August 27th, 2021

Emily Koide
Technical Advisor I
Nunavut Impact Review Board
P.O. Box 1360 Cambridge Bay
Nunavut NU X0B 0C0

2021 Semi-annual (mid-year) report on suspended particulate monitoring at the Meliadine site

Dear Mrs. Koide,

In accordance with Agnico Eagle's response to the Government of Nunavut (GN)'s recommendation in their review of the Agnico Eagle's 2020 Annual Report to the NIRB (GN-01: Air Quality – Suspended Particulate Monitoring), please find enclosed the following report:

> Technical Memorandum - Meliadine Site Air Quality Monitoring Program – 2021 Mid-Year Update, August 27th 2021, Agnico Eagle.

Should you have any questions or require further information, please do not hesitate to contact us.

With my best regards,

Anne-Laurence Paquet
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RMMS & Compliance Technician

AGNICO EAGLE

TECHNICAL MEMORANDUM

Date: August 27th, 2021

To: Emily Koide (Technical Advisor I, NIRB)

From: Leilan Baxter, Sara Savoie, Robin Allard (Agnico Eagle Mines Ltd.)

CC: N/A

Re: Meliadine Site Air Quality Monitoring Program - 2021 Mid-Year Update

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In their review of Agnico Eagle's 2020 Annual Report to the NIRB for the Meliadine site, the GN provided the following recommendation (GN-1 Air Quality – Suspended Particulate Monitoring):

> *The Proponent should submit quarterly or semi-annual reports on the operation of the Partisol units starting in 2021, including results for TSP, $PM_{2.5}$ and PM_{10} to inform the need for adaptive management based on the lack of data presented to date. The first of these reports should be prepared upon receipt of these comments to update the status of Partisol monitoring for the first half of 2021.*

In response (July 28, 2020), Agnico indicated:

> *Agnico will also provide a 2021 semi-annual (mid-year) report on suspended particulate monitoring at the Meliadine site. This report will include analysis of TSP, PM_{10} and $PM_{2.5}$ concentrations for samples analyzed to date, along with a commentary on Partisol operation and any planned adaptive management actions. This report will be provided to the GN within 30 days (by August 27 2021).*

In accordance with Agnico's response to the GN recommendation, this document presents the requested 2021 mid-year report on suspended particulate monitoring.

1.1 BACKGROUND, OBJECTIVES, AND METHODS

The complete background, objectives, and methods for the suspended particulate monitoring program at Meliadine are provided in the 2020 Air Quality Monitoring Report, submitted as an appendix of the 2020 Annual Report to the NIRB.

Briefly, monitoring for suspended particulates (TSP, PM_{10}, $PM_{2.5}$) is scheduled to occur every six days using Partisol Model 2025i/2025iD samplers. These Partisol units are located on the southeast (downwind) and northwest (upwind) boundaries of the Production Lease (sites DF-5 and DF-7, respectively – Figure 1). Partisol sampling began at the end of 2018. Due to a combination of equipment failure, increased wear and tear due to sub-Arctic weather conditions, limited servicing and repair possibilities on site, and COVID-related delays, Partisol down time has been more common than anticipated. As a result, a reduced dataset was available for 2019

(generally January – April) and 2020 (October – December). Since re-installation of the machines by the supplier in October 2020, Agnico has obtained a set of spare parts as recommended, and technicians are carrying out a schedule of routine maintenance to ensure minimal data loss.

This technical memorandum presents results of the Partisol sampling program for 2021 to date. Results are available for January through May. Laboratory results for June and July have not yet been received. According to the Air Quality Monitoring Plan (Version 2, April 2020), processed data is compared to the GN Environmental Guidelines for Ambient Air Quality (October, 2011), where available (TSP, $PM_{2.5}$). For PM_{10}, results are compared to the BC Ambient Air Quality Objective (May, 2018). Results are also compared to model predictions according to Table 5.2-15 in the Project FEIS (Golder, 2014).

Table 1. Government of Nunavut (GN) Environmental Guidelines for Ambient Air Quality (October, 2011), BC Ambient Air Quality Objectives (May, 2018) and FEIS predictions for suspended particulate matter at Meliadine along with the representative monitoring station (DF-5/DF-7). *Maximum predicted values anywhere within the site study area (SSA) or local study area (LSA) according to Table 5.2-15 in Golder (2014).

Parameter	Averaging Time	Regulatory Guideline		FEIS Prediction* ($\mu g/m^3$)	
		Jurisdiction	Guideline ($\mu g/m^3$)	SSA (represented by DF-5)	LSA (represented by DF-7)
$PM_{2.5}$	24-h	GN	30	55.2	19.6
PM_{10}	24-h	BC	50	104.0	58.2
Total Suspended Particulate (TSP)	24-h	GN	120	213.7	122.3
	Annual	GN	60	16.8	17.0

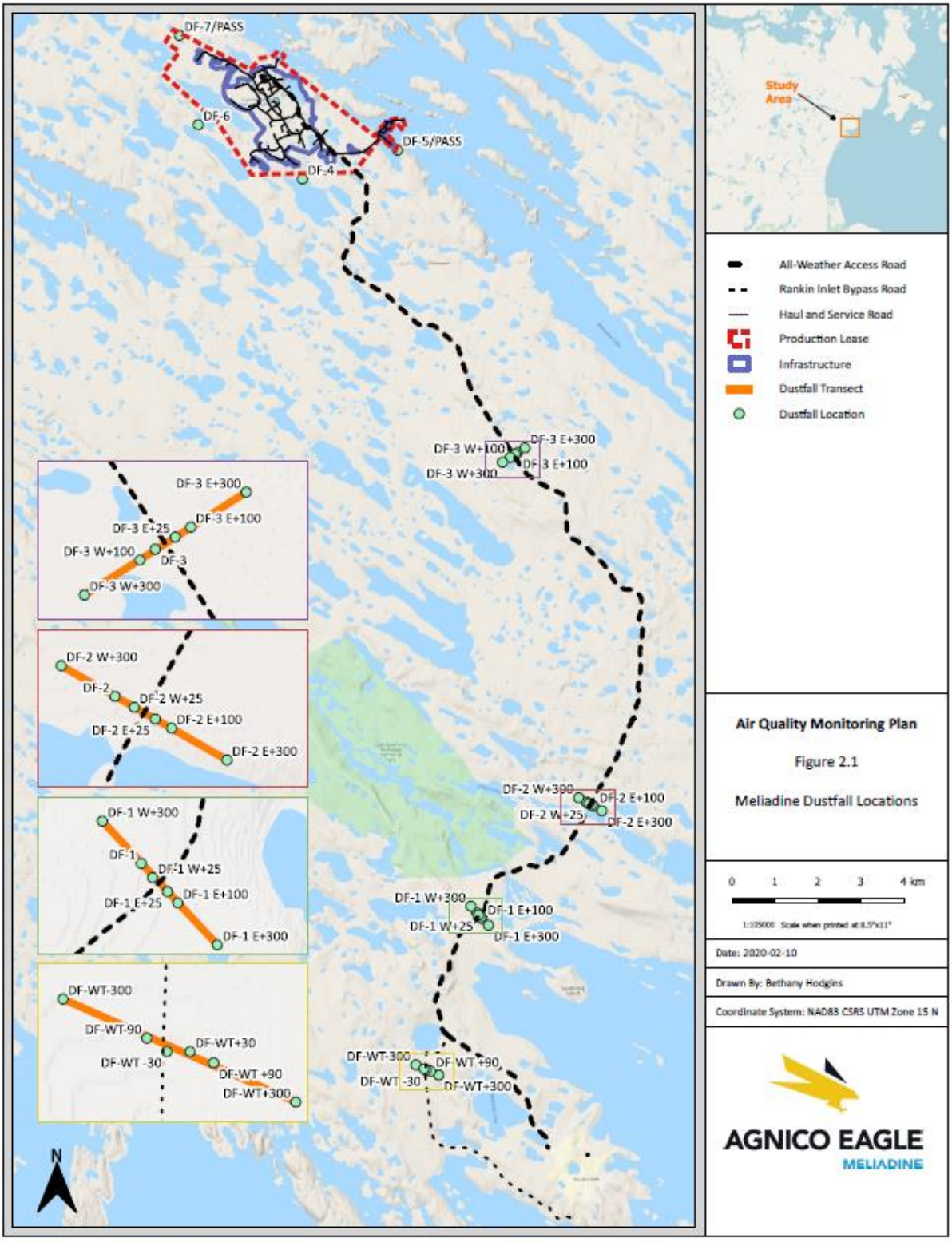

Figure 1. Air quality monitoring locations for the Meliadine Site.

1.2 RESULTS

1.2.1 Data Loss

In 2021, suspended particulate sampling occurred every six days beginning January 4, with the exception of sampling dates where data loss occurred for various reasons, as described in Table 2. As described in the Air Quality Monitoring Plan (Version 2, April 2020) some data loss is anticipated, particularly during the winter months, due to the extreme weather conditions.

For three of the four Partisol units, data loss for the period of this report is considered minor, with rates of 4 - 16% (Table 2). For the dichotomous unit ($PM_{2.5}/PM_{10}$) at DF-7, more extensive data loss occurred. Equipment failure began March 29 and eventually required removal of the unit from the field for troubleshooting in an indoor environment. After communication with the supplier and manufacturer, additional new parts were ordered by April 10. After receiving and installing the new parts, sampling resumed June 15. Agnico is hopeful that no additional downtime will occur for this unit in 2021, and overall data loss will be kept to under 20%. Results for $PM_{2.5}/PM_{10}$ at the other monitoring station (DF-5) are reviewed in particular for this period of data loss to help understand trends in fine and coarse particulate matter onsite. The DF-5 station is located downwind of the site, and is generally anticipated to receive higher concentrations of mine-related suspended particulate matter than DF-7.

Table 2. Summary of data loss due to: software error (e.g. instrument did not correctly initiate sampling sequence), logistical errors (e.g. missing in transit), or other equipment failure (e.g. filter exchange error, broken parts), as indicated. Check mark indicates sample was collected.

Sample Date	TSP		$PM_{2.5}/PM_{10}$	
	DF-5	DF-7	DF-5	DF-7
1/04/21	✓	✓	✓	✓
1/10/21	✓	✓	✓	✓
1/16/21	✓	✓	✓	✓
1/22/21	✓	✓	✓	✓
1/28/21	✓	✓	✓	✓
2/03/21	✓	✓	✓	✓
2/09/21	✓	✓	✓	✓
2/15/21	✓	✓	✓	✓
2/21/21	✓	✓	✓	✓
2/27/21	No sample – equipment failure[1]	✓	No sample – equipment failure[1]	✓
3/05/21	✓	✓	✓	✓
3/11/21	✓	✓	✓	✓
3/17/21	✓	✓	✓	No sample – software error[4]
3/23/21	✓	✓	✓	✓

Sample Date	TSP		$PM_{2.5}/PM_{10}$	
	DF-5	DF-7	DF-5	DF-7
3/29/21	✓	✓	✓	No sample - equipment failure[5]
4/04/21	✓	No sample – software error[4]	✓	
4/10/21	✓	✓	✓	
4/16/21	✓	No sample – equipment failure[2]	✓	
4/22/21	✓		✓	
4/28/21	✓		No sample – equipment failure[3]	
5/04/21	✓	✓	✓	
5/10/21	✓	✓	✓	
5/16/21	✓	✓	✓	
5/22/21	✓	✓	✓	
5/28/21	✓	✓	✓	
[1] - The heated shelter door was found to have broken open and no sample was collected due to the low ambient temperature. Door fixed.				
[2] – O-ring found to have come off in filter compartment when checked on April 28. Re-set.				
[3] – Filter did not exchange properly. Re-set.				
[4] – Software error – sample not collected.				
[5] – Extensive equipment failure requiring supplier and manufacturer support to troubleshoot, resulting in order of additional new parts. After receipt and installation, sampling resumed June 15.				

1.2.2 24-h Averaging Time Results

Available results for the 24-h samples from January – May, 2021 are shown in Figures 2 - 4. All values were below the GN or BC guideline and FEIS prediction for the 24-h averaging time with the exception of a single TSP sample (DF-7). With the large volume of samples collected and potential for localized gusts causing short-term dust events, a small proportion of elevated 24-h results without an apparent trend are typically considered acceptable and do not trigger the initiation of supplemental management. Results will continue to be reviewed to ensure no trends are developing.

No exceedances of regulatory guidelines or FEIS predictions occurred for $PM_{2.5}$ or PM_{10} at either station.

1.2.3 Annual Averaging Time Results

For both DF-5 and DF-7, results for TSP were well below the GN guideline for the annual average (60 µg/m^3), at 7.2 and 16.8 µg/m^3 respectively. These results were also within the FEIS predictions for the annual average (16.8 and 17.0 µg/m^3, respectively).

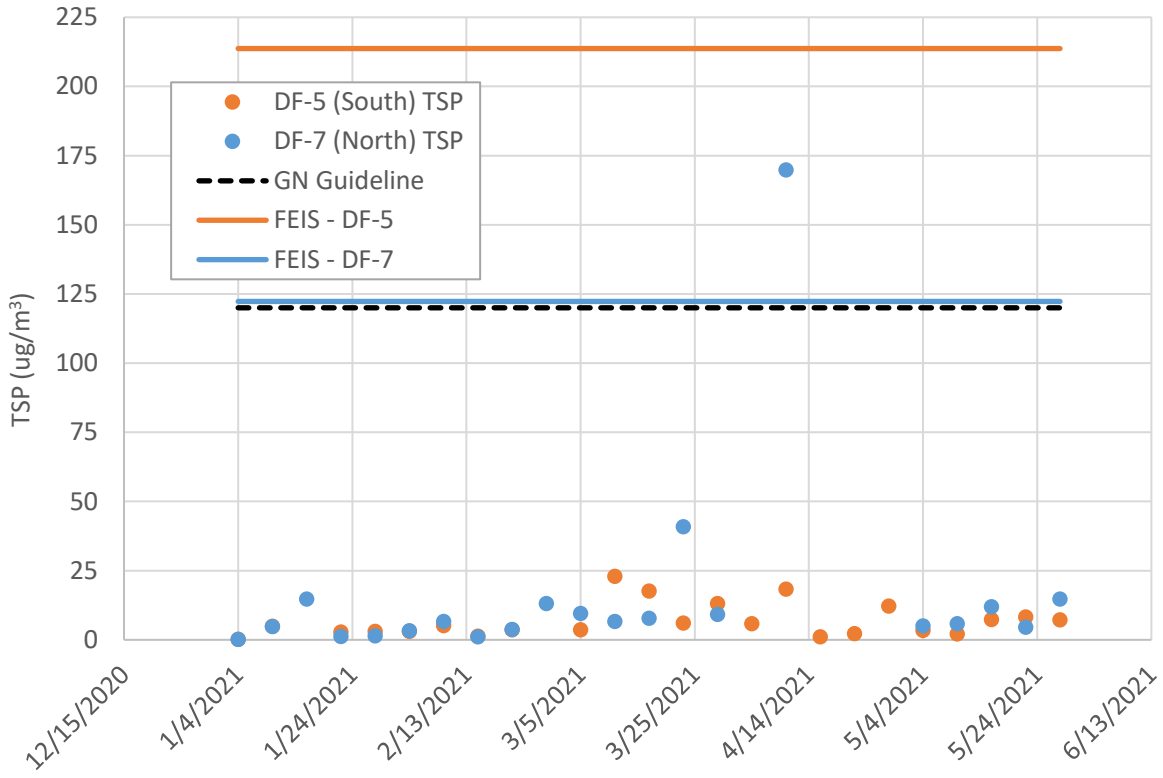

Figure 2. 24-h measured concentrations of total suspended particulates (TSP) at monitoring stations DF-5 and DF-7 at the Meliadine site (points). Lines indicate the Government of Nunavut (GN) guideline and FEIS maximum model predictions for each station.

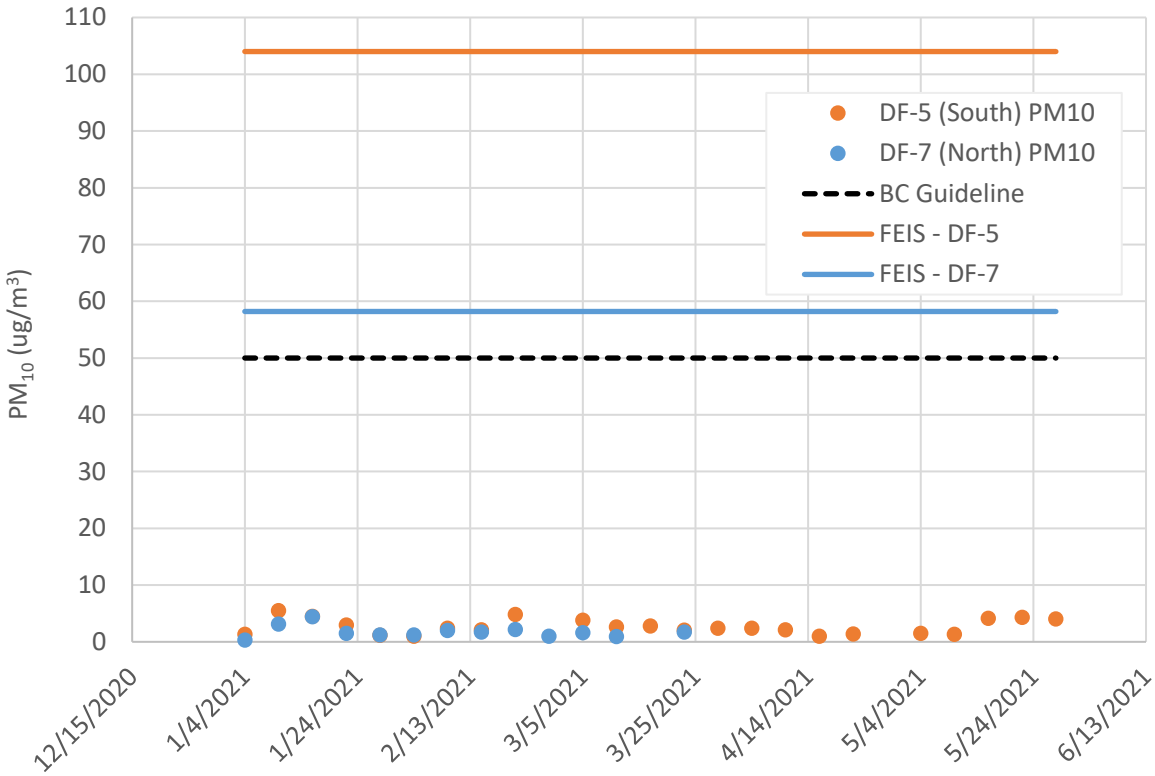

Figure 3. 24-h measured concentrations of PM10 at monitoring stations DF-5 and DF-7 at the Meliadine site (points). Lines indicate the BC guideline and FEIS maximum model predictions for each station.

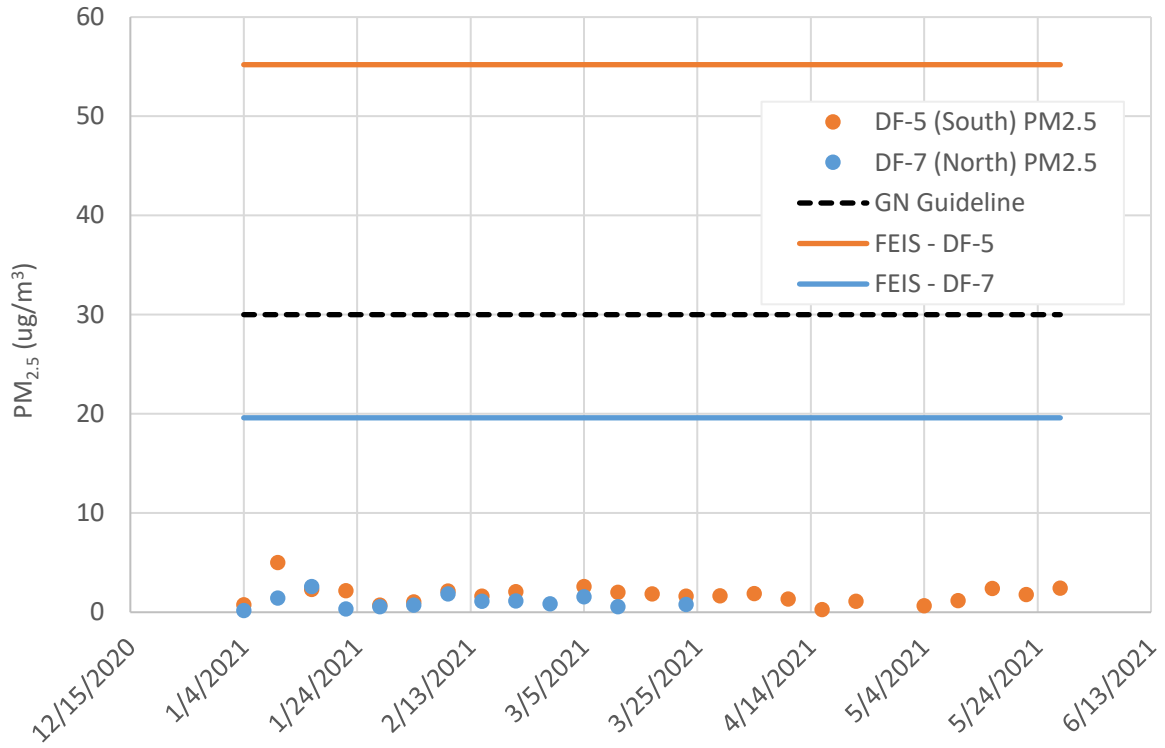

Figure 4. 24-h measured concentrations of $PM_{2.5}$ at monitoring stations DF-5 and DF-7 at the Meliadine site (points). Lines indicate the Government of Nunavut (GN) guideline and FEIS maximum model predictions for each station.

1.3 CONCLUSION

As indicated in the July 28th answer to the GN-01 2020 Annual Report Comment, the Partisol units have been successfully reinstalled in October 2020 and spare parts recommended by the supplier are available on site.

Environmental technicians have received training on Partisol units operation and maintenance from the supplier and are following a schedule of routine equipment inspection and maintenance to ensure the units function properly.

Nonetheless, for reasons out of Agnico Eagle's control, equipment malfunctions did occur, and one unit has experienced approximately 2 months of down time. During this time, three units were fully functional and data from these units has been successfully acquired.

Even though some data loss resulted from this event, substantial investment in capacity building with regards to Partisol operation, troubleshooting, and onsite repair capabilities development allowed for the problem to be identified rapidly and the unit to be reinstalled in the field as soon as the required parts were received onsite. Agnico Eagle continues to build its stockpile of spare parts and onsite servicing capacity to minimize future delays related to shipping times. Agnico has also initiated a project to install direct remote communication with the Partisol sampling units, this would allow the environmental staff to flag any issues as they arise and enable them to reduce data loss and sampling errors.

In addition, and as a first step towards contingency planning for future Partisol downtime, Agnico has begun testing the operation of a low maintenance, non-reference-level instrument (PurpleAir) for potential use in particulate trend analysis and dust management onsite. While Agnico recognizes that this monitor is not intended for use in compliance monitoring, its application for tracking trends in particulate matter during periods of Partisol data loss may be of interest. For the time being, Agnico has obtained and installed a single instrument to observe its performance under site conditions. A commentary on this trial and possible next steps will be provided in the 2021 Air Quality Monitoring Report.

Overall, although significant data loss did occur for one of the four instruments, no air quality trends of concern were identified based on results of Partisol sampling for the period of this report (January – May, 2021).

References

Golder (Golder Associates), 2014. Final Environmental Impact Statement – Meliadine Gold Project, Nunavut. Volume 5.0 Atmospheric Environment and Impact Assessment. April, 2014.