



REPORT

METRO VANCOVER QUATERLY AIR PERMIT REPORTING

Neptune Bulk Terminal Ltd

Prepared for:

Neptune Bulk Terminal Ltd.

1001 Low Level Road

North Vancouver, BC, V7L 1A7

Envirochem Project No.: 8005-23

Reporting Period: 2023 – Q4

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1.0 BACKGROUND

To meet Metro Vancouver Air Permit GVA0081 (issued September 23rd, 2016) requirements, Neptune Bulk Terminals Ltd. (Neptune) has implemented a procedure for periodic permit reporting requirements to Metro Vancouver including this quarterly reporting.

Fulfilling these requirements requires processing and checking large amounts of data. The procedures in this report provide an efficient means of processing large amounts of data and ensuring that all calculations and outputs generated are completed accurately. In order to increase the efficiency of this process, Neptune has implemented a data management system which allows for uploading of data to the Neptune database and generation of outputs. Envirochem Services Inc. (Envirochem) has been retained to calculate, tabulate and report these requirements to Metro Vancouver and ensure that:

- Raw data being collected and used for generating outputs is valid,
- Correct methodologies are used to generate these outputs, and
- Any outputs being generated undergo quality assurance/quality control (QA/QC) before being submitted electronically to Metro Vancouver.

All of the procedures contained within this report detail methodologies in conformance with Section 3 Schedules A and B of the current version of the permit (September 23rd, 2016).

This report includes quarterly particulate matter monitoring reporting requirements.

2.0 QUARTERLY REPORTING

2.1 ON-SITE PM_{2.5} AND PM₁₀ MONITORING – 24 HR ROLLING AVERAGES

2.1.1 METHODOLOGY

Neptune is conducting continuous PM_{2.5} and PM₁₀ monitoring using two Met-One E-BAM Plus monitors on-site near the northwest boundary of Neptune Terminals on the roof of the terminal's electrical substation building.

Ambient Air Monitoring data for PM_{2.5} and PM₁₀ are stored in Neptune's database. These data are retrieved and verified by Envirochem. QA/QC is performed on the raw data and any invalid data are flagged. Neptune's data management system is then updated accordingly.

2.1.2 RESULTS

Using Neptune's data management system, Envirochem:

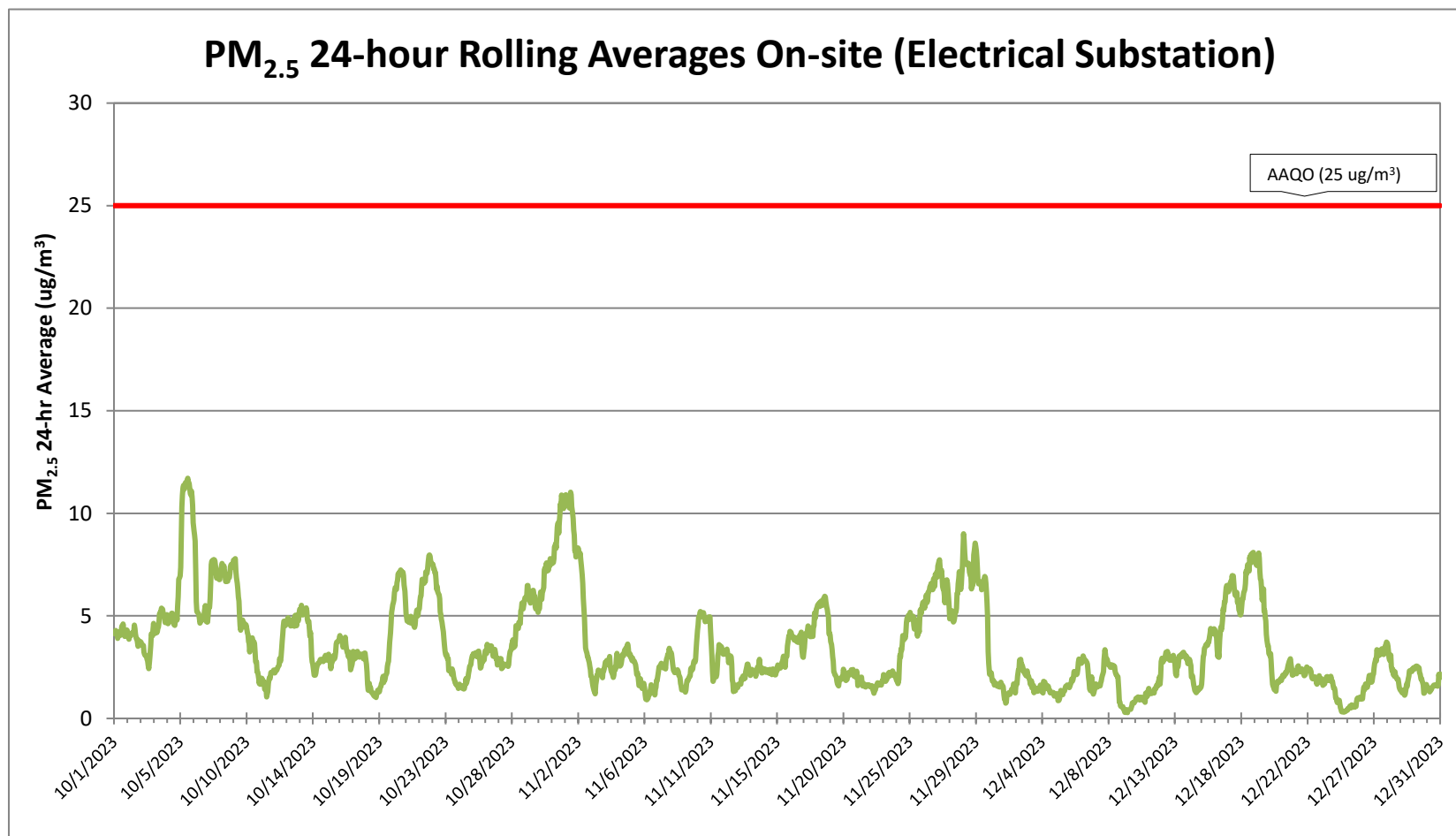
- Converts the vetted PM_{2.5} and PM₁₀ data to 24-hour rolling averages and performs QA/QC;
- On a quarterly basis, submits the graphs (**Figure 1** and **Figure 2**) to Metro Vancouver.

During Quarter 4 of 2023, there were some exceedances of the 24-hour PM₁₀ AAQO at Neptune's on-site monitor (electrical substation, presented in **Figure 2**).

To investigate the attributable particulate to the PM₁₀ exceedances:

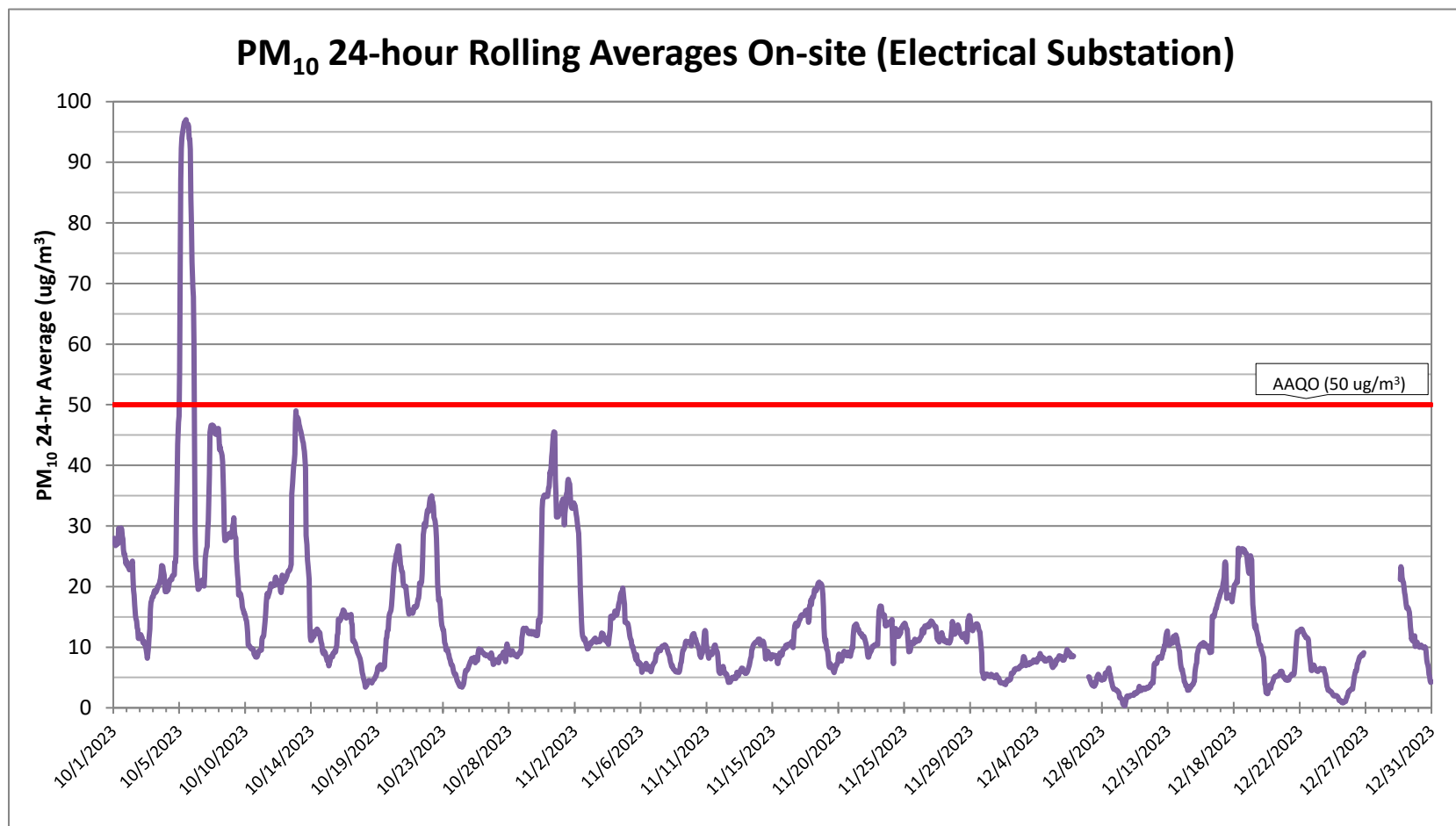
- Wind speed and direction during hours with PM₁₀ concentrations where the hourly average concentration was at or above the 24-hour AAQO level of 50 µg/m³ were analyzed (**Figure 3**).
- Optical (microscopic) analysis of the E-BAM filter tape was performed (**Figure 4**).

Results and findings are summarized below.



**Figure 1: 24-hour rolling averages of PM_{2.5} data from on-site monitor for the fourth calendar quarter 2023
(October 1st to December 31st, 2023)**

Note: Blank space indicates that no data is available due to power failure or instrument maintenance.



**Figure 2: 24-hour rolling averages of PM₁₀ data from on-site monitor for the fourth calendar quarter 2023
(October 1st to December 31st, 2023)**

Note: Blank space indicates that no data is available due to power failure or instrument maintenance.

2.1.3 WIND ANALYSIS

To investigate the attributable particulate to the observed PM₁₀ exceedances, wind speed and direction during hours of those events with hourly average PM₁₀ concentrations of 50 µg/m³ or greater were analyzed. 50 µg/m³ was conservatively chosen as it is the 24-hour AAQO for PM₁₀. Hence, hours with 50 µg/m³ PM₁₀ or above were considered to have a possible contribution to the AAQO exceedances. Hours during periods impacted by Metro Vancouver Air Quality Advisories for fine particulate are not considered. As can be seen in **Figure 3**, during hours with 50 µg/m³ of PM₁₀ or higher, the most frequent wind direction was blowing from the west.

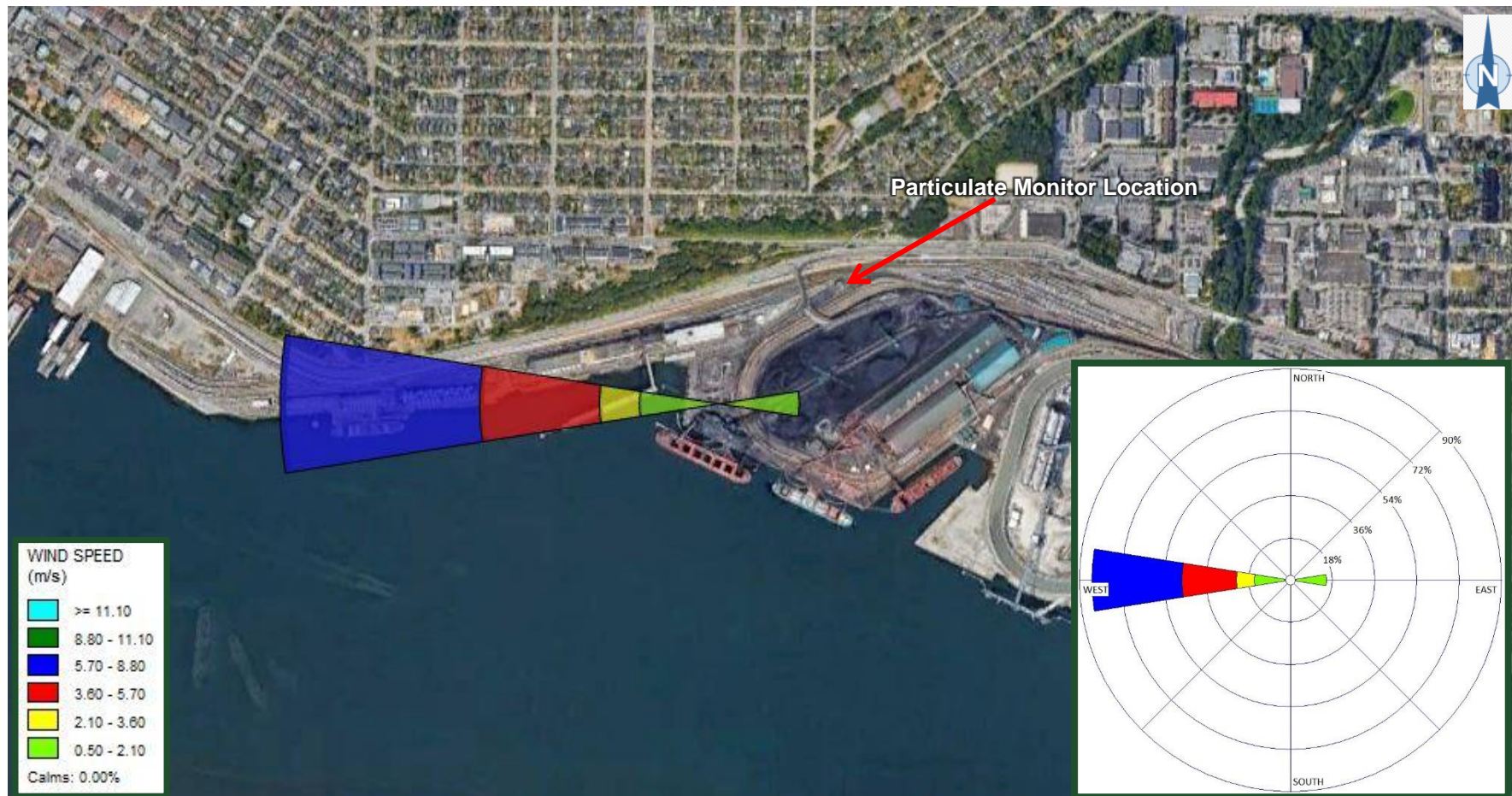


Figure 3: Wind rose during hours contributing to PM₁₀ 24-hr rolling average AAQO exceedances with PM₁₀ concentrations greater than 50 µg/m³ for the fourth calendar quarter 2023 (October 1st to December 31st, 2023)

Note: The presented wind rose is based on "winds blowing from"

2.1.4 OPTICAL (MICROSCOPIC) ANALYSIS

To support the findings from the wind data, optical analysis was performed for some E-BAM Plus filter tape spots during hours with PM_{10} concentrations greater than $50 \mu\text{g}/\text{m}^3$ that contributed to PM_{10} 24-hr rolling average AAQO exceedances that were not associated with a Metro Vancouver Air Quality Advisory. An example spot is shown in **Figure 4**.

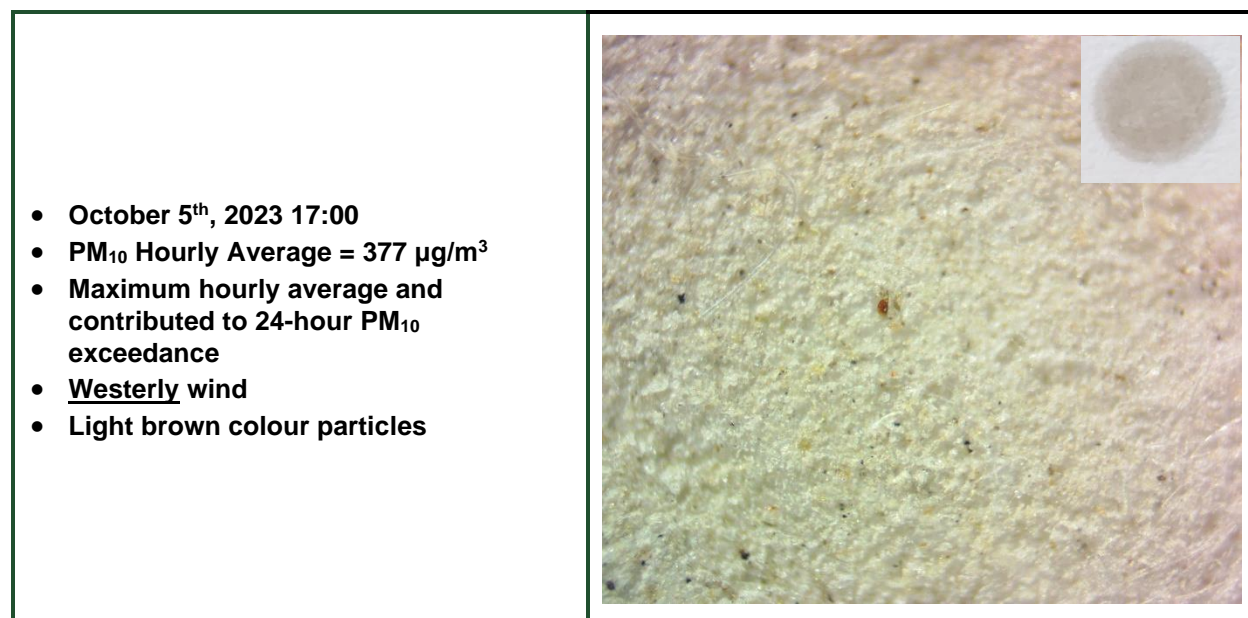


Figure 4: Microscopic analysis of E-BAM filter tape showing an example hour with westerly wind and brown coloured particles (50x magnification)

The optical analysis was conducted to elucidate the major components of the particulate on the E-BAM filter tape with respect to coal dust and other particles. For this analysis, a light microscope (OMAX 40x-2500x) with a 10x ocular lens, 4x/10x/40x objective lenses, and a 0.5x mountable camera (OMAX A3RDF50) was used. E-BAM filter tape is made of glass fibres that are visible in the microscopic pictures.

The microscopic analyses indicated that hours with westerly winds often show a majority of grain particles (chaff and flake with a brown color) associated with offsite sources from the west of the site boundary. The microscopic analysis therefore supports the wind analysis and suggests that there are significant sources of dust in the area that contribute to monitored particulate concentrations that are not coal (e.g. grain dust etc.).

2.2 OFF-SITE PM_{2.5} AND PM₁₀ MONITORING – 24 HR ROLLING EXCEEDANCES OF PM_{2.5} AND PM₁₀ FROM AAQO

2.2.1 METHODOLOGY

Neptune is conducting continuous PM_{2.5} and PM₁₀ monitoring off-site from the terminal at these two locations (in the neighbouring areas):

- To the northeast of Neptune Terminals, on the roof of 340 Brooksbank Avenue (Neptune's office) equipped with a PM₁₀ monitor (Met One E-BAM Plus) and a PM_{2.5} monitor (SHARP 5030i).
- To the northwest of Neptune Terminals in the Moodyville residential area at 618 2nd Street East using two pole mounted PM_{2.5} and PM₁₀ monitors (Met One E-BAM Plus).

Ambient Air Monitoring data for PM_{2.5} and PM₁₀ is stored in Neptune's database. These data are retrieved and verified by Envirochem. QA/QC is performed on the raw data and any invalid data are flagged. Neptune's data management system is then updated accordingly.

2.2.2 RESULTS

Using Neptune's data management system, Envirochem:

- Converts the vetted PM_{2.5} and PM₁₀ data to 24-hour rolling averages;
- Retrieves the quarterly 24-hour rolling averages from Neptune's database;
- Identifies and flags any 24-hour rolling averages which exceed Metro Vancouver Ambient Air Quality Objectives (AAQOs) for PM_{2.5} and PM₁₀;
- On a quarterly basis, tabulates all exceedances (**Table 1**) and submits them to Metro Vancouver.

Table 1: Off-Site 24-hour rolling average PM_{2.5} and PM₁₀ AAQO exceedances for the fourth calendar quarter 2023 (October 1st to December 31st, 2023)

METRO VANCOUVER PERMIT GVA 0081	
Neptune Bulk Terminals (Canada) Ltd.	
OFF-SITE 24-HR ROLLING AVERAGE PM _{2.5} AND PM ₁₀ AAQO EXCEEDANCES	
Reporting Period:	October 1 st – December 31 st , 2023

Exceedance Event	MV AAQO		Neptune Office (340 Brooksbank Ave)	Neighbourhood Pole (618 E 2 nd St.)	Comment
	Contaminant	µg/m ³	Period of Exceedance		
1	PM _{2.5}	25	No exceedances	(a)	-
	PM ₁₀	50	No exceedances	(a)	-

Note: AAQOs are based on 24-hour rolling averages. For hours presented above, periods are representative of the previous 24 hours.

(a): The PM_{2.5} and PM₁₀ units at Neighbourhood Pole (618 E 2nd St) were non-operational during this period due to an electrical supply issue caused by construction adjacent to the monitor as communicated with Metro Vancouver staff.