Comhairle Cathrach
& Contae **Luimnigh**

Limerick City
& County Council

Air Quality Report for Limerick

March 2018

Introduction

Limerick City and County Council has installed three air quality monitors in the metropolitan area of Limerick to provide live indicative air quality data to the public. These monitors are located in Limerick City, Mungret and Castletroy. They measure particulate matter (measured since 10th May 2017) and gases (added to the monitoring suite on 24th January 2018), including nitrogen dioxide (NO_2), sulphur dioxide (SO_2), carbon monoxide (CO) and ozone. Real time data from these monitors can be accessed at www.airqweb.com.

Particulate matter

Particulate matter (PM) which is commonly used as an indicator of dust particles in air, including total suspended particulates, PM_{10}, $PM_{2.5}$ and PM_1.

PM_{10} is particulate matter 10 microns or less in diameter, $PM_{2.5}$ is particulate matter 2.5 microns or less in diameter and PM_1 is particulate matter 1 micron or less. $PM_{2.5}$ is generally described as fine particulates. As a comparison, the width of a human hair is around 100 microns so approximately 40 $PM_{2.5}$ will fit along its width.

The particulate matter indices that are of primary concern for human health are PM_{10}, $PM_{2.5}$ and PM_1. These are the sub-fraction of particles which can penetrate into the alveoli (air sacs) in the lungs. Chronic exposure to particles contributes to the risk of developing cardiovascular and respiratory diseases, as well as of lung cancer.

Nitrogen dioxide

Nitrogen dioxide (NO_2) is produced during combustion at high temperatures with the main sources in Ireland being vehicles and power stations. Short-term exposure to NO_2 is linked to adverse respiratory effects including airway inflammation in healthy people and increased respiratory symptoms in asthmatics. Long-term exposure is associated with increased risk of respiratory infections in children.

Sulphur dioxide

Sulphur dioxide (SO_2) is a gas which is formed when sulphur containing fuels (e.g. coal and oil) are burned in power stations, domestically and elsewhere. Impacts of high concentrations of SO_2 include temporary breathing difficulties for those that suffer from respiratory conditions such as asthma. Long-term exposure to SO_2 can aggravate existing cardiovascular disease and respiratory illness.

Carbon monoxide

Carbon monoxide (CO) is a colourless gas, formed from incomplete oxidation during combustion of fuel. Outdoor sources of CO are mainly from vehicles with concentrations generally highest in areas of traffic congestion. CO enters the bloodstream through the lungs and impairs the delivery of oxygen to the body's organs and tissues. The health impact of CO concentrations in ambient air is most serious for those suffering cardiovascular disease such as angina.

Ozone

Ozone (O_3) is formed as a secondary pollutant in the troposphere from the chemical reaction of NO_x (the two pollutants nitric oxide, NO, and nitrogen dioxide, NO_2), CO and volatile organic compounds (VOCs) in the presence of sunlight. Ozone can also be present in the troposphere due to downward flux from the ozone-rich stratosphere, where it occurs naturally and has a role in absorbing harmful UV radiation. Ground-level ozone is depleted through reactions with traffic-emitted pollutants and so levels of ozone are higher in rural areas than in urban areas.

Ozone irritates the eyes, nose, throat and lungs. It can destroy throat and lung tissue leading to a decrease in lung function and respiratory symptoms such as coughing, shortness of breath, aggravated asthma and other lung diseases.

Air Quality Standards

The CAFE (Clean Air for Europe) Directive sets air quality standards for member states in Europe and has been transposed into Irish legislation by the **Air Quality Standards Regulations.** The limit values for particulates are given below.

Pollutant	Objective	Averaging Period	Limit Value	Basis of Application of the Limit Value	Limit Value Attainment Date
PM_{10}	Protection of human health	24-hours	50 µg/m^3	Not to be exceeded more than 35 times in a calendar year	1 Jan 2005
PM_{10}	Protection of human health	Calendar year	40 µg/m^3	Annual mean	1 Jan 2005
$PM_{2.5}$	Protection of human health	Calendar year	25 µg/m^3	Annual mean	1 Jan 2005
$PM_{2.5}$	Protection of human health	Calendar year	20 µg/m^3	Annual mean	1 Jan 2020
NO_2	Protection of human health	1-hour	200 µg/m^3	Not to be exceeded more than 18 times in a calendar year	1 Jan 2010
NO_2	Protection of human health	Calendar year	40 µg/m^3	Not to be exceeded more than 18 times in a calendar year	1 Jan 2010
SO_2	Protection of human health	1-hour	150 µg/m^3	Not to be exceeded more than 24 times in a calendar year	1 Jan 2005
SO_2	Protection of human health	24-hours	125 µg/m^3	Not to be exceeded more than 3 times in a calendar year	1 Jan 2005
CO	Protection of human health	Maximum 8-hour mean*	10mg/m^3	60% of the hourly running 8-hour averages	1 Jan 2005

**The maximum daily 8-hour mean concentration is selected by examining eight-hour running averages, calculated from hourly data.*

The World Health Organisation (WHO) provides air quality guidelines as follows:

Pollutant	Averaging period	Guideline
PM_{10}	Calendar year	20 µg/m^3
	24-hours	50 µg/m^3
$PM_{2.5}$	Calendar year	10 µg/m^3
	24-hours	25 µg/m^3
NO_2	Calendar year	40 µg/m^3
	1-hour	200 µg/m^3
SO_2	24-hour	20 µg/m^3
	10-minutes	500 µg/m^3
Ozone	8-hour	100 µg/m^3

Air Quality in March

The graphs on the following pages show the 24 hourly mean values of Total Particulates, PM_{10}, $PM_{2.5}$, PM_1, NO_2, SO_2, CO and ozone for the month of March at the three monitoring sites. The monitoring results for particulate matter have been filtered out where the humidity at the station has been measured as greater than 85 %, as per a recommendation by the EPA[1]. The relevant air quality standards or WHO guideline values for PM_{10}, $PM_{2.5}$, NO_2, SO_2 and CO also indicated. There are no standards currently set for Total Particulates, PM_1 and ozone.

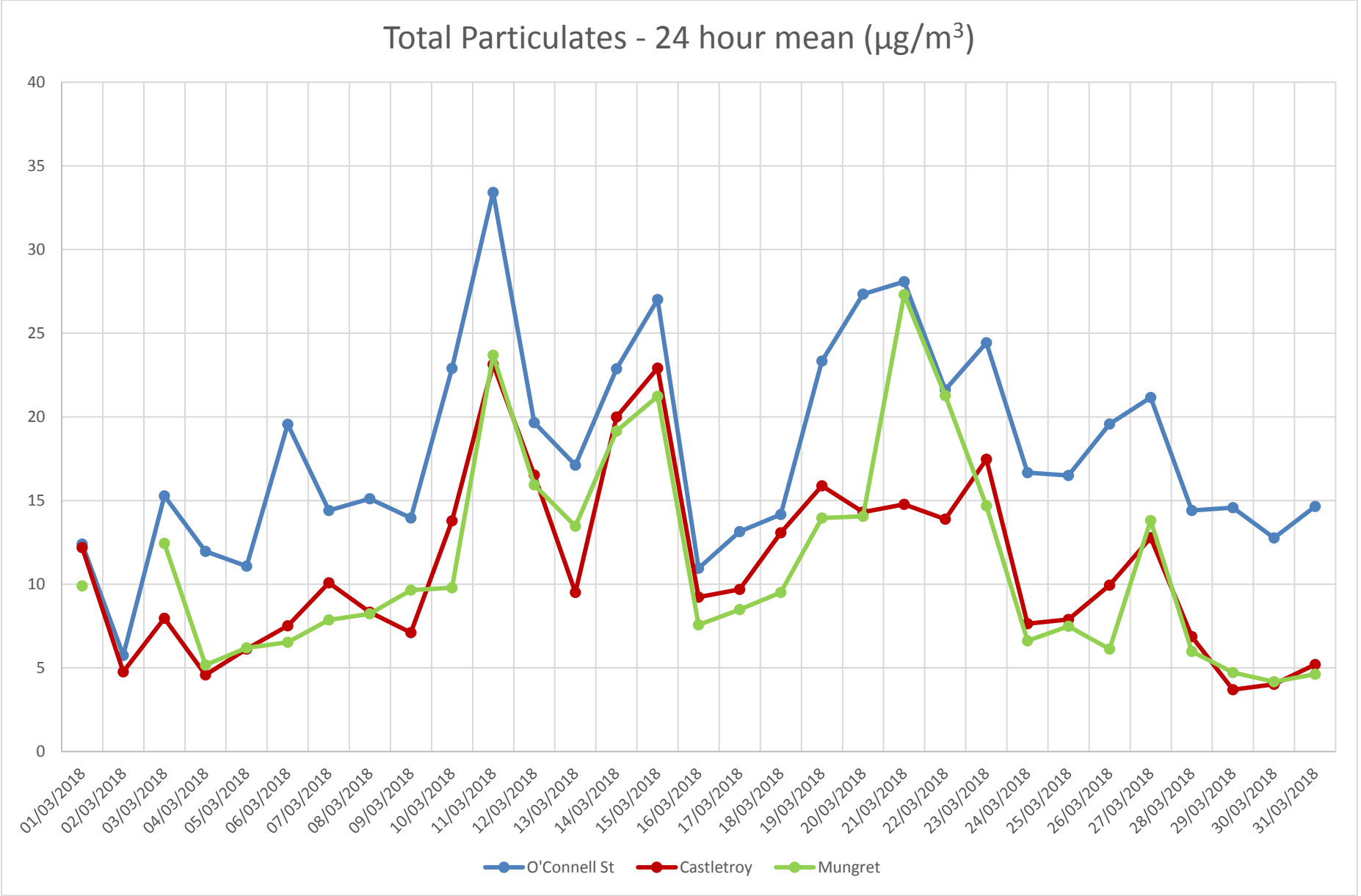
At all three monitoring sites, the results for particulate matter and gases (NO_2, SO_2, CO and ozone) indicated generally good air quality throughout March.

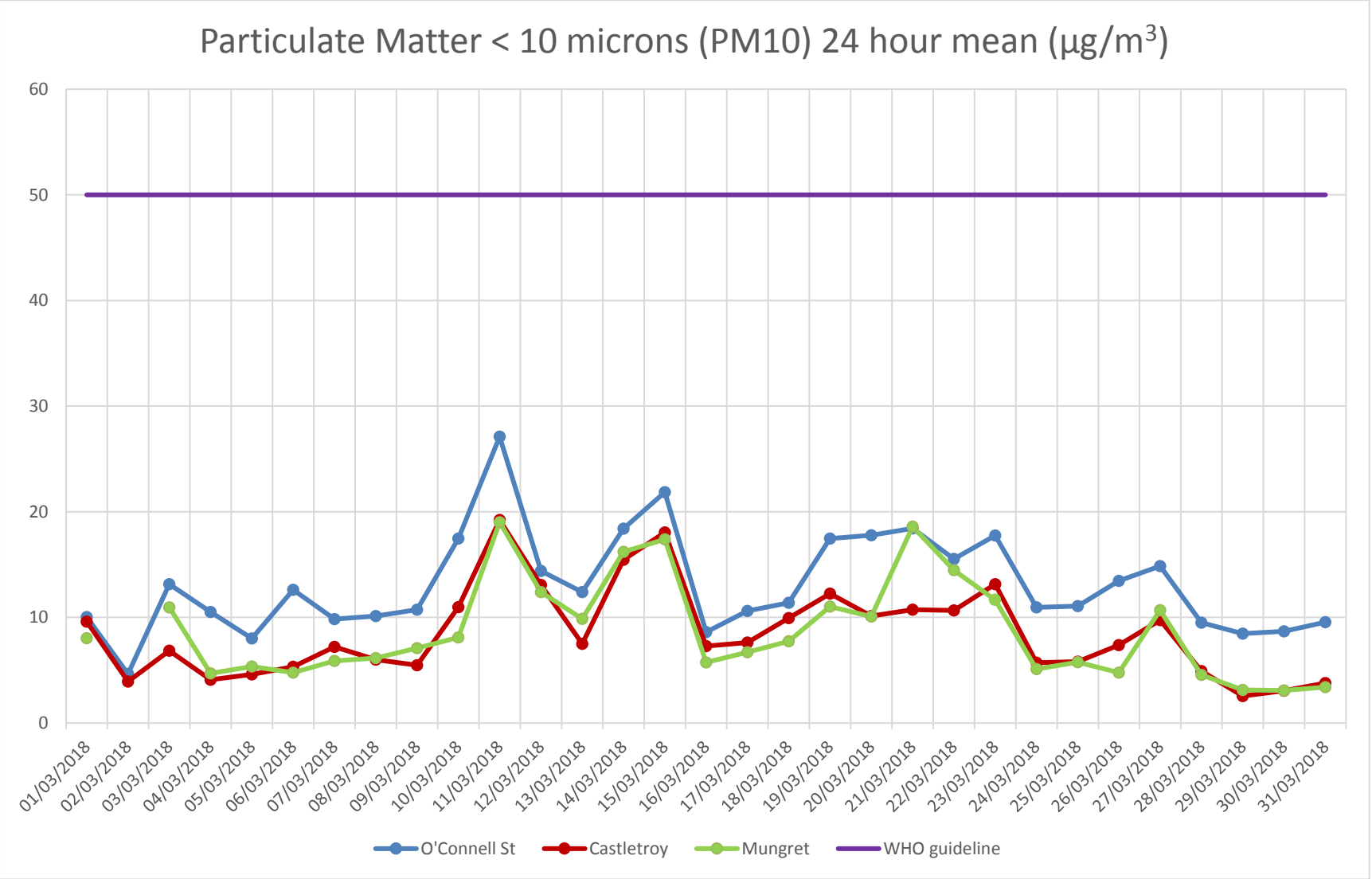
Further information on air quality and health can be found at: http://www.epa.ie/air/quality/index/#d.en.51478

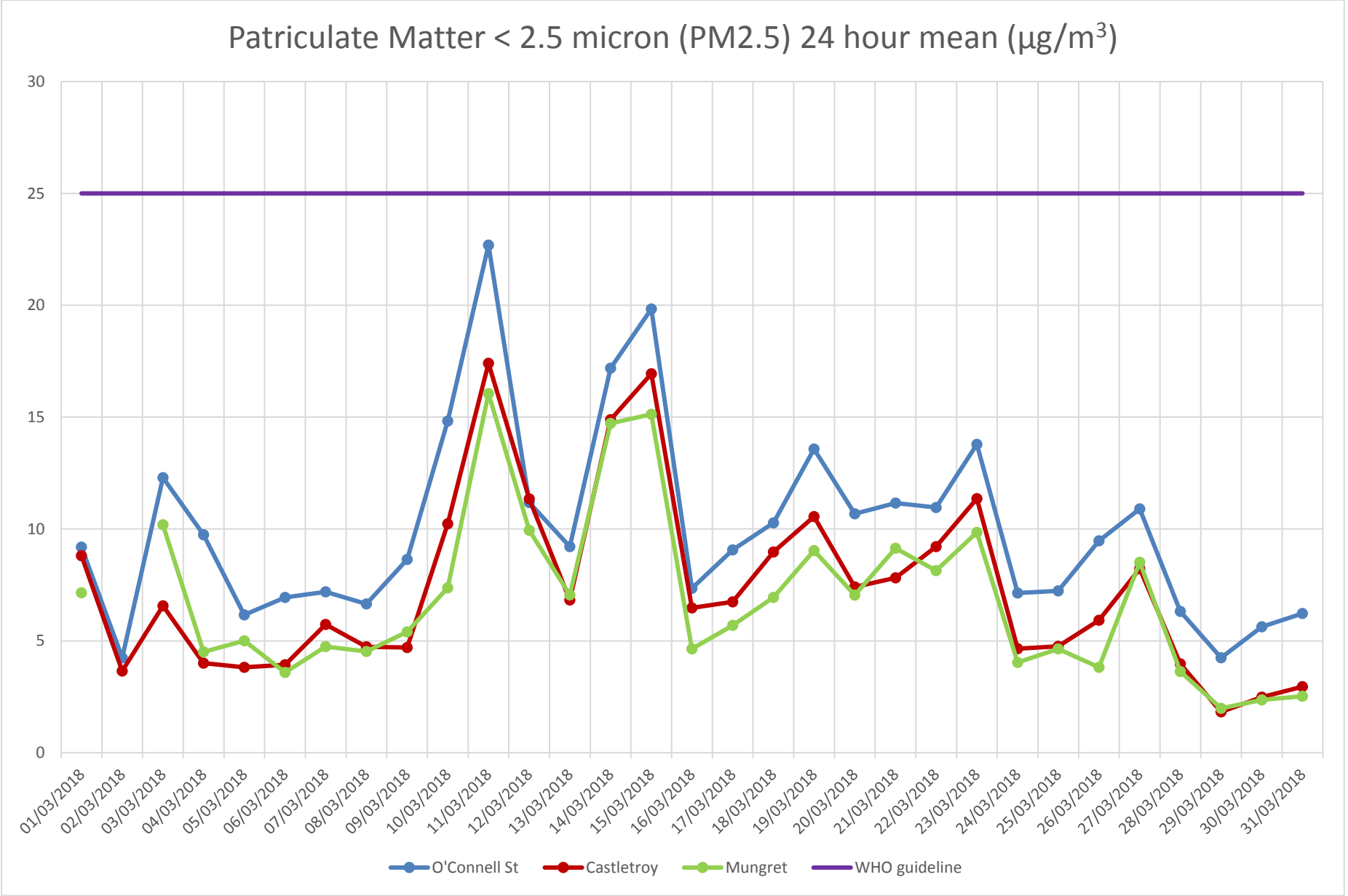
The long term mean values for particulate matter and gases (NO_2, SO_2, CO and ozone) since the monitors were installed are shown in the table below and compared with the annual mean limits and guidelines. There were not any exceedances of WHO guideline values.

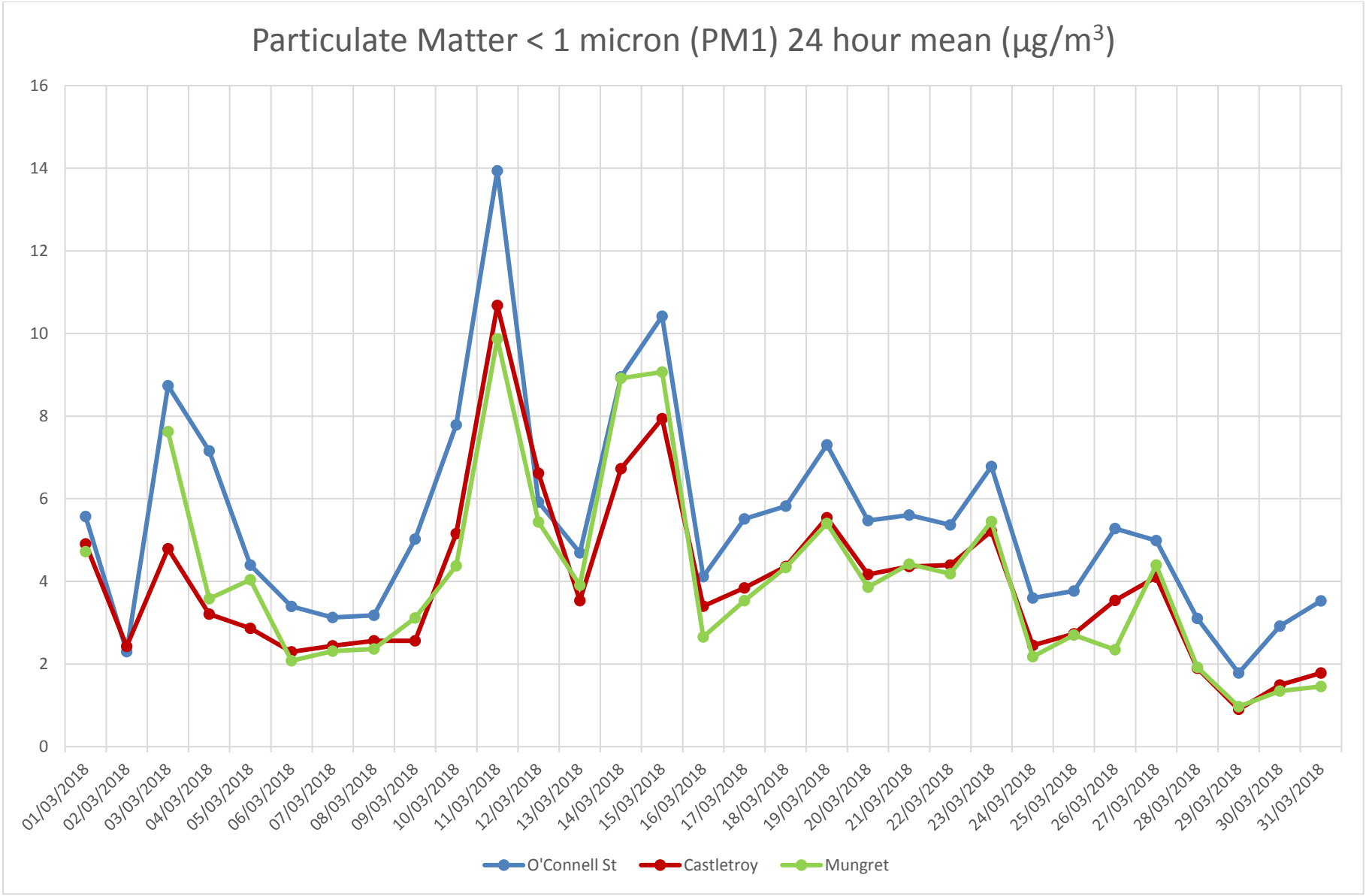
[1] Limerick City and County Council included humidity and temperature sensors to the monitoring suite on 24th January 2018.

Parameter	Location	Measured long term mean (µg/m^3)	WHO annual mean guideline (µg/m^3)	EU CAFÉ directive annual mean limit(µg/m^3)
Total Particulates (May 17 – Mar 18)	O'Connell St	16 µg/m^3	None specified	None specified
	Castletroy	11 µg/m^3		
	Mungret	10 µg/m^3		
PM_{10} (May 17 – Mar 18)	O'Connell St	12 µg/m^3	20 µg/m^3	40 µg/m^3
	Castletroy	8 µg/m^3		
	Mungret	7 µg/m^3		
$PM_{2.5}$ (May 17 – Mar 18)	O'Connell St	9 µg/m^3	10 µg/m^3	25 µg/m^3
	Castletroy	6 µg/m^3		
	Mungret	6 µg/m^3		
PM_1 (May 17 – Mar 18)	O'Connell St	4 µg/m^3	None specified	None specified
	Castletroy	3 µg/m^3		
	Mungret	3 µg/m^3		
NO_2 (Jan 18 – Mar 18)	O'Connell St	19 µg/m^3	40 µg/m^3	40 µg/m^3
	Castletroy	11 µg/m^3		
	Mungret	11 µg/m^3		
SO_2 (Jan 18 – Mar 18)	O'Connell St	7 µg/m^3	None specified	20 µg/m^3
	Castletroy	7 µg/m^3		
	Mungret	6 µg/m^3		
CO (Jan 18 – Mar 18)	O'Connell St	0.3 mg/m^3	None specified	None specified
	Castletroy	0.1 mg/m^3		
	Mungret	0.1 mg/m^3		
Ozone (Jan 18 – Mar 18)	O'Connell St	36 µg/m^3	None specified	None specified
	Castletroy	53 µg/m^3		
	Mungret	57 µg/m^3		


Total Particulates - 24 hour mean (µg/m3)
40
35
30
25
20
15
10
5
0
01/03/2018
02/03/2018
03/03/2018
04/03/2018
05/03/2018
06/03/2018
07/03/2018
08/03/2018
09/03/2018
10/03/2018
11/03/2018
12/03/2018
13/03/2018
14/03/2018
15/03/2018
16/03/2018
17/03/2018
18/03/2018
19/03/2018
20/03/2018
21/03/2018
22/03/2018
23/03/2018
24/03/2018
25/03/2018
26/03/2018
27/03/2018
28/03/2018
29/03/2018
30/03/2018
31/03/2018
O'Connell St
Castletroy
Mungret


Particulate Matter < 10 microns (PM10) 24 hour mean (µg/m3)
60
50
40
30
20
10
0
01/03/2018
02/03/2018
03/03/2018
04/03/2018
05/03/2018
06/03/2018
07/03/2018
08/03/2018
09/03/2018
10/03/2018
11/03/2018
12/03/2018
13/03/2018
14/03/2018
15/03/2018
16/03/2018
17/03/2018
18/03/2018
19/03/2018
20/03/2018
21/03/2018
22/03/2018
23/03/2018
24/03/2018
25/03/2018
26/03/2018
27/03/2018
28/03/2018
29/03/2018
30/03/2018
31/03/2018
O'Connell St
Castletroy
Mungret
WHO guideline


Patriculate Matter < 2.5 micron (PM2.5) 24 hour mean (µg/m3)
30
25
20
15
10
5
0
01/03/2018
02/03/2018
03/03/2018
04/03/2018
05/03/2018
06/03/2018
07/03/2018
08/03/2018
09/03/2018
10/03/2018
11/03/2018
12/03/2018
13/03/2018
14/03/2018
15/03/2018
16/03/2018
17/03/2018
18/03/2018
19/03/2018
20/03/2018
21/03/2018
22/03/2018
23/03/2018
24/03/2018
25/03/2018
26/03/2018
27/03/2018
28/03/2018
29/03/2018
30/03/2018
31/03/2018
O'Connell St
Castletroy
Mungret
WHO guideline


Particulate Matter < 1 micron (PM1) 24 hour mean (µg/m3)
16
14
12
10
8
6
4
2
0
01/03/2018
02/03/2018
03/03/2018
04/03/2018
05/03/2018
06/03/2018
07/03/2018
08/03/2018
09/03/2018
10/03/2018
11/03/2018
12/03/2018
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16/03/2018
17/03/2018
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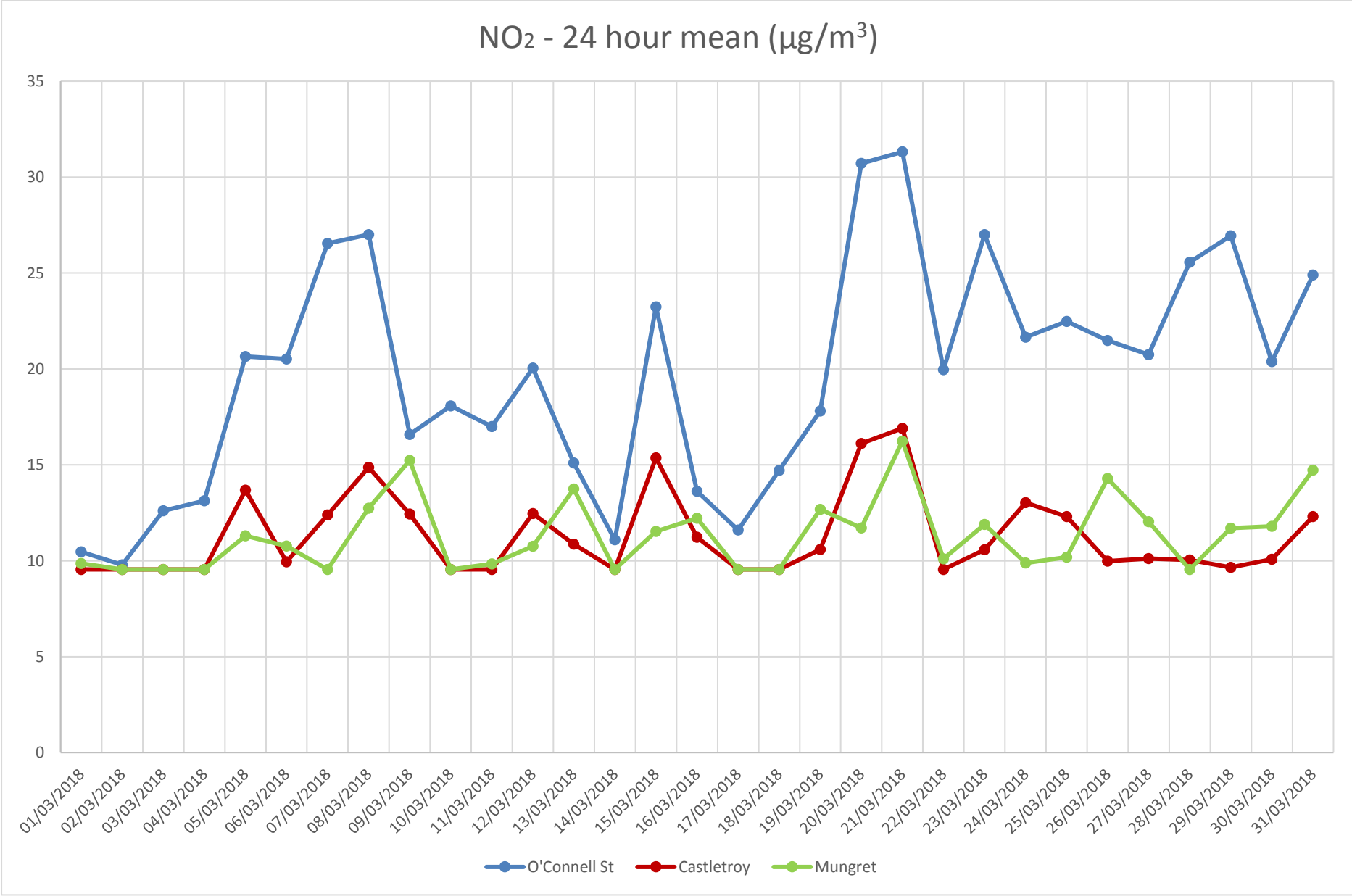
21/03/2018
22/03/2018
23/03/2018
24/03/2018
25/03/2018
26/03/2018
27/03/2018
28/03/2018
29/03/2018
30/03/2018
31/03/2018
O'Connell St
Castletroy
Mungret


NO2 - 24 hour mean (µg/m3)
35
30
25
20
15
10
5
0
01/03/2018
02/03/2018
03/03/2018
04/03/2018
05/03/2018
06/03/2018
07/03/2018
08/03/2018
09/03/2018
10/03/2018
11/03/2018
12/03/2018
13/03/2018
14/03/2018
15/03/2018
16/03/2018
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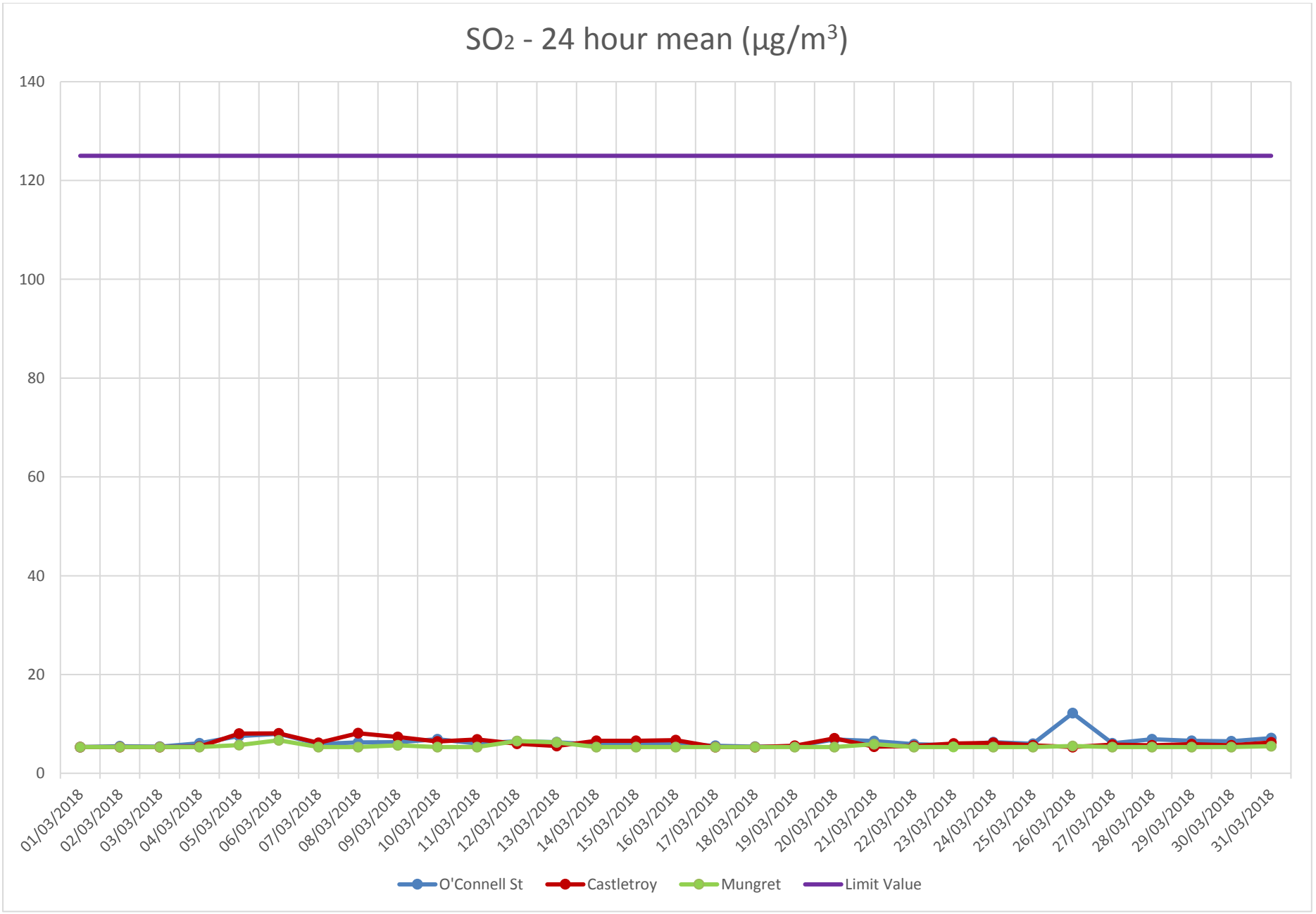
23/03/2018
24/03/2018
25/03/2018
26/03/2018
27/03/2018
28/03/2018
29/03/2018
30/03/2018
31/03/2018
O'Connell St
Castletroy
Mungret


SO2 - 24 hour mean (µg/m3)
140
120
100
80
60
40
20
0
01/03/2018
02/03/2018
03/03/2018
04/03/2018
05/03/2018
06/03/2018
07/03/2018
08/03/2018
09/03/2018
10/03/2018
11/03/2018
12/03/2018
13/03/2018
14/03/2018
15/03/2018
16/03/2018
17/03/2018
18/03/2018
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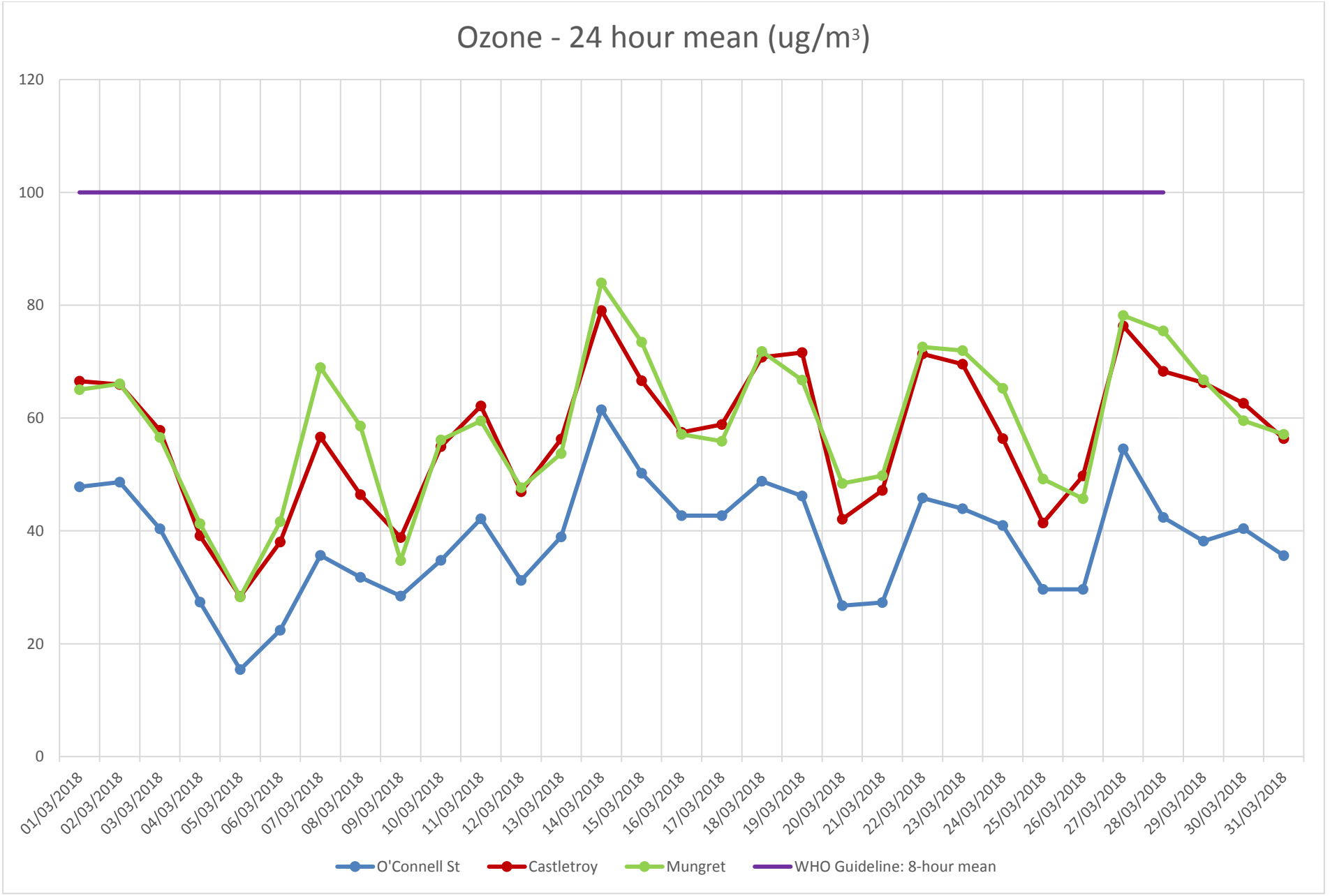
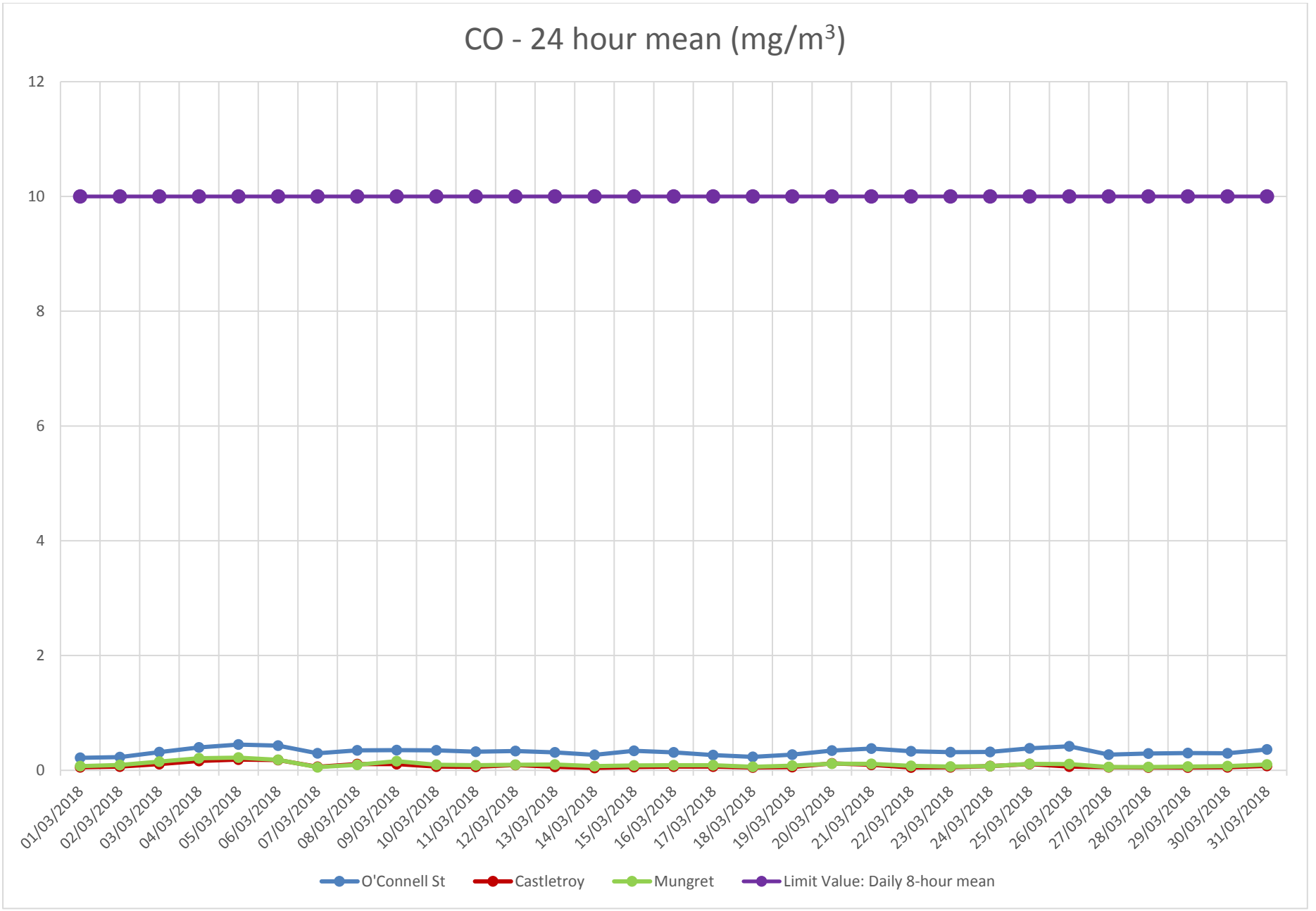
20/03/2018
21/03/2018
22/03/2018
23/03/2018
24/03/2018
25/03/2018
26/03/2018
27/03/2018
28/03/2018
29/03/2018
30/03/2018
31/03/2018
O'Connell St
Castletroy
Mungret
Limit Value


Ozone - 24 hour mean (ug/m3)
120
100
80
60
40
20
0
01/03/2018
02/03/2018
03/03/2018
04/03/2018
05/03/2018
06/03/2018
07/03/2018
08/03/2018
09/03/2018
10/03/2018
11/03/2018
12/03/2018
13/03/2018
14/03/2018
15/03/2018
16/03/2018
17/03/2018
18/03/2018
19/03/2018
20/03/2018
21/03/2018
22/03/2018
23/03/2018
24/03/2018
25/03/2018
26/03/2018
27/03/2018
28/03/2018
29/03/2018
30/03/2018
31/03/2018
O'Connell St
Castletroy
Mungret
WHO Guideline: 8-hour mean


CO - 24 hour mean (mg/m3)
12
10
8
6
4
2
0
01/03/2018
02/03/2018
03/03/2018
04/03/2018
05/03/2018
06/03/2018
07/03/2018
08/03/2018
09/03/2018
10/03/2018
11/03/2018
12/03/2018
13/03/2018
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23/03/2018
24/03/2018
25/03/2018
26/03/2018
27/03/2018
28/03/2018
29/03/2018
30/03/2018
31/03/2018
O'Connell St
Castletroy
Mungret
Limit Value: Daily 8-hour mean