

# Tackling roadside nitrogen dioxide concentrations in Wales



Llywodraeth Cymru  
Welsh Government

Welsh Government supplemental plan to the UK plan for tackling roadside nitrogen dioxide concentrations 2017 – Annual Data for NO<sub>2</sub> Concentrations for the Motorway and Trunk Road for 2020 and 2021

September 2022



Mae'r ddogfen yma hefyd ar gael yn Gymraeg.

This document is also available in Welsh.

## Foreword

The Welsh Government is committed to building healthier communities and better environments. Tackling poor air quality is a priority that is reflected in our national strategy – ‘Prosperity for All’. In November 2018 we published our Welsh Government supplemental plan to the UK plan for tackling roadside nitrogen dioxide (NO<sub>2</sub>) concentrations 2017 setting out how we will reduce concentrations of NO<sub>2</sub> around roads where levels are above legal limits.

The plan built on Section 7.6 (Additional Actions in Wales) of the 2017 UK plan for tackling roadside nitrogen dioxide concentrations, setting out how we will comply within the shortest possible time with the limit values for NO<sub>2</sub>. These values are set by the Ambient Air Quality Directive (2008/50/EC) and the Air Quality Standards (Wales) Regulations 2010.

This report is to confirm the current levels of NO<sub>2</sub> concentrations on the Welsh Government Motorway and Trunk Road network at the five sites identified in the plan. It provides the data for the calendar years 2020 and 2021 and an update on Welsh Government’s progress in relation to action to achieve sustained compliance at the five sites.

This report should be read in conjunction with the following:

Welsh Government supplemental plan to the UK plan for tackling roadside nitrogen dioxide (NO<sub>2</sub>) concentrations 2017 – Interim Data on NO<sub>2</sub> Concentrations for the Motorway and Trunk Road, published in September 2019:

- [Interim data on NO<sub>2</sub> concentrations for the motorway and trunk road](#)

Welsh Government supplemental plan to the UK plan for tackling roadside nitrogen dioxide (NO<sub>2</sub>) concentrations 2017 – Annual Data for NO<sub>2</sub> Concentrations for the Motorway and Trunk Road for 2018 and 2019, published in March 2020:

- [Annual data on NO<sub>2</sub> concentrations for the motorway and trunk road: 2018 to 2019](#)

Welsh Government supplemental plan to the UK plan for tackling roadside nitrogen dioxide (NO<sub>2</sub>) concentrations 2017, published in November 2018:

- [Air quality plan: roadside nitrogen dioxide](#)

Welsh Government Transport Appraisal Guidance Reports Stages 1, 2 and 3 for Tackling Roadside Nitrogen Dioxide Concentrations on the Motorway and Trunk road Network sites in Wales:

- [Tackling roadside nitrogen dioxide concentrations in Wales](#)
- [Tackling roadside nitrogen dioxide concentrations in Wales \(WelTAG stage 3\)](#)

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## 1. Summary of Data on NO<sub>2</sub> Concentrations for the Motorway and Trunk Road

This report provides an updated summary of the NO<sub>2</sub> concentrations recorded at the five sites on the motorway and trunk road network and has been produced to support the commitment to present results as set out in the Welsh Government supplemental plan to the UK plan for tackling roadside nitrogen dioxide concentrations 2017, published November 2018.

As detailed in the supplemental plan, the five sites where NO<sub>2</sub> concentrations are above the limit level – 40 µg/m<sup>3</sup> set out in the EU Ambient Air Quality Directive (2008/50/EC) and the Air Quality Standards (Wales) Regulations 2010 are:-

1. A483 near Wrexham (North Wales Zone);
2. A494 at Deeside (North Wales Zone);
3. A470 between Upper Boat and Pontypridd (South Wales Zone).
4. M4 between Junctions 25 and 26 at Newport (South Wales Zone; and
5. M4 between Junctions 41 and 42 at Port Talbot (Swansea and South Wales Zone).

50mph speed limits at the above five sites have been in operation since June 2018. In the annual report published in March 2020, annual data sets for the 2018 and 2019 calendar years were provided. This report contains data for the 2020 calendar year to the 2021 calendar year.

DEFRA Pollution Climate Mapping Data (PCM) (Modelled information) has been excluded from the report due to this information being theoretical and model based. Instead, on-site, real world data recorded via diffusion tubes is provided.

An update on the Precautionary Retained Measures (PRMs) is also included in this report.

The following data is contained in the appendices to this report:-

- Diffusion Tube Monitoring Data (including bias adjustment with national factors) (Appendix A)
- Continuous Reference Method Monitor Data (Appendix A)
- Interim Speed Data (Appendix B)
- A graphical representation of the data is provided in (Appendix C).

The following points can be drawn from the data:

- The data indicates that the annual NO<sub>2</sub> concentrations have continued to reduce at the five sites, with concentrations using national bias adjustment factors being below the annual mean limit value at all locations in 2020 and 2021;
- In the South Wales Zone, concentrations on the M4 at Newport still remain relatively high. However, it is noted that in 2019, traffic increased due to the tolls being removed from the Severn Bridges. In future reports it is planned to review traffic volumes alongside the other data;
- We know that people weren't able to travel during the pandemic as much as they did before, so NO<sub>2</sub> levels were lower. It shows that we can lower NO<sub>2</sub> levels if we choose different ways to travel like walking, cycling and using public transport;
- While average speeds are below 50mph and compliance is much greater, there still remains a percentage of drivers exceeding the 50mph at certain times of the day;
- Though the trend is decreasing for annual concentrations of NO<sub>2</sub> at all 5 sites, the situation still remains complicated. Air quality is sensitive to a number of issues including the weather/seasonal effects, traffic flows including volume, speeds and fleet mix;
- With this additional information, the trends remain positive and it appears that the measures that have been implemented are effective in reducing concentrations. Therefore, all measures introduced at the five sites will be retained for the foreseeable future; and
- The reduction in NO<sub>2</sub> concentrations is positive news for the five sites. The Welsh Ministers continue to work towards delivery of their duty to reduce concentrations of NO<sub>2</sub> in Wales within the shortest possible time in accordance with the Directive and the Welsh Regulations. This includes the continued development, and stakeholder engagement, on the PRMs.

A further report will be published in April 2023 on the next set of data for NO<sub>2</sub> annual concentrations for calendar year 2022 adjusted in accordance with national bias factors.

## Precautionary Retained Measures

Work is ongoing to develop the PRMs at all five sites, involving collection of survey data and further traffic and air quality modelling. The following table includes the sites and PRMs detailed in the November 2018 Plan:-

Location	PRM
A494 Deeside	S4 - Air Quality Barriers
A483 Wrexham	S4 - Air Quality Barriers
A470 Pontypridd	S4 - Air Quality Barriers
	S46 - Clean Air Zone
	S27 - Improved car parking
M4 J25-26 Newport	S46 - Clean Air Zone
M4 J41-42 Port Talbot	S16 – Junction closures
	S19 – Variable diversions

The below table provides a summary of the PRMs progress:-

Measure	Update
S4 - Air Quality Barrier (A494 Deeside, A483 Wrexham, A470 Pontypridd)	<p>Early engineering constraints reports have been drawn up for the potential barrier locations.</p> <p>These reports have provided an initial assessment of the potential risks to the delivery of barriers due to the size and existing features in the area;</p> <p>Computational fluid dynamics (CFD) modelling has been undertaken to identify the height of barriers required to bring forward compliance with the limit values at roadside properties, taking into account the local topography. It was concluded that 9m barriers were optimal, but that in places 6m barriers could provide some benefits;</p> <p>Pre-application discussions have taken place with the Local Planning Authorities for barriers at the A494 and A483 sites together with the formal submission of a pre-application inquiry and Environmental Impact Screening opinion request. From the formal responses received from Local Planning Authorities Technical reports have been undertaken to support the development of a planning application submission, the reports undertaken are Landscape Visual Impact Assessment/Daylight and Sunlight Assessment/Preliminary Ecological Appraisal/Arboriculture Impact Assessment/Planning Statement.</p>

	<p>The next stage of the planning application development will be to enter into a voluntary Pre-application Consultation (PAC) due to the unique nature of the proposals with stakeholders in accordance with the PAC Guidance. A PAC report will be produced recording the comments received through the PAC process and the content of the planning applications would be reviewed and updated as part of this process.</p> <p>Diffusion Tube Monitoring is ongoing together with the instillation of Continuous Reference Analysers to provide additional air quality data.</p> <p>Ongoing review of the monitoring and limit value compliance alongside the A494 and A483 Wrexham is providing strong evidence that the barrier PRMs potentially will not be required in these locations, even as traffic volumes recover following the removal of travel restrictions.</p> <p>With this evidence and the review of ongoing monitoring, if the ongoing monitoring identifies a continuous rise towards the limit value then the planning application technical reports are ready to commence engagement with stakeholders through the PAC process.</p> <p>Additional air quality and wind data has been collected alongside the A470 to investigate the efficacy of existing vegetation belts in reducing pollution levels. The analysis of this data is ongoing but early indications are that the existing vegetation has a beneficial impact on exposure at properties.</p>
<p>S46 Clean Air Zone (A470 Pontypridd ,M4 J25-26 Newport)</p>	<p>Stated intent surveys were undertaken in summer 2021 to develop our understanding of how drivers may respond to different levels of charge. This revealed that large numbers of drivers of older (non-compliant) vehicles were likely to choose to make the same journey using a different route. This could be detrimental to both Pontypridd and Newport, particularly Local Air Quality Management Areas which may be impacted by increased traffic. Work is ongoing to further develop our understanding of the impacts of charges at these two locations both in terms of the ability of Clean Air Zones to further reduce polluting emissions along these routes, and also the management of re-routing traffic onto local roads.</p>
<p>S27 improved car parking (A470 Pontypridd)</p>	<p>Surveys of usage at the new Abercynon Park and Ride location have been undertaken on the A470. This site will serve as a proxy for the success of such schemes on the A470.</p> <p>The surveys have shown that use of the site is not currently capacity limited and the use of the site will be monitored</p>

	Measures are being identified to improve usage of these sites with reporting in Autumn 2022.
S16 Junction closures (M4 J41-42 Port Talbot)	<p>– A Welsh Transport Appraisal Guidance (WelTAG) Study has considered options for improvement in the area and the study included the closure of slip roads and improved use of the Port Talbot Distributor Road (PDR). Subsequent technical analysis has revealed that the PDR would not provide a suitable route to accommodate motorway traffic due to more recent residential development along the PDR, and a nearby school. Therefore, to divert traffic along this route would have wider impacts than anticipated.</p> <p>Further modelling is being undertaken on alternative ramp metering options to assess the potential of this approach to support further reductions on NO<sub>2</sub> concentrations. The South West and Mid Wales Transport Model (SWMWTM), developed by TfW, as the most recent traffic resource this has been utilised to understand the traffic redistribution through the options.</p> <p>A VISSIM traffic model is being developed from the outputs of SWMWTM to inform inputs into the air quality assessments. TfW are providing analytical assurance for the transport modelling and interface between traffic models. The air quality assessments will enable comparison between the PRM's. This technical work is ongoing.</p>
S19 Variable diversions (M4 J41-42 Port Talbot)	

## Appendix A

### Diffusion Tube Monitoring Data

Concentrations of NO<sub>2</sub> at the roadside at each of the five sites have been recorded via a series of triplicate diffusion tubes since mid-December 2017 and the data has been used to help establish the effect that the measures have had on NO<sub>2</sub> concentrations. To help obtain a more robust picture on concentrations, these tubes were supplemented with continuous reference method analysers in 2019.

The table below details the NO<sub>2</sub> concentrations recorded via the diffusion tubes during the calendar year for 2018, 2019, 2020 and 2021. The data has been averaged for the year and corrected for seasonal variations using national bias adjustment factors.

Bias adjustment factors are used in adjusting the results that are obtained via diffusion tube methods. Further information on the need for adjustment is available at:

<https://laqm.defra.gov.uk/bias-adjustment-factors/bias-adjustment.html>

**Annual mean NO<sub>2</sub> concentrations for calendar year 2018, 2019, 2020 and 2021 adjusted with national bias adjustment factors:**

Site Type		2018 Annual Mean NO <sub>2</sub> Concentration (µg/m <sup>3</sup> )		2019 Annual Mean NO <sub>2</sub> Concentration (µg/m <sup>3</sup> )		2020 Annual Mean NO <sub>2</sub> Concentration (µg/m <sup>3</sup> )		2021 Annual Mean NO <sub>2</sub> Concentration (µg/m <sup>3</sup> )	
		Raw	National bias (0.88)	Raw	National bias (0.88)	Raw	National bias (0.85)	Raw	National bias (0.86)
<b>A483</b> Wrexham North Wales	Roadside	<b>57.0</b>	<b>50.2</b>	<b>46.5</b>	<b>40.9</b>	32.3	27.5	29.6	25.5
	Urban Background	18.9	16.6	16.4	14.4	15.0	12.8	13.8	11.9
<b>A494</b> Deeside North Wales	Roadside	<b>47.9</b>	<b>42.2</b>	<b>41.6</b>	36.6	31.2	26.5	32.6	28.0
	Urban Background	21.7	19.1	19.9	17.5	15.7	13.3	15.8	13.6
<b>A470</b> Pontypridd South Wales	Roadside	<b>64.6</b>	<b>56.8</b>	<b>54.7</b>	<b>48.1</b>	35.9	30.5	38.7	33.3
	Urban Background	20.7	18.2	19.9	17.5	15.3	13.0	15.8	13.5
<b>M4</b> Newport South Wales	Roadside	<b>72.2</b>	<b>63.5</b>	<b>67.3</b>	<b>59.2</b>	<b>45.2</b>	38.4	<b>45.4</b>	39.2
	Urban Background	26.6	23.4	25.2	22.4	21.4	18.2	21.9	18.9
<b>M4 Port Talbot</b> South Wales	Roadside	<b>55.0</b>	<b>48.4</b>	<b>48.9</b>	<b>43.0</b>	33.1	28.2	39.1	33.6
	Urban Background	15.2	13.4	14.2	12.5	9.3	7.9	12.2	10.5

2018, 2019, 2020 and 2021 Annual mean roadside data averaged across each site, bias adjusted and annualised where required

*Bold indicates a value that is greater than the relevant national air quality objective.*

**Monthly average NO<sub>2</sub> concentration recorded at continuous reference method monitors – 2020 calendar year**

Month	A483 Wrexham	A494 Deeside	A470 Pontypridd	M4 Newport	M4 Port Talbot
	North Wales	North Wales	South Wales	South Wales	South Wales
January	24.1	27.3	N/A*	18.0	N/A*
February	17.5	18.4	N/A*	23.5	N/A*
March	19.7	18.6	N/A	23.2	N/A
April	11.4	13.4	N/A**	19.9	N/A
May	10.5	14.5	N/A***	15.1	N/A***
June	13.7	18.9	N/A***	16.7	N/A***
July	13.7	15.4	N/A***	13.2	N/A***
August	15.0	20.9	N/A***	19.1	N/A***
September	19.1	19.2	N/A***	21.3	N/A***
October	19.4	21.4	N/A***	20.6	N/A***
November	21.9	24.4	N/A***	22.6	N/A***
December	21.5	27.4	N/A***	25.7	N/A***

2020 annual mean values					
Monitor Type	NO <sub>2</sub> Concentrations (µg/m <sup>3</sup> )				
	A483 Wrexham	A494 Deeside	A470 Pontypridd	M4 Newport	M4 Port Talbot
	North Wales	North Wales	South Wales	South Wales	South Wales
Permanent Monitor	17.3	20.0	N/A***	19.9	N/A***

2020 Annual mean data averaged across each site, adjusted and annualised where required.  
 Table Footnotes- \*Site not installed, \*\*No visit during lockdown, \*\*\*Calibration data not available,  
 \*\*\*\*Missing or no data

**Monthly average NO<sub>2</sub> concentration recorded at continuous reference method monitors – 2021 calendar year**

<b>Month</b>	<b>A483 Wrexham  North Wales</b>	<b>A494 Deeside  North Wales</b>	<b>A470 Pontypridd  South Wales</b>	<b>M4 Newport  South Wales</b>	<b>M4 Port Talbot  South Wales</b>
January	23.5	24.8	29.4	26.8	N/A <sup>***</sup>
February	19.8	31.1	N/A <sup>***</sup>	23.0	N/A <sup>***</sup>
March	19.4	22.1	N/A <sup>***</sup>	21.7	N/A <sup>***</sup>
April	22.5	28.4	N/A <sup>***</sup>	22.2	N/A <sup>***</sup>
May	16.7	21.0	N/A <sup>***</sup>	18.5	N/A <sup>***</sup>
June	16.7	21.6	N/A <sup>***</sup>	18.3	N/A <sup>***</sup>
July	16.1	21.3	N/A <sup>***</sup>	17.7	N/A <sup>***</sup>
August	15.7	20.7	N/A <sup>***</sup>	18.8	N/A <sup>***</sup>
September	19.5	27.3	N/A <sup>***</sup>	22.7	N/A <sup>***</sup>
October	15.0	20.4	N/A <sup>***</sup>	17.7	N/A <sup>***</sup>
November	17.1	21.0	N/A <sup>***</sup>	27.7	N/A <sup>***</sup>
December	18.3	27.7	N/A <sup>***</sup>	23.9	N/A <sup>***</sup>

<b>2021 annual mean values</b>					
<b>Monitor Type</b>	<b>NO<sub>2</sub> Concentrations (µg/m<sup>3</sup>)</b>				
	<b>A483 Wrexham  North Wales</b>	<b>A494 Deeside  North Wales</b>	<b>A470 Pontypridd  South Wales</b>	<b>M4 Newport  South Wales</b>	<b>M4 Port Talbot  South Wales</b>
Permanent Monitor	18.3	24.0	N/A <sup>***</sup>	21.6	N/A <sup>***</sup>

**2021 Annual mean data averaged across each site, adjusted and annualised where required.**  
 Table Footnotes- \*Site not installed, \*\*No visit during lockdown, \*\*\*Calibration data not available,  
 \*\*\*\*Missing or no data

## **Appendix B**

### **Interim Speed Data**

The 50mph speed limits were initially implemented at four of the five sites in mid-June 2018. Following publication of the supplemental plan, these 50mph speed limits have remained in force.

The one exception is the M4 at Newport where a 50mph speed limit was set to operate overnight (21:00 to 06:00) via the variable speed limit (VSL) in May 2018. A maximum 50mph speed limit was set to operate at all times via the VSL in February 2019 which was subsequently replaced with a fixed 50 mph speed limit in March 2021.

From September 2021, advisory notices were issued as a temporary measure whilst the new environmental 50mph speed limit bedded in. The advisory notice letters outlined that no further action will be taken at this time, but also provided detailed guidance and direction and explained the public health impacts from poor air quality and the requirement need to comply with the speed limit to reduce levels of NO<sub>2</sub> in the shortest possible time. The letters were presented as a final warning and explained that further exceedance of the speed limit would result in prosecution according to the Road Traffic Regulation Act 1984.

While most people drive at around 50mph, the National Police Chiefs Council (NPCC) suggests that many people are still driving over the limit.

In April 2022 we ceased issuing advisory notices and now full enforcement will take place as appropriate. This will help us to achieve the reductions we need to make in the shortest possible time.

Measures to reduce traffic speeds have been successful and improvement in NO<sub>2</sub> concentrations have been realised however it is not possible to attribute any specific numerical reduction in NO<sub>2</sub> concentrations to such measures alone.

Welsh Transport Appraisal Guidance (WelTAG) stage Four and Five studies will be undertaken to record what happened so that lessons can be learnt. They may lead to alterations to the current scheme and will form valuable evidence for use in future WelTAG appraisals.

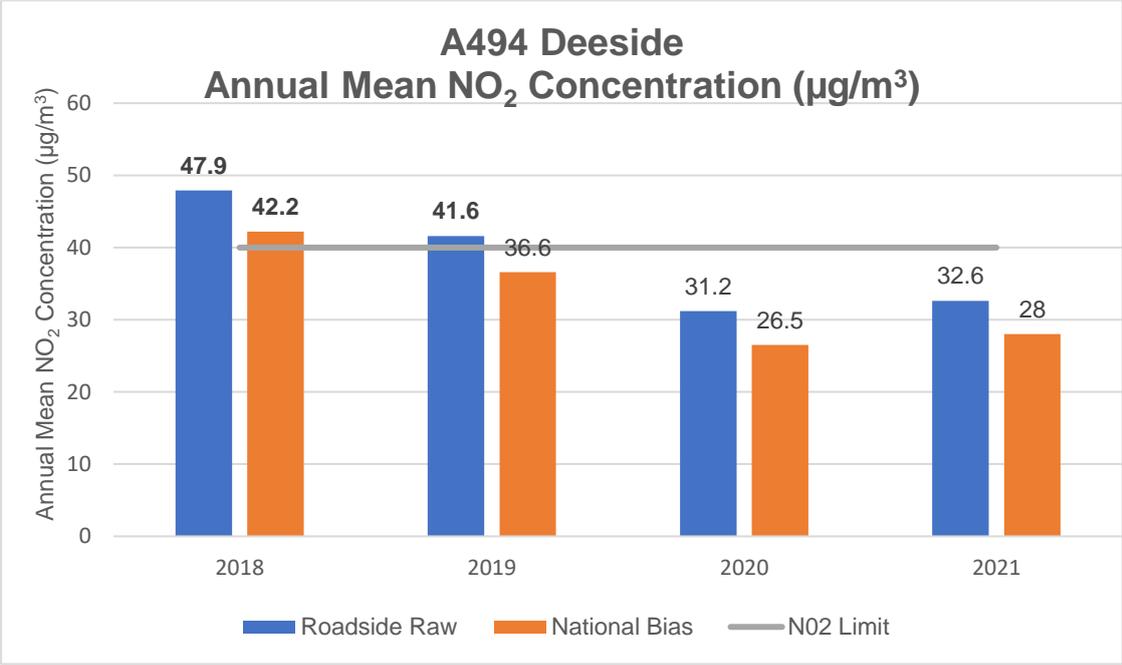
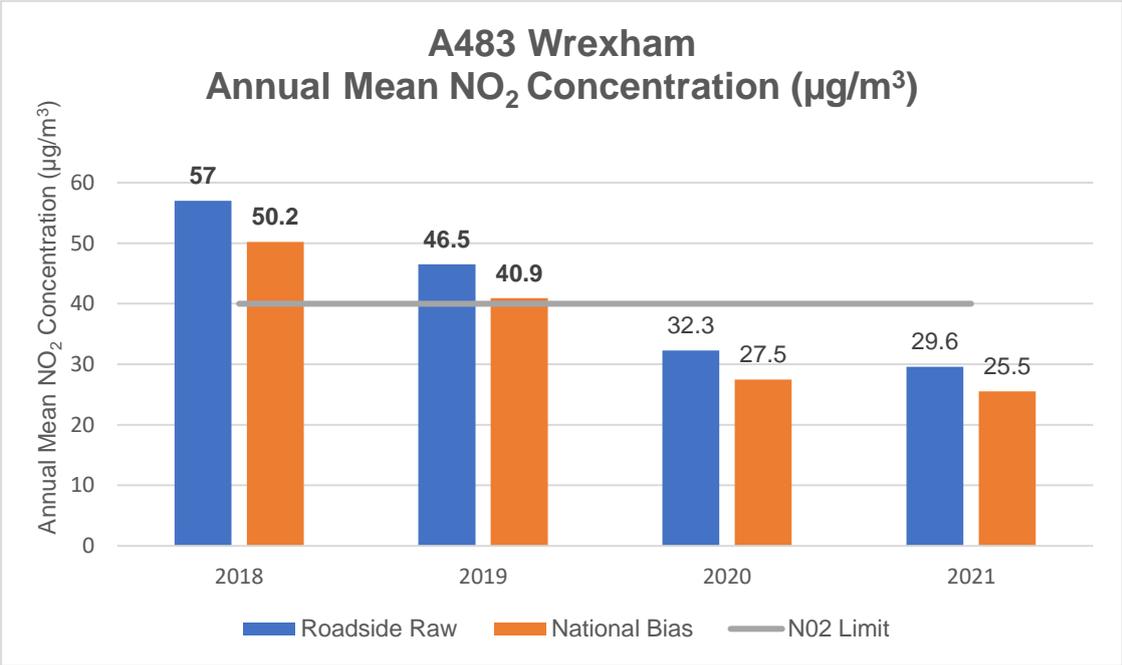
**Speed compliance data at locations with speed camera monitoring – 1<sup>st</sup> January 2022 to 5<sup>th</sup> May 2022:**

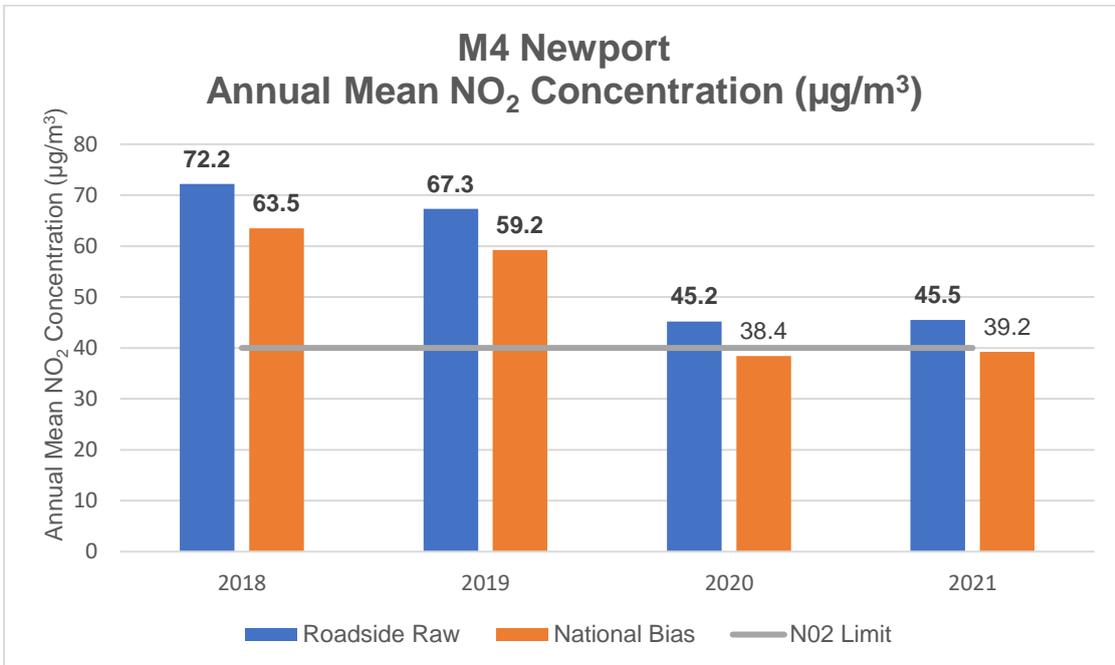
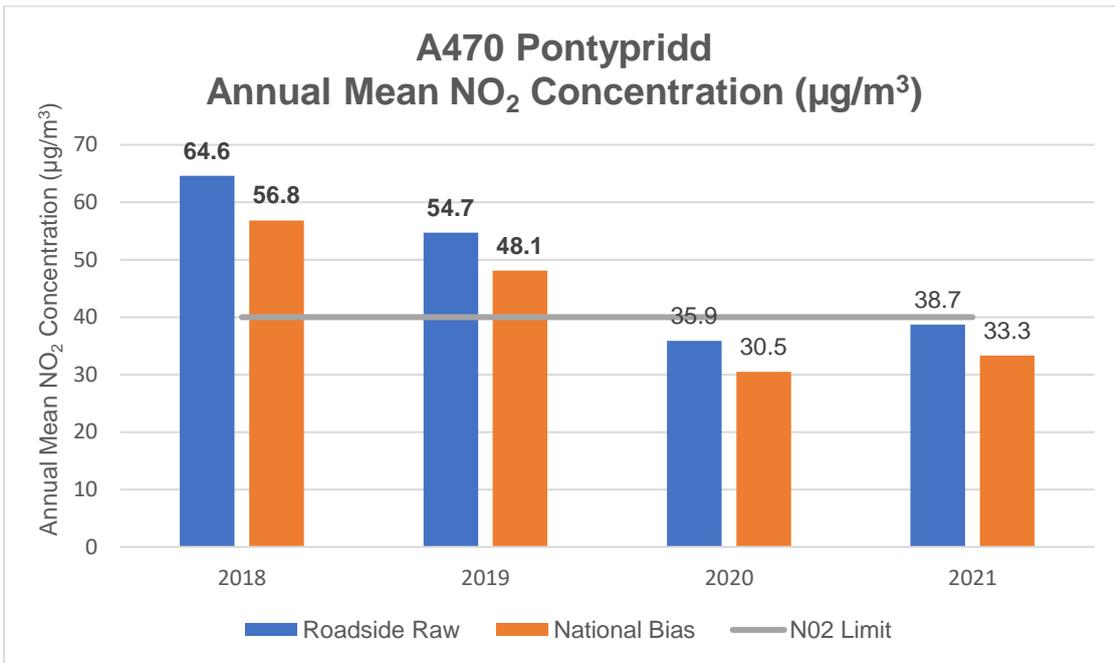
<b>Route</b>	<b>Direction</b>	<b>Average Speed (mph)</b>	<b>Percentage travelling over 50mph</b>
<b>A483 Wrexham</b>	Southbound	46.75	8.5%
	Northbound	47.22	9.8%
<b>A494 Deeside</b>	Westbound	43.6	4.6%
	Eastbound	45.97	7.7%
<b>A470 Upper Boat to Pontypridd</b>	Northbound	45.34	5.1%
	Southbound	44.58	5.7%
<b>M4 Newport</b>	Westbound	N/A	N/A
	Eastbound	N/A	N/A
<b>M4 Junction 41 to 42</b>	Westbound	45.82	4.0%
	Eastbound	46.60	5.9%

N/A - M4 Newport average speed cameras are operational and enforcement will commence shortly.

### Appendix C Graphs

The following graphs show Annual mean roadside data averaged across each site, bias adjusted and annualised where required:





### M4 Port Talbot Annual Mean NO<sub>2</sub> Concentration (µg/m<sup>3</sup>)

