Preston New Road

December 2017

Background Air Quality Monitoring

In August 2017 we deployed a Mobile Monitoring Facility (MMF) in the vicinity of Cuadrilla's shale gas exploratory site at Preston New Road, Little Plumpton.

The purpose of carrying out monitoring at this stage is to understand the background level of the types of pollutants that may be detectable before the hydraulic fracturing and well testing stages commence. We will use this information to assess the concentrations of each substance in the environment before contributions are made during the flaring stage of operations. Our monitoring of air quality will continue during these stages to identify any changes. We also carry out a comparison of before, during and after operations for both surface water and groundwater monitoring.

The pollutants that have been measured are oxides of nitrogen (NO_X, NO, NO_2), particulates (PM_{10} and $PM_{2.5}$), methane (CH_4), benzene, toluene, ethylbenzene and m&p-xylene (BTEX), wind speed and wind direction.

This is the first report to be produced since we started monitoring air quality. We shall publish subsequent reports to our citizen space page.

Figure 1. Photograph of a Mobile Monitoring Facility

The tables below show levels of pollutants from the 23rd August 2017 up until the 4th December 2017. The BTEX data is only reported from the 9th September 2017, due to technical problems with the instrument prior to this date.

Results

Provisional data for each pollutant, from the 23rd August 2017 until the 4th of December 2017, is shown in a series of time series plots below.

Particulates

Figure 2 shows the hourly particulate concentrations (PM_{10} and $PM_{2.5}$) at the monitoring site. The particulate data was collected using TEOM instruments. PM_{10} data has been adjusted using the King's College London (KCL) Volatile Correction Model (VCM), which allows you to make a small adjustment to TEOM measurements to correct for the loss of volatile components of PM_{10}. The VCM uses FDMS instrument data from sites within 130km distance of the MMF in order to adjust the PM_{10} measurements to be comparable with the reference method. There is not currently a validated correction factor for $PM_{2.5}$ TEOM data.

The plot shows that particulate levels have been relatively low at the monitoring site, apart from an event on the night of the 5th November - morning of the 6th November, where levels of particulate, mainly as $PM_{2.5}$ were high (see Figure 3). This is likely to be the result of the build of emissions from bonfire night below the atmospheric boundary layer. This is also seen in the BTEX data.

The average PM_{10} and $PM_{2.5}$ concentrations during this period were 12.8µg/m^3 and 6.60µg/m^3[TEOM] respectively.

Figure 2. Time series plot of PM_{10} and $PM_{2.5}$ 1-Hour Mean Concentrations.

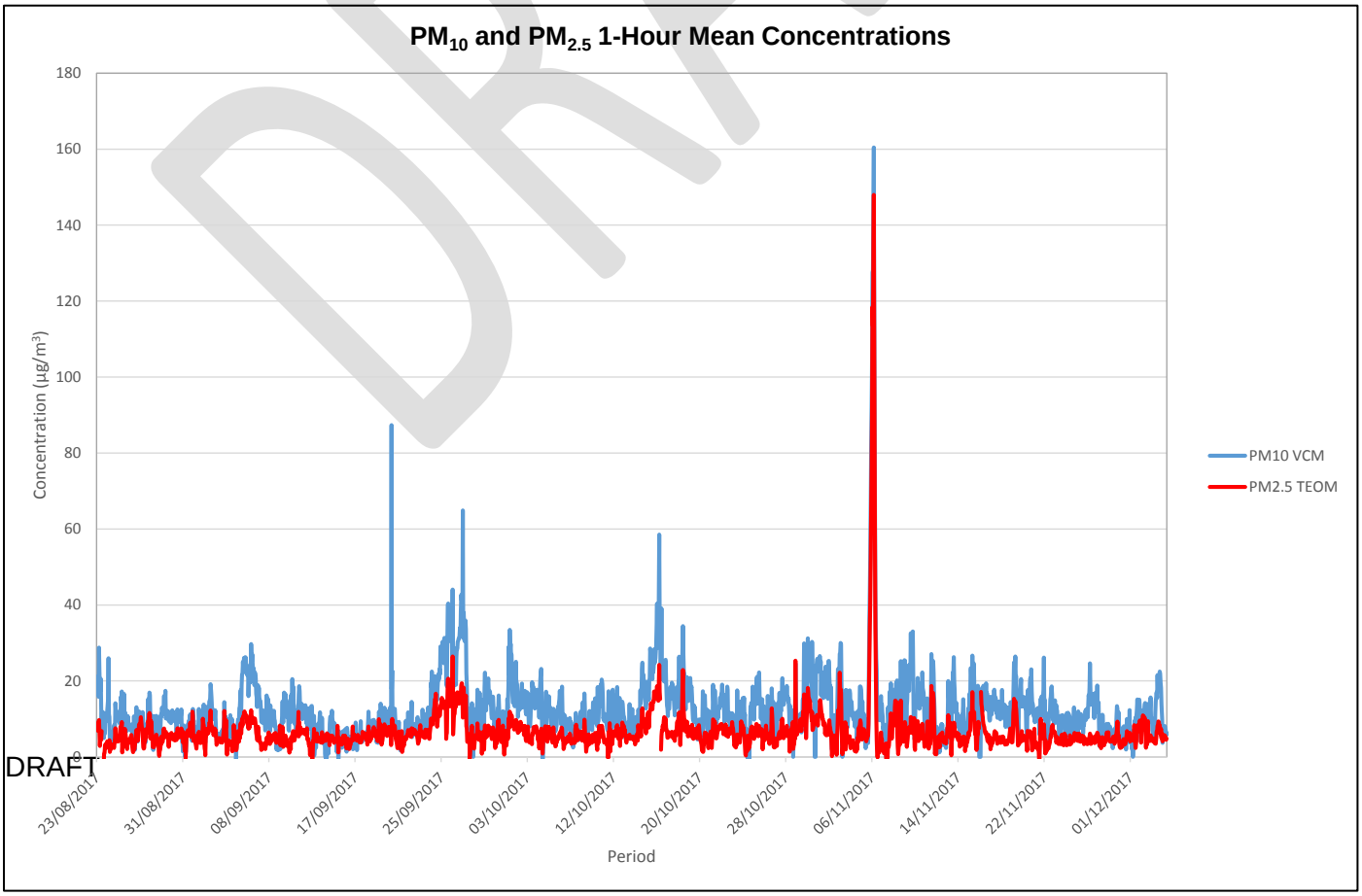
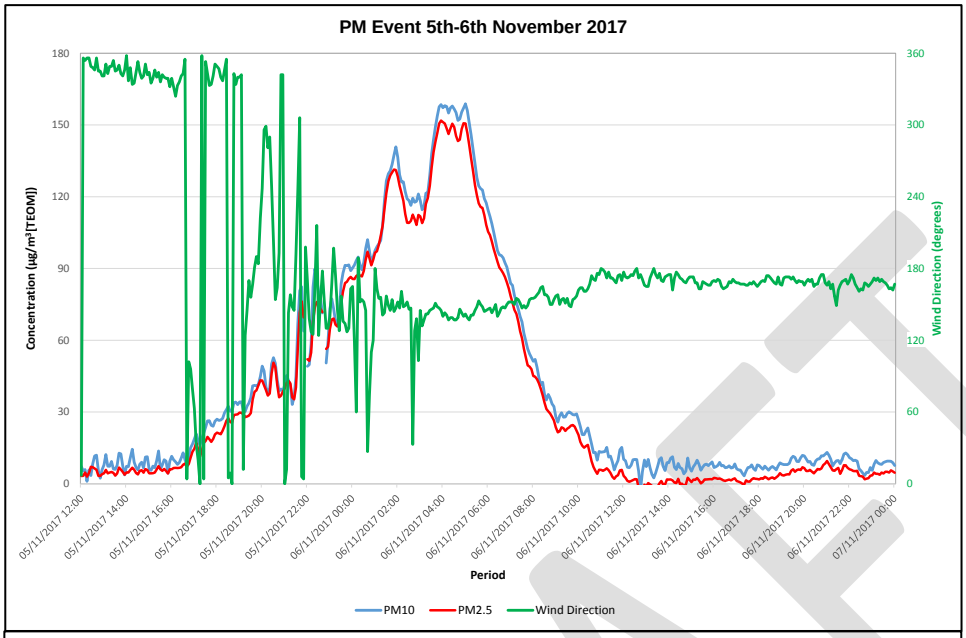
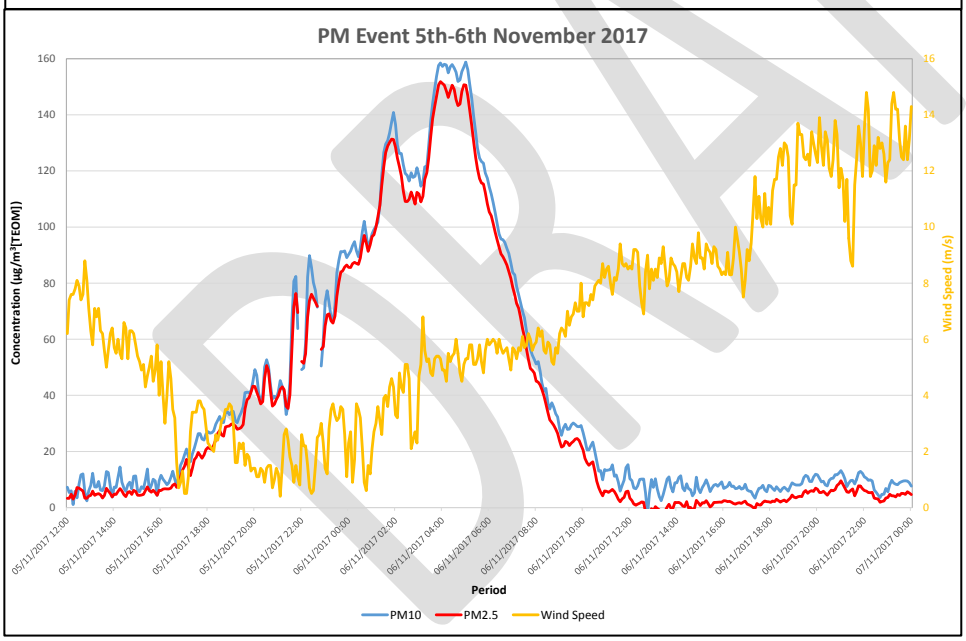


Figure 3. Comparison of PM_{10} and $PM_{2.5}$ event on the 5th-6th November 2017 with wind direction (degrees) and wind speed (m/s)

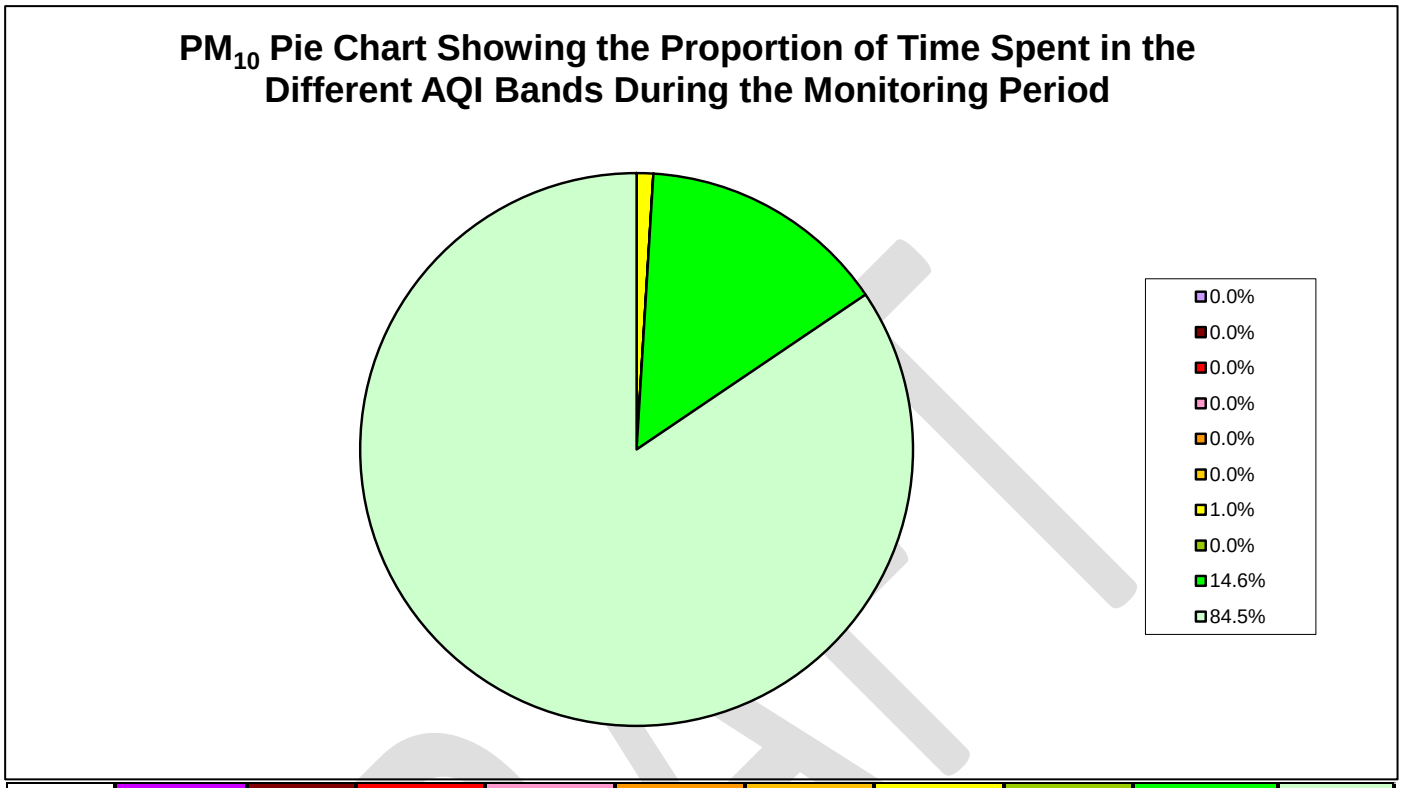




In the United Kingdom a daily Air Quality Index has been developed. The system uses an index numbered 1-10 (low – high pollution), divided into four bands to provide more detail on a daily basis about air pollution levels to the general population and those at higher risk from air pollution.

Figures 4 looks retrospectively at the daily PM_{10} concentrations at the monitoring site in relation to the Air Quality Index banding. The plot shows that PM_{10} 24-hour concentrations were mainly in the low banding at the monitoring site, apart from one day in the moderate banding, which was associated with bonfire night.

Figure 4. PM_{10} AQI Pie Chart.

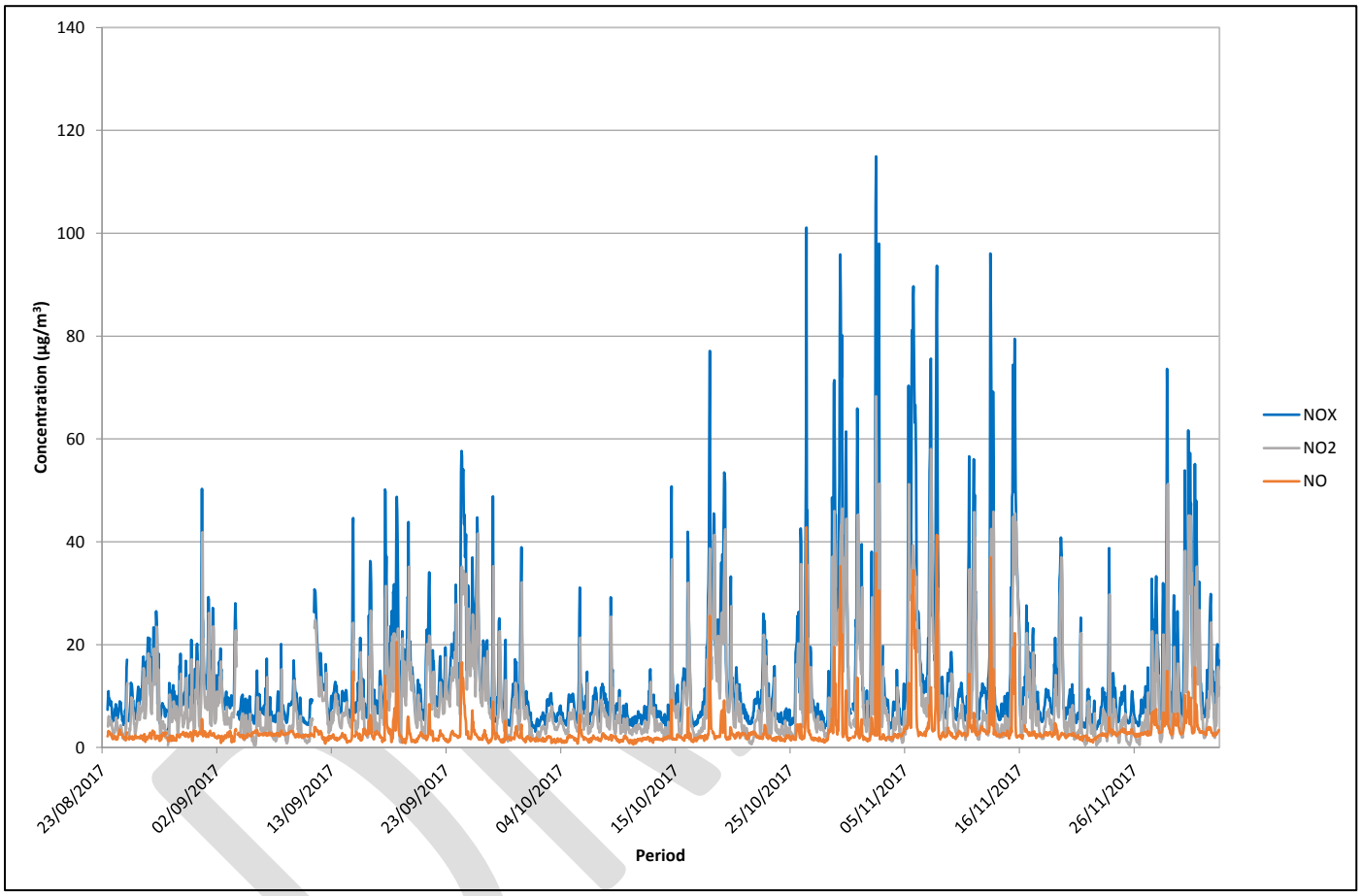


Index Band	10	9	8	7	6	5	4	3	2	1
	Very High	High	High	High	Moderate	Moderate	Moderate	Low	Low	Low
µg/m^3	101+	92 - 100	84 - 91	76 - 83	67 - 75	59 - 66	51 - 58	34 - 50	17 - 33	0 - 16
	0.0%	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**1.0%**	**0.0%**	**14.6%**	**84.5%**

Oxides of Nitrogen

Figure 5 shows that levels are relatively low at the monitoring site. The average NO_X and NO_2 concentrations during this period were 13.9µg/m^3 and 9.31µg/m^3.

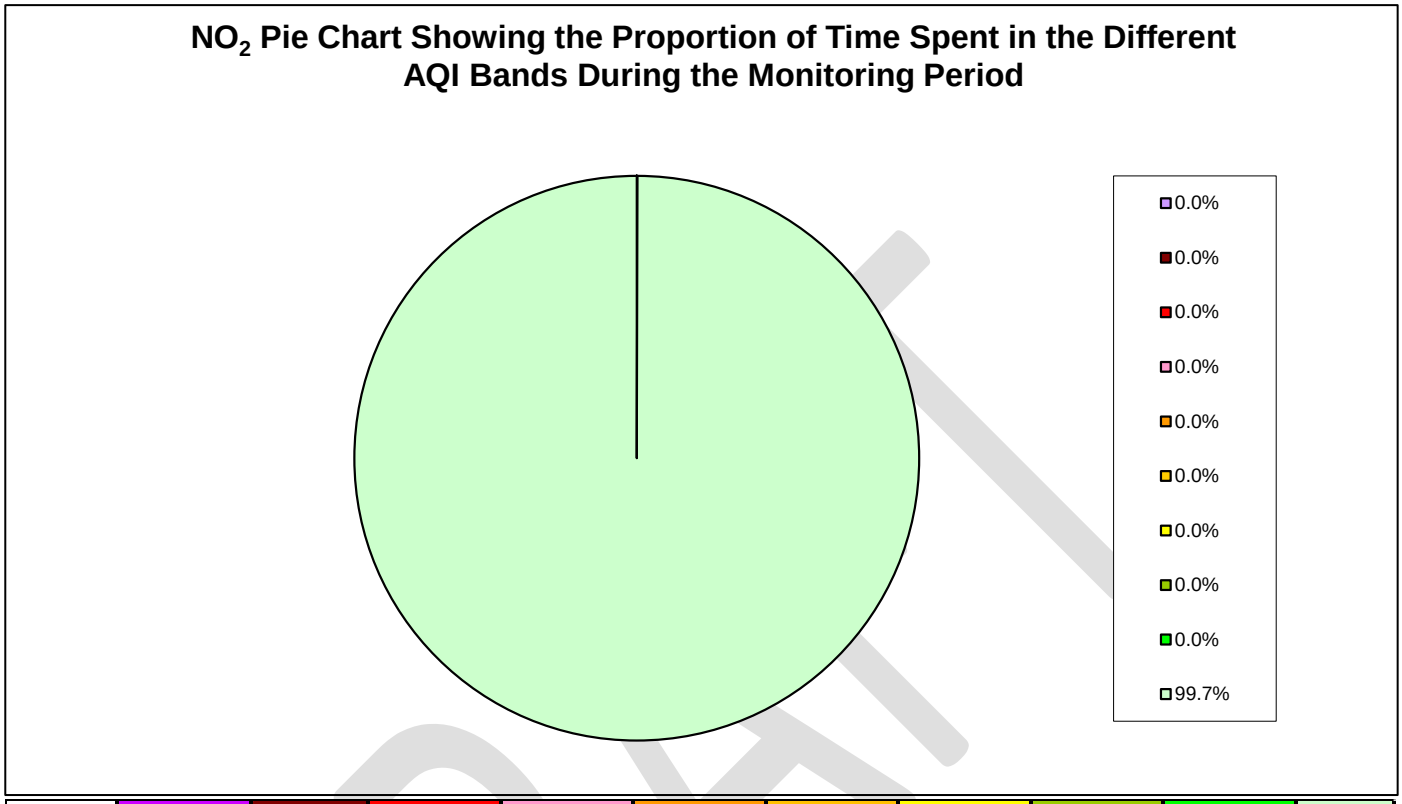
Figure 5. Time series plot of the oxides of nitrogen 1-Hour Mean Concentrations (µg/m^3).



In the United Kingdom a daily Air Quality Index has been developed. The system uses an index numbered 1-10 (low – high pollution), divided into four bands to provide more detail on a daily basis about air pollution levels to the general population and those at higher risk from air pollution.

Figure 6 looks retrospectively at the daily NO_2 concentrations at the monitoring site in relation to the Air Quality Index banding. The figure shows that during the monitoring period the NO_2 1-hour concentrations remained in the low banding of the Air Quality Index.

Figure 4. NO_2 AQI Pie Chart.

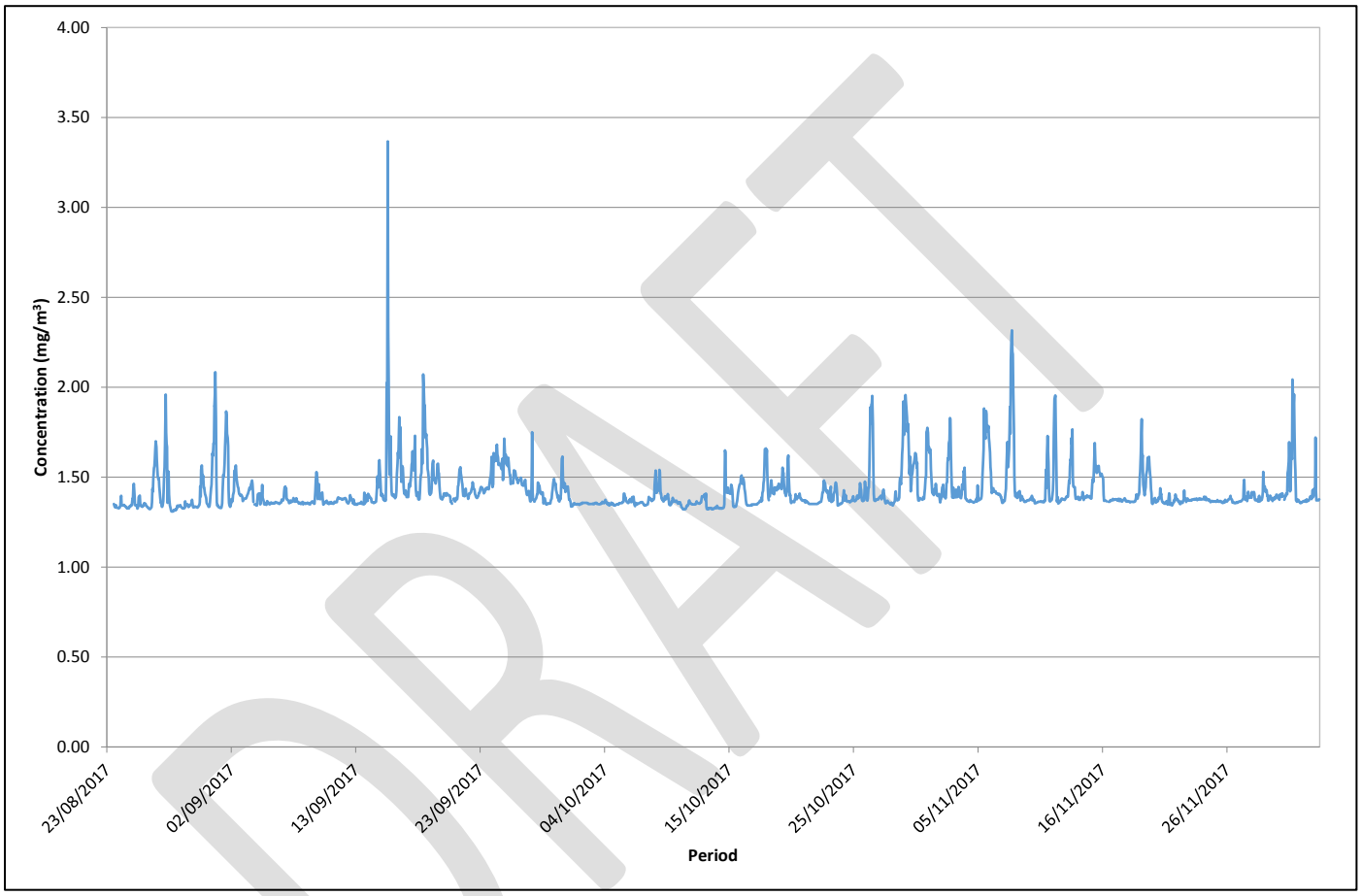


Band	10	9	8	7	6	5	4	3	2	1
	Very High	High	High	High	Moderate	Moderate	Moderate	Low	Low	Low
µg/m^3	601+	535-600	468-534	401-467	335-400	268-334	201-267	135-200	68-134	0-67
	0.0%	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**99.7%**

Methane

Figure 4 shows that the CH_4 levels are relatively low at the monitoring site. The average CH_4 concentration during this period was 1.42mg/m^3.

Figure 4. Time series plot of the methane (CH_4) 1-Hour Mean Concentrations (mg/m^3).



BTEX

Figure 5 shows that the BTEX levels are relatively low at the monitoring site. Table 1 shows the average concentration of each of the BTEX during the monitoring period. The build-up of emissions from bonfire night is also evident in the BTEX data, especially in the benzene data, where the hourly average benzene concentration was 7.83µg/m^3 at 05:00 on the 6th November. This corresponds with the peak in particulate concentrations.

Table 1. Average BTEX concentrations (µg/m^3)

VOC	Average (µg/m^3)
Benzene	0.27
Toluene	0.64
Ethylbenzene	0.30
m&p-Xylene	1.13

Figure 5. Time series plot of the BTEX 1-Hour Mean Concentrations (µg/m^3).