Appendix G11

2015 AWAR Dustfall Monitoring Report

AGNICO EAGLE

MEADOWBANK GOLD PROJECT

2015 All-Weather Access Road Dust Monitoring Report

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March, 2016

EXECUTIVE SUMMARY

AEM has conducted studies of dustfall along the Meadowbank AWAR to Baker Lake since 2012. These studies characterize dust deposition rates with respect to distance from the AWAR in order to help determine the potential for impacts to habitat and wildlife in excess of those predicted in the Final Environmental Impact Statement (FEIS). While predicted dustfall rates were not specified, the FEIS indicated that the majority of dustfall was anticipated to occur within 100 m of the road. The smallest zone of influence (ZOI; area where habitat is assumed lost due to sensory disturbance and other factors) for any wildlife VEC is also 100 m. Therefore, dustfall studies focused around the 100 m distance. Through these studies, AEM aimed to quantify dustfall with respect to distance from the AWAR, and compare results to background levels and regulatory guidelines.

While data from previous studies is referenced in this report, it should be noted that the study in 2012 was preliminary with only 10 sample locations, and in 2013 only seven samples were able to be analyzed due to disruption of sample canisters in the field. Based on these studies, improvements to methods were made and studies conducted in 2014 and 2015 were more robust.

Results to date indicate that more than a 50% reduction in average total dustfall is occurring from 25 m to 100 m on the downwind (most impacted) side of the road, indicating that the majority of dustfall does settle within the predicted 100 m zone. In addition, average rates of dustfall decline below Alberta Environment's guideline for recreational areas within 100 m of the AWAR. Further, all but one sample collected at 300 m from the AWAR and many samples collected at 100 and 150 m are within the range of background dustfall levels. Within 1000 m (the assumed ZOI for ungulates), all samples are within the range of background dustfall. Based on these results, it is unlikely that FEIS predictions are being exceeded and that impacts to VECs (vegetation community productivity and wildlife) due to dust are occurring beyond assumed ZOIs.

These conclusions are supported by wildlife monitoring conducted under the Terrestrial Ecosystem Management Plan, including the 2015 Breeding Bird Study and the most recent (2014) Wildlife Screening Level Risk Assessment. These studies indicate no significant effect of the road on breeding bird abundance or risk from consumption of chemical contaminants. Similar results were observed in a study at Ekati Diamond Mine, where Male and Nol (2005) found no measurable effect of haul roads on Lapland longspurs, despite higher rates of dustfall than occur at Meadowbank.

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SECTION 1 • INTRODUCTION

1.1 BACKGROUND

In accordance with NIRB Project Certificate No.004, AEM has conducted annual dustfall and air quality monitoring around the Meadowbank site since 2011. Evaluation and monitoring of fugitive dust along the AWAR was not required as a component of this program, because air quality modelling in support of the FEIS predicted that the worst case levels of dust would occur onsite where monitoring was planned, and would be in the range of air quality objectives.

In 2012, the hamlet of Baker Lake raised concerns about high dust levels along the AWAR near the community. In response, AEM provided calcium chloride to the hamlet as a dust suppressant, and conducted a preliminary study to begin to evaluate dustfall along the AWAR (it should also be noted that AEM continues to apply dust suppressant on most heavily-travelled section of the AWAR, between the main site and the former Meadowbank Exploration Camp site). A larger-scale study was conducted in 2013, but insufficient data was obtained due to disruption of the majority of the sampling canisters. As a result, the study was repeated with more robust methods in 2014 and 2015.

The primary goal of these studies has been to confirm the accuracy of impacts predicted in the FEIS with regards to AWAR dust. Meadowbank's Terrestrial Ecosystem Impact Assessment (Cumberland, 2005) indicated:

> "Potential effects from roads (e.g., all-weather access road)…will include … reduced habitat effectiveness and habitat degradation due to dust and exhaust, and potential for increased contaminant loading in food sources (Auerbach et al, 1997; Fisk et al, 2003). With or without mitigation, these overall impacts in the LSA (local study area) are not expected to be significant."

Potential impacts of the road on contaminant loading in food sources are addressed through the Wildlife Screening Level Risk Assessment program (see 2014 Annual Report). Potential impacts on animal VECs and indirectly, degradation of their habitat, are or have been assessed through various components of the Terrestrial Ecosystem Management Plan (TEMP) such as breeding bird, waterfowl, raptor and caribou surveys. However, since several components of the AWAR terrestrial wildlife monitoring programs were discontinued in 2011 or 2012 due to lack of observed effects (per the TEMP schedule), dustfall studies can be used to ensure rates of dustfall are not increasing, in which case these programs may need to be re-instated on a regular basis.

While predicted dustfall rates were not specified, the FEIS indicated that the majority of dustfall was anticipated to occur within 100 m of the road. The smallest zone of influence (ZOI; area where habitat is assumed lost due to sensory disturbance and other factors) for any wildlife VEC is also 100 m, with the prediction that impacts to VECs outside this zone would not be significant (< 1% change within the LSA from baseline). Therefore, dustfall studies focused around the 100 m distance, and particularly on the downwind (most impacted) side of the road. Through these studies, AEM aimed to quantify dustfall with respect to distance from the AWAR, and compare results to background levels and regulatory guidelines.

Further, in 2015 AEM applied for an amendment to their Type B Water License through the Nunavut Water Board to permit development of an all-weather access road between Meadowbank and the Amaruq exploration site, located 50 km northwest of Meadowbank. In consideration of community concerns regarding potential generation and impacts of dust, as well as the low availability of background dusfall rates in the North, AEM included an assessment of dustfall in the area of the

proposed Amaruq AWAR in this 2015 study. These results serve as baseline concentrations for future assessments in this area, as well as background or reference values for the Meadowbank AWAR assessment.

1.2 PAST STUDY DESIGN

The initial dustfall study was conducted along the AWAR in 2012, and included sampling of two single transects along the road to a 100 or 150 m distance (km 76 and 78), and two clusters on the minesite. This initial study was used to assess methods, and assist in the design of the larger scale study to be completed in 2013. In 2013 an expanded study was conducted to more fully characterize dustfall rates in relation to distance from the AWAR. Two duplicated transects of samplers were deployed at km 18 and 78, up to 300 m from the AWAR, as well as a number of single canisters at 50 m (km 1, 103, Vault haul road) and two background samples at 1000 m upwind. However, due to disruption by extreme high winds, only 7 of 35 samplers could be analyzed. This study was conducted again in 2014 after establishing more robust sampling methods. Locations were the same as 2013, except background samplers were moved to an established reference site on the east side of Inuggugayualik Lake, which is approximately 10km northwest (upwind) of the mine site.

Methods of the 2015 study were similar, and are described in Section 2, and all results to date are summarized in this report.

1.3 2015 STUDY OBJECTIVES

Similar to 2014, the 2015 study aimed to characterize dust deposition rates with respect to distance from the Meadowbank AWAR in order to determine the potential for impacts to habitat in excess of those predicted in the FEIS. In addition, dustfall was measured in the area of the proposed Amaruq AWAR to obtain measurements of background dustfall in this location, and to act as reference samples for the Meadowbank AWAR.

The objectives of the study conducted in 2015 were to:

1. Characterize the dustfall gradient in relation to distance from the Meadowbank AWAR.
2. Compare rates of dustfall with background concentrations and regulatory guidelines.
3. Identify inter-annual trends in rates of dustfall.
4. Relate results to impact predictions as described in the Terrestrial Ecosystem Impact Assessment (Cumberland, 2005).
5. Record the range of background rates of dustfall occurring in the area of the proposed Amaruq AWAR.

SECTION 2 • METHODS

2.1 SAMPLE COLLECTION AND ANALYSIS

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.

Dustfall canisters were deployed from August 5 to September 7, 2015 (Meadowbank AWAR) and August 8 to September 9, 2015 (proposed Amaruq AWAR route), and calculated dustfall rates were normalized to 30 days (mg/cm^2/30 days, per ASTM 1739-98). For approximately 8 months of the year (October to May), the all weather road is snow covered. Thus dustfall sampling is conducted in August, which is one of the driest months with a high volume of traffic (i.e. at the peak of the shipping season at Meadowbank). AEM believes the August sampling adds a level of conservatism and is a "worst case" evaluation of dustfall rates along the road.

ASTM and Ontario MOE 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. Due to the difficulty of constructing and deploying stands to hold the sample containers in this remote location, the 2012 study compared dustfall at ground level and at 2 m height to inform future sampling method decisions. Based on these results and the assumption that any re-entrainment would result in conservatively high estimates of dustfall, all sampling canisters have been deployed at ground level in since 2013.

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.

2.2 SAMPLE LOCATIONS

Meadowbank and Amaruq AWAR sampling locations to date are shown in Figures 1 and 2.

2.2.1 Meadowbank AWAR

Samples were collected at 25 m, 50 m, 100 m, 150 m, 300 m and 1000 m from both sides of the road (east and west) in duplicated transects at AWAR km 18 and 78, with the exception of the km 18, 1000 m east location. Samples at 1000 m on the east side at km 18 could not be deployed because the transect was intersected by an extensive drainage channel from White Hills Lake. Duplicate transects were approximately 20 m apart. 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). Sampling transects were located perpendicular to road segments that are relatively straight with few notable topographical features, in order to limit confounding factors that alter prevailing winds and create different micro-climates.

2.2.2 Amaruq AWAR

Samples were collected at 25 m, 50 m, 100 m, 150 m, 300 m and 1000 m from both sides of the proposed road alignment (east and west) in a duplicated transect between eventual AWAR km 36

and 37. This location corresponds with breeding bird study transect #4, (see 2015 Whale Tail Pit Terrestrial Characterization Report) and is located approximately mid-way along the road route. Topography in this location is gently rolling, with a more prominent north-south slope at each end of the transect.

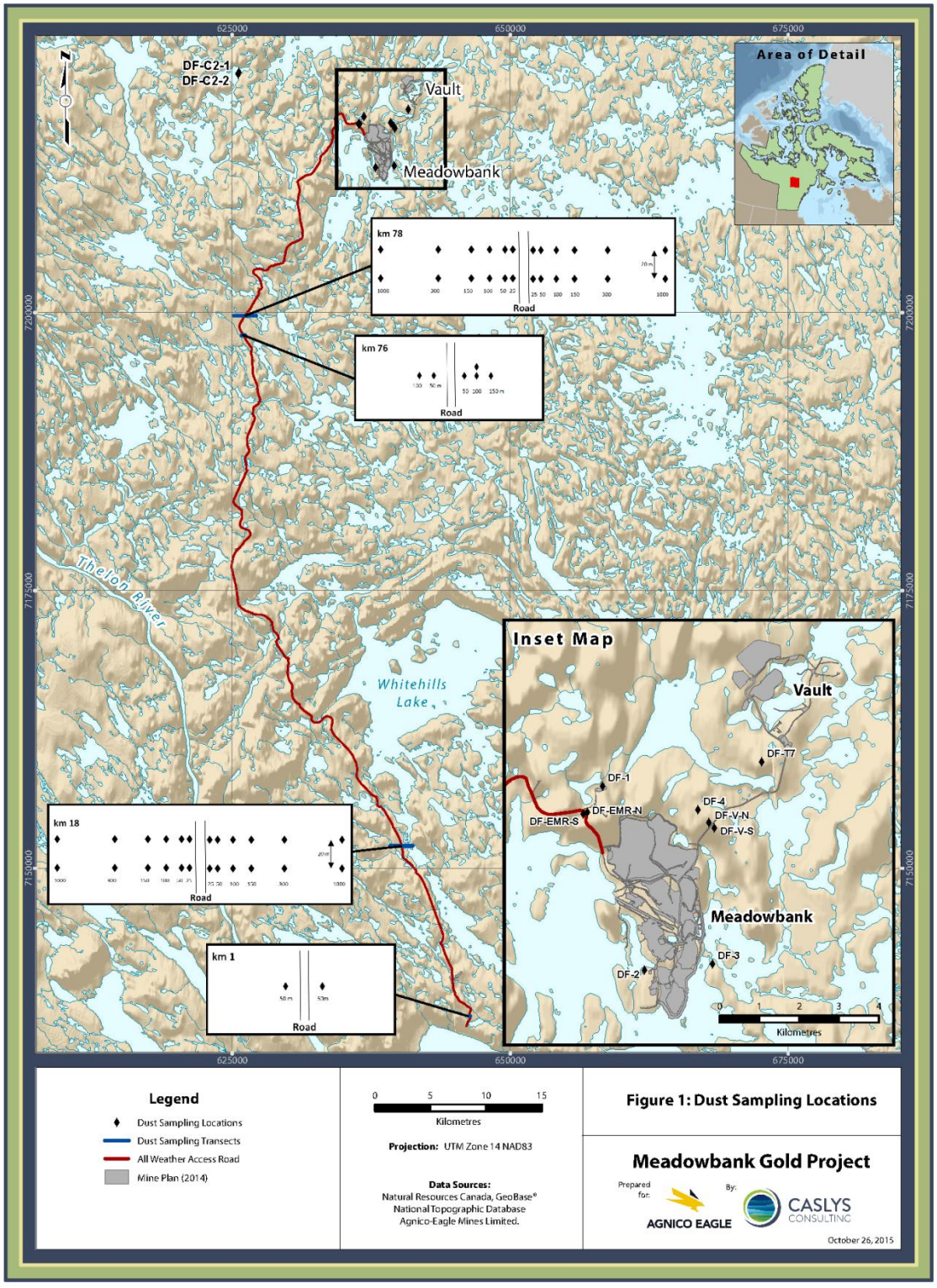

Figure 1. Dustfall sampling locations to date along the Meadowbank AWAR.

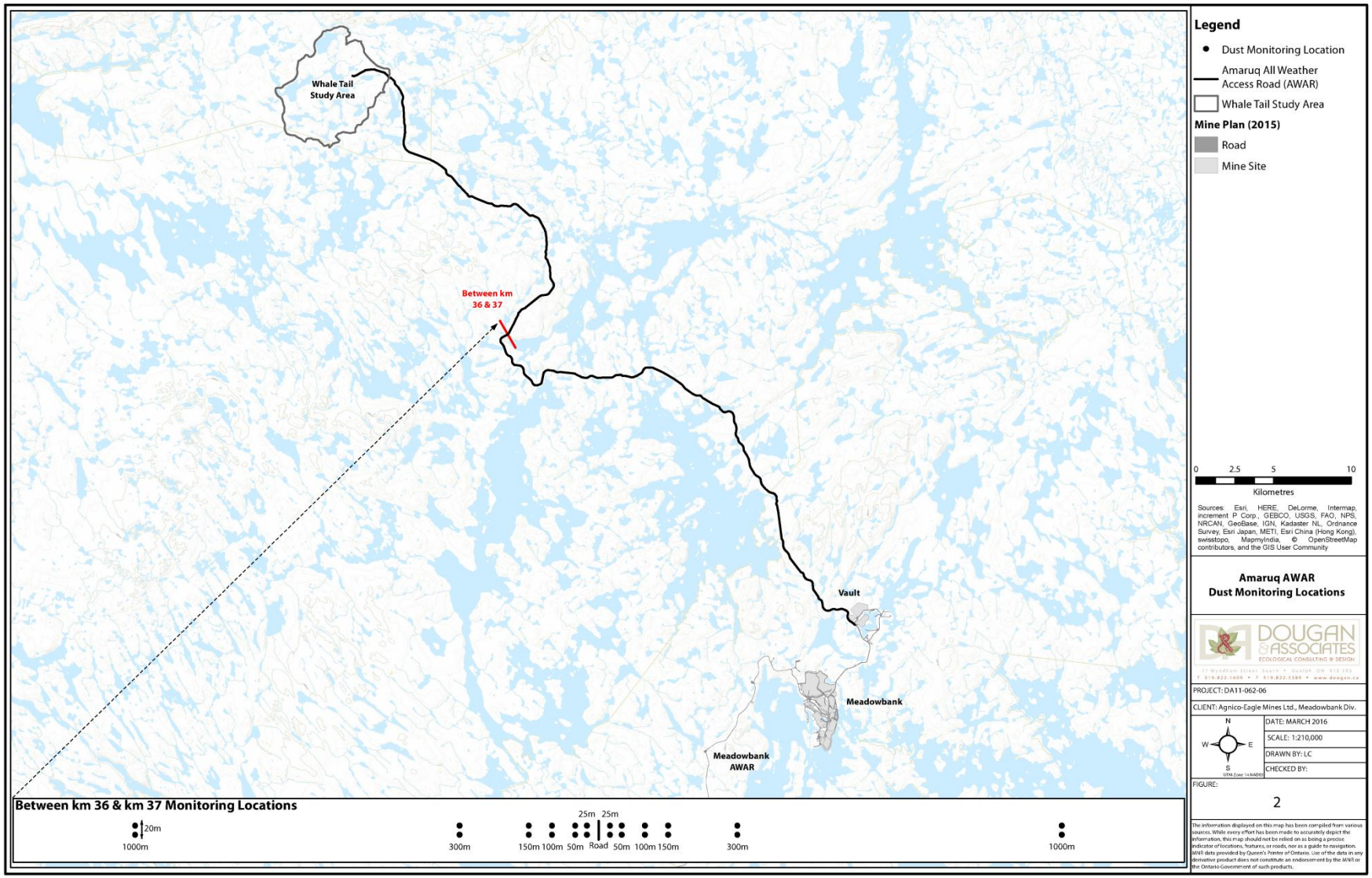

Figure 2. Dustfall sample locations to date along the Amaruq AWAR.

2.3 QA/QC

2.3.1 Sample Handling

Sampling canisters and analytical services were provided by an accredited laboratory (Maxxam Analytics Inc.). Canisters were received and deployed by appropriately trained personnel. Sample collection containers remained sealed until they were installed at the specified sampling points. Once containers were installed, container lids were removed and sampling commenced. All sample collection containers were labeled with time, date and sampling location. To avoid contamination or sample loss, no material was removed from the containers. Only canisters that were upright at the time of collection were used in data analyses (see Results section).

2.3.2 Field Duplicates

Precision of the study results was assessed by calculating the relative percent difference (RPD) between duplicate measurements. For samples that are > 5x the method detection limit, RPD can be calculated as:

$$RPD = \frac{(A - B)}{((A + B)/2)} \times 100$$

where: A = analytical result

B = duplicate result

Samples for the purpose of determining precision were collected at a rate of 10%, including one canister at each distance from the road. These duplicates consisted of two canisters within approximately 30 cm proximity.

2.4 DATA ANALYSIS

Cumulative results to date are presented in this report.

All samples were compared to available regulatory guidelines from Alberta Environment, as well as to the range of background dustfall rates (samples collected at the Inuggugayualik Lake reference site in 2014, and proposed Amaruq road location in 2015).

A qualitative year-over-year comparison for all data is presented.

SECTION 3 • REGULATORY GUIDELINES

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 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 are compared to these guidelines to provide context.

SECTION 4 • RESULTS

4.1 2015 RESULTS

4.1.1 QA/QC

The relative percent difference (RPD) values calculated for total dustfall for duplicate canisters were 8, 45, 19 and 44% at distances of 50, 100, 150 and 300 m from the road, respectively (one duplicate per distance). Alberta Environment (2006) indicates results should be treated with caution when field duplicates exceed 25% (in water samples), and that the source of the difference should be investigated (e.g. field or laboratory contamination). No similar recommendations were found specifically for dustfall samples, but spatial variability of the magnitude observed does not appear to be uncommon; up to 99% RPD was found in samples collected just 20 m apart (see Table 4-1, DF-18W-25A & B), and a range of 8 – 25% was previously reported in a study assessing passive dustfall collector design (Sanderson et al. 1963). Further, the range of sample results for each distance is well within the range of variability seen in comparison to dustfall rates at other mine sites. For instance, a variation of up to 1.8 mg/cm^2/30d was observed between Ekati haul roads at the 50 m distance (Male and Nol, 2005).

However, this relatively large apparent natural variability should be noted, as it reduces the ability to distinguish statistically significant differences between sample sites, and to effectively compare individual results to guideline values. Replication at each sampling distance therefore becomes more important in order to assess trends in averages, which are more representative of expected conditions in any one location, rather than single values.

4.1.2 Data Summary

Results for all samples collected in 2015 along with location and duplicate information are provided in Tables 4-1 and 4-2. Total dustfall rates are shown in comparison to regulatory guidelines and background samples on Figure 4-1, Section 4.2.

Table 1. 30-d total and fixed dustfall rates for samples collected in 2015 along the Meadowbank AWAR. The Alberta Environment guideline for total dustfall is 0.53 mg/cm^2/30 d for recreational/residential areas, and 1.58 mg/cm^2/30 d for industrial areas.

Location	Sample Name	Distance from Road	Upwind /Downwind	Total Dusfall Rate (mg/cm^2/30 d)
AWAR km 18	DF-18E-25A	25 m	D	0.675
	DF-18E-25B	25 m	D	0.554
	DF-18E-50A	50 m	D	0.407
	DF-18E-50B	50 m	D	0.434
	DF-18E-100A	100 m	D	0.207
	DUP-2	Duplicate of DF-18E-100A		0.327
	DF-18E-100B	100 m	D	0.18
	DF-18E-150A	150 m	D	0.194
	DF-18E-150B	150 m	D	0.194
	DF-18E-300A	300 m	D	0.14
	DF-18E-300B	300 m	D	0.287
	DF-18W-25A	25 m	U	0.421
	DF-18W-25B	25 m	U	1.249

Location	Sample Name	Distance from Road	Upwind /Downwind	Total Dusfall Rate ($mg/cm^2/30$ d)
	DF-18W-50A	50 m	U	0.407
	DUP -1	Duplicate of DF-18W-50A		0.374
	DF-18W-50B	50 m	U	0.354
	DF-18W-100A	100 m	U	0.474
	DF-18W-100B	100 m	U	0.214
	DF-18W-150A	150 m	U	0.207
	DF-18W-150B	150 m	U	0.174
	DF-18W-300A	300 m	U	0.361
	DF-18W-300B	300 m	U	0.16
	DF-18W-1000A	1000 m	U	0.094
	DF-18W-1000B	1000 m	U	0.18
AWAR km 78	DF-78E-25A	25 m	D	1.349
	DF-78E-25B	25 m	D	2.211
	DF-78E-50A	50 m	D	0.701
	DF-78E-50B	50 m	D	0.588
	DF-78E-100A	100 m	D	0.274
	DF-78E-100B	100 m	D	0.668
	DF-78E-150A	150 m	D	0.715
	DF-78E-150B	150 m	D	0.367
	DF-78E-300A	300 m	D	0.167
	DUP-4	Duplicate of DF-78E-300A		0.26
	DF-78E-300B	300 m	D	0.247
	DF-78E-1000A	1000 m	D	0.107
	DF-78E-1000B	1000 m	D	0.033
	DF-78W-25A	25 m	U	2.05
	DF-78W-25B	25 m	U	3.279
	DF-78W-50A	50 m	U	1.289
	DF-78W-50B	50 m	U	1.209
	DF-78W-100A	100 m	U	0.614
	DF-78W-100B	100 m	U	0.568
	DF-78W-150A	150 m	U	0.341
	DUP-3	Duplicate of DF-78W-150A		0.281
	DF-78W-150B	150 m	U	0.434
	DF-78W-300A	300 m	U	0.18
	DF-78W-300B	300 m	U	0.267
	DF-78W-1000A	1000 m	U	0.094
	DF-78W-1000B	1000 m	U	0.1

Table 2. 30-d total and fixed dustfall rates for samples collected in 2015 along the proposed Amaruq AWAR. "-" indicates sampler was not upright at the time of collection, so results were not assessed. The Alberta Environment guideline for total dustfall is 0.53 mg/cm^2/30 d for recreational/residential areas, and 1.58 mg/cm^2/30 d for industrial areas.

Location	Sample Name	Distance from Road	Upwind /Downwind	Total Dusfall Rate (mg/cm^2/30 d)
Proposed AWAR km 36	DF-36E-25A	25 m	D	-
	DUP-5	Duplicate of DF-36E-25A		-
	DF-36E-25B	25 m	D	-
	DF-36E-50A	50 m	D	0.138
	DF-36E-50B	50 m	D	0.028
	DF-36E-100A	100 m	D	0.021
	DF-36E-100B	100 m	D	0.055
	DF-36E-150A	150 m	D	0.021
	DF-36E-150B	150 m	D	0.034
	DF-36E-300A	300 m	D	0.055
	DF-36E-300B	300 m	D	0.028
	DF-36E-1000A	1000 m	U	0.021
	DF-36E-1000B	1000 m	U	0.007
	DF-36W-25A	25 m	U	-
	DF-36W-25B	25 m	U	0.135
	DF-36W-50A	50 m	U	0.057
	DF-36W-50B	50 m	U	0.071
	DF-36W-100A	100 m	U	0.078
	DF-36W-100B	100 m	U	0.021
	DF-36W-150A	150 m	U	0.036
	DF-36W-150B	150 m	U	0.27
	DF-36W-300A	300 m	U	0.128
	DF-36W-300B	300 m	U	0.057
	DF-36W-1000A	1000 m	U	0.057
	DUP-6	Duplicate of DF-36W-1000A		0.034
	DF-36W-1000B	1000 m	U	0.071

4.2 RESULTS TO DATE

All results collected along the Meadowbank AWAR to date are presented in Figure 4-1 in relation to Alberta Environment guidelines for total dustfall and the range of background values observed to date. The range of background concentrations (grey bar) was determined from 2 samples collected at an established external reference site (near Inuggugayualik Lake) in 2014, and 22 samples collected along the proposed Amaruq AWAR in 2015. Both locations are > 10 km from any activity.

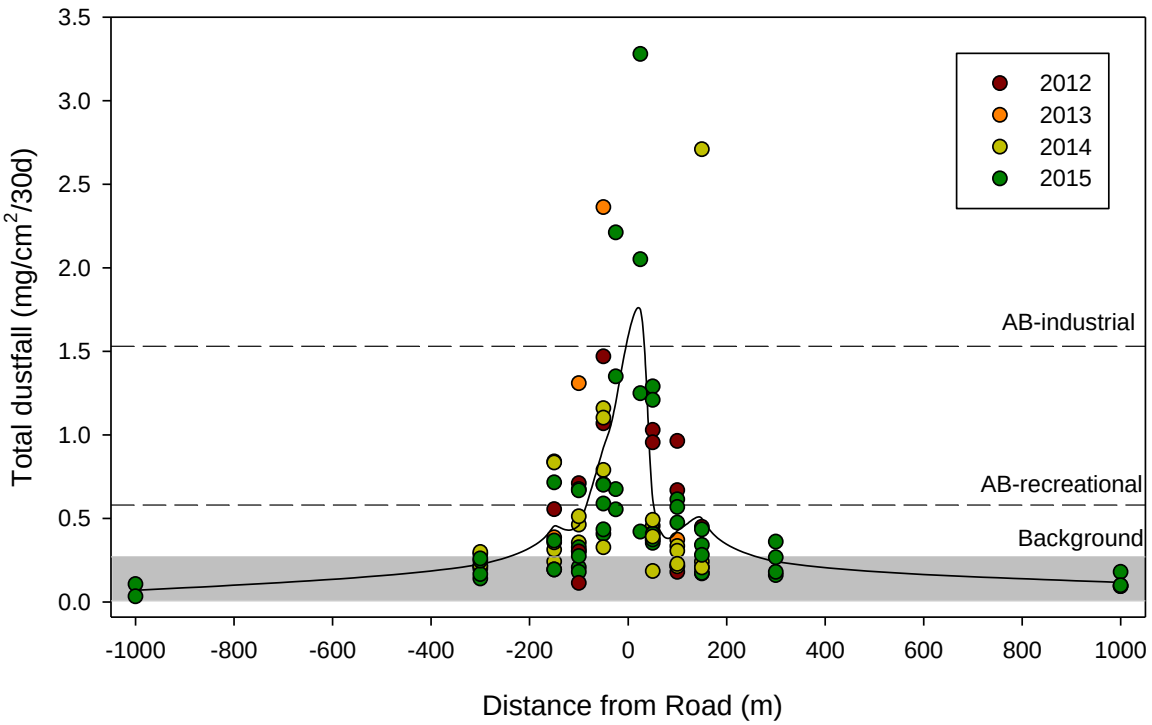

Figure 3. Total dustfall rates (mg/cm^2/30d) for all samples collected since 2012 along the Meadowbank AWAR. Negative distances represent the downwind (east) side of the road, and positive distances represent the upwind (west) side.

In addition to the results shown in Figure 3 for the Meadowbank AWAR, extra samples were collected on the Meadowbank site in 2013 and 2014 at 50 m from the road at the EMR turnoff (AWAR km 103), and in one location along the Vault haul road. Assessment of those exploratory samples was discussed in prior reports, and results are provided here for continuity (Table 4-4). Dustfall samples are also collected continually throughout the year at four locations around the Meadowbank site as a component of the Air Quality and Dustfall Monitoring Program, and results are presented in Meadowbank's Annual Report to NIRB/NWB.

Table 3. Total and fixed dustfall rates for supplementary sampling on the Meadowbank site.

Location	Year	Distance from Road	Upwind /Downwind	Total Dustfall Rate (mg/cm^2/30 d)	Fixed Dustfall Rate (mg/cm^2/30 d)
Vault haul road	2013	50 m	D	1.942	1.867
	2014	50 m	D	3.030	2.886
	2014	50 m	U	0.576	0.540
	2014	600 m	U	0.110	0.076
EMR turnoff (km 103)	2013	50 m	D	1.178	1.123
	2014	50 m	D	0.489	0.464
	2014	50 m	U	0.738	0.722

4.2.1 Comparison to Regulatory Guidelines and Background Values

To date (2012 – 2015), 5 samples have exceeded the Alberta Environment total dustfall guideline for industrial areas of 1.53 mg/cm^2/30d, with 4 out of 5 occurrences at the 25 or 50 m distance (i.e. within the zone where all habitat is assumed lost). One sample exceeded the industrial guideline at 150 m (upwind) in 2014, but all other samples at that distance have been well below the recreational area guideline, suggesting an anomaly occurred either due to natural variability, sample interference, or sampling/analytical error.

At and beyond the 100 m distance (smallest assumed ZOI), the majority of samples have been below the Alberta Environment recreational area guideline of 0.58 mg/cm^2/30d. In total, 11 out of 65 samples collected have exceeded the guideline, all at the 100 or 150 m distance. Average total dustfall to date at 100 and 150 m is below the guideline for recreational areas, at 0.46 and 0.45 mg/cm^2/30d, respectively (n = 14 and 11).

All samples collected at the 300 or 1000 m distance have been near or within the range of background values, especially those collected in 2015. Average dustfall rates meet background values between 200 and 300 m from the road.

4.2.2 Inter-annual Trends

While sampling effort for each distance has varied by year, and some distances were only sampled in one year (e.g. 25 m samples were added in 2015), the results provided in Table 4-1 do not demonstrate any clear trends towards increasing rates of dustfall along the Meadowbank AWAR.

4.2.3 Effect of Distance from the Road

Results of the 2012-2015 AWAR dustfall studies have shown that dustfall rates decline by more than 50% from 25 m to 100 m on the downwind (most impacted) side of the AWAR, from an average of 1.2 mg/cm^2/30d (n = 4) at 25 m to 0.46 mg/cm^2/30d (n = 14) at 100 m (km 18, 76 and 78 data; all study years combined). A further halving of dustfall rates to an average of 0.23 mg/cm^2/30 d (n=10) occurs by 300 m.

SECTION 5 • DISCUSSION

5.1 SUMMARY OF DUSTFALL RESULTS

Under assumptions of continuous, long-term dust emissions from AWAR traffic, the FEIS predicted that effects of dust on vegetation and wildlife would not be significant (<1% change in the Local Study Area, outside an assumed zone of influence), even without the use of mitigation measures such as minimizing traffic and applying dust suppressants. Although the FEIS does not quantify anticipated dust levels in relation to the AWAR, it is stated that “Results from modeling, air monitoring, and snow surveys indicate that most dust particles will settle out within 100 m of the source (BHP, 2000).” The smallest zone of influence (ZOI; area where habitat is assumed lost due to sensory disturbance and other factors) for any wildlife VEC is also 100 m. Therefore, the main goal of the AWAR dustfall studies is to determine whether the majority of dustfall does settle out within 100 m.

Results to date indicate that more than a 50% reduction in average total dustfall is occurring from 25 m to 100 m on the downwind (most impacted) side of the road, indicating that the majority of dustfall

does settle within the predicted 100 m zone. In addition, average rates of dustfall decline below Alberta Environment's guideline for recreational areas within 100 m of the AWAR. Further, all but one sample collected 300 m from the AWAR and many samples collected at 100 and 150 m have been within the range of background dustfall levels. Based on these results, it is unlikely that FEIS predictions are being exceeded and that impacts to VECs (vegetation community productivity and wildlife) due to dust are occurring beyond the smallest assumed ZOI (100 m).

These results are supported by wildlife monitoring conducted under the Terrestrial Ecosystem Management Plan, including the Wildlife Screening Level Risk Assessment, as described below.

5.2 INTEGRATION OF DUSTFALL AND WILDLIFE MONITORING RESULTS

It should be noted that the dustfall guideline from Alberta Environment of 0.58 mg/cm^2/30d for residential/recreational areas is based nuisance concerns, and is not a strict threshold for anticipated environmental or health effects. As a result, AEM uses this value for reference only, and combines information from dustfall assessments with data from wildlife monitoring studies to assess whether predicted impacts are being exceeded

In order to assess potential effects of ingestion of chemical contaminants, wildlife screening level risk assessments (SLRAs) were conducted in 2005 (baseline), 2011 and 2014. The 2014 assessment included analysis of soil and plant samples collected at 100 m on the downwind side of the Meadowbank AWAR, and indicated no incremental risk to wildlife associated with consumption of soil and vegetation in this area. It is important to note that while dustfall canisters measure accumulation over a 30-d period (and results are compared to a 30-d guideline), soil and vegetation samples collected for the SLRA naturally measure the cumulative effect of all dustfall deposited in the area since road construction.

Road-related effects on wildlife populations have also been assessed directly through the Terrestrial Ecosystem Management Plan (TEMP). Until 2011 and 2012, AEM conducted assessments of breeding birds and waterfowl along the AWAR. Both components were terminated because no significant impacts of the road on these VECs were found. Since that time, AEM has conducted studies of dustfall along the AWAR, ensuring that generation of dust is not increasing to levels that would warrant re-instating regular breeding bird and waterfowl monitoring programs. Although results to date have not suggested it may be necessary, a supplementary follow-up survey of breeding birds along the AWAR was conducted in 2015 in recognition of continued community concerns regarding dust. Results indicated no significant effect of the road on breeding bird abundance or diversity (see 2015 Wildlife Summary Report). Similar results have been found elsewhere in the North – for example, Male and Nol (2005) did not find a measurable effect of haul roads on Lapland longspurs at the Ekati Diamond Mine site, despite higher levels of dustfall compared to Meadowbank.

Although annual assessments for breeding birds and waterfowl have ceased under the TEMP, assessments along the AWAR for raptors and ungulates are ongoing annually and are integrated with results of the dustfall analysis to determine whether road dust could be causing any observed impacts beyond established thresholds. As described previously, dustfall results are reviewed for temporal trends, and compared to background levels and regulatory guidelines to determine the potential for impacts to VECs beyond their assumed ZOI. For raptors, the assumed ZOI in the FEIS is 200 m (i.e. raptor habitat within 200 m is assumed lost). To date only 4 out of 19 samples over a four year study period have exceeded the Alberta recreational area guideline at 150 m from the road. At 300 m, no samples have exceeded the guideline, and most are in the range of background values measured to date. Since no thresholds for protection of raptors have been exceeded to date along the AWAR through the wildlife monitoring program, impact predictions are not being exceeded. For ungulates,

the assumed zone of influence in the FEIS is 1000 m (i.e. ungulate habitat within 1000 m of the road is assumed lost). Dustfall sampling in 2015 indicated that rates of dustfall at 1000 m are within the range of measured background concentrations. Therefore, no excess impacts of road dust on ungulate habitat are anticipated.

5.3 CONCLUSION

Wildlife monitoring to date has indicated no significant road-related effects, dust monitoring has indicated no trend towards increasing rates of dustfall, and risk assessment has indicated no incremental risk for wildlife from chemical contaminants near the AWAR. Therefore, impacts of Meadowbank AWAR road dust to not appear to be exceeding predictions made in the FEIS.

SECTION 6 • REFERENCES

Alberta Environment, 2006. Guidelines for Quality Assurance and Quality Control in Surface Water Quality Programs in Alberta. Prepared by Patricia Mitchell Environmental Consulting. July, 2006. Web Site: http://www3.gov.ab.ca/env/info/infocentre/publist.cfm

Auerbach, N.A., Walker, M.D. and D. A. Walker 1997. Effects of roadside disturbance on substrate and vegetation properties in arctic tundra. Ecological Applications: Vol. 7, No. 1, pp. 218–235.

Cumberland (Cumberland Resources Ltd.), 2005. Meadowbank Gold Project- Terrestrial Ecosystem Impact Assessment. October 2005.

Fisk, A. T., Hobbs, K., and D. C.G. Muir. Editors, 2003. Contaminant Levels, trends and effects in the biological environment. Canadian Arctic Contaminants Assessment Report II Indian and Northern Affairs, Canada.

Male, S. and E. Nol. 2005. Impacts of roads associated with the Ekati Diamond Mine, Northwest Territories, Canada, on reproductive success and breeding habitat of Lapland longspurs. Canadian Journal of Zoology 83:1286-1296.