Scottish Environment Protection Agency
Buidheann Dìon Àrainneachd na h-Alba

SEPA response to flaring at Mossmorran: Air quality data summary

Tuesday 15 September 2020

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We call this **One Planet Prosperity**

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Executive Summary

SEPA deployed three particulate monitors during the flaring at ExxonMobil Chemical Limited that began on Monday, 12 August 2019. These monitors were in place during the plant shut down and remain in place following the start-up process. This report provides detail of the monitoring SEPA carried out.

A summary of the latest findings are below:

- PM_{10} levels were within the daily (UK) Air Quality Standard of 50 µg/m^3 (micrograms per cubic metre).
- PM_{10} and $PM_{2.5}$ would be classified as “low” using the (UK) Daily Air Quality Index bandings.
- More information on particulate matter and Daily Air Quality Index bandings is available in the Supplementary Information section at the end of this report.

1. Introduction

ExxonMobil Chemical Limited began unplanned elevated flaring at the Mossmorran Fife Ethylene Plant (FEP) on 12 August 2019 and continued until 15 August 2019 at which point the FEP shutdown. In late January 2020 the FEP entered the start-up process with ground flaring and intermittent elevated flaring taking place. Throughout the shutdown/start-up period Shell U.K. Limited's Natural Gas Liquids (NGL) Plant utilised ground flaring of excess gas.

On 21 February 2020 ExxonMobil Chemical Limited announced that the start-up was complete and the plant had returned to normal production.

Reports have been issued that cover all data from Monday, 12 August 2019.

2. Monitoring

SEPA has had a particulate monitor deployed at a location in Lochgelly since Thursday, 4 July 2019 to assess long-term air quality conditions and this remains in place gathering data.

SEPA also deployed semi-permanent monitoring equipment in Auchtertool and Donibristle (Cowdenbeath) on Wednesday, 14 August 2019 to cover a wider area and ensure there are monitors downwind of the prevailing wind conditions. It also means we have comparable data from upwind of the Mossmorran Complex.

3. Results

The particulate data measurements are compared against the relevant UK Daily Air Quality Index (DAQI) and the daily Air Quality Standard (AQS). All measurements are within the 'Low' banding. The average values for the monitoring periods are outlined in Table 1.

The graphs on the following pages show the measured data since 31 August 2020 for PM_{10} particles and $PM_{2.5}$ particles (Figures 1 – 4).

The PM_{10} daily AQS of 50 µg/m^3 (which cannot be breached more than seven times in a year) was not breached at any location. There is no daily AQS for $PM_{2.5}$.

Annual Air Quality Standards exist for PM_{10} (18 µg/m^3) and $PM_{2.5}$ (10 µg/m^3) – which is why we have also shown the overall average (Table 1).

Table 1: A summary of the particulate data collected at Lochgelly, Auchtertool and Donibristle. Excluding short breaks due to equipment downloads, data collection for this period was 100 %.

Location	Data Collection Period	Daily Average (µg/m^3)			Overall Average (µg/m^3)*	
		Dates	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$
Lochgelly	11:45 04 July 2019 – Ongoing	31 August 2020	5.64	2.71	7.33	4.46
		01 September 2020	6.60	3.47		
		02 September 2020	4.62	1.73		
		03 September 2020	10.14	4.52		
		04 September 2020	8.49	4.24		
		05 September 2020	7.87	4.11		
		06 September 2020	5.17	2.69		
		07 September 2020	3.04	1.20		
		08 September 2020	3.45	1.50		
		09 September 2020	9.73	5.07		
		10 September 2020	12.24	6.20		
		11 September 2020	8.76	4.67		
		12 September 2020	9.57	5.54		
		13 September 2020	4.99	2.63		
Auchtertool	09:30 14 August 2019 – Ongoing	31 August 2020	5.37	1.79	6.88	4.96
		01 September 2020	5.96	2.43		
		02 September 2020	5.28	2.43		
		03 September 2020	12.31	8.34		
		04 September 2020	12.28	9.85		
		05 September 2020	10.35	8.09		
		06 September 2020	5.61	3.51		
		07 September 2020	2.53	1.45		
		08 September 2020	3.05	1.45		
		09 September 2020	10.50	7.83		
		10 September 2020	15.63	11.53		
		11 September 2020	10.36	8.26		
		12 September 2020	14.53	12.41		
		13 September 2020	5.94	4.34		

* The overall average is a calculation of the average since monitoring began.

Table 1: Continued

Location	Data Collection Period	Daily Average (µg/m^3)			Overall Average (µg/m^3)*	
		Dates	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$
Donibristle	12:00 14 August 2019 – ongoing	31 August 2020	2.91	1.47	6.16	4.69
		01 September 2020	4.32	2.33		
		02 September 2020	3.40	2.06		
		03 September 2020	8.12	6.52		
		04 September 2020	7.39	7.03		
		05 September 2020	6.92	6.33		
		06 September 2020	4.54	3.24		
		07 September 2020	1.43	1.12		
		08 September 2020	1.61	1.11		
		09 September 2020	6.91	6.10		
		10 September 2020	11.60	9.82		
		11 September 2020	7.40	6.88		
		12 September 2020	10.67	10.13		
		13 September 2020	3.82	3.32		

* The overall average is a calculation of the average since monitoring began.

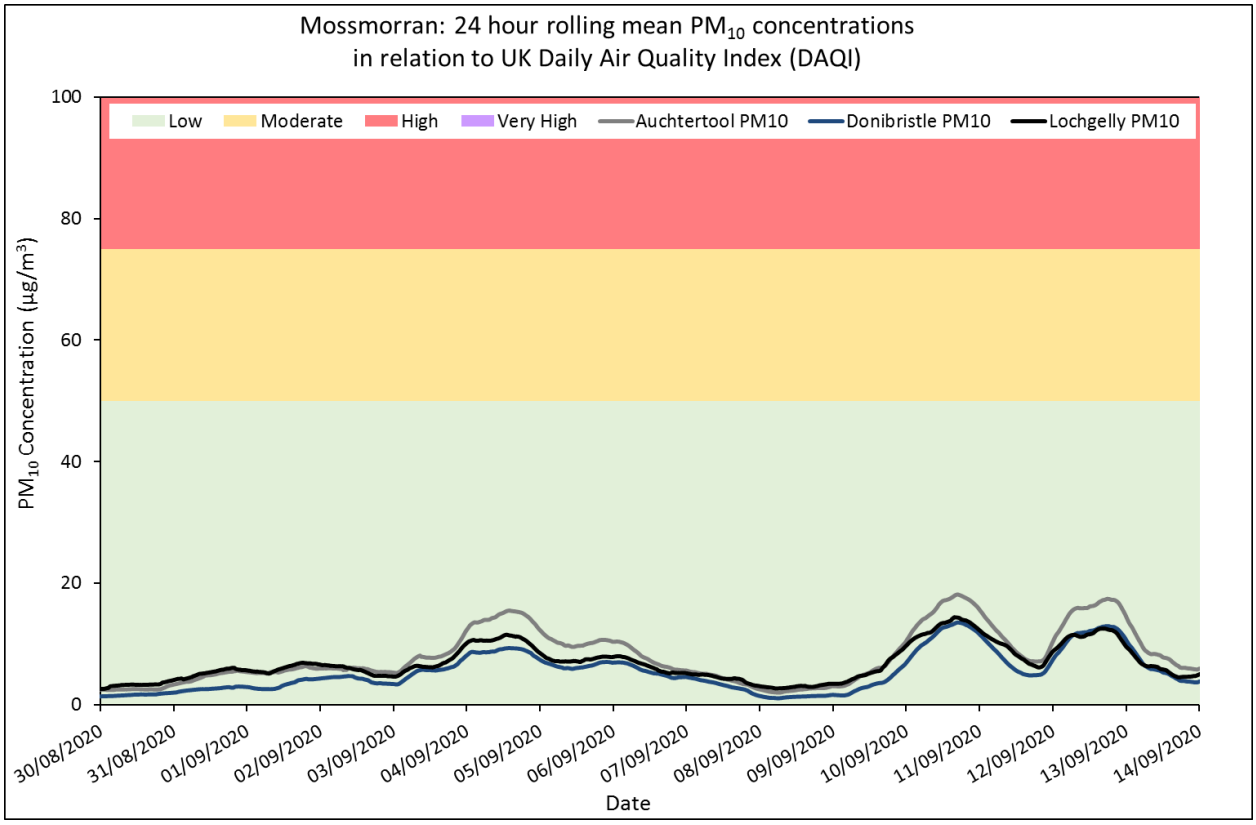

Figure 1: 24 hour rolling means for PM_{10} at Lochgelly, Auchtertool and Donibristle. Dotted lines represent mean values based on less than 24 hours of data collection.

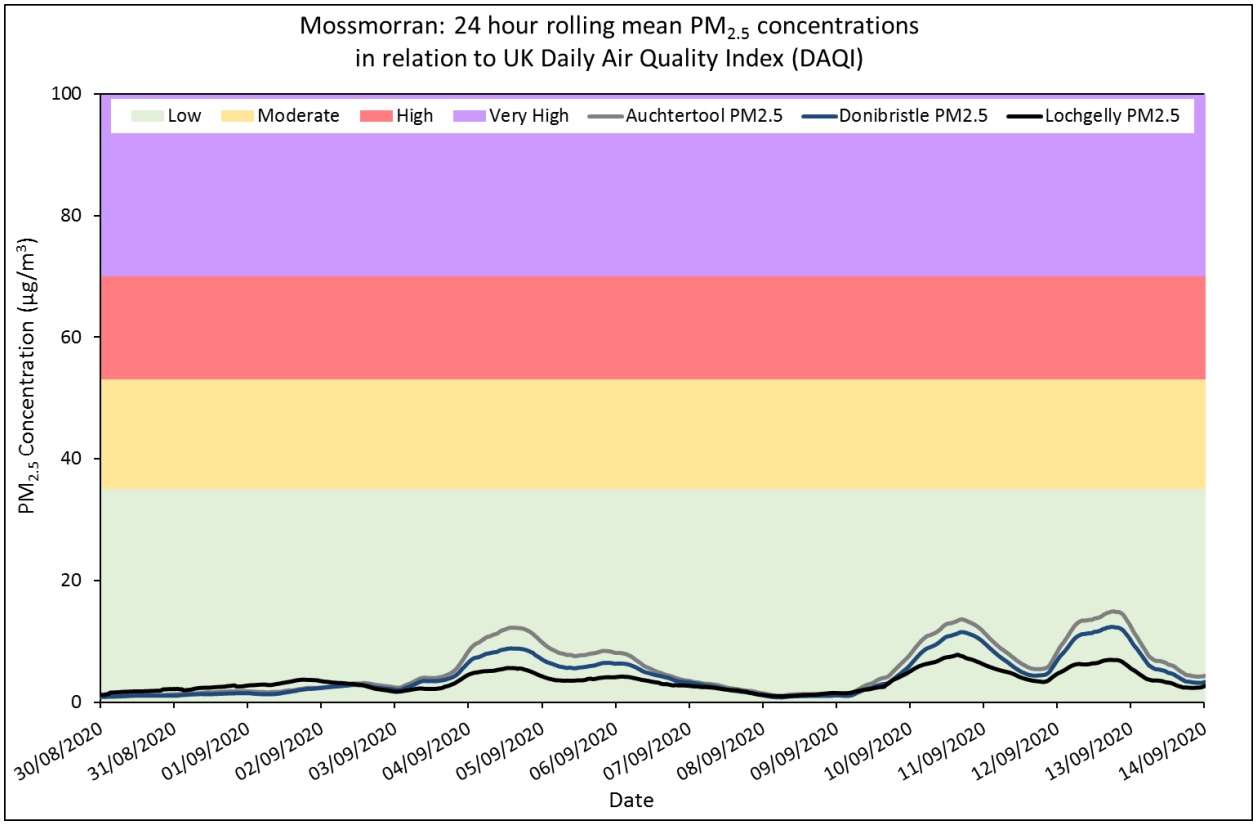

Figure 2: 24 hour rolling means for $PM_{2.5}$ at Lochgelly, Auchtertool and Donibristle. Dotted lines represent mean values based on less than 24 hours of data collection.

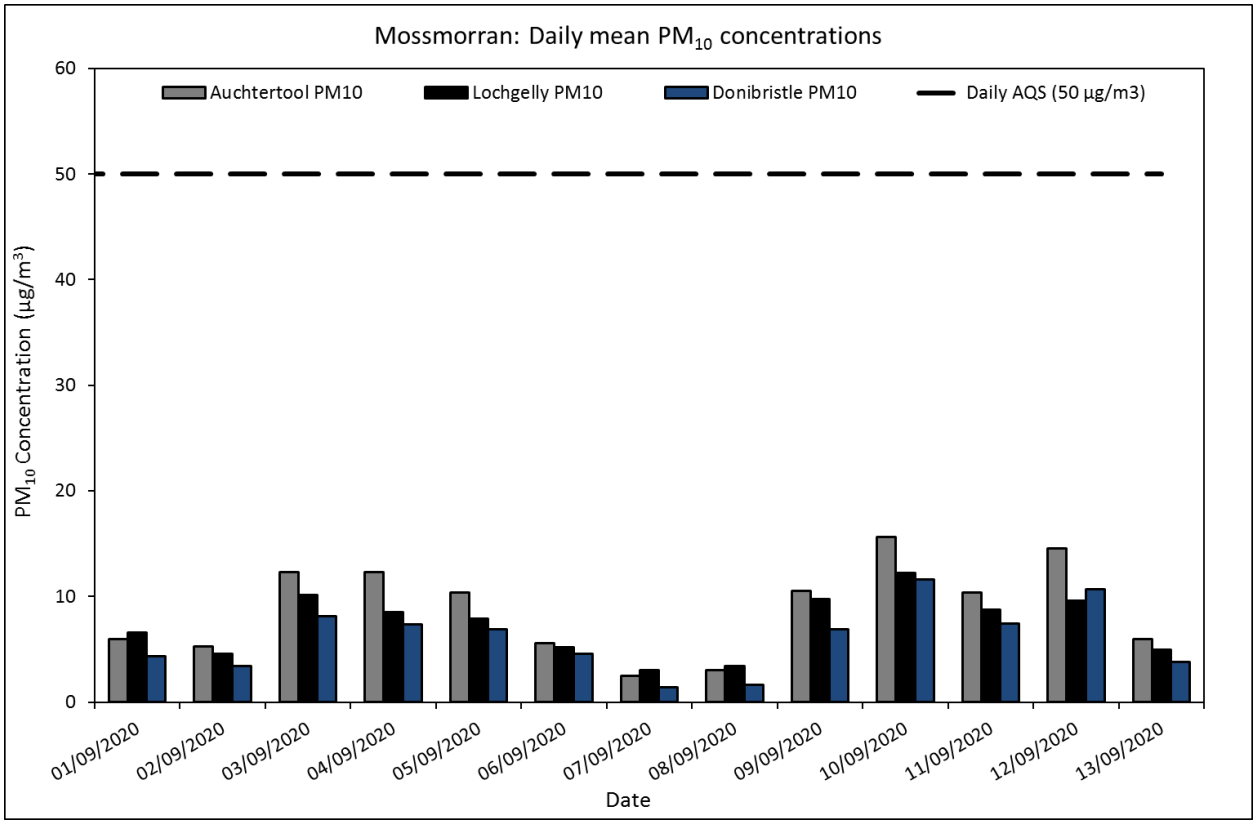

Figure 3: Daily means for PM_{10} at Lochgelly, Auchtertool and Donibristle. Dotted lines represent mean values based on less than 24 hours of data collection.

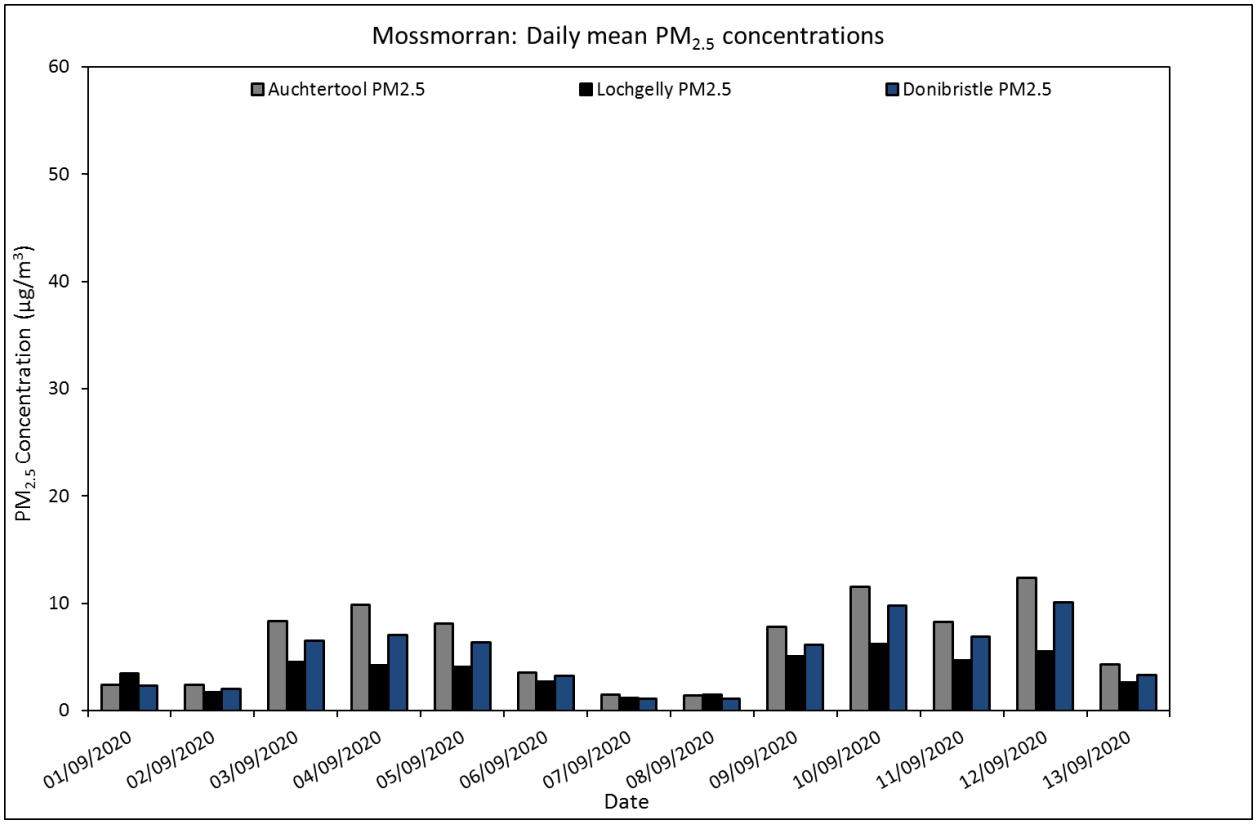

Figure 4: Daily means for $PM_{2.5}$ at Lochgelly, Auchtertool and Donibristle. Dotted lines represent mean values based on less than 24 hours of data collection.

4. Conclusion

PM_{10} levels were within the daily (UK) Air Quality Standard of 50 µg/m^3 (micrograms per cubic metre) and the values recorded for both PM_{10} and $PM_{2.5}$ would be classified as “low” using the (UK) Daily Air Quality Index (DAQI) bandings.

Appendix 1 – Supplementary Information

Particulate Matter

Particulate matter is made up of a number of components, including chemical substances, and soil and dust particles and comes from both human-made and natural sources. It consists of substances, which are released directly from the source into the atmosphere, and secondary components, which are formed in the atmosphere by chemical reactions.

Particulate matter is not made up of one type of substance; it is a classification of particles by size. It is measured in micrometres (µm). A human hair is approximately 100 µm wide.

Larger particles are generally filtered in the nose and throat, but particulate matter smaller than about 10 micrometres (µm) can be inhaled, which is why these are the ones measured for air quality monitoring.

- PM_{10} means the particles are 10 µm or smaller. The measurement of this figure includes $PM_{2.5}$.
- $PM_{2.5}$ means the particles are 2.5 µm or smaller.

Particulate levels can vary for a variety of reasons, such as rush hour traffic, building work, elevated pollen levels and emissions from industrial activities. Changes in wind direction can also have an impact on the measurements at a monitoring site.

What does the UK Daily Air Quality Index mean?

The following information is taken from the Air Quality in Scotland website at *http://www.scottishairquality.scot/air-quality/daqi.*

In the UK most air pollution information services use the index and banding system approved by the Committee on Medical Effects of Air Pollution Episodes (COMEAP).

The overall Daily Air Quality Index (DAQI) looks at five substances, not just PM_{10} and $PM_{2.5}$. These tables are included to help put the levels detected by SEPA into context.

PM_{10} Particles - Based on the daily mean concentration for historical data, latest 24 hour running mean (24 hour average) for the current day.

Index	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Band	Low	Low	Low	Moderate	Moderate	Moderate	High	High	High	Very High
µg/m³	0-16	17-33	34-50	51-58	59-66	67-75	76-83	84-91	91-100	101 or more

$PM_{2.5}$ Particles - Based on the daily mean concentration for historical data, latest 24 hour running mean (24 hour average) for the current day.

Index	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Band	Low	Low	Low	Moderate	Moderate	Moderate	High	High	High	Very High
µg/m³	0-11	12-23	24-35	36-41	42-47	48-53	54-58	59-64	65-70	71 or more

Air Pollution Banding	**Value**	**Accompanying health messages for at-risk individuals***	**Accompanying health messages for the general population**
Low	**1-3**	**Enjoy** your usual outdoor activities.	**Enjoy** your usual outdoor activities.
Moderate	**4-6**	Adults and children with lung problems, and adults with heart problems, **who experience symptoms**, should **consider reducing** strenuous physical activity, particularly outdoors.	**Enjoy** your usual outdoor activities.
High	**7-9**	Adults and children with lung problems, and adults with heart problems, should **reduce** strenuous physical exertion, particularly outdoors, and particularly if they experience symptoms. People with asthma may find they need to use their reliever inhaler more often. Older people should also **reduce** physical exertion.	Anyone experiencing discomfort such as sore eyes, cough or sore throat should **consider reducing** activity, particularly outdoors.
Very High	**10**	Adults and children with lung problems, adults with heart problems, and older people, should **avoid** strenuous physical activity. People with asthma may find they need to use their reliever inhaler more often.	**Reduce** physical exertion, particularly outdoors, especially if you experience symptoms such as cough or sore throat.

* Adults and children with heart or lung problems are at greater risk of symptoms. Follow your doctor's usual advice about exercising and managing your condition. It is possible that very sensitive individuals may experience health effects even on Low air pollution days. Anyone experiencing symptoms should follow the guidance provided on the Defra UK-AIR website.

Appendix 2 – Equipment and Methodologies

PM_{10} and $PM_{2.5}$ monitoring at Auchtertool and Donibristle was completed using a calibrated Turnkey Osiris particulate monitor, following SEPA procedure ES-NFC-WP-031. The Turnkey Osiris is a light scattering-type analyser which is certified (Sira MC090157/06 initial certification 30 September 2009, Renewed 29 September 2019) to measure PM_{10} in the range 0 to 100 µg/m^3. Turnkey Osiris units are capable of measurement of PM_{10} and $PM_{2.5}$ to 6000 µg/m^3; however, the unit is not certified for PM_{10} levels above 100 µg/m^3 or for $PM_{2.5}$. This means that results for these are classed as “indicative”.

PM_{10} and $PM_{2.5}$ monitoring at Lochgelly was completed using a calibrated Palas FIDAS 200 particulate monitor, following SEPA procedure ES-NFC-WP-067. The Palas FIDAS 200 is a light scattering-type analyser which is certified (Sira MC16290/02 issued 23 February 2017) to measure PM_{10} and $PM_{2.5}$ in the range 0 to 10,000 µg/m^3.