Appendix 41

Meadowbank and Whale Tail 2019 Air Quality and Dust Monitoring Report

AGNICO EAGLE

MEADOWBANK GOLD PROJECT

2019 Air Quality and Dustfall Monitoring Report

In Accordance with NIRB Project Certificates No.004 and No.008

Prepared by:
Agnico Eagle Mines Limited – Meadowbank Division

March, 2020

EXECUTIVE SUMMARY

The 2019 air quality and dustfall monitoring program at Meadowbank was conducted according to the Air Quality and Dustfall Monitoring Plan - Version 3 (May, 2018).

The objective of this program is to measure dustfall, NO_2, and/or suspended particulates (TSP, PM_{10}, $PM_{2.5}$) at various monitoring locations around the Meadowbank and Whale Tail sites, Meadowbank All-Weather Access Road (AWAR), and Whale Tail Haul Road (WTHR). Meadowbank locations were established in 2011 in consultation with Environment Canada. AWAR locations were established between 2012 and 2016. Whale Tail locations were established in 2018 and/or 2019 during the regulatory permitting process for that project.

Results obtained for the measured parameters were primarily compared to Government of Nunavut (GN) Environmental Guidelines for Ambient Air Quality (October, 2011) for TSP, $PM_{2.5}$ and NO_2; BC Air Quality Objectives (August, 2013) for PM_{10}; and Alberta Ambient Air Quality Guidelines (August, 2013) for dustfall. AWAR transects are sampled to determine effectiveness of dust suppressants, and track changes in generation of road dust. WTHR transects are monitored to verify predictions made in the Final Environmental Impact Statement for that project (Golder, 2016).

For the Meadowbank site, the vast majority of TSP measurements in 2019 were well below the GN 24-h standard of 120 µg/m^3 (64 of 65 samples). The annual average TSP concentration was below the GN guideline of 60 µg/m^3. All PM_{10} results were below the BC Air Quality Objective of 50 µg/m^3 for the 24-h average, and all $PM_{2.5}$ results were below the GN guideline of 30 µg/m^3 for the 24-h average. Suspended particulate samplers were installed at the Whale Tail site in 2019, but sampling will begin in 2020.

Similarly, all measured rates of dustfall onsite at Meadowbank and Whale Tail were below the Alberta recreational area guideline for recreational areas (0.53 mg/cm^2/30 days) and industrial areas (1.58 mg/cm^2/30 d).

Along the Meadowbank AWAR, increased traffic rates associated with barge activity occurred in August, 2019, compared to other recent years, due to ongoing construction of the Whale Tail site. Despite this, most measured rates of dustfall along the Meadowbank AWAR continue to lie well within the range of historical values. Even in areas without dust suppression, average total dustfall during the highest-traffic period (August) was equivalent to the AB guideline for recreational areas (0.53 mg/cm^2/30d) by a distance of 100 m from the road.

For the WTHR, the majority of samples collected within 100 m of the road exceeded FEIS model predictions for dust deposition. However, since dustfall canisters collect particles up to 0.85 mm, while FEIS models typically assess deposition of particles only up to 0.30 µm, this is considered a very conservative, screening-level comparison. To optimize the comparison, Agnico will collect all dustfall samples on stands (2-m height), rather than at ground level in 2020. Result of that assessment will be used to understand any needs for supplemental mitigation moving forward.

The GN annual average standard for NO_2 of 32 ppb was not exceeded at either monitoring location on the Meadowbank site or Whale Tail site.

Estimated greenhouse gas emissions for the Meadowbank site as reported to Environment Canada's Greenhouse Gas Emissions Reporting Program in 2019 were 189,876 tonnes CO_2 equivalent, which is similar to the values reported in recent years.

A summary of incinerator stack testing results is provided. The measured concentrations of mercury were below the GN standard of 20 µg/Rm^3 in all three tests. Measured concentrations of total dioxins and furans were also below the GN standard (80 pg TEQ / Rm³ @ 11 % v/v O_2) in all three tests.

Aside from potentially elevated dustfall rates along the Whale Tail Haul Road in 2019, there are no apparent trends towards increasing or unpredicted air quality concerns at the Meadowbank site. Rates of dustfall will be reviewed in 2020 following the implementation of refined sampling methods (~2-3 m height rather than ground level). Supplemental methods for dust mitigation in 2020 are described in the 2020 Air Quality and Dustfall Monitoring Plan (V5).

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SECTION 1 • INTRODUCTION

1.1 BACKGROUND AND OBJECTIVES

Since November, 2011, Agnico Eagle Mines Ltd. (Agnico) has conducted outdoor dust and air quality monitoring at the Meadowbank site, near Baker Lake, Nunavut, as required under NIRB Project Certificate No. 004. In 2018, Agnico was issued NIRB Project Certificate No. 008 for development of the Whale Tail site, a satellite deposit at the Meadowbank Mine.

In accordance with conditions of these Project Certificates, air quality and dustfall monitoring in 2018 followed the Air Quality and Dustfall Monitoring Plan - Version 3 (May, 2018). The objective of this program is to monitor ambient air quality around the Meadowbank site and Whale Tail site. Dustfall is also monitored along the Meadowbank All-Weather Access Road (AWAR) and Whale Tail Haul Road (WTHR) as a component of this plan.

Parameters measured at various locations include suspended particulates (TSP, PM_{10}, $PM_{2.5}$), NO_2 and dustfall. Onsite dustfall and NO_2 are measured over one-month periods throughout the year, and suspended particulates are measured over 24 hour periods on a six day cycle throughout the year. Road-side dustfall along the All-Weather Access Road and Whale Tail Haul Road is measured in transects over two one-month periods during the summer season, when peak traffic rates occur.

This report provides results of current year air quality monitoring (Section 4), historical trends (Section 5), onsite weather data (Section 6), greenhouse gas emissions data as required by Environment Canada's Greenhouse Gas Emissions Reporting Program (GHGRP) (Section 7), and a summary of incinerator stack testing as conducted under Meadowbank's Incinerator Waste Management Plan (Agnico, 2018) (Section 8).

1.2 MONITORING LOCATIONS

For all locations, UTM coordinates are provided in Table 1, and locations are shown in relation to minesite features in Figure 1 and Figure 2.

Table 1. UTM coordinates for the Meadowbank air quality and dustfall monitoring locations (all zone 14W). * Temporary stations – see description in Section 1.2.3. ^DF-6 replaced DF-5 in May 2019. Suspended particulate samplers were installed at that location in November, but no sampling occurred in 2019.

Monitoring Location	Measured Parameters	Easting	Northing
DF-1	TSP, PM_{10}, $PM_{2.5}$, NO_2, dustfall	636850	7217663
DF-2	TSP, PM_{10}, $PM_{2.5}$, NO_2, dustfall	637895	7213049
DF-3	Dustfall	639599	7213198
DF-4	Dustfall	639233	7217074
DF-5 (Jan – May)	NO_2, dustfall	608301	7255973
DF-6 (May – Dec)	(TSP, PM_{10}, $PM_{2.5}$)^ NO_2, dustfall	608842	7254348
DF-7			
AWAR km 18	Dustfall	640208	7152082
AWAR km 78	Dustfall	626155	7199739
AWAR km 11*	Dustfall	643278	7164040
AWAR km 25*	Dustfall	636725	7157526
AWAR km 50*	Dustfall	625424	7175033
AWAR km 69*	Dustfall	627418	7192523
AWAR km 80*	Dustfall	628101	7203786
WTHR km 134 (formerly km 18)	Dustfall	630941	7234375
WTHR km 151 (formerly km 36)	Dustfall	618132	7238621
WTHR km 169 (formerly km 54)	Dustfall	613782	7249508

PROJECT: DA11-062-08

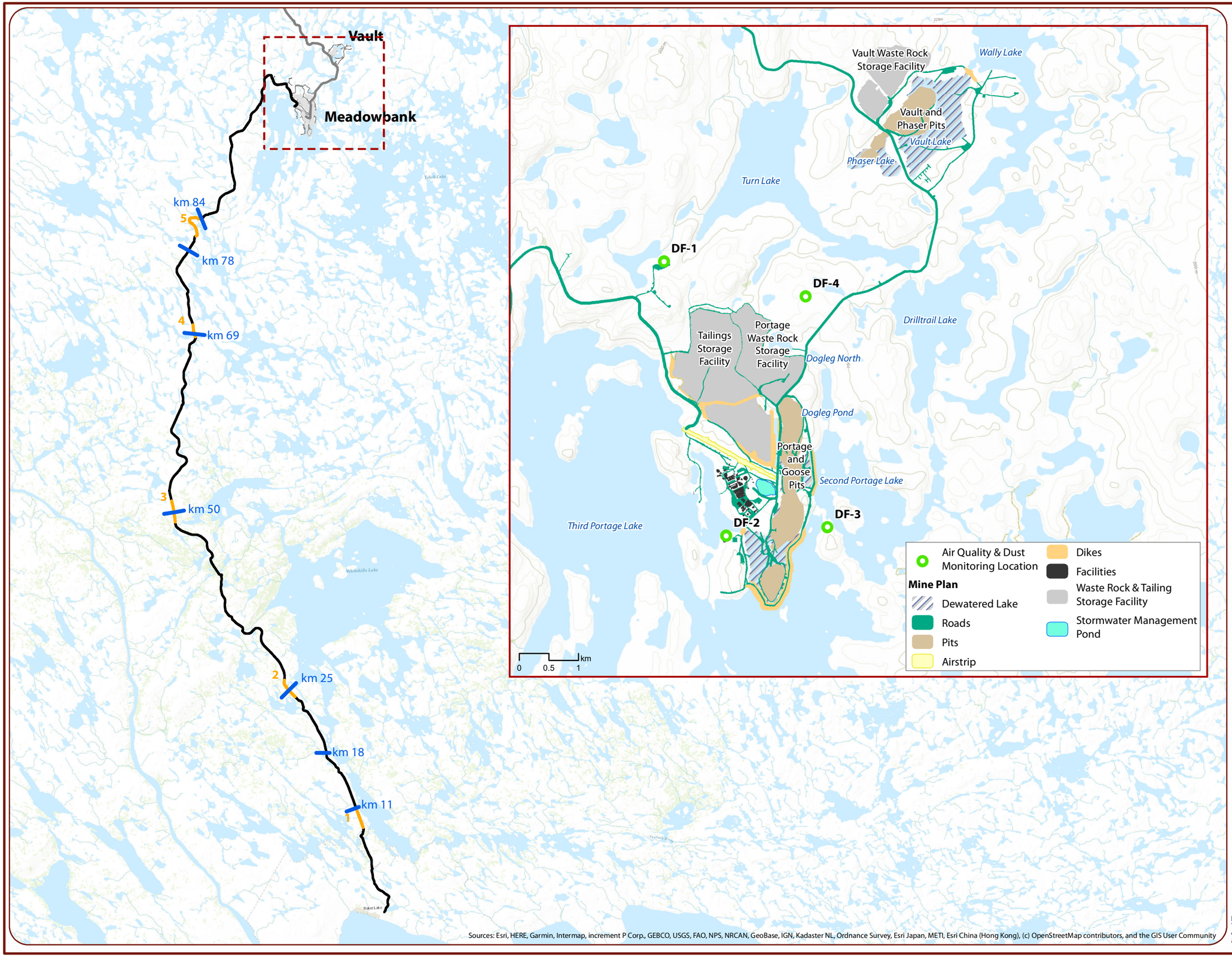
CLIENT: Agnico-Eagle Mines Ltd. Meadowbank Division

DATE: 12, March 2020

DRAWN BY: Janel Sauder

Figure 1: Air Quality and Dustfall Monitoring Locations

Meadowbank Site and All Weather Access Road



Dustfall Monitoring Transect

Dust Suppression

Mine Plan

All Weather Access Road (AWAR)

Road

Mine Site

Dust Suppression:

Segment #	Road Segment
1	Km 10 - Km 12
2	Km 24 - Km 26
3	Km 48 - Km 50
4	Km 68 - Km 70
5	Km 80 - Km 84

0 4 8 16

Kilometres

SCALE: 1:350,000

N

UTM Zone 17N NAD83

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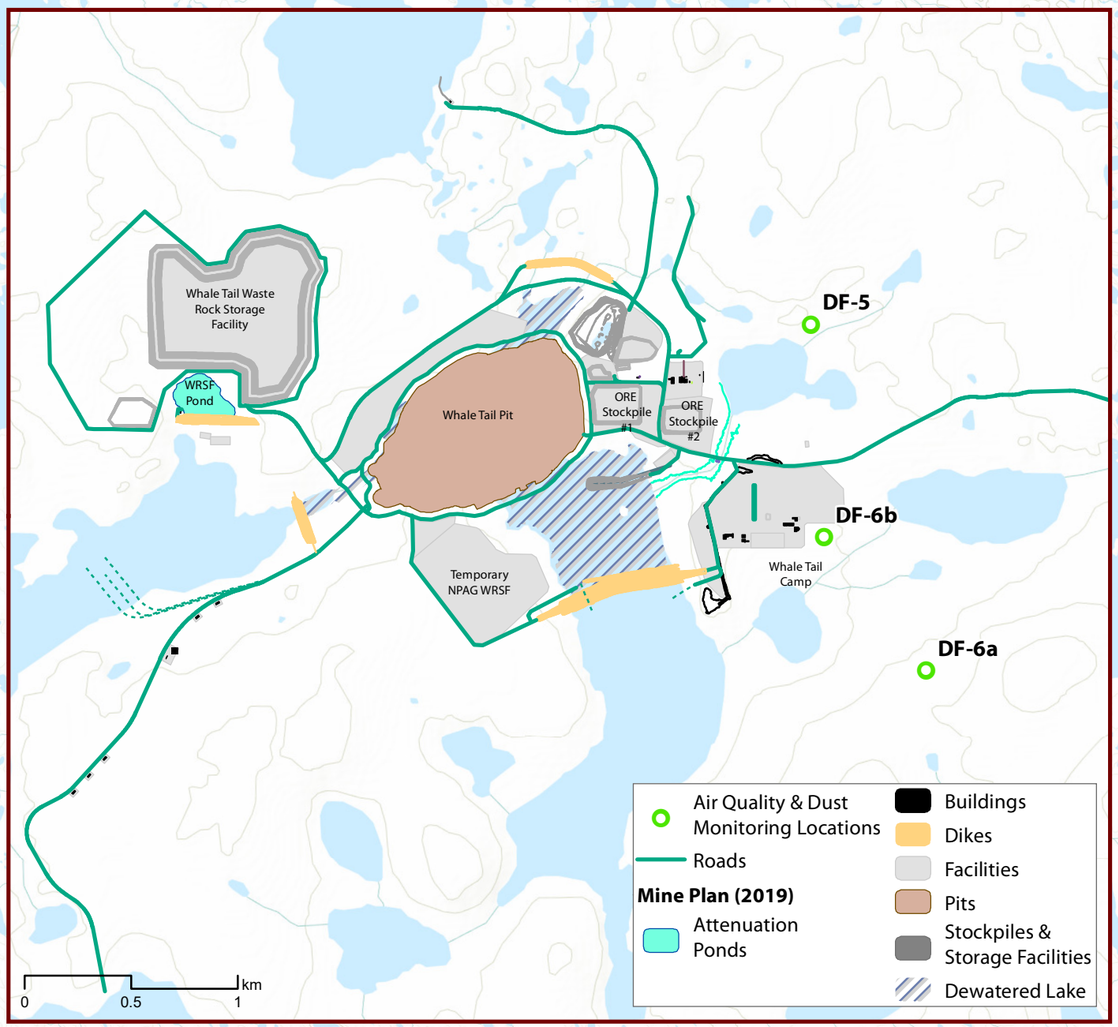
Figure 2: Air Quality and Dustfall Monitoring Locations

Whale Tail Site and Whale Tail Haul Road



Legend

- Dustfall Monitoring Transects
- Dust Suppression

Mine Plan (2019)

- Whale Tail Haul Road
- Road
- Mine Site

0 2 4 8

Kilometres

SCALE: 1:185,000

N

UTM Zone 17N NAD83

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1.2.1 Meadowbank Onsite Locations DF-1 – DF-4

Monitoring locations on the Meadowbank site were determined in consultation with Environment Canada in 2011. One station was moved in 2012 due to changes in the location of the Vault haul road (see 2012 Annual Report – Air Quality and Dust Monitoring Report).

Station DF-1 is located next to the explosive storage area (emulsion plant), and approximately 500 m north of the all-weather access road. PM_{10} and $PM_{2.5}$, NO_2 and dustfall are monitored at this location year-round.

Station DF-2 is located at the northern corner of South Camp Island, near the TCG contractor area. All parameters (TSP, PM_{10} and $PM_{2.5}$, NO_2 and dustfall) are monitored at this location year-round.

Station DF-3 is approximately 1,800 m east of the East Dike. According to the Plan, dustfall only is monitored at this location year-round.

Station DF-4 is approximately 1,500 m southwest of Vault Pit. The original location of this monitoring station was chosen before the beginning of the construction of the Vault Road. Realignment of the road during construction placed the station within 10 feet of the road. Therefore, Agnico re-positioned Station DF-4 approximately 480 m to the north-west on February 29, 2012 to be representative of the originally intended location relative to the road. According to the Plan, dustfall only is monitored at this location year-round.

1.2.2 Whale Tail Onsite Location DF-5 and DF-6

Station DF-5 (Figure 2) is sited with the communications tower on the eastern boundary of the Whale Tail Pit in an area predicted to receive elevated concentrations of particulate matter (TSP, PM_{10} and $PM_{2.5}$) and NO_2 relative to concentrations predicted further from the project footprint. Monitoring at DF-5 was planned to include TSP, PM_{10}, $PM_{2.5}$, passive NO_2, and dustfall year-round. Monitoring at this station occurred for dustfall and NO_2 from January – May, 2019. The Whale Tail onsite air quality monitoring station was then switched to DF-6 as a result of discussions with regulators during permitting for the Whale Tail Expansion Project. DF-6 is located on the southern edge of the main camp in an area identified as significant for determination of particulate matter. In 2019 only passive NO_2 and dustfall were measured at this location (DF-6a). A suspended particulate monitoring station will be installed during winter 2019-2020 at DF-6b where power is available.

1.2.3 Meadowbank AWAR Dustfall Transects

Dustfall transects were established beginning in 2012 at kilometers 18 and 78 along the Baker Lake to Meadowbank Mine AWAR (Figure 1). Dustfall samples are collected twice during the summer season over one-month averaging periods. According to the Plan, monitoring at these transects includes stations at 25 m, 100 m, 300 m and 1000 m from the road on both sides (east/downwind and west/upwind). These distances were chosen to bracket the smallest predicted zone of influence (ZOI) of 100 m. The zone of maximum dustfall has previously been reported to be within 300 m of roads under heavier use than the Meadowbank AWAR (Auerbach et al. 1997). Samples at the 1000 m mark on the upwind side are considered reference locations.

In recent years (from 2017), transects have also been monitored in five locations where dust suppressant is applied (km 11, 25, 50, 69, 80). The purpose of these temporary monitoring stations is to evaluate dust mitigation measures in comparison to the reference sites at km 18 and 78.

1.2.4 Whale Tail Haul Road Dustfall Transects

Dustfall transects were established between kilometers 18 & 19, 36 & 37, and 54 & 55 along the Whale Tail Haul Road (WTHR) in 2018 (Figure 2). In 2019, the WTHR km markers were re-named as a continuation of the AWAR. The WTHR thus begins at km 115, and the sampling locations were renamed as km 134, 151, and 169, respectively.

Dustfall samples are collected twice during the summer season over one-month averaging periods. Each transect includes stations at 25 m, 100 m, 300 m and 1000 m upwind, (east/north) and downwind (west/south) of the haul road.

SECTION 2 • DATA ANALYSIS

2.1 MEADOWBANK AND WHALE TAIL ONSITE LOCATIONS

Data collected from the onsite air quality monitoring program was compared to the available Government of Nunavut Environmental Guidelines for Ambient Air Quality (October, 2011). Guidelines for the measured parameters are provided in Table 2.

Table 2. Government of Nunavut Environmental Guidelines for Ambient Air Quality (October, 2011) for the parameters of concern at Meadowbank. All values are for data normalized to standard conditions of 25°C and 101.3 kPa. *See text below for description of standards used from other jurisdictions.

Parameter	Averaging Period	GN Guideline		Other Standard*
		µg/m³	ppb	
Total Suspended Particulate (TSP)	24-h average	120		
	Annual average	60		
Coarse Particulate Matter (PM_{10})	24-h average			50 µg/m³
Fine Particulate Matter ($PM_{2.5}$)	24-h average	30		28/27 µg/m³
	Annual average			10/8.8 µg/m³
Nitrogen Dioxide (NO_2)	Annual average	60	32	17 ppb
Dustfall	30 day- average			0.53/1.58 mg/cm²

*Other Standards:

In 2015, the Canadian Council of Ministers of the Environment adopted new Canadian Ambient Air Quality Standards (CAAQS) for $PM_{2.5}$. New CAAQS will come into effect for data collected beginning in 2020. Although these have not yet been incorporated into Nunavut's guidelines, the published 24-h values for $PM_{2.5}$ of 28 and 27 µg/m³ (2015 and 2020, respectively) and annual average of 10 and 8.8 µg/m³ (2015 and 2020, respectively) are addressed here for reference. The 2020 CAAQS for the annual average NO_2 (17 ppb) is also identified. CAAQS values represent voluntary objectives for an individual site, and are typically used at a regional scale for airshed planning purposes

No GN standard is available for coarse particulate matter (PM_{10}) so results were compared to the BC Air Quality Objective (August, 2013) of 50 µg/m³.

Likewise, standards for dustfall are not available for Nunavut. Results of the dustfall analysis were compared to the Alberta Environment Department recreational area guideline for total dustfall (August, 2013) of 0.53 mg/cm²/30d and commercial/industrial guideline of 1.58 mg/cm²/30d, to provide context. It should be noted that these guidelines are typically assumed to apply to specific sources of dust, i.e. over and above background dustfall rates, so comparisons to monitoring results are considered conservative.

For the Whale Tail site location, maximum modeled values plus background concentrations of some criteria contaminants are expected to exceed air quality standards. Measured values at DF-5/DF-6 will therefore also compared to these values to ensure modeling adequately captured the worst-case

scenario. Maximum predicted values for the Whale Tail pit site are shown in Table 3. Dustfall rates were predicted for the haul road (see Section 2.3) but not for the Whale Tail site.

Table 3. Maximum predicted plus background concentrations of measured criteria air contaminants for the Whale Tail site (Golder, 2016).

Parameter	Time Frame	Maximum Predicted plus Background Concentration
Total Suspended Particulate (TSP)	24-h average	174 µg/m^3
	Annual geometric mean	16.9 µg/m^3
Coarse Particulate Matter (PM10)	24-h average	52.4 µg/m^3
Fine Particulate Matter (PM2.5)	24-h average	20.1 µg/m^3
	Annual geometric mean	4.3 µg/m^3
Nitrogen Dioxide (NO_2)	Annual arithmetic mean	4.4 ppb

2.2 MEADOWBANK AWAR DUSTFALL TRANSECTS

The primary goal of AWAR dustfall monitoring is to verify that a reduction in dustfall is occurring for segments of the road where dust suppression is applied.

No regulatory standards for dustfall are available for the territory of Nunavut, and those available elsewhere are based on aesthetic or nuisance concerns. On this basis, Alberta Environment has published a guideline for total dustfall in recreational/residential areas of 0.53 mg/cm^2/30d, and a guideline for commercial/industrial areas of 1.58 mg/cm^2/30d. Total dustfall results for AWAR transects are compared to these guidelines to provide context.

Results are also compared to the range of background dustfall rates (samples collected at the Inuggugayualik Lake reference site in 2014 & 2019, proposed Amaruq road location in 2015, and 1000 m upwind samples in 2016 - 2019).

Trends over time (year-over-year, and July vs. August sampling) are identified, as appropriate. Fixed (non-combustible) dustfall is primarily considered in these comparisons, since it is determined to be more representative of road material than total dustfall, which includes organic components (e.g. pollen, plants, animal particles).

2.3 WHALE TAIL HAUL ROAD DUSTFALL TRANSECTS

The primary goal of Whale Tail Haul Road dustfall monitoring is to track trends in dustfall generated by haul road traffic, and verify predictions made during the FEIS process. Comparisons to quantitative FEIS predictions are considered more pertinent than Alberta Environment guidelines for dustfall, since guidelines are based on aesthetic concerns whereas predicted dust deposition rates were used to quantitatively assess impacts across various metrics for environmental health.

However, due to differences in particle sizes collected by static dustfall monitors (typically < 0.85 mm) and those assessed through air quality emissions and dispersion modelling (typically < 0.30 µm), these are considered conservative, screening-level comparisons only. Since dustfall canisters collect particles across a much wider range of sizes than included in standard modeling, they are very likely

to measure higher rates of total dustfall than those specified in the FEIS. However, if measured dustfall is lower than predicted dustfall, model results can be verified as extremely conservative.

Table 4 shows FEIS-predicted maximum monthly dust deposition from haul-road generated dust as a function of distance from the road. Results of the Whale Tail Haul Road monitoring program (total dustfall) are compared to these values plus background concentrations of total dustfall. A background dustfall value of 0.27 mg/cm^2/30d is assumed, based on the maximum dustfall rate measured in this area (km 37, now km 152) during baseline studies for this area in 2015.

In general, the FEIS predicted that atmospheric deposition of nuisance dust may exceed monthly recreational/residential guidelines within 300 m of the haul road, but are not expected to exceed monthly industrial/commercial guideline at distances greater than approximately 100 m from the haul road.

Table 4. Predicted maximum monthly dust deposition rate as a function of distance from the Whale Tail Haul Road (Golder, 2016).

Distance (m)	Predicted Dust Deposition (mg/cm^2/30d)	Measured Background Dust Deposition (mg/cm^2/30d)	Predicted + Background Dust Deposition (mg/cm^2/30d)
25	1.19	0.27	1.46
100	0.56	0.27	0.83
300	0.26	0.27	0.53
1000	0.11	0.27	0.38

SECTION 3 • MONITORING METHODS

3.1 TSP, PM_{10}, $PM_{2.5}$

In 2019, Agnico Eagle field staff aimed to sample suspended particulates (TSP, PM_{10}, $PM_{2.5}$) for 24-h periods every six days using Partisol Plus Model 2025 Sequential Air Samplers (TSP) and Partisol Plus Model 2025-D Dichotomous Sequential Air Samplers ($PM_{2.5}$ and PM_{coarse}). Partisol samplers draw in a stream of ambient air at a controlled flow rate, and particulates are collected on a pre-weighed filter supplied by an accredited laboratory. The exposed filter is then shipped back to the laboratory and re-weighed to measure the total accumulated particulates. Calculations for TSP, PM_{10} and $PM_{2.5}$ were performed according to the Partisol operating manual, as follows.

TSP is calculated as:

$$TSP = M_{TSP}/V$$

Where: TSP = mass concentration of particulates (µg/m^3)

M_{TSP} = final mass of TSP filter – initial mass of filter (µg/filter)

V = volume of air drawn in during the sampling period (~24 m^3)

Since the dichotomous unit splits the intake air stream to determine $PM_{2.5}$ and PM_{coarse} ($PM_{10\text{-}2.5}$), the volume of air is different for each filter. Calculations are performed as follows:

$PM_{2.5}$ is calculated as:

$$PM_{2.5} = M_{2.5}/V_{2.5}$$

Where: $PM_{2.5}$ = mass concentration of particulates (µg/m^3)

$M_{2.5}$ = final mass of $PM_{2.5}$ filter – initial mass of filter (µg/filter)

$V_{2.5}$ = volume of air drawn through the $PM_{2.5}$ filter during the sampling period (~21.7 m^3)

And PM_{coarse} is calculated as:

$$PM_{coarse} = M_{coarse}/V_{total} – PM_{2.5}(V_{coarse}/V_{total})$$

Where: PM_{coarse} = mass concentration of particulates (µg/m^3)

M_{coarse} = final mass of PM_{coarse} filter – initial mass of filter (µg/filter)

V_{total} = total volume of air drawn into unit during sampling (~24m^3)

V_{coarse} = volume of air drawn through the PM_{coarse} filter during the sampling period (~2.4 m^3)

Concentration of PM_{10} is then calculated as PM_{coarse} + $PM_{2.5}$.

For comparison to Government of Nunavut Ambient Air Quality Guidelines (2011), concentrations of particulates need to be calculated using air volumes normalized to 25°C and 101.3kPA (standard temperature and pressure; STP). Depending on system settings, standardized volumes were either recorded by the Partisol unit, or were calculated from average temperature and pressure values recorded by the Partisol unit during the sampling period.

3.2 DUSTFALL

In accordance with ASTM methods for dustfall measurement (ASTM, 2004), dustfall samples were collected in open vessels containing a purified liquid matrix provided by an accredited laboratory (Maxxam Analytics). Particles are deposited and retained in the liquid, which is then filtered to remove large particles (e.g. leaves, twigs) and analyzed by the accredited laboratory for total and fixed (non-combustible) dustfall. Sampling containers are deployed in the field over approximately one-month periods, and calculated dustfall rates are normalized to 30 days (mg/cm^2/30 days per ASTM 1739-98). This sampling method is widely used in air quality studies in Nunavut and elsewhere for dustfall monitoring (e.g. Baffinland, 2014; Sabina, 2012; Pretium, 2013; Taseko, 2011).

ASTM methods suggest collection of the dustfall sample at 2-3 m height on a utility pole to prevent re-entrainment of particulates from the ground, and to reduce vandalism and potential for wildlife interaction. For locations DF-1 – DF-6, samples were collected in this manner. However, due to the difficulty of constructing and deploying stands to hold the large number of sample containers used for road-side dustfall sampling, and the remote locations, the 2012 study compared dustfall at ground level and at 2 m height to inform future sampling method decisions. Based on those results and the assumption that any re-entrainment would result in conservatively high estimates of dustfall, all road-side sampling canisters have been deployed at ground level in since 2013. A supplemental study was conducted in 2019 to understand differences between samples collected at ground level and those on stands.

Difficulty with maintaining canisters upright in 2013 during strong winds resulted in the use of heavy plastic pipe pieces to surround and support canisters starting in 2014. These supports were maintained at a height lower than the canister opening so that dust deposition was not impeded. These supports have proven very effective, maintaining canisters upright even during high wind events.

3.3 NO_2

Concentrations of NO_2 by volume (ppb) were analyzed over one month periods (approximately 30 days) using a passive sampling device provided by Maxxam Analytics. No monitoring was proposed for other gaseous pollutants because of low concentrations predicted in pre-construction dispersion modelling (Cumberland, 2005; Golder, 2016).

The annual average NO_2 concentration by volume was calculated from the monthly data for comparison against the relevant standard.

SECTION 4 • 2019 MONITORING RESULTS

4.1 TSP, PM_{10}, $PM_{2.5}$

Sampling dates and 24-h average concentrations of TSP, PM_{10} and $PM_{2.5}$ are shown in Figures 3 - 5.

Due to ongoing difficulties in maintaining the Partisol instruments, Agnico has committed to replacing one machine per year. In addition, repairs continue to be performed or parts replaced as necessary on all units.

In 2019, the $PM_{2.5}/PM_{10}$ unit at DF-1 was repaired and installed for use on February 10. However regular sampling did not begin until May 26, due to further issues with the operation and troubleshooting of the unit, specifically a major malfunction in the filter exchange mechanism A specialized company was brought to site to review and correct outstanding failures and ensure long term reliability on the monitoring units. TSP sampling at DF-1 began on February 14 after maintenance was performed on the machine (new flow module). TSP results were obtained between February 14 – March 11, May 20-26, and July 7 – October 11.

At DF-2, a new $PM_{2.5}/PM_{10}$ unit was installed on February 10. Samples were successfully collected February 14 – March 16, September 17 – October 16, November 19 – December 19. The TSP unit at DF-2 generally operated in good condition in 2019. Results were collected January 3 – 21, February 20 – March 22, May 15 – October 16, and November 25 – December 25.

As in previous years, TSP concentrations were low, with only one sample exceeding the GN 24-h standard of 120 µg/m^3 on September 23 at DF-2 (129 µg/m^3). This maximum continues to be within the historically recorded high value of 459 µg/m^3 (Section 5.1).

The annual geometric mean concentrations of TSP at DF-1 and DF-2 were 7.0 and 6.6 µg/m^3, respectively. These estimates are well below the annual GN guideline of 60 µg/m^3, and are similar to values observed in previous years (Table 5).

Table 5. Annual geometric mean concentrations of TSP at DF-1 and DF-2. The GN guideline is 60 µg/m³.

Year	TSP (µg/m³)	
	DF-1	DF-2
2012	8	12
2013	4.6	14.0
2014	6.5	12.8
2015	5.1	9.8
2016	3.8	6.4
2017	2.1	10.5
2018	4.9	9.8
2019	7.0	6.6

As in recent years, no samples exceeded the BC Air Quality Objective of 50 µg/m³ for 24-h average PM_{10}, the GN guideline of 30 µg/m³ for 24-h average $PM_{2.5}$, or the 2015 Canadian Ambient Air Quality Standard of 28 µg/m³ for 24-h average $PM_{2.5}$ (neither was the 2020 CAAQS of 27 µg/m³ for 24-h average $PM_{2.5}$ exceeded in any individual sample). Annual average concentrations of $PM_{2.5}$ were 0.5 (n = 30) and 1.5 µg/m³ (n = 18) at DF-1 and DF-2, respectively, which are well below the 2015 and 2020 Canadian Ambient Air Quality Standards for annual average $PM_{2.5}$ of 10 µg/m³ and 8.8 µg/m³, respectively. It is noted that these comparisons are for reference only, since this CAAQS is based on the 3-year average of the annual average of all 1-hour concentrations, while Meadowbank's suspended particulate samplers analyze 24-h concentrations every 6 days.

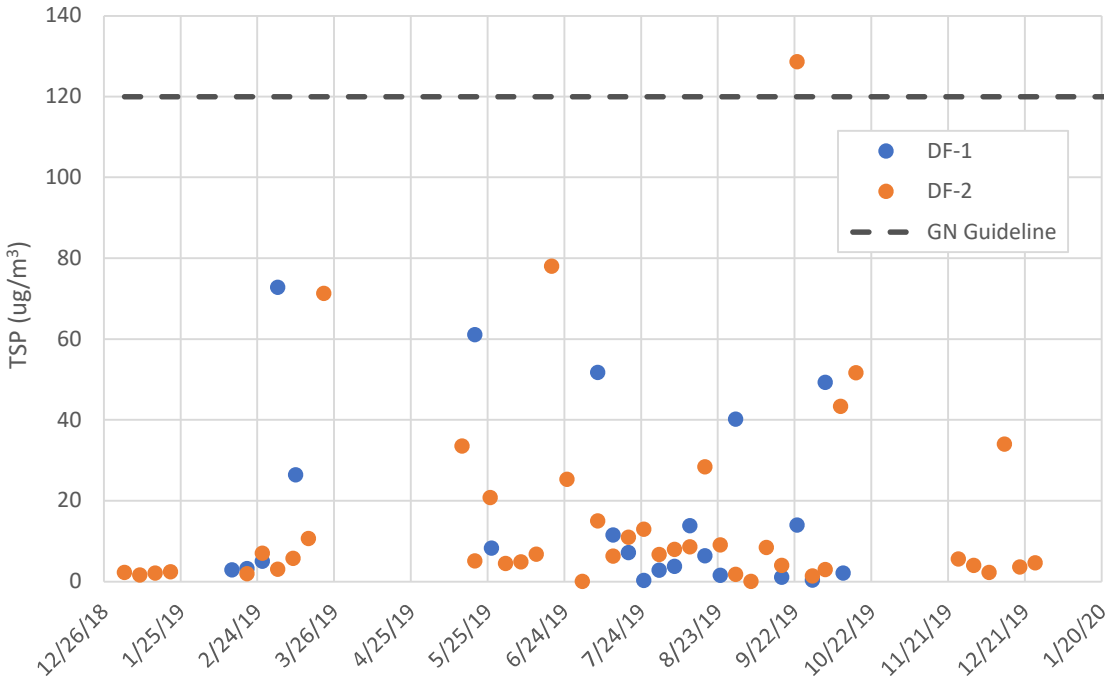

Figure 3. 24-h average concentrations of total suspended particulates (TSP) at Meadowbank stations DF-1 and DF-2. Dashed line indicates the 24-hr average GN guideline for ambient air quality.

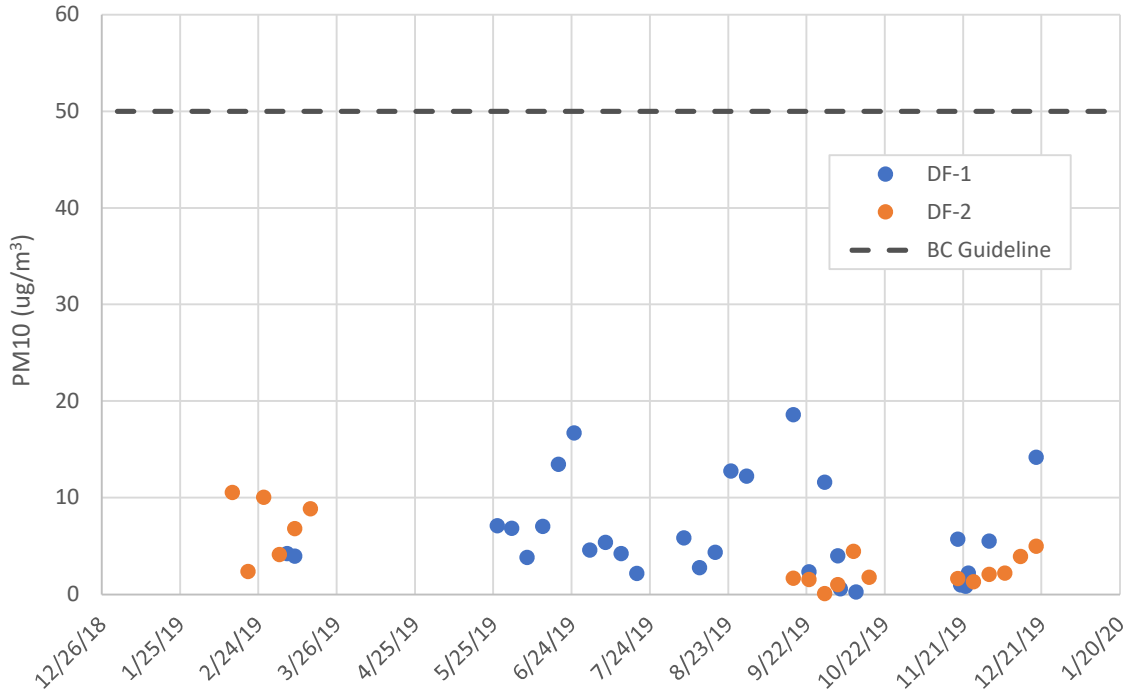

Figure 4. 24-h average concentration of airborne particulate matter less than 10 microns (PM_{10}) at Meadowbank stations DF-1 and DF-2. Dashed line indicates the BC Air Quality Objective for this parameter.

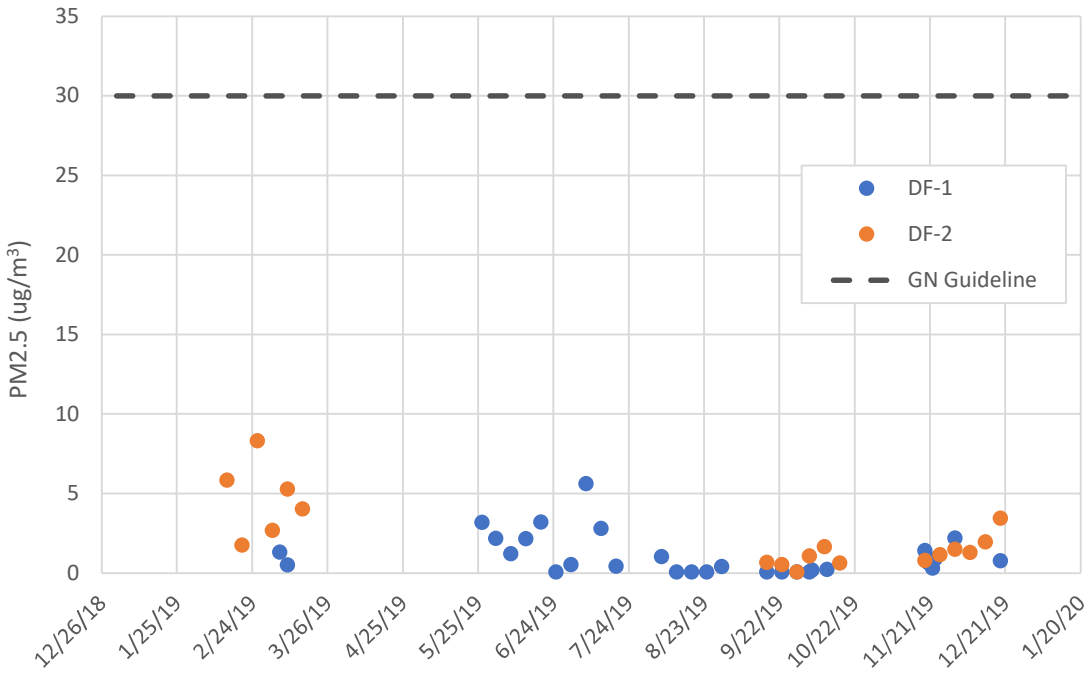

Figure 5. 24-h average concentration of airborne particulate matter less than 2.5 microns ($PM_{2.5}$) at Meadowbank stations DF-1 and DF-2. Dashed line indicates the 24-hr average GN guideline for ambient air quality.

4.2 DUSTFALL

4.2.1 Meadowbank Onsite Locations DF-1 – DF-4

Results of the 2019 dustfall sampling program (30-day normalized rates of total and fixed dustfall) are provided in Figures 6 - 9. Samples are plotted by the collection start date. To provide context, the Alberta Environment Department's recreational/residential and industrial/commercial area dustfall guidelines of 0.53 mg/cm^2/30 days and 1.58 mg/cm^2/30 days are indicated for total dustfall. These guidelines are based on aesthetic or nuisance concerns, and are to be used for airshed planning and management, as a general performance indicator, and to assess local concerns.

The recreational/residential area guideline was marginally exceeded in 1 of 48 samples, which is similar to previous years (2 exceedances in 2018, 3 exceedances in 2017, 1 in 2015 & 2016, 5 in 2014, 11 in 2013, 10 in 2012; see Figure 24). The industrial/commercial area guideline, which is most applicable to these minesite locations, was not exceeded. While the use of these guidelines is not well defined, there are no recreational or residential users within vicinity of the minesite and exceedance of occasional samples is not expected to result in significant aesthetic or nuisance concerns.

Dustfall is generally highest during the summer season, but no significant trends by location are apparent. Relatively low dustfall values overall may reflect continued efforts to manage dust on site roads through use of dust suppressants (calcium chloride application) and water trucks.

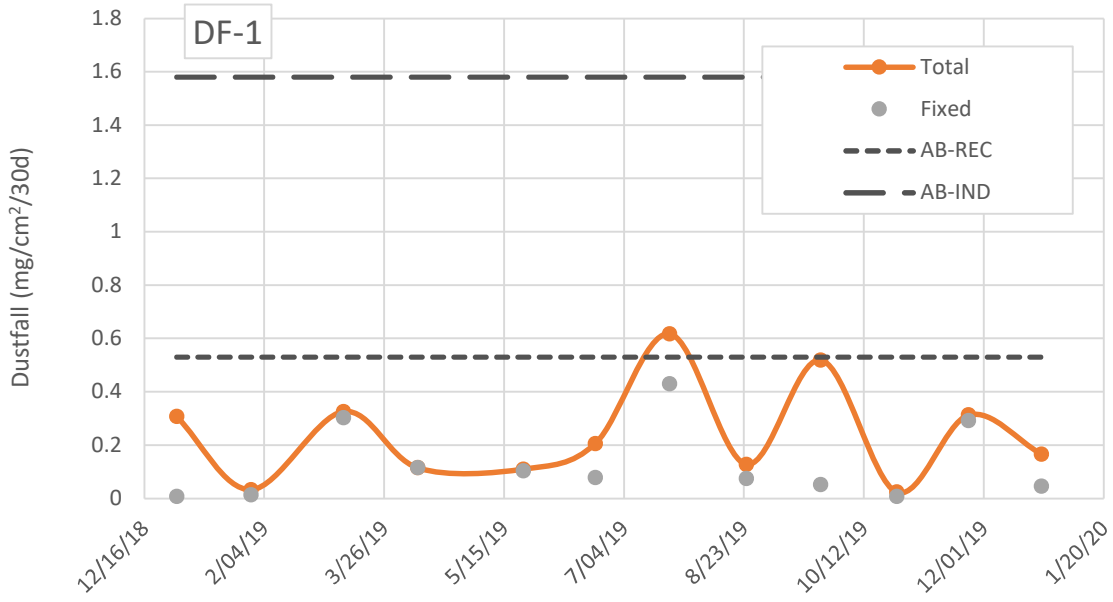

Figure 6. 30-day-normalized rates of total and fixed dustfall at DF-1 at the Meadowbank site. Points represent start date of sample collection. Dashed lines indicate the Alberta Environment Department's recreational area guideline of 0.53 mg/cm^2/30d, and industrial area guideline of 1.58 mg/cm^2/30d.

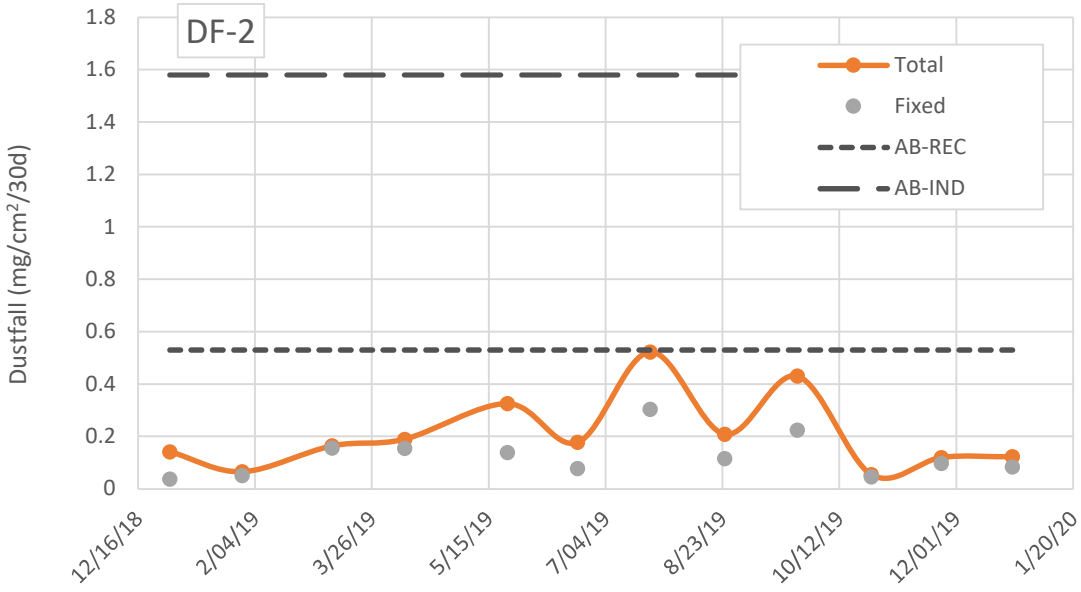

Figure 7. 30-day-normalized rates of total and fixed dustfall at DF-2 at the Meadowbank site. Points represent start date of sample collection. Dashed lines indicate the Alberta Environment Department's recreational area guideline of 0.53 mg/cm²/30d, and industrial area guideline of 1.58 mg/cm²/30d.

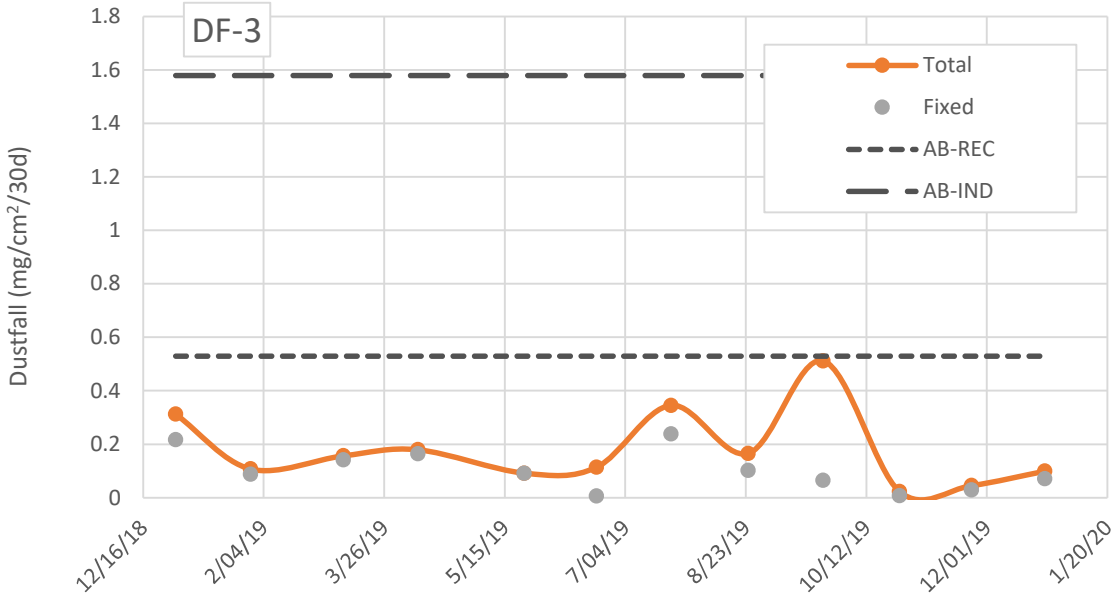

Figure 8. 30-day-normalized rates of total and fixed dustfall at DF-3 at the Meadowbank site. Points represent start date of sample collection. Dashed lines indicate the Alberta Environment Department's recreational area guideline of 0.53 mg/cm²/30d, and industrial area guideline of 1.58 mg/cm²/30d.

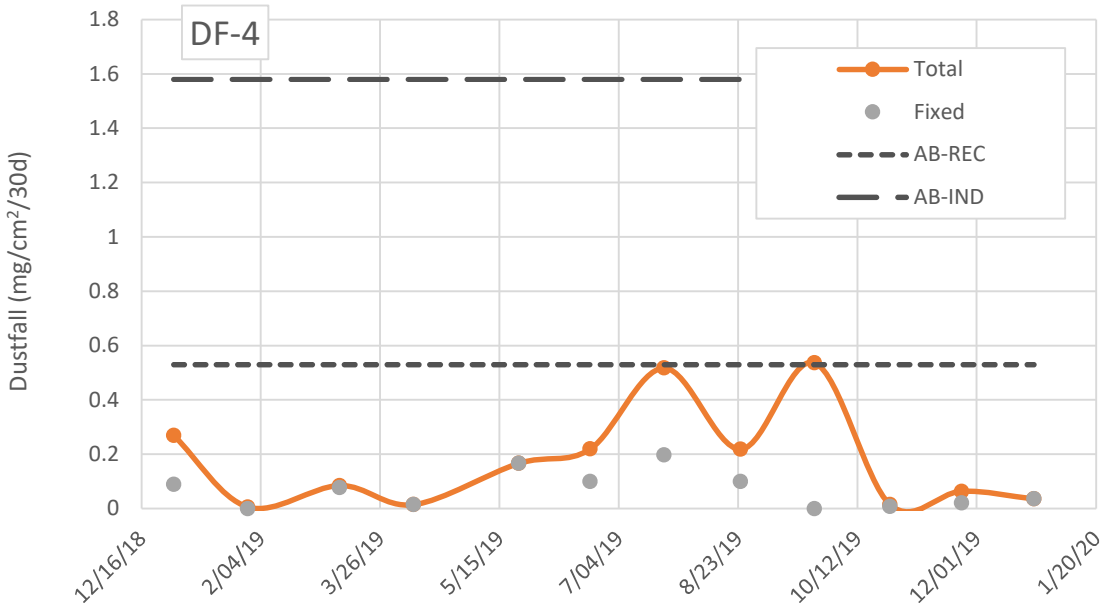

Figure 9. 30-day-normalized rates of total and fixed dustfall at DF-4 at the Meadowbank site. Points represent start date of sample collection. Dashed lines indicate the Alberta Environment Department's recreational area guideline of 0.53 mg/cm^2/30d, and industrial area guideline of 1.58 mg/cm^2/30d.

4.2.2 Whale Tail Onsite Location DF-5/DF-6

Dustfall sampling at DF-5 began in 2019, and the station was moved to DF-6 beginning in April. Results of the 2019 dustfall sampling program (30-day normalized rates of total and fixed dustfall) are provided in Figure 10. Samples are plotted by the collection start date. To provide context, the Alberta Environment Department's recreational/residential and industrial/commercial area dustfall guidelines of 0.53 mg/cm^2/30 days and 1.58 mg/cm^2/30 days are indicated for total dustfall. These guidelines are based on aesthetic or nuisance concerns, and are to be used for airshed planning and management, as a general performance indicator, and to assess local concerns.

The AB recreational/residential area guideline was met in all sample results.

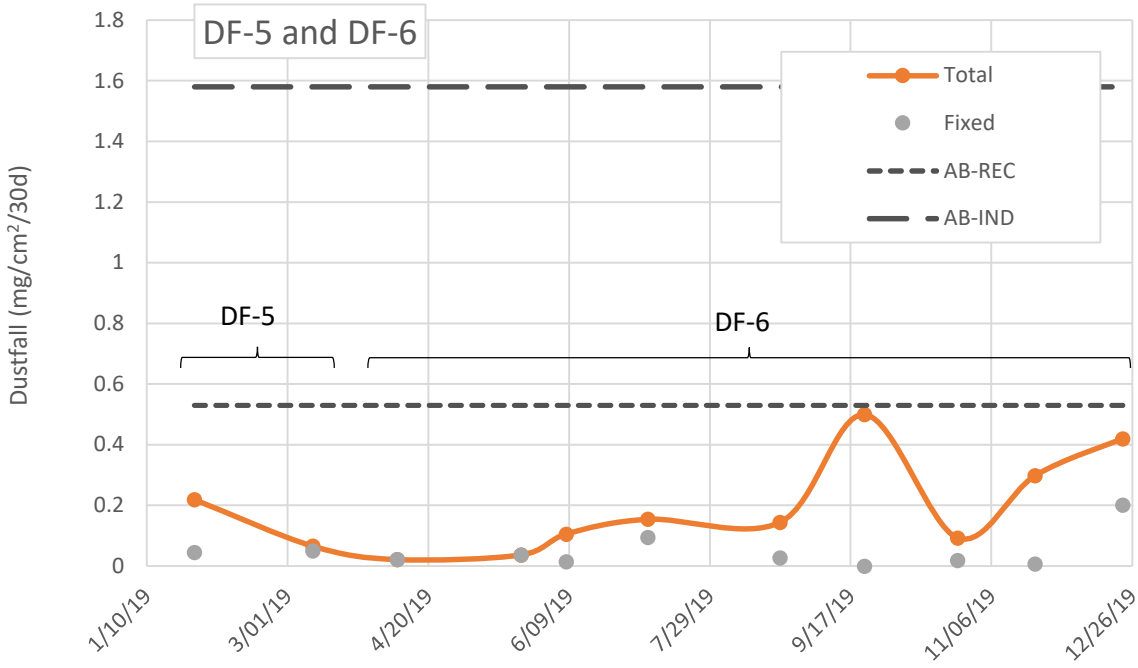

Figure 10. 30-day-normalized rates of total and fixed dustfall at DF-5 and DF-6 at the Whale Tail site. Points represent start date of sample collection. Dashed lines indicate the Alberta Environment Department's recreational area guideline of 0.53 mg/cm^2/30d, and industrial area guideline of 1.58 mg/cm^2/30d.

4.2.3 Meadowbank AWAR Dustfall Transects

Results for all samples collected in 2019 are provided in Appendix B.

4.2.3.1 Effectiveness of Dust Suppression

During the first week of July in 2019, dust suppressant (Tetraflake) was applied to five sections of the AWAR, as well as two locations in the hamlet of Baker Lake, and one area onsite. Locations are described in Table 6, and were the same as 2017 and 2018.

Table 6. Dust suppressant locations in 2019.

Location Type	Dust Suppression Location	Rationale
Hamlet	Agnico Eagle spud barge area	High traffic area near hamlet
Hamlet	Agnico Eagle tank farm to Arctic Fuel site	High traffic area near hamlet
AWAR	km 10 - 12	High traffic area near hamlet & area of concern to HTO – proximity to lake
AWAR	km 24 - 26	Area of concern to HTO – proximity to lake
AWAR	km 48 - 50	Area of concern to HTO – water crossing
AWAR	km 68 - 70	Location identified by Agnico Eagle – water crossing
AWAR	km 80 - 84	Location identified by Agnico Eagle – proximity to water & crossing
Onsite	Emulsion plant turn off to Meadowbank site (km 103 – 110)	High traffic area onsite

For each transect, results of the dustfall sampling are compared to the maximum observed reference site value (Figure 11 and 12), to confirm reductions in dustfall occurred as a result of dust suppressant application. Fixed dustfall rates are compared, since these are determined to be more representative of road material than total dustfall, which includes organic components (e.g. pollen, plants, animal particles).

With the exception of one sample at the 25 m distance during Round 2 (km 84), results were lower for all samples in locations with dust suppression than reference sites. These results indicate that dust suppressant is effectively reducing rates of dustfall, especially within 300 m of the road. Beyond that distance, results were similar for all transects.

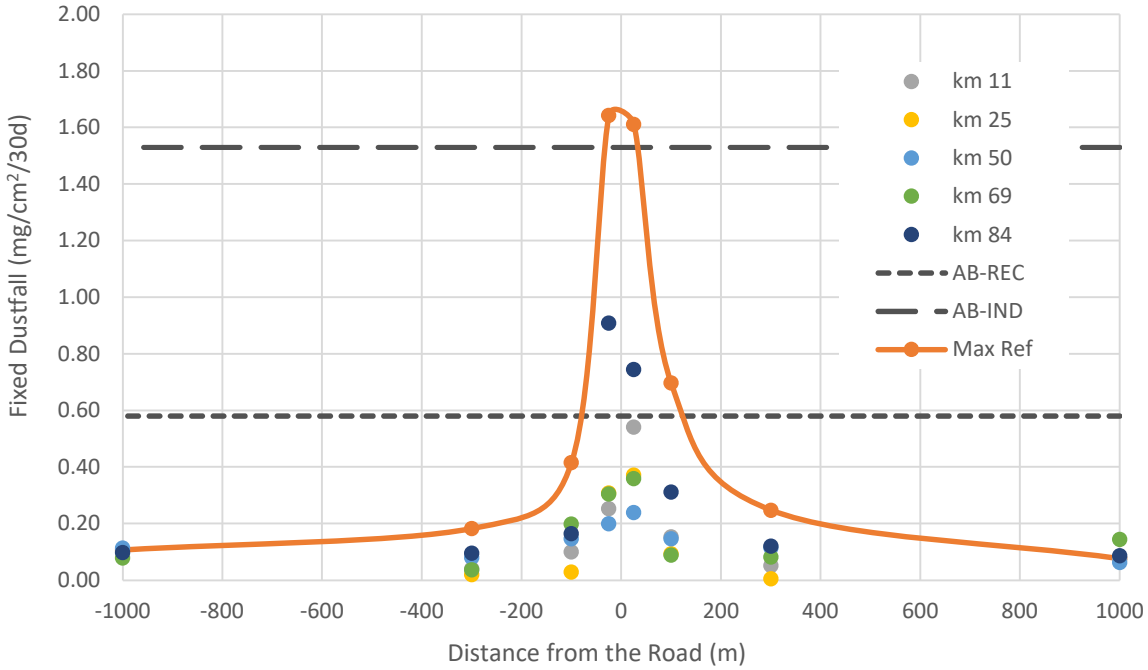

Figure 11. Monitoring Round 1 (June 24 – July 28) - Measured rates of fixed dustfall at 25, 100, 300, and 1000 m on both upwind (positive) and downwind (negative) sides of the Meadowbank AWAR in reference locations (max. measured values) and areas of dust suppression. AB Guidelines are for total dustfall, but are shown for reference.

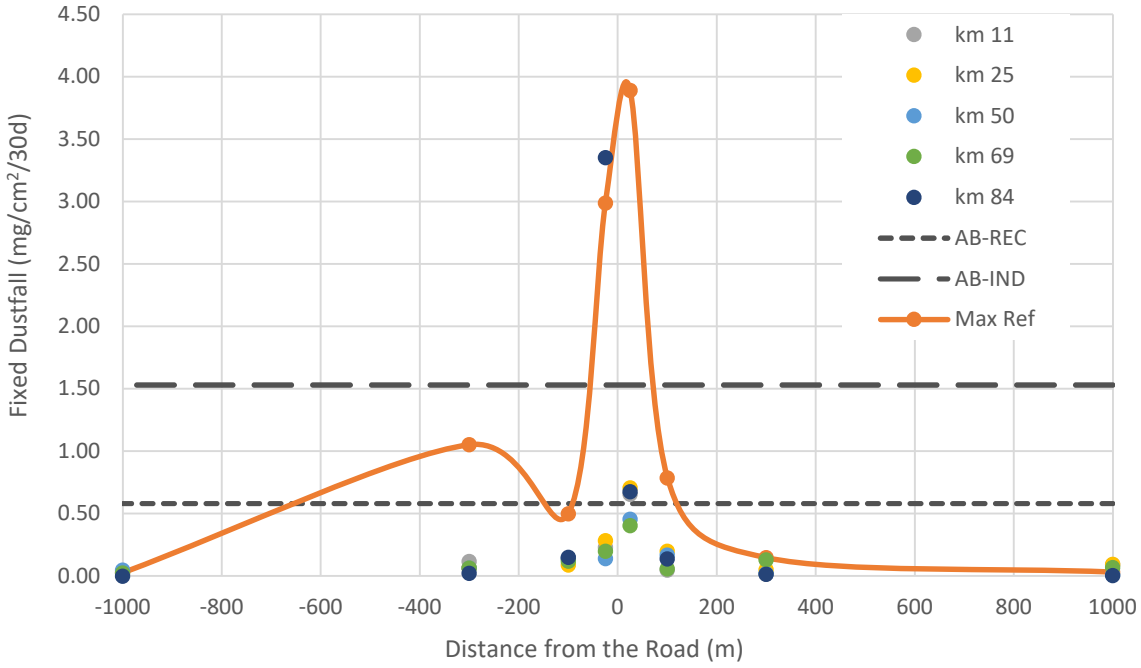

Figure 12. Monitoring Round 2 (July 28 – September 7) - Measured rates of fixed dustfall collected at 25, 100, 300, and 1000 m on upwind (positive) and downwind (negative) sides of the Meadowbank AWAR in reference locations (max. measured value) and areas of dust suppression. AB Guidelines are for total dustfall, but are shown for reference.

4.2.3.2 Comparison to Guideline Values and FEIS

Total dustfall values for all AWAR stations sampled in 2019 are presented in Figures 13 and 14 in relation to Alberta Environment guidelines for total dustfall.

In the Final Environmental Impact Statement for the Project (Cumberland, 2005), all habitat within 100 m from the AWAR was assumed lost due to impacts of the roadway. Thus in order to understand whether FEIS predictions are being exceeded, results of dustfall sampling at and beyond 100 m are compared to the Alberta Environment guideline for recreational areas (0.53 mg/cm^2/30d). However, it should be noted that this guideline is based on nuisance and aesthetic concerns, and not necessarily impacts to vegetation or wildlife. It is also generally considered to apply to a specific dust source, over and above background values. Therefore, this is considered a conservative, screening-level comparison, and any significant, ongoingexceedances will be further investigated.

For samples collected at and beyond 100 m from the AWAR in areas with dust suppression (km 11, 25, 50, 84), no results exceeded the guideline value.

For samples collected at and beyond 100 m from the AWAR in areas without dust suppression (km 18 and 78), one sample marginally exceeded the guideline in Round 1 (0.74 mg/cm^2/30d), and three exceeded the guideline in Round 2 (0.63, 0.87, 1.98 mg/cm^2/30d). While one of these exceedances was considered significant (1.98 mg/cm^2/30d at 300 m, km 78), the result for dustfall collected simultaneously on an adjacent stand, rather than at ground level (in line with ASTM recommended methods) was well below the guideline, at 0.29 mg/cm^2/30d. It is therefore considered likely that

significant re-entrainment from the ground occurred in the original sample. Results of dustfall collection on stands as compared to ground level is further discussed in Section 4.2.3.3.

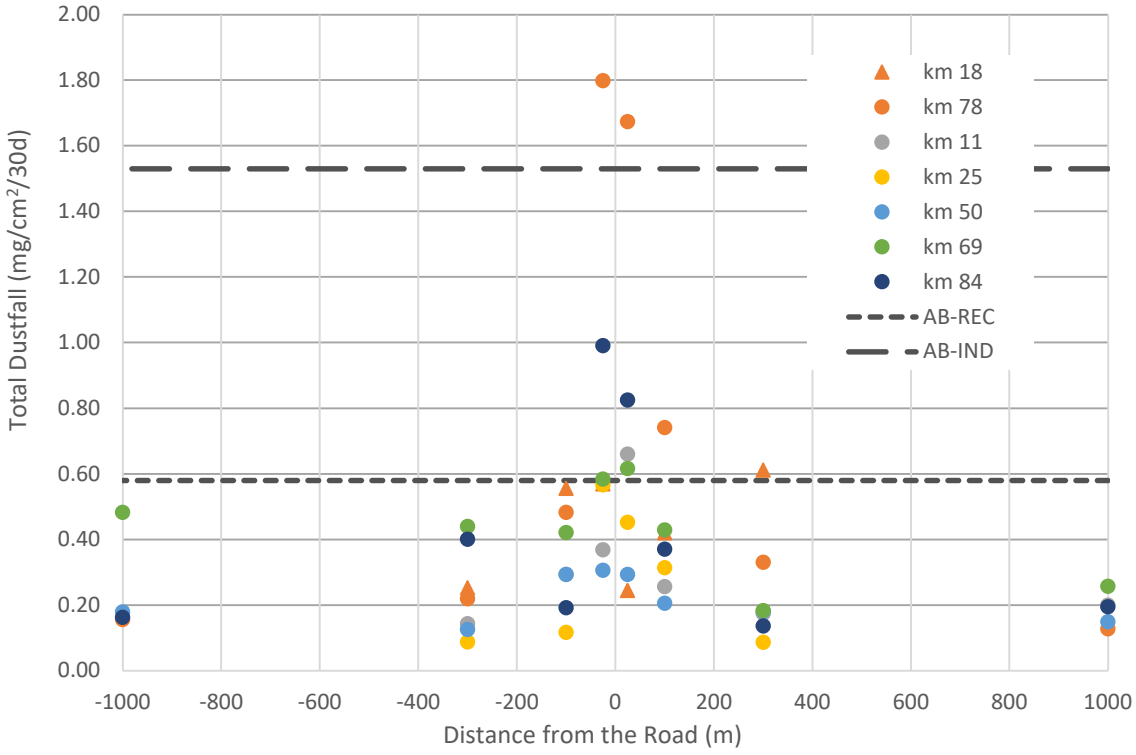

Figure 13. Monitoring Round 1 (June 24 – July 28) - Measured rates of total dustfall at 25, 100, 300, and 1000 m on both upwind (positive) and downwind (negative) sides of the Meadowbank AWAR in areas with (km 11, 25, 50, 69, 84) and without dust suppression (km 18, 78). Dashed lines represent the Alberta Environment guideline for industrial and recreational areas.

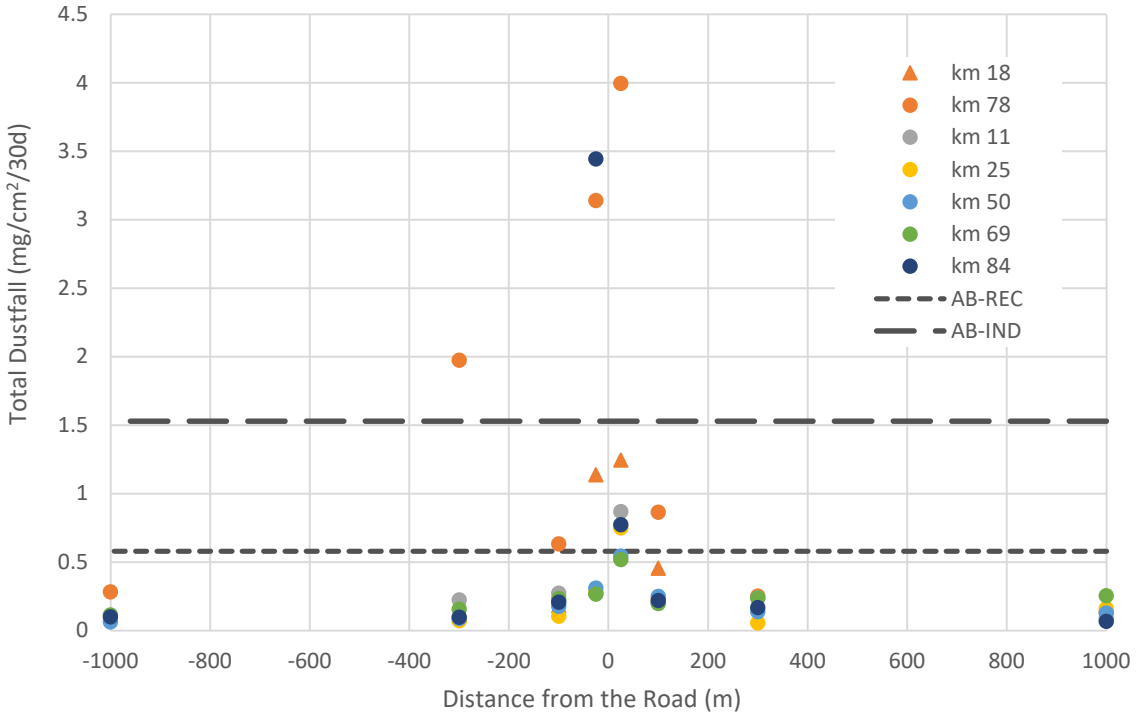

Figure 14. Monitoring Round 2 (July 28 – September 7) - Measured rates of total dustfall at 25, 100, 300, and 1000 m on both upwind (positive) and downwind (negative) sides of the Meadowbank AWAR in areas with (km 11, 25, 50, 69, 84) and without dust suppression (km 18, 78). Dashed lines represent the Alberta Environment guideline for industrial and recreational areas.

4.2.3.3 Comparison of Collection Methods

As described in Section 3.2, ASTM methods suggest collection of dustfall samples at 2-3 m height on a utility pole to prevent re-entrainment of particulates from the ground, and to reduce vandalism and potential for wildlife interaction. Due to the difficulty of constructing and deploying stands to hold the large number of sample containers used for road-side dustfall sampling, and the remote locations, the 2012 study compared dustfall at ground level and at 2 m height. Based on those results and the assumption that any re-entrainment would result in conservatively high estimates of dustfall, all road-side sampling canisters have been deployed at ground level in since 2013. However, in response to ECCC comments on the 2018 Air Quality and Dustfall Monitoring Report, a supplemental study was conducted in 2019 to confirm that dustfall rates measured at ground level continue to align with those measured on stands.

To that end, dustfall samples at km 78 were collected both on stands (1.8 m), and at ground level for all monitoring stations (25, 100, 300, 1000 m from the road). Stands were identical to those that have been used for collection of dustfall onsite, at DF-1 – DF-4.

Total dustfall results for monitoring rounds 1 and 2 are shown in Figures 15 and 16. In all cases, within 300 m of the road, dustfall collected at ground level exceeded that collected on stands. Samples collected at 1000 m are considered background rates, and differences between ground level and stands are marginal.

These results support Agnico's assumptions that ground-level sampling results in conservatively high estimates of dustfall. Nevertheless, Agnico has agreed to conduct all future monitoring for dustfall at the ~2 – 3 m height.

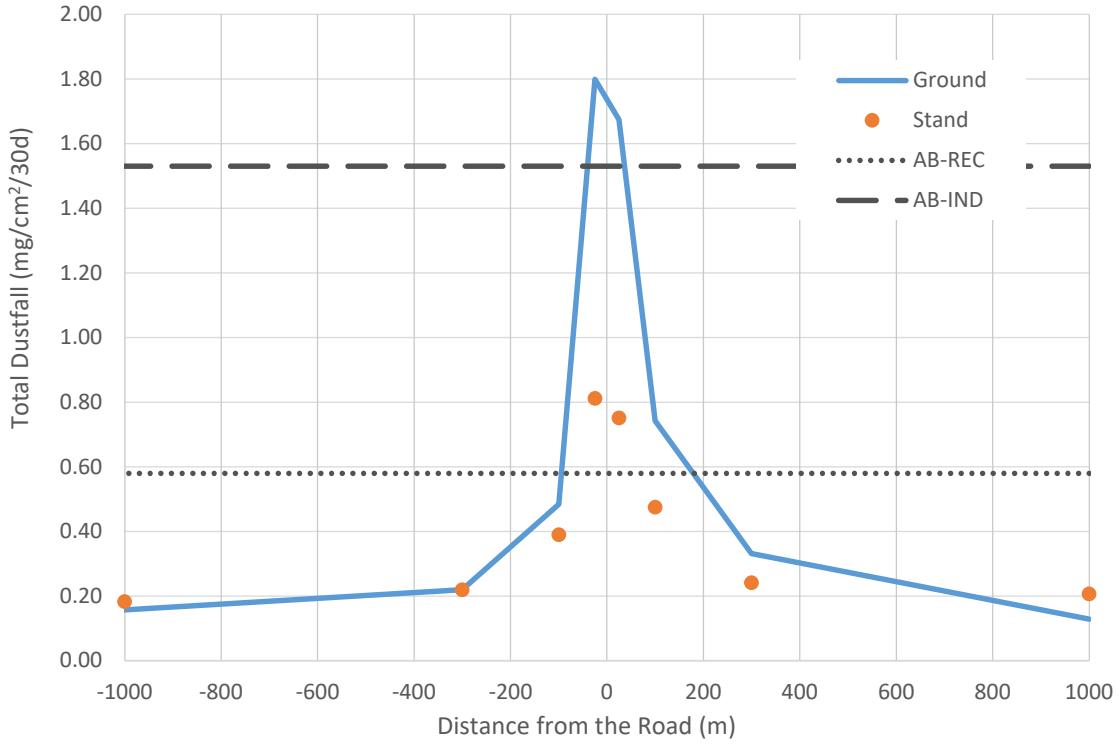

Figure 15. Total dustfall collected on stands (1.8 m height) and at ground level during monitoring round 1 at km 78.

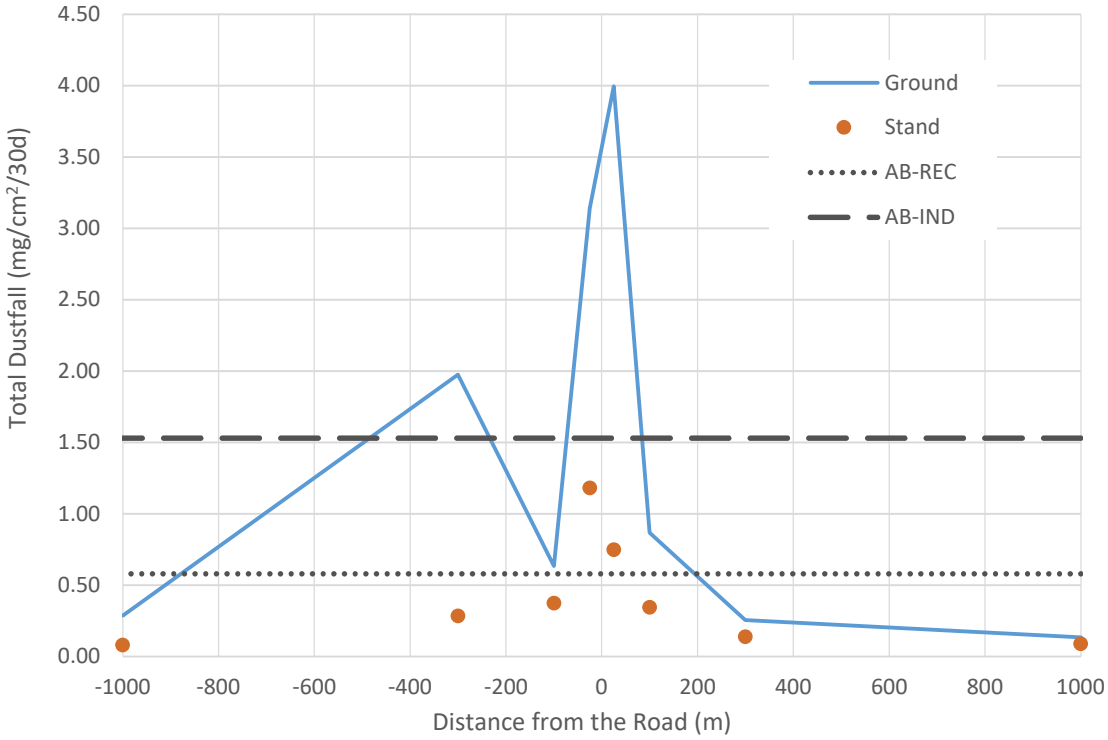

Figure 16. Total dustfall collected on stands (1.8 m height) and at ground level during monitoring round 2 at km 78.

4.2.4 Whale Tail Haul Road Dustfall Transects

Results for all samples collected in 2019 for monitoring rounds 1 (June 23 – July 23, 2019) and 2 (July 23 – August 31, 2019) are provided in Appendix B and are compared to FEIS predicted values in Figures 17 and 18.

Mid-way through round 1 (July 5, 2019), dust suppressant (Tetraflake) was applied along ~1 km sections of the Whale Tail Haul Road at km 133, 151, and 169. These locations were chosen based on visual inspections by the road supervisor, and happened to co-incide with dustfall monitoring transects.

During monitoring round 1, the majority of samples exceeded FEIS predictions, especially within 100 m from the road. During monitoring round 2, overall dustfall rates tended to be lower, but more than half of samples still exceeded FEIS predictions within the 100 m distance. The more general FEIS prediction that the Alberta Environment guideline for recreational areas (0.53 mg/cm^2/30d) would be met within approximately 300 m of the road was generally true, especially given the very conservative nature of the comparison. Occasional exceedances at the 300 m distance occurred for one location (km 151) but none occurred at the 1000 m distance.

As described in Section 2.3, comparisons of measured dustfall using static monitors to dust deposition rates modeled in the FEIS are considered valuable as a screening tool only. Since dustfall canisters collect particles up to 0.85 mm, while standard air quality models typically assess deposition of particles

up to 0.30 µm, canisters are more appropriate for understanding trends than specific comparisons to model outputs.

However, as described in Section 4.2.3.3, collection of dustfall on stands will provide a more accurate comparison to FEIS predictions. While the logistics of monitoring at ground level greatly facilitate data collection in remote locations, it is evident from the comparison performed in 2019 along the Meadowbank AWAR that collection on stands helps to eliminate peaks likely caused by re-entrainment from the ground (which are not included in standard dispersion modelling). That methodology will be followed in 2020 for all sampling locations, and results in comparison to FEIS predictions will be reviewed at that time to understand needs for supplemental mitigation.

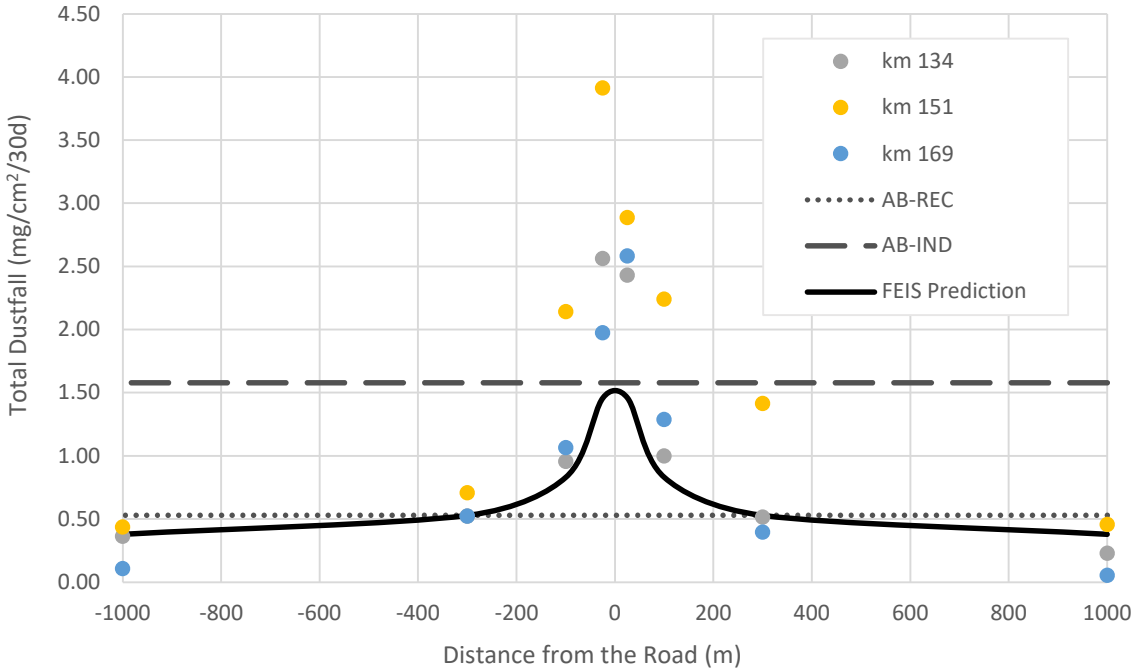

Figure 17. Monitoring Round 1 (June 23 – July 23) - Measured values of total dustfall for transects at km 134, 151 and 169 along the Whale Tail Haul Road, FEIS predictions, and Alberta Environment's guidelines for recreational and industrial areas. Negative values denote locates on the east side of the road, while positive values denote locations on the west side of the road.

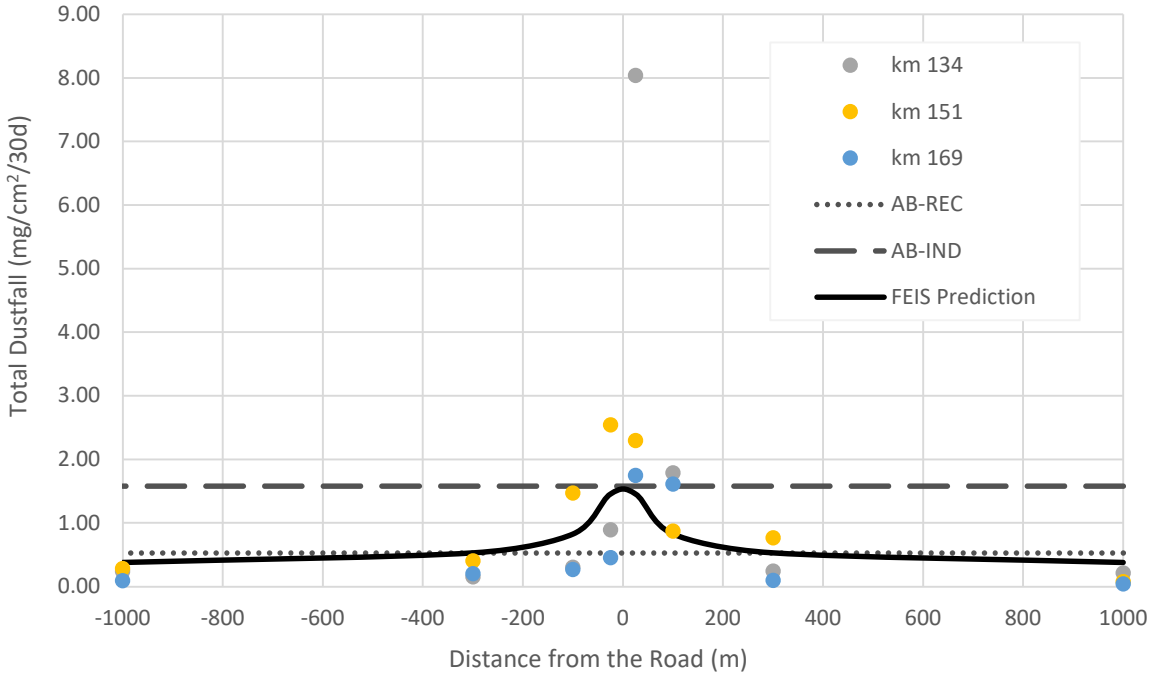

Figure 18. Monitoring Round 2 (July 23 – August 31) - Measured values of total dustfall for transects at km 134, 151 and 169 along the Whale Tail Haul Road, FEIS predictions, and Alberta Environment's guidelines for recreational and industrial areas. Negative values denote locates on the east side of the road, while positive values denote locations on the west side of the road.

4.3 NO_2

4.3.1 Meadowbank Site

Monthly-average NO_2 trends in 2019 are provided in Figure 19. Samples are referred to by the collection start date. Concentrations of NO_2 vary between non-detect (<0.1) and 3.3 ppb. This maximum value is similar to those observed previously for the Meadowbank site (Section 5.3). At most time points, concentrations continue to be slightly lower at DF-1 than DF-2. This is likely because DF-1 is further from the main camp area and there is generally less vehicular activity in the vicinity.

Annual arithmetic mean concentrations were calculated for each station from the monthly-average values. The annual mean concentrations of NO_2 were 0.68 and 1.47 ppb for DF-1 and DF-2, respectively (December 29, 2018 – January 25, 2019). These are all well below the Government of Nunavut Ambient Air Quality Standard of 32 ppb for the annual average. For reference, these results are also well below the 2020 CAAQS for the annual average concentration of NO_2 (17.0 ppb).

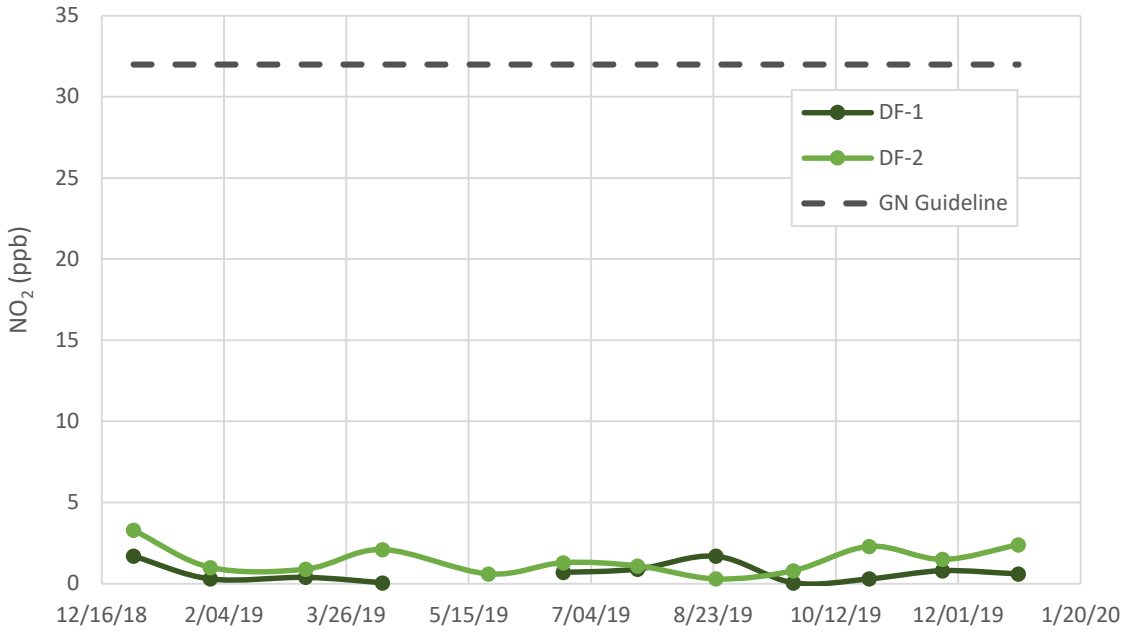

Figure 19. Monthly average concentration of NO_2 at DF-1 and DF-2. Points represent start date of sample collection. Dashed line indicates GN standard for the annual average.

4.3.2 Whale Tail Site

Results for DF-5 and DF-6 at the Whale Tail site are similar to those observed at the Meadowbank site (Figure 20). For the Whale Tail site, the maximum monthly mean concentration was 4.4 ppb. The annual mean concentration was 1.46 ppb, calculated using data from both DF-5 and DF-6. This is well below the Government of Nunavut Ambient Air Quality Standard of 32 ppb for the annual average and the FEIS prediction for the annual average (4.4 ppb).

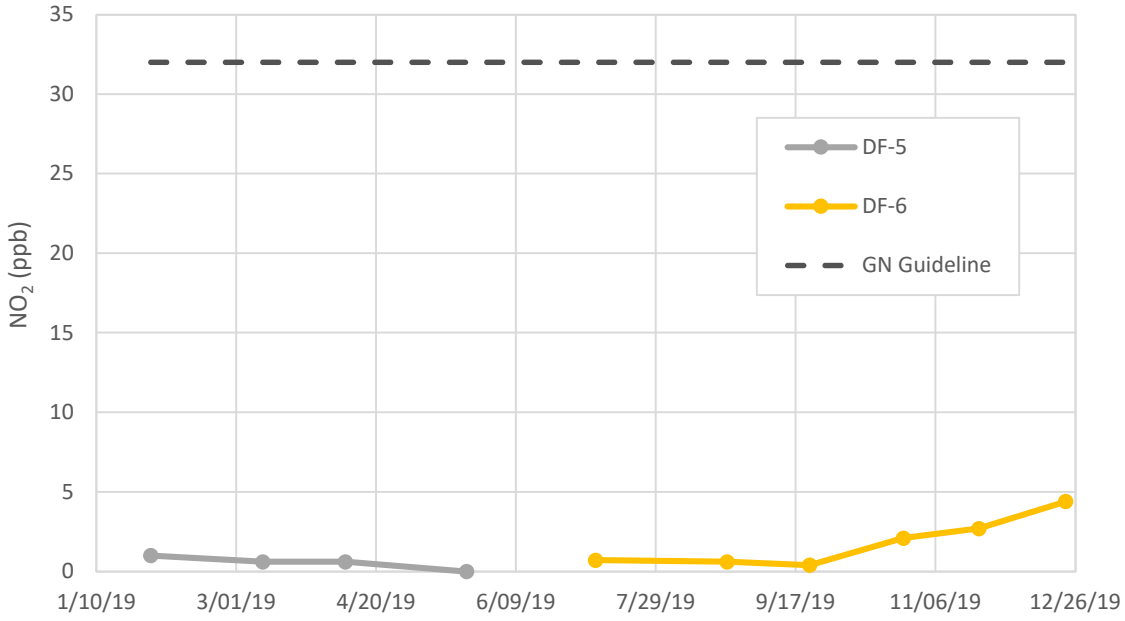

Figure 20. Monthly average concentration of NO_2 at DF-5 and DF-6. Points represent start date of sample collection. Dashed line indicates GN standard for the annual average.

4.4 QA/QC

QA/QC procedures in 2019 included the use of an accredited lab for sample preparation and analysis, sample collection by appropriate personnel (trained by a professional air quality specialist), use of travel blanks for suspended particulate and NO_2 samples, and use of field duplicates for road-side dustfall samples.

Travel blanks were used as part of 11 suspended particulate sample submissions. In total, detections occurred in 6 filters, with concentrations between 3 and 11 µg/filter (MDL = 3 µg/filter), which is identical to 2018. Detections in travel blanks are relatively common, with up to 8 contaminated blanks occurring yearly from 2014 - 2018, up to 14 ug/filter. In the majority of cases, blanks marginally exceeded the detection limit (e.g. 4 or 5 ug/filter) and never exceeded 5x the MDL. Since there were few exceedances of regulatory guidelines, interpretation of field results was not modified based on this analysis.

Travel blanks were also analyzed for each NO_2 sampling event. Unopened canisters were shipped to Meadowbank site by the laboratory, stored in the field office, and shipped back to the laboratory with each monthly NO_2 analysis. Detections occurred in all but one sample, from 0.1 to 1.1 ppb. Since NO_2 concentrations are well below regulatory guidelines, interpretation of field results was not modified based on this analysis.

Field duplicate dustfall canisters are collected in the immediate vicinity of regular samples. The relative percent difference (RPD) values calculated for fixed dustfall for duplicate canisters are shown in Table 7. Relative to other media, RPDs in dustfall samples have tended to be very high, which is understandable given the potential for debris to be entrained by passing vehicles and land in adjacent dustfall canisters. This variability is taken into consideration when interpreting the results of the dustfall studies.

Table 7. RPD values for duplicate dustfall canisters.

Sampling Event	Location	Sample ($mg/cm^2/30d$)	Duplicate ($mg/cm^2/30d$)	RPD (%)
Event 1	DF-11W-100	0.15	0.11	36.9
	DF-18E-100	0.31	0.33	6.2
	DF-50E-1000	0.11	0.14	20.5
	DF-70W-25	0.36	0.45	21.8
	DF-84E-300	0.10	0.10	7.0
Event 2	DF-25E-100	0.09	0.13	37.1
	DF-25W-100	0.20	0.19	5.2
	DF-50E-25	0.14	0.17	17.6
	DF-70E-25	0.20	0.21	5.4

SECTION 5 • HISTORICAL COMPARISON

5.1 TSP, PM_{10}, $PM_{2.5}$

In order to understand trends of suspended particulate concentrations at the Meadowbank site over time, measured values of TSP, PM_{10}, and $PM_{2.5}$ at DF-1 and DF-2 were plotted since monitoring began in 2012 (Figures 21 - 23). These results indicate that concentrations of suspended particulates are relatively stable and have not been increasing over time.

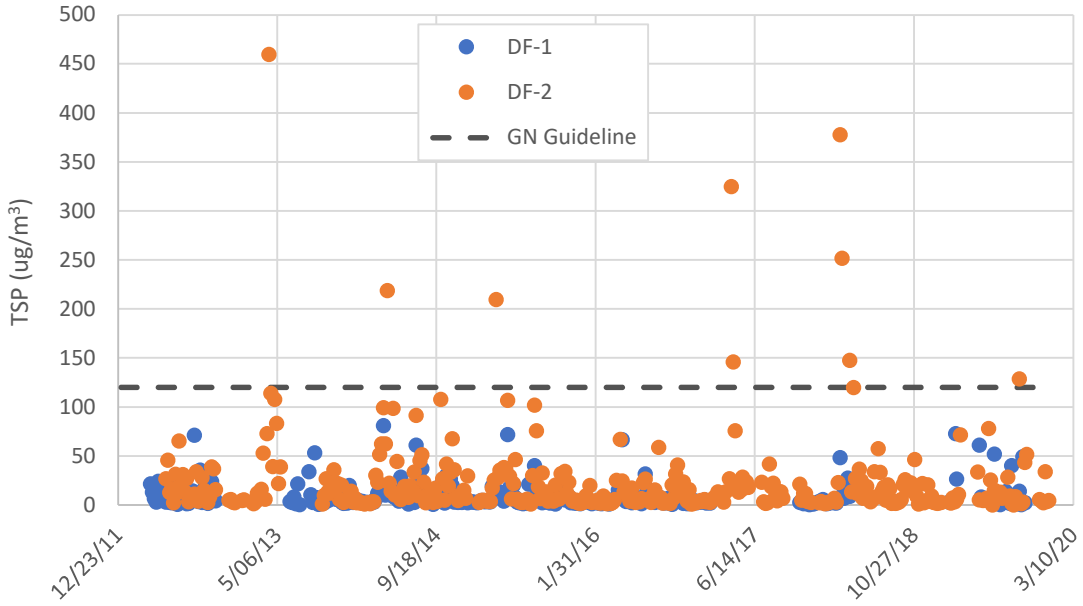

Figure 21. 24-h average concentrations of total suspended particulates (TSP) at Meadowbank stations DF-1 and DF-2. Dashed line indicates the 24-hr average GN guideline for ambient air quality.

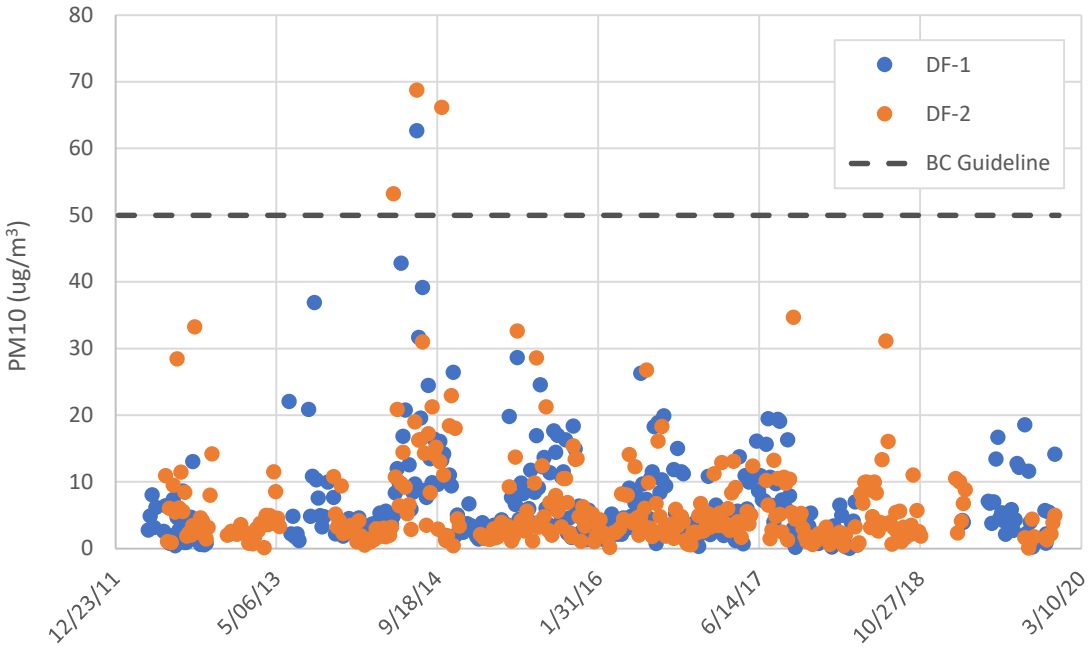

Figure 22. 24-h average concentration of airborne particulate matter less than 10 microns (PM_{10}) at Meadowbank stations DF-1 and DF-2. Dashed line indicates the BC Air Quality Objective for this parameter.

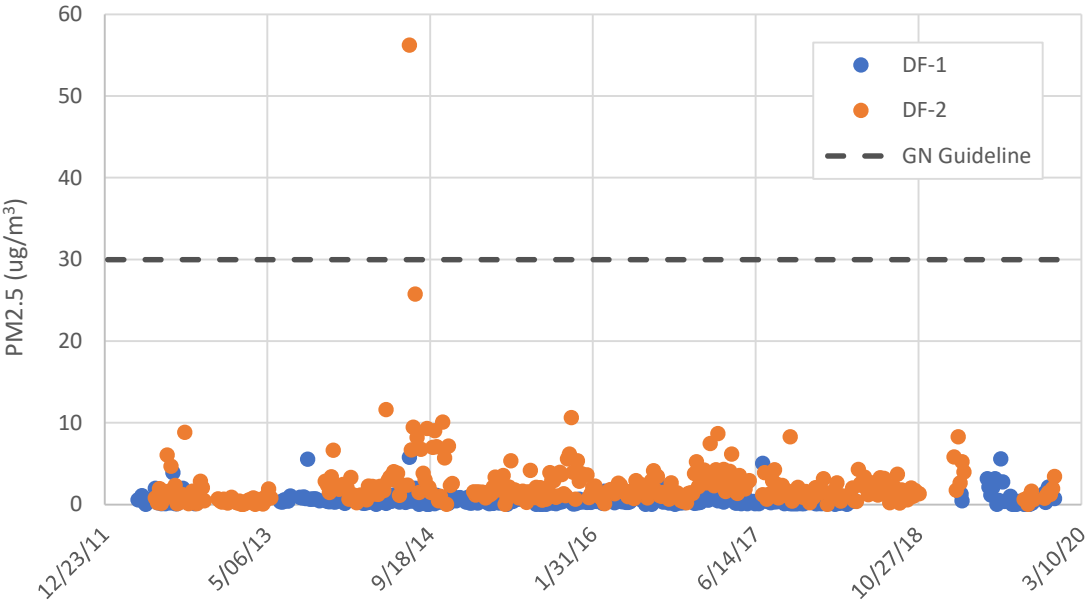

Figure 23. 24-h average concentration of airborne particulate matter less than 2.5 microns ($PM_{2.5}$) at Meadowbank stations DF-1 and DF-2. Dashed line indicates the 24-hr average GN guideline for ambient air quality.

5.2 DUSTFALL

5.2.1 Meadowbank Onsite Locations DF-1 – DF-4

In order to understand trends in generation of deposited particulate matter at the Meadowbank site over time, measured values of dustfall at DF-1, DF-2, DF-3, and DF-4 were plotted since monitoring began in 2012 (Figure 24). These results indicate that rates of dustfall have not been increasing over time.

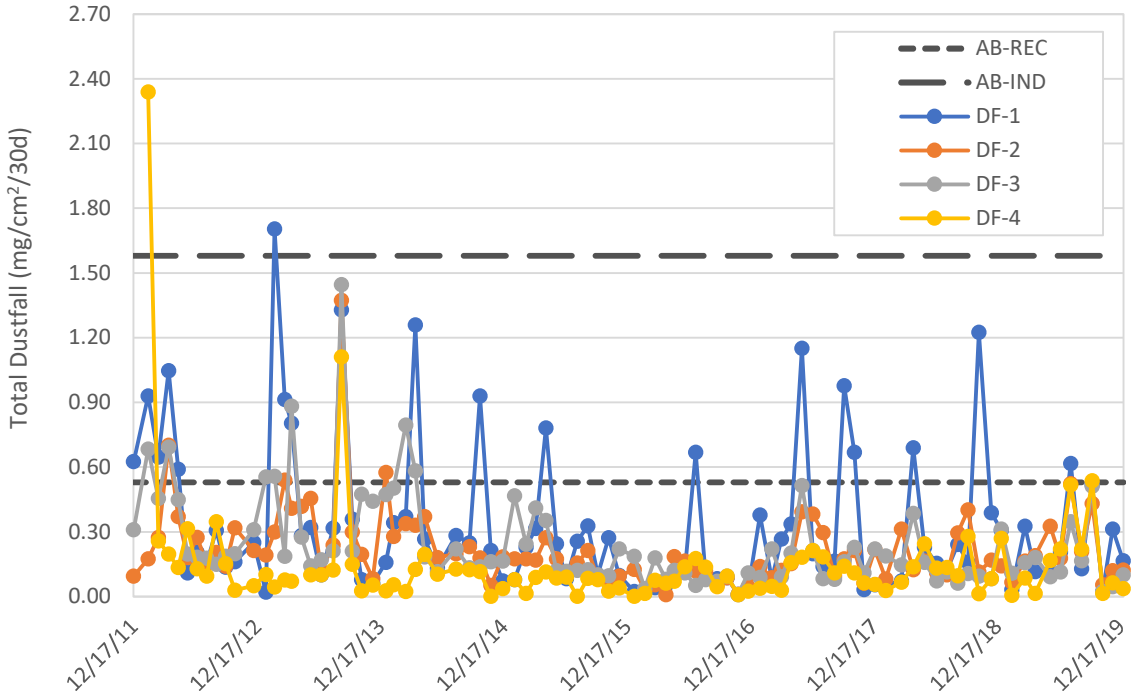

Figure 24. Total 30-day-normalized dustfall at DF-1 – 4 at the Meadowbank site. Points represent start date of sample collection. Dashed lines indicate the Alberta Environment Department's recreational area guideline of 0.53 mg/cm²/30d, and industrial area guideline of 1.58 mg/cm²/30d. Plot omits the initial sample from DF-4 (6.26 mg/cm²/30d; December 17, 2011), which is considered to be an outlier.

5.2.2 Whale Tail Onsite Location DF-5/DF-6

Since dustfall monitoring at the Whale Tail site began in 2019, historical comparisons will begin in 2020.

5.2.3 Meadowbank AWAR Dustfall Transects

All results collected along the Meadowbank AWAR to date (since 2012) in locations without dust suppression are presented in Figure 25 in relation to Alberta Environment guidelines for total dustfall and background samples. Results are compared here only for samples collected mainly in August, since historically sampling was only performed during this month, when the highest traffic rates and driest weather occurs.

The range of background concentrations was determined from a total of 34 samples collected from four reference locations in 2014 – 2019, including: an established external reference site near Inuggugayualik Lake, baseline samples for the proposed Whale Tail Haul Road, and sampled collected 1000 m upwind of the AWAR at km 18 and 78.

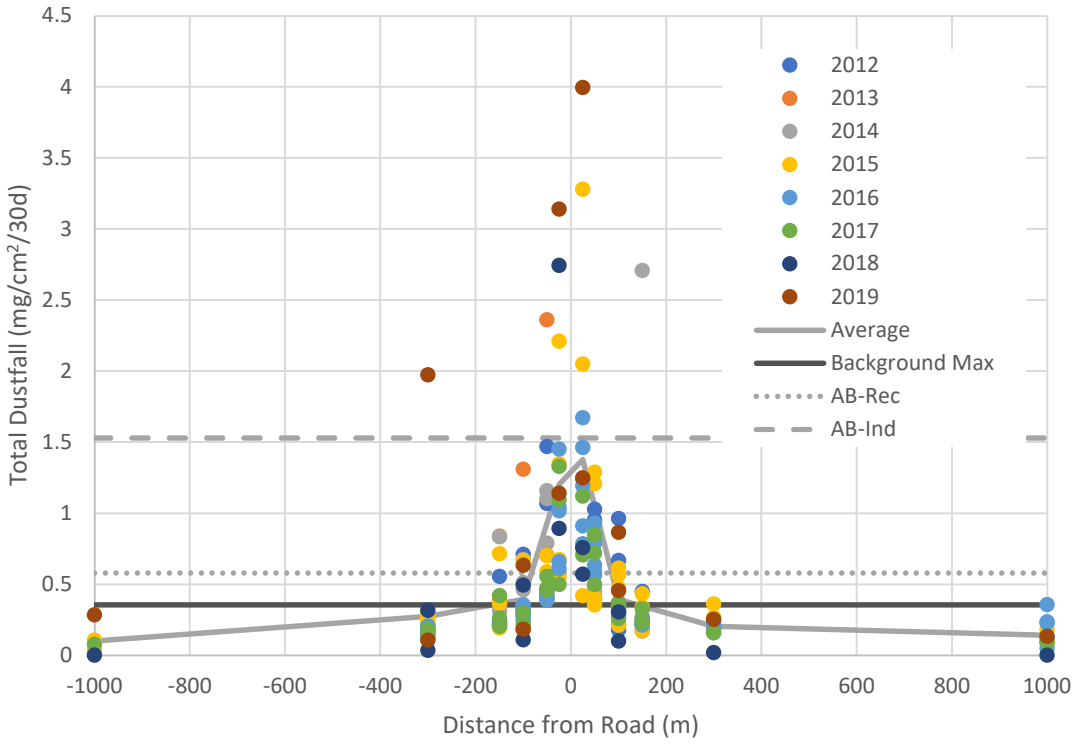

Figure 25. Total dustfall rates (mg/cm²/30d) for all samples collected since 2012 (August sampling events) along the Meadowbank AWAR in areas without dust suppression. Negative distances represent the downwind (east) side of the road, and positive distances represent the upwind (west) side.

In 2019, two samples were elevated compared to historical results – one at the 25 m distance, and one at the 300 m distance. As described in Section 4.2.3, the elevated result at 300 m only occurred in the ground-level sample for that location. The adjacent sample collected on a stand was lower than the AB guideline, suggesting significant re-entrainment from the ground or another type of contamination occurred for the ground-level sample. This sample is considered an outlier, but included in all analyses for discussion purposes.

In 2019, rates of barge unloading activity and associated traffic along the AWAR were higher than other recent years, due to construction of the Whale Tail site. However, monitoring results indicate no significant increase in overall rates of dustfall.

As described in Section 4.2.3, 100 m was the smallest zone of influence assumed in the Project FEIS. All habitat within this area was assumed lost due to impacts of the roadway. However, average total dustfall to date at 100 m from the AWAR (for samples collected during August monitoring events) continues to lie below the AB guideline for recreational areas, at 0.39 mg/cm²/30d (n = 51). In 2019,

average dustfall at 100 m was slightly higher than average, at 0.53 mg/ cm^2/30d, but still met the AB guideline for recreational areas.

With the exception of one outlier sample collected in 2019, all samples collected at the 300 or 1000 m distance continue to lie within the range of background values measured to date (0.007 – 0.357 mg/cm^2/30d).

5.2.4 Whale Tail Haul Road Dustfall Transects

All results collected to date along the Whale Tail Haul Road (2018 & 2019) are shown in Figure 26. Overall rates of dustfall in 2019 were higher than those observed in 2018. In particular, one value at 25 m from the road (8 mg/cm^2/30d) was the highest recorded to date on site.

Increased dustfall rates in 2019 along the Whale Tail Haul Road coincide with the start of commercial production at Whale Tail Pit (mid-2019), and the associated increase in heavy equipment traffic as ore is hauled to the Meadowbank mill.

Dust mitigation in 2019 consisted of a single application of Tetraflake at three locations – km 133, 151, and 169. Planned dust suppression in 2020 is described in the updated Air Quality and Dustfall Monitoring Plan (V5), submitted as an appendix of the 2019 Annual Report. As mentioned in Section 4.2.4, data will be collected at the ~2 – 3 m height moving forward, for better comparison with regulatory guidelines, FEIS predictions, and to better understand needs for supplemental dust mitigation.

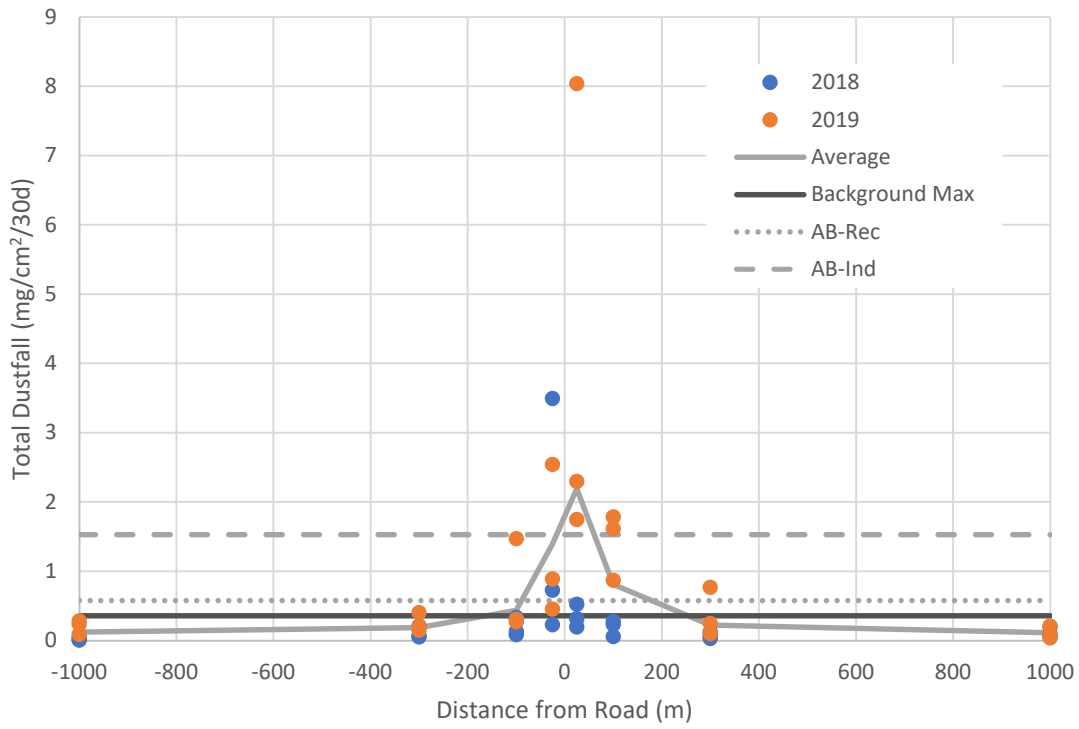

Figure 26. Total dustfall rates (mg/cm^2/30d) for all samples collected along the Whale Tail Haul Road to date. Negative distances represent the east side of the road, and positive distances represent the west side.

5.3 NO_2

5.3.1 Meadowbank Site

In order to understand trends in concentrations of gaseous pollutants at the Meadowbank site over time, measured values of NO_2 at DF-1 and DF-2 were plotted since monitoring began in 2012 (Figure 27). These results indicate that concentrations of NO_2 in the area have remained very low, and are not increasing over time.

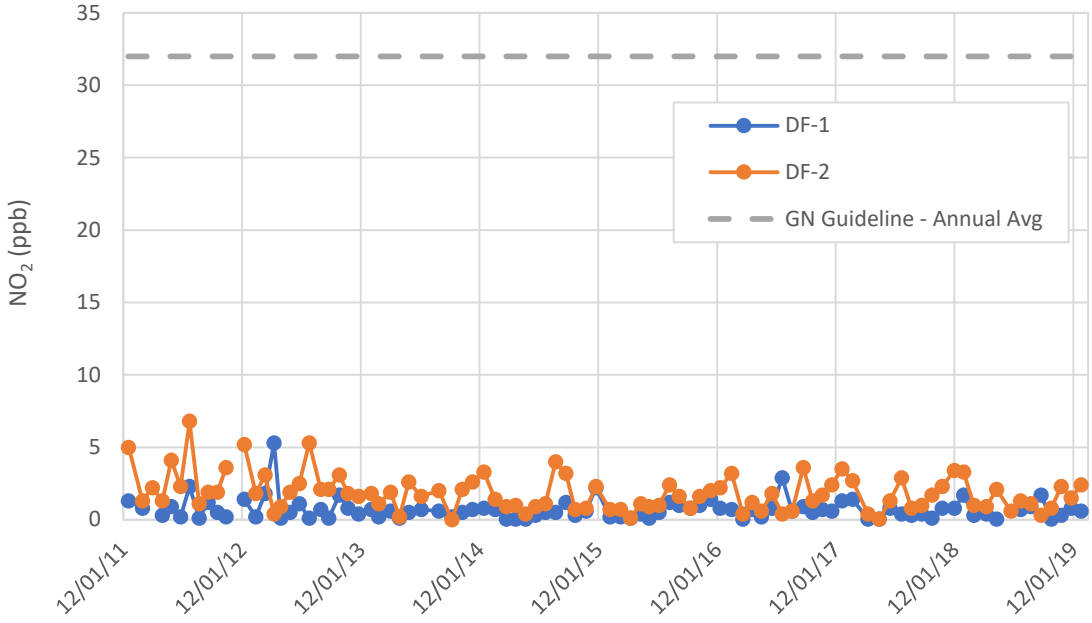

Figure 27. Monthly average concentration of NO_2 at DF-1 and DF-2. Points represent start date of sample collection. Dashed line indicates GN standard for the annual average.

5.3.2 Whale Tail Site

Since NO_2 monitoring at the Whale Tail site began in 2019, historical comparisons will begin in 2020.

SECTION 6 • WEATHER DATA

Weather data for the dustfall and air quality monitoring periods was collected using the mine site's permanent weather station. Daily averages for wind speed, wind direction and temperature were available from this station.

Daily averages for wind speed, wind direction and temperature are provided in Appendix A.

SECTION 7 • GREENHOUSE GAS EMISSIONS

Agnico is required by Environment Canada's Greenhouse Gas Emissions Reporting Program (GHGRP) to track greenhouse gas emissions based on annual fuel consumption, composition and the US EPA's AP-42 emission factors.

Estimated greenhouse gas emissions for the Meadowbank site as reported to Environment Canada's Greenhouse Gas Emissions Reporting Program in 2019 were 189,876 tonnes CO_2 equivalent. This is similar to the value observed in past years (Table 8).

Table 8. Estimated greenhouse gas emissions for the Meadowbank site as reported to Environment Canada's Greenhouse Gas Emissions Reporting Program. 2018+ includes Meadowbank and Whale Tail sites.

Year	Reported CO_2 Emissions (tonnes CO_2 equivalent)
2012	202,201
2013	195,686
2014	179,889
2015	187,280
2016	184,223
2017	194,440
2018	186,122
2019	189,876

SECTION 8 • INCINERATOR STACK TESTING

Incinerator stack testing is conducted under Agnico Eagle's Incinerator Waste Management Plan (AEM, 2018), and results are summarized here. As determined in consultation with Environment and Climate Change Canada, incinerator stack testing is undertaken every two years, and annually for five years following an exceedance of ECCC/GN criteria. In 2014, stack testing was conducted from July 11th to July 13th by Exova Canada Inc. Results indicated that the average (of 3 tests) measured mercury level (64.09 µg / Rm³ @ 11 % v/v O_2) exceeded the GN standard (20 µg / Rm³ @ 11 % v/v O_2). Laboratory re-analysis confirmed these results. An investigation with Meadowbank's Site Services Department was performed to determine the potential sources. Although Meadowbank has an alkaline battery recycling program, the investigation revealed that there could still be a significant volume of batteries disposed of with regular solid waste destined for the onsite incinerator. In addition, the incinerator may have been overloaded on the day of testing which would result in some incomplete combustion but this would not be considered as a major contributing factor. The dioxin and furans results in 2014 (53.6 pg TEQ / Rm³ @ 11 % v/v O2) were well below the GN standard (80 pg TEQ / Rm³ @ 11 % v/v O_2).

Following these tests, Agnico Eagle implemented a comprehensive site wide information campaign to reinforce the requirements of the recycling program. This included regular meetings with individual departments as well as placing information on the Agnico Eagle intranet site.

Results of annual stack testing are provided in Table 9. Since 2015, concentrations of mercury have been below the GN standard of 20 µg/ Rm³ @ 11 % v/v O_2, suggesting that efforts to reduce improper disposal of batteries were effective. Concentrations of dioxins and furans have also continued to meet the GN standard (80 pg TEQ / Rm³ @ 11 % v/v O_2).

The complete 2019 report on incinerator emissions is provided as an appendix of the 2019 Annual Report.

Table 9. Historical stack testing results for mercury and dioxins and furans at the Meadowbank site. *The GN standard is for the average of three tests, as reported here.

Year	Mercury (µg/Rm³ @ 11% v/v O_2)		Dioxins and Furans (pg/Rm³ @ 11% v/v O_2)	
	GN Standard	Stack Testing Results (Average*)	GN Standard	Stack Testing Results (Average*)
2014	20	64.09	80	53.6
2015		<0.22		21.0
2016		<0.46		33
2017		3.8		22
2018		<0.19		10
2019		0.453		27

SECTION 9 • CURRENT YEAR MONITORING SUMMARY

9.1 SUSPENDED PARTICULATES (TSP, PM_{10}, $PM_{2.5}$)

For TSP, only one sample exceeded the GN 24-h guideline of 120 µg/m^3, and the annual guideline was not exceeded.

All results of $PM_{2.5}$ and PM_{10} analyses were below the relevant air quality criteria for 24-h and annual averaging times.

9.2 DUSTFALL

No dustfall samples collected on the Meadowbank or Whale Tail sites exceeded the Alberta Environment guidelines for recreational or industrial areas.

Along the Meadowbank AWAR in areas with dust suppression (km 11, 25, 50, 84), no samples collected at and beyond the 100 m distance (smallest assumed ZOI) exceeded the Alberta Environment recreational area guideline.

For samples collected at and beyond 100 m from the AWAR in areas without dust suppression (km 18 and 78), one of ten samples marginally exceeded the guideline in Round 1 (0.74 mg/cm^2/30d), and three of ten samples exceeded the guideline in Round 2 (0.63, 0.87, 1.98 mg/cm^2/30d). However, only one of these was considered a significant exceedance (1.98 mg/cm^3/30d), and the corresponding sample collected on a stand was less than the guideline. All samples will be collected on stands in 2020, providing a better basis for comparison with the guideline.

For the WTHR, the majority of samples exceeded FEIS predictions, especially at and below the 100 m distance, and particularly during monitoring round 1 which began prior to applications of dust suppressant. However, the more general FEIS prediction that the Alberta Environment guideline for recreational areas (0.53 mg/cm^2/30d) would not be exceeded beyond approximately 300 m of the road was generally met, with occasional exceedances at the 300 m distance for one location (km 151) but none at the 1000 m distance. Given the difference in size fractions measured by static dustfall monitoring (up to 0.85 mm) and FEIS air quality dispersion modelling (typically up to 0.30 um), this is considered a very conservative, screening level comparison. A change to monitoring methods to measure dustfall at the 2-m height will be implemented in 2020 to improve the analysis.

9.3 NO_2

Annual average NO_2 did not exceed the GN guideline of 32 ppb for any station at the Meadowbank or Whale Tail sites. In addition, annual average NO_2 at the Whale Tail site did not exceed the FEIS prediction for that location.

9.4 GHG EMISSIONS

Estimated greenhouse gas emissions for the Meadowbank site as reported to Environment Canada's Greenhouse Gas Emissions Reporting Program in 2019 were 189,876 tonnes CO_2 equivalent.

9.5 INCINERATOR EMISSIONS

Results from stack testing in 2019 indicated that all measured mercury concentrations were below the GN standard (20 µg / Rm^3 @ 11 % v/v O_2), and all measured total dioxin and furans concentrations were below the GN standard (80 pg TEQ / Rm^3 @ 11 % v/v O_2).

9.6 CONCLUSION

Aside from potentially elevated dustfall rates along the Whale Tail Haul Road in 2019, there are no apparent trends towards increasing or unpredicted air quality concerns at the Meadowbank site. Rates of dustfall will be reviewed in 2020 following the implementation of refined sampling methods (~2-3 m height rather than ground level). Supplemental methods for dust mitigation in 2020 are described in the 2020 Air Quality and Dustfall Monitoring Plan (V5).

SECTION 10 • ACTIONS

The following actions were identified for 2019, and Agnico's response to each is indicated:

- Sampling for dustfall, NO_2, and suspended particulates will commence at Whale Tail site DF-5.
    - Dustfall and NO_2 sampling began. Partisol units were installed for the analysis of suspended particulates, and sampling will begin in 2020.
- Replacement of two Partisol units.
    - A new PM2.5/PM10 unit was installed on February 10 at DF-2, and the unit at DF-1 was professionally repaired and re-installed on the same date.
- A supplemental study will be conducted in 2019 to confirm that dustfall rates measured at ground level continue to align with those measured on stands.
    - Complete.

Actions identified for 2020 are:

- Moving forward, dustfall sampling along the AWAR will occur at two reference locations (km 18 and 78). The frequency of sampling (2 x 1 month periods during the summer) and transect stations (25, 100, 300, 1000 m) will not change. Since three years of sampling in areas with dust suppression has confirmed efficacy of the product, the sampling focus will shift back to tracking dustfall in areas without dust suppression.
- Dustfall rates will be analyzed for a reference transect (area without dust suppression) along the Whale Tail Haul Road, if possible.
- All dustfall monitoring will be conducted at approx. 2-3 m height, in accordance with ASTM methods.
- Ensure and continue training of all the Environmental staff in suspended particulate monitoring equipment maintenance and troubleshooting to reduce downtime.
- Assess potential alternative technologies in suspended particulate monitoring (possible pilot project with alternate monitoring equipment).

SECTION 11 • REFERENCES

Agnico Eagle Mines Ltd. (AEM), 2018. Meadowbank Gold Project – 2017 Wildlife Screening Level Risk Assessment. March, 2018. Prepared for Nunavut Impact Review Board.

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Agnico Eagle Mines Ltd (AEM), 2012. 2011 Dust and Air Quality Monitoring Report. Meadowbank Gold Project. Prepared for Nunavut Impact Review Board.

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Golder Associates Ltd. (Golder) 2016. Environmental Impact Statement for the Whale Tail Pit and Haul Road Project – Volume 4: Atmospheric Environment. June, 2016.

Golder Associates Ltd. (Golder) 2008. Technical Memorandum. Addendum Report: Air Quality Monitoring Meadowbank Gold Project. Prepared for Agnico-Eagle Mines Ltd. May 16, 2008.

Rescan Environmental Services Ltd. (Rescan) 2009. Doris North Gold Mine Project: Air Quality Compliance Report for Section 4 Item 30 of the Project Certificate. Prepared for Hope Bay Mining Ltd. November, 2009.

Appendix A

Weather Data

Table A- 1. Daily temperature, wind speed and wind direction in 2019 at the Meadowbank site.

Date	Average Temperature (°C)	Minimum Temperature (°C)	Maximum Temperature (°C)	Average Wind Speed (m/s)	Average Wind Direction (deg.)
1/01/18	-30.4	-27.2	-32.2	2.37	245
1/02/18	-29.8	-25.9	-33.7	3.52	324
1/03/18	-32.0	-29.7	-34.3	6.48	315
1/04/18	-30.8	-27.8	-33.7	4.86	310
1/05/18	-34.1	-31.0	-35.6	1.99	311
1/06/18	-33.5	-31.4	-35.5	2.98	116
1/07/18	-28.6	-25.8	-31.6	4.53	99
1/08/18	-22.7	-20.2	-26.0	2.71	147
1/09/18	-23.0	-20.7	-27.5	3.93	298
1/10/18	-33.9	-27.2	-37.3	9.21	310
1/11/18	-34.7	-31.6	-37.1	8.20	302
1/12/18	-30.2	-27.4	-31.6	9.12	310
1/13/18	-24.2	-21.3	-27.5	10.51	305
1/14/18	-27.1	-23.6	-32.9	5.79	285
1/15/18	-32.2	-27.4	-35.0	5.09	302
1/16/18	-22.4	-17.9	-29.3	5.42	198
1/17/18	-18.6	-16.4	-24.0	4.06	86
1/18/18	-23.8	-19.3	-29.5	2.27	323
1/19/18	-31.4	-26.1	-35.6	1.64	330
1/20/18	-26.3	-23.6	-33.2	1.55	94
1/21/18	-37.5	-32.4	-39.7	0.07	71
1/22/18	-38.0	-36.0	-39.1	0.00	0
1/23/18	-37.8	-33.9	-39.2	0.00	0
1/24/18	-36.2	-31.8	-39.4	0.00	0
1/25/18	-29.9	-23.9	-33.1	0.00	0
1/26/18	-23.8	-22.4	-29.5	0.00	0
1/27/18	-25.9	-20.3	-30.2	0.00	0
1/28/18	-21.3	-19.7	-22.7	0.00	299
1/29/18	-24.5	-21.7	-28.0	0.00	0
1/30/18	-29.3	-26.4	-32.1	0.00	0
1/31/18	-30.6	-27.4	-36.3	0.00	0
2/01/18	-35.8	-34.0	-37.0	0.00	0
2/02/18	-36.2	-34.9	-37.3	0.00	0
2/03/18	-35.6	-33.6	-37.3	0.00	0
2/04/18	-31.5	-25.7	-37.1	0.00	0
2/05/18	-38.3	-27.2	-41.3	3.88	318
2/06/18	-32.7	-31.0	-38.3	4.98	296

Date	Average Temperature (°C)	Minimum Temperature (°C)	Maximum Temperature (°C)	Average Wind Speed (m/s)	Average Wind Direction (deg.)
2/07/18	-39.5	-33.7	-41.9	5.67	318
2/08/18	-39.5	-37.7	-41.7	6.07	297
2/09/18	-27.2	-19.4	-37.8	5.81	284
2/10/18	-34.6	-24.7	-39.1	8.28	328
2/11/18	-37.9	-34.8	-39.7	4.87	322
2/12/18	-34.2	-31.7	-36.2	1.25	218
2/13/18	-31.1	-29.4	-34.4	1.52	169
2/14/18	-35.9	-34.2	-40.6	2.72	14
2/15/18	-38.3	-35.4	-42.2	6.81	277
2/16/18	-40.8	-38.2	-43.4	4.21	312
2/17/18	-42.4	-39.9	-44.0	1.93	358
2/18/18	-44.1	-41.3	-46.6	4.85	322
2/19/18	-40.9	-39.4	-42.8	7.83	325
2/20/18	-38.3	-35.9	-40.6	6.50	312
2/21/18	-36.0	-30.7	-39.1	2.67	50
2/22/18	-38.9	-36.4	-41.3	3.39	109
2/23/18	-35.6	-30.4	-39.4	3.93	35
2/24/18	-32.2	-23.0	-38.5	4.76	168
2/25/18	-24.5	-21.2	-29.1	3.02	242
2/26/18	-28.7	-24.7	-33.3	2.26	164
2/27/18	-28.6	-25.1	-32.2	2.24	153
2/28/18	-22.6	-15.9	-28.6	6.63	107
3/01/18	-16.9	-13.5	-19.6	9.34	115
3/02/18	-14.7	-13.2	-19.8	4.71	113
3/03/18	-22.8	-18.3	-28.2	1.11	29
3/04/18	-24.4	-18.8	-30.4	2.68	116
3/05/18	-17.7	-15.9	-19.3	7.52	167
3/06/18	-20.4	-18.2	-23.5	3.57	147
3/07/18	-16.4	-12.5	-20.7	5.51	144
3/08/18	-15.7	-13.5	-18.2	6.58	140
3/09/18	-14.9	-12.4	-19.3	3.01	95
3/10/18	-20.7	-16.4	-29.8	2.83	285
3/11/18	-27.8	-24.0	-32.9	2.02	103
3/13/18	-28.0	-23.9	-30.9	3.51	313
3/14/18	-27.7	-24.3	-33.7	6.49	23
3/15/18	-29.9	-23.3	-35.6	4.13	144
3/16/18	-28.4	-21.6	-37.5	8.17	327
3/17/18	-33.6	-28.0	-38.7	3.93	50

Date	Average Temperature (°C)	Minimum Temperature (°C)	Maximum Temperature (°C)	Average Wind Speed (m/s)	Average Wind Direction (deg.)
3/18/18	-27.7	-23.0	-29.9	2.12	133
3/19/18	-26.7	-22.0	-30.6	2.47	169
3/20/18	-17.3	-14.1	-22.1	3.48	133
3/21/18	-25.5	-17.7	-32.9	7.34	358
3/22/18	-32.3	-28.04	-35.62	6.171	319.6
3/23/18	-29.54	-23.99	-34.95	3.722	252.5
3/24/18	-23.61	-18.57	-28.65	3.979	168.1
3/25/18	-19.17	-16.76	-21.08	5.668	43.18
3/26/18	-20.7	-15.21	-28.18	7.433	347.7
3/27/18	-30.0	-27.4	-32.7	8.51	284
3/28/18	-30.1	-25.2	-33.8	3.09	64
3/29/18	-26.9	-25.5	-28.5	15.43	343
3/30/18	-28.5	-26.0	-32.0	14.09	327
3/31/18	-25.0	-21.4	-28.6	10.90	331
4/01/18	-25.5	-22.4	-28.9	6.38	18
4/02/18	-25.9	-21.7	-31.9	6.50	324
4/03/18	-24.9	-22.8	-27.4	5.87	322
4/04/18	-15.5	-5.9	-23.4	11.07	39
4/05/18	-19.7	-16.3	-24.8	6.45	21
4/06/18	-19.1	-14.5	-26.6	10.76	340
4/07/18	-26.3	-23.3	-29.0	9.10	330
4/08/18	-20.7	-16.2	-26.8	5.48	312
4/09/18	-23.5	-21.6	-25.4	4.69	296
4/10/18	-25.3	-22.1	-28.2	3.61	297
4/11/18	-28.0	-23.7	-32.2	4.24	305
4/12/18	-28.5	-24.6	-32.6	6.78	336
4/13/18	-24.9	-19.1	-30.4	4.68	339
4/14/18	-20.83	-15.35	-27.23	4.128	221.4
4/15/18	-15.53	-10.83	-20.88	4.528	159.9
4/16/18	-10.35	-6.709	-16.56	5.134	148.8
4/17/18	-14.56	-8.59	-19.93	7.431	342.8
4/18/18	-16.81	-11.7	-22.5	2.775	75.94
4/19/18	-6.722	-1.116	-12.71	10.88	138.9
4/20/18	-10.67	-0.913	-16.29	6.857	227.3
4/21/18	-5.322	-0.51	-15.08	7.708	126.4
4/22/18	-10.2	-1.0	-20.9	7.63	311
4/23/18	-19.4	-15.1	-24.1	3.16	301
4/24/18	-17.3	-12.7	-22.6	3.36	253

Date	Average Temperature (°C)	Minimum Temperature (°C)	Maximum Temperature (°C)	Average Wind Speed (m/s)	Average Wind Direction (deg.)
4/25/18	-17.9	-12.6	-21.8	3.39	298
4/26/18	-19.1	-13.5	-24.8	5.41	310
4/27/18	-18.9	-15.7	-22.7	3.83	312
4/28/18	-17.2	-12.7	-20.5	4.04	254
4/29/18	-12.8	-5.8	-19.6	4.44	201
4/30/18	-18.6	-16.0	-21.6	7.48	303
5/01/18	-18.3	-14.9	-21.7	8.25	287
5/02/18	-17.4	-13.7	-21.7	3.59	242
5/03/18	-10.1	-5.2	-18.2	8.04	180
5/04/18	-12.8	-5.1	-18.5	5.92	326
5/05/18	-18.7	-14.7	-22.9	4.11	312
5/06/18	-16.4	-11.7	-22.6	2.72	181
5/07/18	-7.8	1.0	-14.3	8.50	220
5/08/18	-15.1	-13.7	-16.6	11.38	312
5/09/18	-13.8	-11.2	-16.6	6.52	301
5/10/18	-11.5	-9.5	-14.8	5.76	317
5/11/18	-8.0	-4.3	-13.6	6.67	291
5/12/18	-11.2	-7.2	-15.3	8.09	314
5/13/18	-12.2	-9.5	-17.6	3.72	217
5/14/18	-11.6	-9.1	-14.3	5.41	294
5/15/18	-13.9	-10.2	-17.1	8.44	317
5/16/18	-12.1	-9.1	-16.6	6.01	332
5/17/18	-10.5	-8.6	-12.8	9.95	314
5/18/18	-10.2	-8.5	-12.8	8.57	313
5/19/18	-8.3	-1.9	-14.3	4.10	258
5/20/18	-6.5	-0.4	-11.0	8.17	303
5/21/18	-9.5	-6.7	-11.7	8.11	302
5/22/18	-7.1	-4.4	-10.3	4.15	305
5/23/18	-6.1	-5.0	-7.4	3.40	197
5/24/18	-3.6	-0.8	-6.3	6.91	116
5/25/18	-3.9	-0.8	-10.0	5.34	9
5/26/18	-8.2	-3.5	-13.2	4.71	88
5/27/18	-2.1	-0.2	-4.3	7.26	132
5/28/18	-2.1	-0.4	-6.8	6.58	354
5/29/18	-6.7	-2.5	-10.0	4.08	257
5/30/18	-2.6	-1.6	-3.3	3.98	107
5/31/18	-4.4	-2.4	-6.1	9.78	300
6/01/18	-6.1	-4.2	-8.7	9.78	303

Date	Average Temperature (°C)	Minimum Temperature (°C)	Maximum Temperature (°C)	Average Wind Speed (m/s)	Average Wind Direction (deg.)
6/02/18	-4.7	-2.1	-7.6	3.68	328
6/03/18	-5.9	-0.6	-10.4	3.61	74
6/04/18	-3.9	0.3	-8.2	3.62	91
6/05/18	-2.1	0.8	-5.8	1.71	108
6/06/18	-0.1	3.1	-3.2	2.61	86
6/07/18	-1.6	2.2	-5.6	3.59	82
6/08/18	1.7	6.4	-4.1	2.68	313
6/09/18	3.5	7.5	0.2	2.59	169
6/10/18	3.3	7.3	0.2	5.00	103
6/11/18	5.5	10.7	0.4	4.54	95
6/12/18	4.8	7.6	1.6	8.44	100
6/13/18	3.9	7.2	1.4	9.96	115
6/14/18	6.6	12.4	0.8	5.82	134
6/15/18	8.9	15.0	1.4	3.07	124
6/16/18	9.7	15.1	4.0	3.76	128
6/17/18	7.5	11.0	5.3	2.01	150
6/18/18	10.2	19.3	3.2	4.16	270
6/19/18	5.0	8.4	2.7	6.14	326
6/20/18	8.1	15.6	1.5	3.75	267
6/21/18	9.6	17.8	3.6	5.93	270
6/22/18	4.2	7.2	2.2	9.09	313
6/23/18	5.3	10.0	0.9	5.04	329
6/24/18	6.9	14.1	1.8	2.47	269
6/25/18	8.2	12.6	3.8	5.40	148
6/26/18	5.9	8.4	2.7	8.76	354
6/27/18	5.9	11.0	1.4	4.32	322
6/28/18	10.0	14.4	1.1	2.51	26
6/29/18	8.3	12.0	4.0	5.24	2
6/30/18	8.7	13.7	3.8	2.62	342
7/01/18	12.0	18.7	4.6	2.76	175
7/02/18	11.4	17.5	6.2	5.03	178
7/03/18	8.3	12.1	4.9	6.09	345
7/04/18	9.2	14.6	3.4	4.81	321
7/05/18	12.0	16.6	5.1	1.37	271
7/06/18	11.1	15.5	7.0	3.81	231
7/07/18	12.4	19.9	5.5	3.32	158
7/08/18	9.2	14.5	4.8	6.74	14
7/09/18	7.0	10.7	3.2	5.55	298

Date	Average Temperature (°C)	Minimum Temperature (°C)	Maximum Temperature (°C)	Average Wind Speed (m/s)	Average Wind Direction (deg.)
7/10/18	12.0	20.2	5.0	3.98	259
7/11/18	19.1	27.6	10.7	3.22	219
7/12/18	20.7	28.8	13.5	3.68	169
7/13/18	18.0	24.6	12.0	5.19	247
7/14/18	13.2	18.0	9.4	9.63	1
7/15/18	10.5	14.6	6.5	7.59	1
7/16/18	13.0	18.4	6.7	4.79	349
7/17/18	15.3	20.8	8.1	2.57	313
7/18/18	17.5	22.0	12.1	5.28	133
7/19/18	14.1	18.3	11.0	5.84	119
7/20/18	15.2	20.6	9.6	5.27	331
7/21/18	13.9	20.3	8.3	4.89	279
7/22/18	14.1	19.0	10.4	3.56	345
7/23/18	13.7	16.2	9.0	4.71	354
7/24/18	11.3	17.8	6.2	3.93	301
7/25/18	17.1	24.3	9.6	5.07	236
7/26/18	16.1	19.6	12.7	5.13	311
7/27/18	13.2	17.9	8.3	3.92	323
7/28/18	17.2	23.4	11.3	4.59	245
7/29/18	10.5	16.1	7.3	7.33	322
7/30/18	7.6	11.3	3.9	7.29	328
7/31/18	7.4	10.0	5.3	7.05	317
8/01/18	10.8	16.9	4.7	5.67	260
8/02/18	10.6	14.6	5.9	8.38	263
8/03/18	7.8	11.7	4.3	6.35	323
8/04/18	8.4	10.0	7.1	6.21	133
8/05/18	7.3	9.0	5.9	10.43	342
8/06/18	9.6	14.3	6.1	8.38	294
8/07/18	11.5	15.3	6.6	2.35	161
8/08/18	12.0	14.7	9.8	3.82	345
8/09/18	10.6	14.4	7.5	5.80	335
8/10/18	8.8	10.5	7.0	3.40	60
8/11/18	9.1	12.4	5.5	3.69	3
8/12/18	10.6	13.1	7.3	8.19	221
8/13/18	6.7	9.2	5.1	11.52	311
8/14/18	9.5	13.7	4.2	4.37	248
8/15/18	11.0	13.5	8.9	5.88	152
8/16/18	8.2	12.1	4.6	8.57	321

Date	Average Temperature (°C)	Minimum Temperature (°C)	Maximum Temperature (°C)	Average Wind Speed (m/s)	Average Wind Direction (deg.)
8/17/18	8.0	12.7	3.5	6.69	264
8/18/18	13.1	17.6	9.2	5.12	238
8/19/18	9.9	17.5	4.4	5.70	261
8/20/18	5.2	7.7	2.8	8.39	304
8/21/18	5.5	7.4	3.4	4.85	278
8/22/18	4.4	6.7	1.7	6.19	316
8/23/18	3.7	6.5	0.9	6.88	343
8/24/18	3.5	5.0	1.5	10.50	324
8/28/18	7.2	12.0	2.6	1.47	199
8/29/18	9.5	15.1	6.3	3.55	168
8/30/18	8.7	11.7	7.3	3.55	203
8/31/18	8.3	12.7	4.2	2.40	341
9/01/18	8.8	12.7	4.9	2.47	94
9/02/18	8.3	11.5	4.2	4.66	172
9/03/18	8.9	12.3	6.5	7.35	167
9/04/18	8.3	11.7	6.2	5.76	166
9/05/18	4.2	9.1	0.9	5.52	326
9/06/18	4.8	8.4	1.8	5.31	196
9/07/18	2.8	4.0	1.9	8.86	330
9/08/18	5.3	11.2	0.4	4.65	217
9/09/18	3.4	6.7	1.1	5.54	302
9/10/18	2.4	6.8	0.7	7.73	274
9/11/18	2.7	6.1	0.6	6.80	229
9/12/18	0.1	2.6	-1.5	5.97	281
9/13/18	-0.4	1.5	-2.0	6.28	264
9/14/18	0.1	1.9	-1.5	5.97	250
9/15/18	0.3	1.9	-0.7	4.52	243
9/16/18	-0.6	1.2	-1.9	4.92	294
9/17/18	-0.9	0.3	-2.9	7.44	280
9/18/18	1.3	4.1	-1.1	7.93	213
9/19/18	-2.6	3.2	-4.7	6.47	286
9/20/18	-4.0	-2.7	-5.4	5.48	240
9/21/18	-4.2	-2.7	-5.9	3.47	133
9/22/18	-4.1	-1.5	-7.3	6.35	353
9/23/18	-2.4	-0.6	-4.2	6.71	293
9/24/18	0.9	4.1	-1.9	7.28	201
9/25/18	-0.2	2.4	-2.0	4.96	267
9/26/18	-2.2	-0.9	-3.2	4.88	293

Date	Average Temperature (°C)	Minimum Temperature (°C)	Maximum Temperature (°C)	Average Wind Speed (m/s)	Average Wind Direction (deg.)
9/27/18	-2.1	0.2	-3.8	5.99	245
9/28/18	-4.2	-1.1	-7.1	8.67	287
9/29/18	-3.1	-1.9	-4.4	4.44	267
9/30/18	-5.1	-3.6	-7.2	5.34	354
10/01/18	-5.4	-3.9	-6.6	5.11	287
10/02/18	-5.6	-3.9	-7.5	4.49	294
10/03/18	-7.0	-4.8	-11.6	3.96	79
10/04/18	-8.6	-6.6	-11.3	5.52	2
10/05/18	-6.4	-4.0	-10.5	7.73	346
10/06/18	-4.4	-3.6	-5.8	8.06	347
10/07/18	-6.4	-4.4	-7.7	10.27	321
10/08/18	-4.4	-2.5	-6.5	11.85	305
10/09/18	-4.8	-3.6	-6.5	10.13	316
10/10/18	-5.6	-4.6	-6.6	8.24	314
10/11/18	-4.7	-0.9	-7.3	5.05	254
10/12/18	-5.6	-2.5	-8.0	3.35	157
10/13/18	-7.7	-4.4	-10.2	3.14	25
10/14/18	-8.6	-6.9	-10.9	6.06	315
10/15/18	-12.0	-8.9	-14.3	2.55	319
10/16/18	-13.7	-11.7	-15.8	2.95	46
10/17/18	-11.7	-9.5	-15.6	6.67	305
10/18/18	-10.8	-8.5	-14.8	5.46	267
10/19/18	-11.2	-5.6	-17.0	4.91	112
10/20/18	-10.9	-5.8	-15.2	8.13	357
10/21/18	-13.2	-10.2	-15.5	5.04	185
10/22/18	-9.1	-7.1	-12.8	7.41	105
10/23/18	-11.6	-7.5	-17.9	3.50	343
10/24/18	-19.3	-15.9	-21.4	1.30	26
10/25/18	-21.8	-17.4	-23.9	0.59	327
10/26/18	-19.5	-13.1	-23.4	3.69	104
10/27/18	-7.7	-5.4	-13.6	10.81	138
10/28/18	-3.8	-2.3	-6.1	3.71	132
10/29/18	-4.3	-2.5	-8.9	2.72	10
10/30/18	-2.2	-1.0	-3.8	4.48	47
10/31/18	-3.6	-1.9	-5.9	5.93	39
11/01/18	-6.8	-4.0	-11.6	5.91	43
11/02/18	-10.7	-8.1	-14.1	3.90	19
11/03/18	-15.0	-11.9	-17.5	2.49	328

Date	Average Temperature (°C)	Minimum Temperature (°C)	Maximum Temperature (°C)	Average Wind Speed (m/s)	Average Wind Direction (deg.)
11/04/18	-14.9	-11.8	-17.5	2.20	103
11/05/18	-9.6	-7.5	-12.7	8.04	89
11/06/18	-9.7	-8.1	-14.3	7.11	45
11/07/18	-16.4	-14.1	-17.5	8.59	339
11/08/18	-15.5	-13.9	-17.2	10.66	321
11/09/18	-17.8	-16.1	-19.3	10.16	318
11/10/18	-21.9	-18.6	-24.1	3.92	298
11/11/18	-19.9	-18.3	-21.0	1.65	340
11/12/18	-20.3	-18.1	-22.5	1.76	313
11/13/18	-22.4	-19.4	-24.5	1.58	307
11/14/18	-22.9	-19.7	-25.1	3.43	323
11/15/18	-27.5	-19.7	-29.8	3.60	319
11/16/18	-29.9	-28.1	-31.0	2.90	298
11/17/18	-29.5	-26.3	-31.0	0.95	242
11/18/18	-28.8	-26.8	-30.4	3.60	325
11/19/18	-30.8	-29.4	-32.3	4.05	305
11/20/18	-32.4	-29.2	-33.9	3.23	341
11/21/18	-32.9	-31.5	-33.9	4.81	317
11/22/18	-31.8	-26.8	-33.9	2.62	202
11/23/18	-23.4	-20.5	-29.4	7.70	82
11/24/18	-30.3	-23.5	-32.9	5.35	329
11/25/18	-30.9	-27.2	-32.9	3.08	335
11/26/18	-30.3	-28.3	-31.6	1.87	67
11/27/18	-30.0	-28.2	-31.8	0.73	108
11/28/18	-27.4	-24.8	-29.7	1.74	112
11/29/18	-22.4	-17.1	-26.6	1.04	119
11/30/18	-15.6	-12.9	-17.8	0.38	144
12/01/18	-12.6	-11.0	-14.8	0.19	196
12/02/18	-20.2	-14.7	-23.7	0.11	306
12/03/18	-19.2	-14.3	-24.1	0.08	208
12/04/18	-17.0	-11.7	-28.1	6.08	282
12/05/18	-32.1	-28.0	-33.9	8.29	325
12/06/18	-31.0	-28.2	-33.7	6.47	305
12/07/18	-28.9	-25.1	-32.5	1.14	153
12/08/18	-24.9	-22.2	-28.0	3.24	144
12/09/18	-26.7	-21.6	-30.6	3.45	51
12/10/18	-22.8	-16.3	-30.8	7.42	120
12/11/18	-15.2	-13.9	-16.6	10.13	142

Date	Average Temperature (°C)	Minimum Temperature (°C)	Maximum Temperature (°C)	Average Wind Speed (m/s)	Average Wind Direction (deg.)
12/12/18	-11.9	-8.1	-16.0	4.03	175
12/13/18	-12.6	-10.1	-18.0	4.07	123
12/14/18	-9.8	-8.5	-12.1	6.05	128
12/15/18	-11.5	-9.8	-17.0	2.50	206
12/16/18	-18.7	-16.4	-21.6	6.87	295
12/17/18	-22.6	-17.6	-27.4	8.83	322
12/18/18	-28.1	-24.6	-30.1	3.92	318
12/19/18	-23.7	-21.7	-26.0	1.17	68
12/20/18	-28.6	-25.1	-31.2	2.21	320
12/21/18	-31.9	-29.4	-33.7	0.72	100
12/22/18	-31.7	-30.1	-33.2	1.45	102
12/23/18	-30.6	-27.8	-32.4	1.73	104
12/24/18	-24.1	-20.3	-28.3	3.15	149
12/25/18	-21.4	-19.1	-23.7	4.11	252
12/26/18	-28.3	-21.6	-33.9	9.59	333
12/27/18	-34.6	-32.7	-36.3	6.44	307
12/28/18	-34.4	-33.0	-35.2	3.46	297
12/29/18	-34.9	-33.6	-35.7	5.53	326
12/30/18	-34.4	-32.9	-35.1	5.16	323
12/31/18	-33.4	-31.7	-34.8	5.77	316

Appendix B

Results of Dustfall Monitoring along the AWAR and WTHR

Table B- 1. 30-d total and fixed dustfall rates for samples collected in 2019 along the Meadowbank AWAR (km 11, 18, 25, 50, 69, 78, 84). NA = result unavailable (damaged sampler). *Dates are approx. (analysis adjusted to 30-d period)

Km	Side of Road	Distance (m)	June 24 – July 28*		July 28 – August 24*	
			Total Dustfall ($mg/cm^2/30d$)	Fixed Dustfall ($mg/cm^2/30d$)	Total Dustfall ($mg/cm^2/30d$)	Fixed Dustfall ($mg/cm^2/30d$)
11	E	25	0.37	0.25	0.27	0.23
11	E	100	0.29	0.10	0.27	0.14
11	E	300	0.14	0.04	0.23	0.12
11	W	25	0.66	0.54	0.87	0.66
11	W	100	0.26	0.15	0.20	0.05
11	W	100 (dup)	0.18	0.11	-	-
11	W	300	0.18	0.05	0.24	0.02
11	W	1000	0.20	0.08	0.09	0.09
18	E	25	0.57	0.48	1.14	1.13
18	E	100	0.56	0.31	0.18	0.18
18	E	100 (dup)	0.58	0.33		
18	E	300	0.25	0.18	0.11	0.10
18	W	25	0.25	0.05	1.25	1.21
18	W	100	0.42	0.27	0.46	0.37
18	W	300	0.61	0.19	NA	NA
25	E	25	0.57	0.31	0.28	0.28
25	E	100	0.12	0.03	0.11	0.09
25	E	100 (dup)	-	-	0.14	0.13
25	E	300	0.09	0.02	0.07	0.07
25	W	25	0.45	0.37	0.75	0.71
25	W	100	0.32	0.09	0.23	0.20
25	W	100 (dup)	-	-	0.21	0.19
25	W	300	0.09	0.01	0.06	0.05
25	W	1000	-	-	0.16	0.09
50	E	25	0.31	0.20	0.31	0.14
50	E	25 (dup)	-	-	0.20	0.17
50	E	100	0.29	0.15	0.18	0.14
50	E	300	0.13	0.08	0.09	0.07
50	E	1000	0.18	0.11	0.07	0.05
50	E	1000 (dup)	0.24	0.14	-	-
50	W	25	0.29	0.24	0.55	0.46
50	W	100	0.21	0.15	0.25	0.17
50	W	300	0.18	0.12	0.14	0.02
50	W	1000	0.15	0.06	0.13	0.01
69	E	25	0.59	0.31	0.27	0.20

Km	Side of Road	Distance (m)	June 24 – July 28*		July 28 – August 24*	
			Total Dustfall (mg/cm^2/30d)	Fixed Dustfall (mg/cm^2/30d)	Total Dustfall (mg/cm^2/30d)	Fixed Dustfall (mg/cm^2/30d)
69	E	25 (dup)			0.33	0.21
69	E	100	0.42	0.20	0.24	0.12
69	E	300	0.44	0.04	0.16	0.06
69	E	1000	0.48	0.08	0.12	0.03
69	W	25	0.62	0.36	0.52	0.40
69	W	25 (dup)	0.73	0.45	-	-
69	W	100	0.43	0.09	0.20	0.06
69	W	300	0.18	0.08	0.24	0.13
69	W	1000	0.26	0.15	0.26	0.07
78	E	25	1.80	1.64	3.14	2.99
78	E	100	0.48	0.42	0.63	0.50
78	E	300	0.22	0.18	1.98	1.05
78	E	1000	0.16	0.11	0.29	0.03
78	E	25 (stand)	-	-	1.18	1.04
78	E	100 (stand)	-	-	0.38	0.15
78	E	300 (stand)	-	-	0.29	0.08
78	E	1000 (stand)	-	-	0.08	0.02
78	W	25	1.67	1.61	4.00	3.89
78	W	100	0.74	0.70	0.87	0.79
78	W	300	0.33	0.25	0.25	0.15
78	W	1000	0.13	0.08	0.14	0.03
84	E	25	0.99	0.91	3.45	3.35
84	E	100	0.19	0.17	0.21	0.15
84	E	300	0.40	0.10	0.10	0.02
84	E	300 (dup)	0.23	0.10	-	-
84	E	1000	0.16	0.10	0.10	< 0.001
84	W	25	0.83	0.75	0.78	0.68
84	W	100	0.37	0.31	0.22	0.14
84	W	300	0.14	0.12	0.17	0.02
84	W	1000	0.20	0.09	0.07	0.01

Table B- 2. 30-d total and fixed dustfall rates for samples collected in 2018 along the Whale Tail Haul Road (km 134, 151, 169). NA = result unavailable (damaged sampler). *Approx. dates (analysis adjusted to 30-d period).

Km	Side of Road	Distance (m)	July 23 – August 22*		August 31 – October 9*	
			Total Dustfall ($mg/cm^2/30d$)	Fixed Dustfall ($mg/cm^2/30d$)	Total Dustfall ($mg/cm^2/30d$)	Fixed Dustfall ($mg/cm^2/30d$)
134	E	25	2.56	2.50	0.90	0.83
134	E	25 (dup)	2.41	2.29	1.05	1.00
134	E	100	0.96	0.86	0.31	0.25
134	E	300	0.52	0.40	0.16	0.10
134	E	1000	0.36	0.25	0.24	0.08
134	W	25	2.43	2.23	8.04	7.85
134	W	100	1.00	0.93	1.79	1.62
134	W	300	0.51	0.43	0.25	0.15
134	W	1000	0.23	0.14	0.22	0.10
151	E	25	3.91	3.75	2.55	2.31
151	E	25 (dup)	-	-	2.99	2.82
151	E	100	2.14	1.99	1.48	1.44
151	E	300	0.71	0.64	0.41	0.17
151	E	800	0.44	0.35	0.29	0.09
151	W	25	2.89	2.75	2.30	2.07
151	W	100	2.24	2.15	0.88	0.63
151	W	300	1.42	1.11	0.77	0.25
151	W	1000	0.46	0.26	0.08	0.04
169	E	25	1.98	1.69	0.46	0.42
169	E	25 (dup)	-	-	0.62	0.54
169	E	100	1.06	0.81	0.27	0.24
169	E	300	0.52	0.25	0.21	0.16
169	E	1000	0.11	0.02	0.10	0.03
169	W	25	2.58	2.45	1.75	1.74
169	W	100	1.29	1.22	1.62	1.53
169	W	300	0.40	0.29	0.10	0.06
169	W	1000	0.05	< 0.001	0.05	0.02