels were in the Milne Port vicinity (at berth and at anchor) in 2023; and
ECCC-TRC-01 (2)	Baffinland will conduct an internal review of the continuous air quality monitoring data from July 1 to October 31 to identify potential hourly and daily concentrations greater than the 2025 Canadian Ambient Air Quality Standards and Nunavut Ambient Air Quality Standards. Concentrations greater than the threshold will be investigated to determine potential cause. Baffinland will provide results of the review of the continuous air quality monitoring data to ECCC by December 15th, 2023. All data for the season will continue to be reported on the standard annual report timeline.

On November 28, 2023 Baffinland provided email correspondence to Eva Walker and Melissa Pinto of ECCC, confirming the actual dates the Capesize vessels were in the Milne Port vicinity (at berth and at anchor) in 2023, satisfying commitment ECCC-TRC-01(1).

The remainder of this memo focuses on satisfying commitment ECCC-TRC-01(2). Continuous monitoring of gaseous ambient sulfur dioxide (SO_2) and nitrogen dioxide (NO_2) is carried out at the Mary River Mine Site Complex (MSC) and the Milne Port Site Complex (PSC) in adherence to the Project Certificate Term and Conditions No. 7 and No. 8. Typically, continuous ambient air quality monitoring for SO_2 and NO_2 is conducted at the Project Development Area (PDA) boundary. However, due to the absence of power sources along the PDA boundary, the SO_2 and NO_2 monitors are located in active areas of the facility, such as accommodation and office facilities.

At the MSC and PSC ambient air quality monitoring stations using Met One Beta Attenuation Mass Monitors (BAM 1020s) are used to measure total suspended particulates (TSP) and respirable particulates with a diameter of 2.5 µm or less ($PM_{2.5}$).

Monitoring Locations

The Mary River Project has two permanently installed continuous air quality monitoring stations, one at the MSC and another at the PSC. Both continuous air monitoring stations consist of the following equipment and monitor for the following air quality parameters:

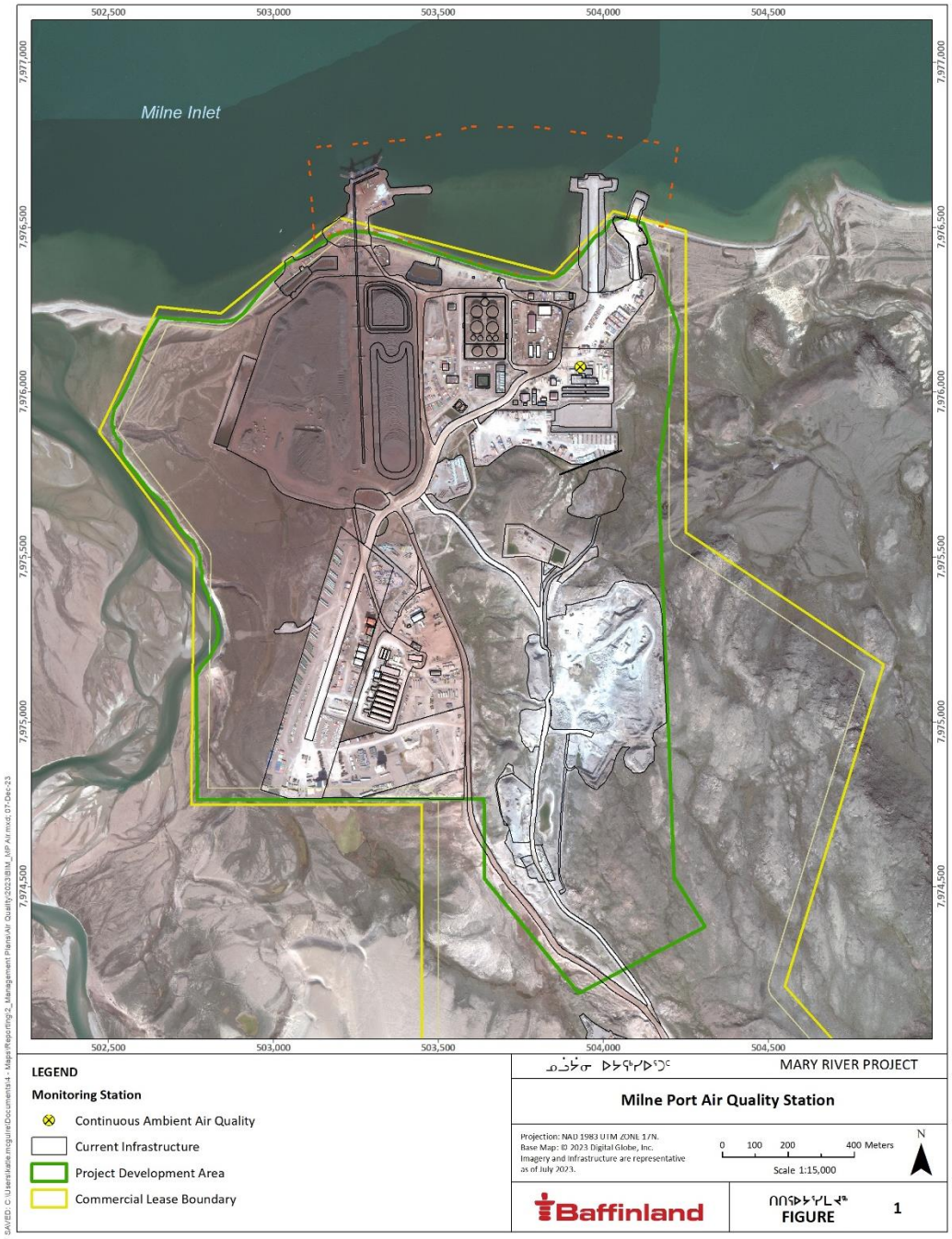
- Continuous monitoring for Nitrogen Oxides (NOx) and NO_2 using a Teledyne API Model T200 NOx analyzer, and SO_2 using the Teledyne API Model T100 UV Fluorescence SO_2 Analyzer.

Continuous monitoring for ambient TSP and $PM_{2.5}$ concentrations utilize the Met One BAM 1020 air quality monitoring instrument.

It is important to note that both the Canadian and Nunavut Ambient Air Quality Standards are intended to monitor ambient air quality "at the fenceline" and are not applicable to the locations where a reliable power supply has dictated these stations need to be located within the PDA boundary.

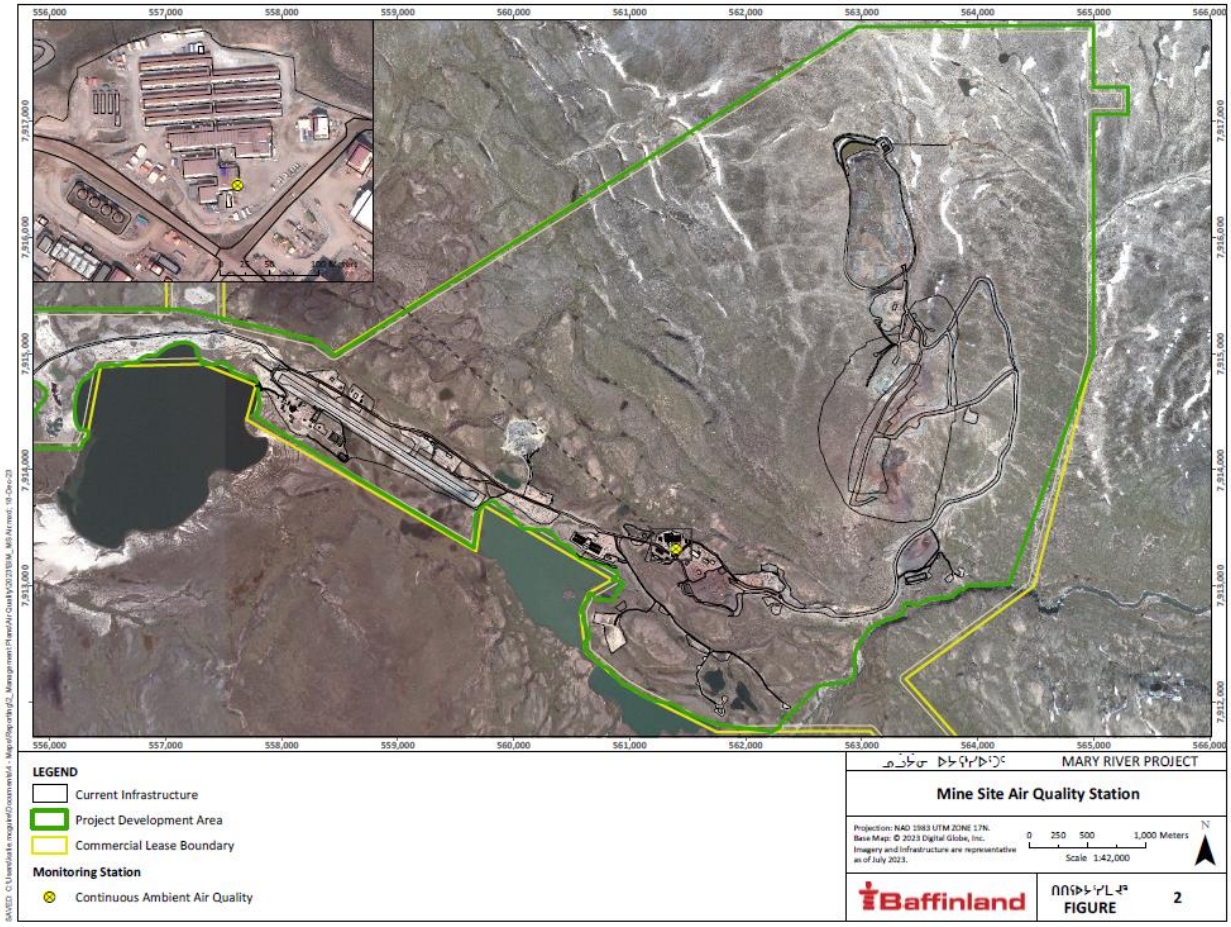
Milne Port

The continuous ambient air quality monitoring station at Milne Port is located at the PSC , within the PDA (aka, “the fence line”), and as shown in the figure below.



Mary River Mine Site

The continuous ambient air quality monitoring station at Mary River is located at the MSC, within the PDA (aka, “the fence line”) and as shown in the figure below.



Methodology

Monitoring results from Mary River were excluded from this analysis, due to the initial concern centering around the Capesize vessels calling into Milne Port, and the monitoring period lining up with the shipping season. The Mary River air quality station is ~100 km from Milne Port and would not receive any influence from the air emissions from any vessels, including the Capesize.

There were three visits of two Capesize vessels in 2023, The Hauke Oldendorff, which visited August 25-26, and September 25-26, and the Heide Oldendorff, which visited September 4-5.

Ambient air quality monitoring results from Milne Port from July 1 – October 31, 2023 for NO_2, SO_2, $PM_{2.5}$ and TSP were used for this analysis. While NO_2 and SO_2 values were documented on an hourly basis, $PM_{2.5}$ and TSP were assessed based on 24-hour averages to coincide with their respective 2025 CAAQS and NAAQS. Given that this analysis covers a three-month period, it is important to note a study limitation: the statistical form of the 2025 CAAQS, as detailed in Table 1, necessitates a three-year average of the 98-99th percentile for comparison.

The CAAQS established by the Canadian Council of Ministers of the Environment (CCME) for 2025 and the NAAQS established by the Government of Nunavut (GN) in 2011 were compared to the measured ambient air quality data from Mary River and Milne Port. Instances where values exceeded the standard are summarized in Tables 4 and 5. An investigation into the potential causes for exceedances was undertaken and the results are discussed in the footnotes to Tables 4 and 5.

Table 1: 2025 Canadian Ambient Air Quality Standards used in this Assessment

Pollutant	Averaging Time	Statistical Form	Units	CAAQS
Sulphur Dioxide (SO_2)	1-hr	The 3-year average of the annual 99th percentile of the SO2 daily maximum 1-hour average concentrations.	ppb	65
Nitrogen Dioxide (NO_2)	1-hr	The 3-year average of the annual 98th percentile of the daily maximum 1-hour average concentrations.	ppb	42
Fine Particulate Matter ($PM_{2.5}$)*	24-hr	The 3-year average of the annual 98th percentile of the daily 24-hour average concentrations.	µg/m^3	27

Note: The 2020 CAAQS value was used as there is no published 2025 CAAQS value for $PM_{2.5}$.

Table 2: 2011 Nunavut Ambient Air Quality Standards used in this Assessment

Pollutant	Averaging Time	Statistical Form	Units	NAAQS
Sulphur Dioxide (SO_2)	1-hr	1 hour average	ppb	172
Nitrogen Dioxide (NO_2)	1-hr	1 hour average	ppb	213
Fine Particulate Matter ($PM_{2.5}$)	24-hr	24 hour average	$\mu g/m^3$	30
Total Suspended Particle (TSP)	24-hr	24 hour average	$\mu g/m^3$	120

Results

It is important to acknowledge the aforementioned study limitation and that the commitment as written is fundamentally flawed for the following reasons:

1. As noted above, the majority of the 2025 CAAQS are intended to be applied at the "fence line" or boundary of the operation to monitor the potential increase loading of air contaminants to the ambient air quality. The 2025 CAAQS are not intended to be applied within an active industrial site.
2. The 1-hour limits listed above are intended to be applied to a 3-year running average, and the commitment asks for a comparison to the limits from 4 months of measured ambient air quality data only, and to compare raw daily numbers to limits based on averages of percentiles over that 3-year timeframe.

Therefore, any comparisons presented here of results to the 2025 CAAQS do not reflect the intent of the CCME Air Quality Management System that fostered their development and are being miss-applied as strict limits.

Tables 3 and 4 present a summary of the ambient air quality monitoring results compared to the 2025 CAAQS and the 2011 NAAQS.

Table 3: Monitoring Results compared to 2025 Canadian Ambient Air Quality Standards

Pollutant	Averaging Time	Units	CAAQS	Milne Port Maximum Value
Sulphur Dioxide (SO_2)	1-hr	ppb	65	1.3
Nitrogen Dioxide (NO_2)	1-hr	ppb	42	18
Fine Particulate Matter ($PM_{2.5}$)*	24-hr	$\mu g/m^3$	27	21

Table 4: Monitoring Results compared to 2025 Canadian Ambient Air Quality Standards

Pollutant	Averaging Time	Units	CAAQS	Milne Port		
				Period Average	Number of Hourly/Daily Exceedances[1]	Exceedances[1] During Capesize Vessel Docking
Sulphur Dioxide (SO_2)	1-hr	ppb	65	1.2	0	0
Nitrogen Dioxide (NO_2)	1-hr	ppb	42	7.1	**71[2]**	0
Fine Particulate Matter ($PM_{2.5}$)	24-hr	µg/m^3	27	3.5	0	0

Note: Bold and shaded entries exceed the applicable limits.

1. Hourly limits are miss-applied in this instance and are not representative of true exceedances. Limits are intended to be based on a 3-year average of the 98th or 99th percentile of the daily maximum concentrations, not hourly instantaneous readings.

2. There were 71 instances of the 1-hour averageNO_2 concentrations exceeding the CAAQS "limit" of 42 ppb. These typical exceedances of NO_2 may be attributed to vehicles or other diesel combustion equipment occasionally operating at locations near the ambient air quality monitoring stations.

Table 5: Monitoring Results compared to 2011 Nunavut Ambient Air Quality Standards

Pollutant	Averaging Time	Units	NAAQS	MILNE PORT		
				Period Average	Number of Daily Exceedances[1]	Exceedances[1] During Capesize Vessel Docking
Sulphur Dioxide (SO_2)	1-hr	ppb	172	1.2	0	0
Nitrogen Dioxide (NO_2)	1-hr	ppb	213	7.1	0	0
Fine Particulate Matter ($PM_{2.5}$)	24-hr	$\mu g/m^3$	30	3.5	0	0
Total Suspended Particle (TSP)	24-hr	$\mu g/m^3$	120	13	**3[2]**	0

Note: Bold and shaded entries exceed the applied limits.

1. Hourly limits are miss-applied in this instance and are not representative of true exceedances. Limits are intended to be based on a 3-year average of the 98th or 99th percentile of the daily maximum concentrations, not the hourly average measurements.

2. There were three instances of measured 24-hour average TSP concentrations exceeding the NAAQS "limit" of 120 $\mu g/m^3$. Exceedances of TSP at this station are typically due to fugitive dust emissions from nearby site roads during dry periods.

Conclusions

The commitment made under the SOP has significant limitations inherent in comparing 3-year average based limits to a 4-month data set. Further, the data does not show any observable trends of air quality impacts associated with the times that Capesize vessels were in the Milne Port area, regardless of the 2025 CAAQS or 2011 NAAQS limits being applied. Through this memo Baffinland has satisfied commitment ECCC-TRC-01(2). Given the inherent limitations outlined above, Baffinland will not be integrating similar reporting into the Annual Monitoring Report to NIRB. Baffinland does welcome further discussion with ECCC through the Annual Monitoring Report to NIRB with respect to our air quality analysis for the entire year.