



MERTHYR TYDFIL
County Borough Council

Cyngor Bwrdeistref Sirol
MERTHYR TUDFUL

2015 Updating and Screening Assessment for Merthyr Tydfil County Borough Council

In fulfillment of Part IV of the
Environment Act 1995
Local Air Quality Management

Date (June, 2016)

Merthyr Tydfil County Borough Council

Local Authority Officer	Aileen Rahilly
Department	Environmental Health Department
Address	Civic Centre Castle Street Merthyr Tydfil CF47 8AN
Telephone	01685 725000
e-mail	aileen.rahilly@merthyr.gov.uk
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Executive Summary (English)

This report fulfils the requirements of the Local Air Quality Management process as set out in Part IV of the Environment Act (1995), the Air Quality Strategy for England, Scotland, Wales and Northern Ireland 2007 and the relevant Policy and Technical Guidance documents.

The LAQM process places an obligation on all local authorities to regularly review and assess air quality in their areas, and to determine whether or not the air quality objectives are likely to be achieved. Where exceedances are considered likely, the local authority must then declare an Air Quality Management Area (AQMA) and prepare an Air Quality Action Plan (AQAP) setting out the measures it intends to put in place in pursuit of the objectives.

Diffusion tubes indicate that nitrogen dioxide levels found at sites around 55 Twynrodyn Road exceeded the annual mean air quality objective. NO₂ results increased at all sites across the district during 2013 and fell but remained higher than 2012 levels in 2014. This is believed to be a consequence of roadworks during 2013 and 2014, which disrupted traffic flow around the district. As the roadworks to improve traffic flow around the district have been completed it is expected NO₂ levels will reduce, however early indications are they will not reduce on Twynrodyn Road to below the air quality objective.

Additional monitoring in the location of Twynrodyn Road was carried out using an ECC monitor, to monitor 15 minute NO₂ concentrations from March 2014 onwards. This indicated the need for further action. Subsequently in 2015 a detailed assessment of air quality along Twynrodyn Road was carried out.

As a consequence of that detailed assessment the Council is going through the legal process of declaring of an Air Quality Management Area for this location. The Environmental Health Department is working with Engineering to achieve traffic management solutions. Modelling has been commissioned.

Crynodeb Gweithredol (Cymraeg)

Mae'r adroddiad hwn yn cyflawni gofynion proses Rheoli Ansawdd yr Aer yn Lleol fel y'u dynodwyd yn Rhan IV Deddf yr Amgylchedd (1995), Strategaeth Ansawdd Aer ar gyfer Lloger, Yr Alban, Cymru a Gogledd Iwerddon 2007 a'r dogfennau perthnasol ynghylch Canllawiau Polisi a Thechnegol.

Mae'r broses Rheoli Ansawdd yr Aer yn Lleol yn gosod rheidrwydd ar bob awdurdod lleol i adolygu ac asesu ansawdd yr aer yn eu hardaloedd, ac i bennu a yw'n debygol ai peidio bod nodau ansawdd yr aer yn cael eu cyflawni. Pan yr ystyrir ei fod yn debygol y bydd ansawdd yr aer yn fwy na'r ffin cyfreithiol, rhaid i'r awdurdod lleol ddatgan Ardal Rheoli Ansawdd a pharatoi Cynllun Gweithredu Ansawdd yr Aer sy'n gosod allan y mesurau y mae'n bwriadu eu gosod mewn lle er mwyn cyflawni'r nodau.

Mae tiwbiau trylediad yn dynodi fod lefelau nitrogen deuocsid a ganfuwyd mewn safleoedd o gwmpas 55 Heol Twynrodyn yn fwy na chymedr nod ansawdd yr aer blyneddol. Cynyddodd canlyniadau NO₂ yn yr holl safleoedd ledled y rhanbarth yn ystod 2013 gan ddisgyn ond parhau'n uwch na lefelau 2012 yn 2014. Credir bod hyn o ganlyniad i waith ffordd rhwng 2013 a 2014, a wnaeth darfu ar lif traffig o gwmpas yr ardal. Gan fod y gwaith ffordd i wella llif y traffig o gwmpas yr ardal wedi ei gwblhau, disgwylir y bydd lefelau NO₂ yn gostwng, fodd bynnag, mae dangosyddion cynnar yn awgrymu na fyddant yn gostwng ar Heol Twynrodyn Road i fod yn is na nod ansawdd yr aer.

Cafodd monitro ychwanegol yn lleoliad Heol Twynrodyn ei gyflawni gan ddefnyddio monitro ECC i fonitro crynodiadau 15 munud NO₂ o Fawrth 2014 ymlaen. Dynododd hyn yr angen am weithredu pellach. Ar ôl hynny yn 2015, cafodd asesiad manwl o ansawdd yr aer ei gyflawni ar hyd Heol Twynrodyn.

O ganlyniad i'r asesiad manwl hwn, mae'r Cyngor yn mynd drwy'r broses gyfreithiol o ddatgan Ardal Rheoli Ansawdd yr Aer ar gyfer y lleoliad hwn. Mae'r Adran Iechyd Amgylcheddol yn gweithio â Pheirianeg i gyflawni atebion rheoli traffig. Cafodd modelu ei gomisiynu.

Glossary

AQMA	Air Quality Management Area
AQO	Air Quality Objective
AQ	Air Quality
AURN	Automatic Urban and Rural (air quality monitoring) Network
CO	Carbon monoxide
DA	Detailed Assessment
DEFRA	Department for Environment Food and Rural Affairs
ECC	Electrochemical Cell
LAQM	Local Air Quality Management
mg/m ³	Milligrams of the pollutant per cubic metre of air
µg/m ³	Micrograms of the pollutant per cubic metre of air
MTCBC	Merthyr Tydfil County Borough Council
NO	Nitric oxide
NO ₂	Nitrogen dioxide
NOx	Nitrogen oxides
PM ₁₀	Particles with diameter less than 10µm
PM _{2.5}	Particles with diameter less than 2.5µm
QA/QC	Quality Assurance / Quality Control
SO ₂	Sulphur dioxide
TEOM	Tapered Element Oscillating Microbalance
USA	Updating and Screening Assessment
WAQF	Welsh Air Quality Forum

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1 Introduction

1.1 Description of Local Authority Area

Merthyr Tydfil County Borough Council (MTCBC) is the Local Authority for the town of Merthyr Tydfil and various outlying towns and villages from the Northern part of the Taff Valley and from the Taff Bargoed Valley. The Local Authority consists of 11 wards covering a population of approximately 55,000.

Merthyr Tydfil is a town at the head of the Taff Valley approximately 20 miles north of Cardiff. It has a population of approximately 30,000, and is the main settlement covered by MTCBC. Pentrebach and Dowlais are the main industrialised areas of the town and on the outskirts are the areas of Cefn Coed, Trefechan, and Abercanaid with the village of Pontsticill further out in the Northern part of the Borough where it is part of the Brecon Beacons National Park. In the south of the Borough are Treharris, a former colliery town, and the nearby former colliery villages of Trelewis, Bedlinog and Edwardsville. The villages of Merthyr Vale, Troedyrhiw and Aberfan are also situated in the south located on the River Taff.

The A470 and A465 are the major road links in the Valley. The A470 runs from Cardiff to Llandudno passing through the Borough to the west of the Merthyr Tydfil town. The section within the Borough is a dual carriageway road extensively used by commuters. The A465, known as the Heads of the Valleys Road, is located to the north of the town and within the Borough is mainly single carriageway at this time. There is an ongoing Welsh Government project to develop it to dual carriageway, which will affect Merthyr Tydfil within the new future. The A470 and A465 connect to the north-west of the town but are also linked by the A4060, mainly dual-carriageway, which passes the town on the eastern side. There are few residential properties in close proximity to these roads. The A4060 is linked to the town centre by Twynrobyn Road which has relatively high traffic flows as a result.

Historically Merthyr Tydfil has played a large part in the industrial activity of South Wales, with steel works, iron works and coal mining operations. This, however, has declined dramatically over the last 50 years or so and today there are only a few industrial processes

within the Borough which require permits for their operation. With the exception of a major coal extraction operation and the three Part A1 processes regulated by Natural Resources Wales these are mainly small Part B processes such as vehicle refinishers, wood processors etc.

Although there are no longer any significant industrial sources in the Borough traffic pollution has been increasing, particularly on the Twynyrodyn Road link. Traffic flows on the link have been monitored for a number of years and have shown a consistent rise over the same period. This is a result of new residential developments on the outskirts of the town towards the A4060 combined with the opening and expansion of retail and leisure facilities in the town centre and the introduction of one way traffic in the town centre affecting the traffic flow on the road network as a whole.

1.2 Purpose of Report

This report fulfils the requirements of the Local Air Quality Management process as set out in Part IV of the Environment Act (1995), the Air Quality Strategy for England, Scotland, Wales and Northern Ireland 2007 and the relevant Policy and Technical Guidance documents. The LAQM process places an obligation on all local authorities to regularly review and assess air quality in their areas, and to determine whether or not the air quality objectives are likely to be achieved. Where exceedences are considered likely, the local authority must then declare an Air Quality Management Area (AQMA) and prepare an Air Quality Action Plan (AQAP) setting out the measures it intends to put in place in pursuit of the objectives.

The objective of this Updating and Screening Assessment is to identify any matters that have changed which may lead to risk of an air quality objective being exceeded. A checklist approach and screening tools are used to identify significant new sources or changes and whether there is a need for a Detailed Assessment. The USA report should provide an update of any outstanding information requested previously in Review and Assessment reports.

1.3 Air Quality Objectives

The air quality objectives applicable to LAQM in Wales are set out in the Air Quality (Wales) Regulations 2000, No. 1940 (Wales 138), The Air Quality (Amendment) (Wales) Regulations 2002, No 3182 (Wales 298), and are shown in Table 1.1. This table shows the objectives in units of micrograms per cubic metre $\mu\text{g}/\text{m}^3$ (milligrams per cubic metre, mg/m^3 for carbon monoxide) with the number of exceedences in each year that are permitted (where applicable).

Table 1.1 Air Quality Objectives included in Regulations for the purpose of LAQM in Wales

Pollutant	Air Quality Objective		Date to be achieved by
	Concentration	Measured as	
Benzene	16.25 $\mu\text{g}/\text{m}^3$	Running annual mean	31.12.2003
	5.00 $\mu\text{g}/\text{m}^3$	Running annual mean	31.12.2010
1,3-Butadiene	2.25 $\mu\text{g}/\text{m}^3$	Running annual mean	31.12.2003
Carbon monoxide	10.0 mg/m^3	Running 8-hour mean	31.12.2003
Lead	0.5 $\mu\text{g}/\text{m}^3$	Annual mean	31.12.2004
	0.25 $\mu\text{g}/\text{m}^3$	Annual mean	31.12.2008
Nitrogen dioxide	200 $\mu\text{g}/\text{m}^3$ not to be exceeded more than 18 times a year	1-hour mean	31.12.2005
	40 $\mu\text{g}/\text{m}^3$	Annual mean	31.12.2005
Particles (PM ₁₀) (gravimetric)	50 $\mu\text{g}/\text{m}^3$, not to be exceeded more than 35 times a year	24-hour mean	31.12.2004
	40 $\mu\text{g}/\text{m}^3$	Annual mean	31.12.2004
Sulphur dioxide	350 $\mu\text{g}/\text{m}^3$, not to be exceeded more than 24 times a year	1-hour mean	31.12.2004
	125 $\mu\text{g}/\text{m}^3$, not to be exceeded more than 3 times a year	24-hour mean	31.12.2004
	266 $\mu\text{g}/\text{m}^3$, not to be exceeded more than 35 times a year	15-minute mean	31.12.2005

1.4 Summary of Previous Review and Assessments

MTCBC has previously undertaken the following review and assessment reports as required by Local Air Quality Management:

First Stage Review and Assessment - 1998

- This concluded there was a negligible risk of air quality objectives (AQOs) for benzene, 1,3-butadiene, carbon monoxide and lead being exceeded in the area; second or third stage assessment were considered unnecessary, and there was a possible risk of objectives for PM₁₀, sulphur dioxide (SO₂), and nitrogen dioxide (NO₂), being exceeded. On this basis further review and assessment was necessary.

Second Stage Review and Assessment – 2000

- This concluded there was a negligible risk of AQOs for PM₁₀, SO₂ and NO₂ being exceeded in the area. It was considered unnecessary to proceed any further with the review and assessment process or to declare any AQMAs.

Updating and Screening Assessment and Progress Reports – 2003 - 2005

- AQOs for the seven pollutants detailed in the regulations were likely to be met at all locations with relevant public exposure. It was considered unnecessary to carry out a detailed risk assessment or declare any AQMAs.
- The progress reports 2004 and 2005 found no significant changes in air quality and no developments that might affect air quality within the Borough.

Updating and Screening Assessment and Progress Reports – 2006 - 2008

- AQOs for the seven pollutants detailed in the regulations were likely to be met at all locations with relevant public exposure. It was considered unnecessary to carry out a detailed risk assessment or declare any AQMAs.
- The Progress Report 2007 found NO₂ levels had increased but within the annual air quality objective of 40 µg/m³ at all locations. However, levels at WAQF 29, 55 Twynyrodyn Road, were close to the limit and the monitoring network was expanded in this area.

- The Progress Report 2008 found NO₂ levels had increased and at WAQF 29, 55 Twynrodyn Road, a marginal exceedance was identified. It was considered necessary to proceed to detailed assessment for NO₂ in this area.

Detailed Assessment - 2009

- This reviewed the data for the monitoring sites on Twynrodyn Road (WAQF 29, 29A and 29B) and modeled NO₂ levels for the length of the road. It recommended the siting of additional diffusion tubes at various points on the road and the declaration of AQMA.

Updating and Screening Assessment and Progress Reports – 2009 - 2011

- AQOs for the seven pollutants detailed in the regulations were met at all locations with relevant public exposure. It was considered unnecessary to carry out a detailed risk assessment or declare any AQMAs.
- There were two new permitted installations and one substantially changed installation; detailed assessments considered to be necessary for these processes.
- The Progress Report 2010 found a decrease in NO₂ monitored levels and no exceedences of the annual air quality objective. As a result, although the detailed assessment of NO₂ levels around site 29 (undertaken in 2009 following the recommendations of the 2008 report) had suggested an AQMA should be declared this was deferred.
- The Progress Report 2011 found NO₂ levels had increased within the objective, however at WAQF 29, 55 Twynrodyn Road, an unusually marked exceedance was identified. It was considered necessary to further increase the number of monitoring sites on Twynrodyn Road prior to declaring an AQMA in relation to this site.

Detailed Assessment - 2011

- This reviewed the emissions data for the Prince Charles Hospital combustion plant (the only site remaining of those identified in the 2009 USA as requiring further study) and modelled NO₂ and SO₂ levels in the vicinity. It concluded that emissions

will not result in any exceedences of the objectives for either pollutant unless the large, on-site emergency diesel generators were to be used for extended periods.

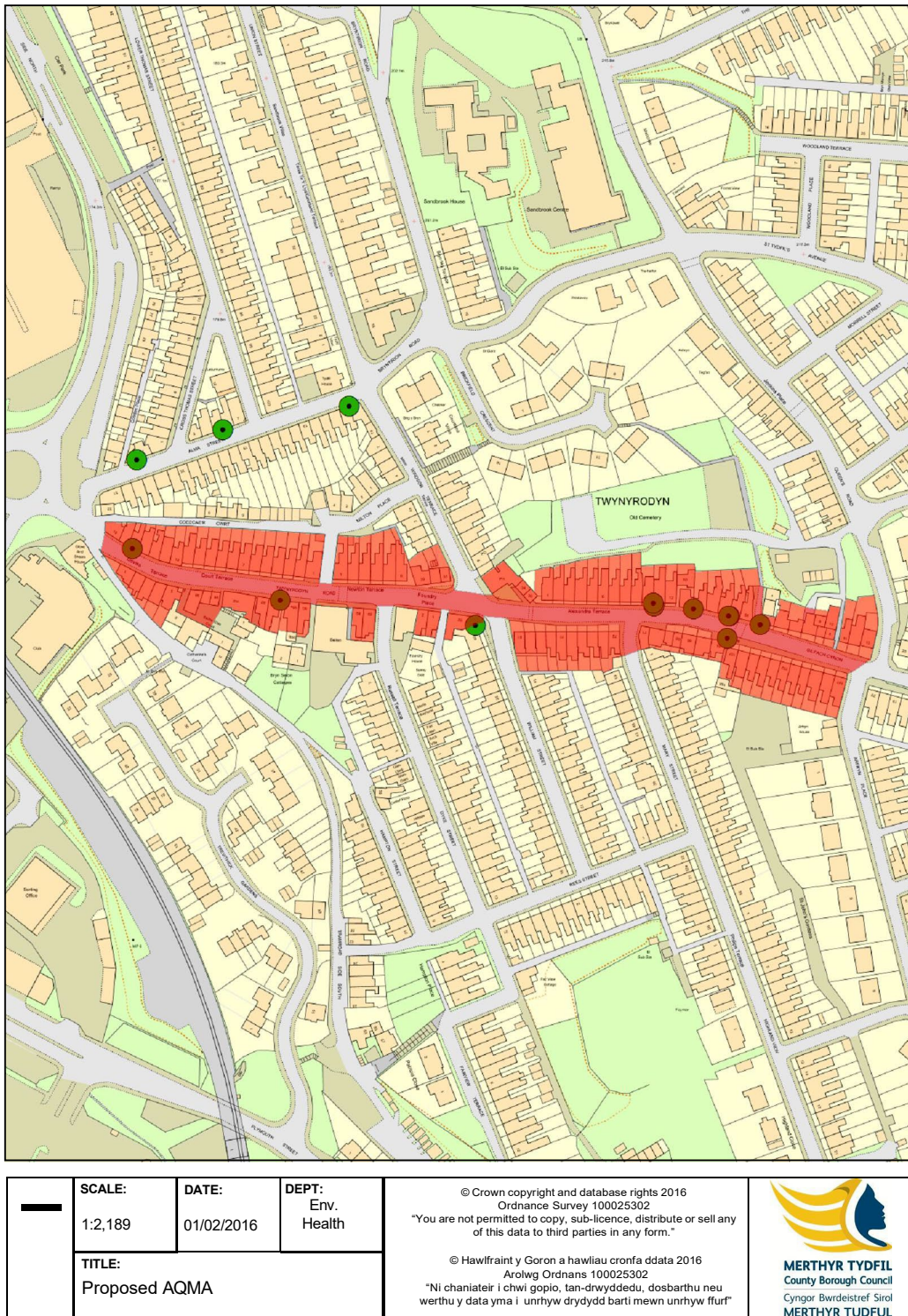
Updating and Screening Assessment and Progress Reports – 2012 - 2014

- Monitored PM₁₀ and PM_{2.5} levels to comply with the AQO and proposed AQO respectively.
- There were no new developments, and no proposed developments, which could be considered to adversely affect air quality.
- Of the 24 nitrogen dioxide monitoring sites in the Borough, only one exceeded the annual mean air quality objective and this was at WAQF 29, 55 Twynyrodyn Road.
- As a breach of similar magnitude had occurred at this site in 2010 it concluded that an assessment to determine the extent of the Air Quality Management Area (AQMA) to be declared was necessary.
- The Progress Report 2013 found action taken to reduce nitrogen dioxide levels at WAQF 29, Twynyrodyn Hill, had reduced it to below the annual mean AQO.
- Additional monitoring proposed in previous reports to identify the extent of the area affected established the existence of a further location on the same road link where NO₂ levels exceed the objective and where similar remedial action is required.
- The Progress Report 2014 stated the development of a new bus station was proposed may adversely affect air quality. The department were liaising with the Regeneration Group to ensure air quality was considered as part of the planning process.
- NO₂ levels on Twynyrodyn Hill had increased to exceed air quality standards. It was unclear whether this was temporary and related to a number of ongoing changes to traffic flow. Further monitoring was proposed.
- It was concluded that a declaration of an AQMA for this location and a Detailed Assessment of NO₂ in the defined area was therefore required.

Detailed assessment 2015

- Elevated NO₂ on Twynyrodyn Road was associated with traffic. Wind speed and direction, and two storey terraced housing without front gardens resulted in nitrogen dioxide accumulating around 55 Twynyrodyn Road.
- Real time monitoring showed this was predominantly associated with uphill traffic flowing away from the town centre and Tesco supermarket.
- It is considered necessary to declare an AQMA from the Western End of Twynyrodyn Road to 147 Gilfach Cynon. MTCBC will produce an action plan, aiming to reduce NO₂ concentrations. As NO₂ is associated with traffic emissions solutions to reduce the speed, improve the flow and reduce the amount of traffic will be carried out.
- The AQMA is currently going through the declaration process within the Council.

Figure 1.1 Map of proposed AQMA Boundary



The proposed AQMA will cover Twynnyrodyn Road from the Western roundabout to Arfryn Place and Queens Road.

2 New Monitoring Data

2.1 Summary of Monitoring Undertaken

2.1.1 Automatic Monitoring Sites

Particulate matter (PM₁₀ and PM_{2.5})

As a result of planning conditions placed on a local coal extraction process the operators, Miller Argent (South Wales) Ltd, have been monitoring fine particulates, PM₁₀, and ultra-fine particulates, PM_{2.5}, at a site in the locality since 2007. The air quality monitoring system is intended to determine ambient PM₁₀ and PM_{2.5} concentrations and detect any increases in PM₁₀ and PM_{2.5} resulting from this operation.

Two Tapered Elemental Oscillating Microbalance (TEOM) analysers provide continuous measurements of PM₁₀ and PM_{2.5}. Data is averaged and stored every 15 minutes, then periodically downloaded to a data management system for later analysis. All data is ratified. The instruments are maintained and calibrated by the site developer in accordance with the quality requirements of the DEFRA and the AURN. Quality assurance and quality control procedures are detailed in Appendix B. The system also monitors ambient temperature and barometric pressure, as well as storing data for wind speed and wind direction supplied by remote roof-mounted sensors.

PM₁₀ and PM_{2.5} monitoring location

The TEOM analysers have been located in the grounds of Twynrodyn Primary school as shown in figure 2.1a. The site location was chosen for the following reasons:

- Distance from opencast site
- Security
- Power supply
- Relevant public exposure

Nitrogen Dioxide

The real time ECC monitor was installed in January 2014 outside 55 Twynyrodyn Road. There was a brief period of stabilisation. Data of a suitable quality was obtained from March 2014 onwards.

Real time data has been used to examine short term variations in order to indicate the cause(s) of the exceedance. 15 minute summary NO₂ readings have been combined into 1-hour readings and screened for short term exceedances, and data has been compared with traffic data and meteorological data.

Nitrogen dioxide monitoring location

The ECC monitor has been located on a lamppost outside 55 Twynyrodyn Road as shown in figure 2.1b. The site location was chosen for the following reasons:

- Relevant exposure, specifically, location area where NO₂ exceeds AQO.
- Power supply
- Colocation with NO₂ diffusion tubes.

Figure 2.1 Maps of Automatic Monitoring Sites – TEOM operated by Miller Argent

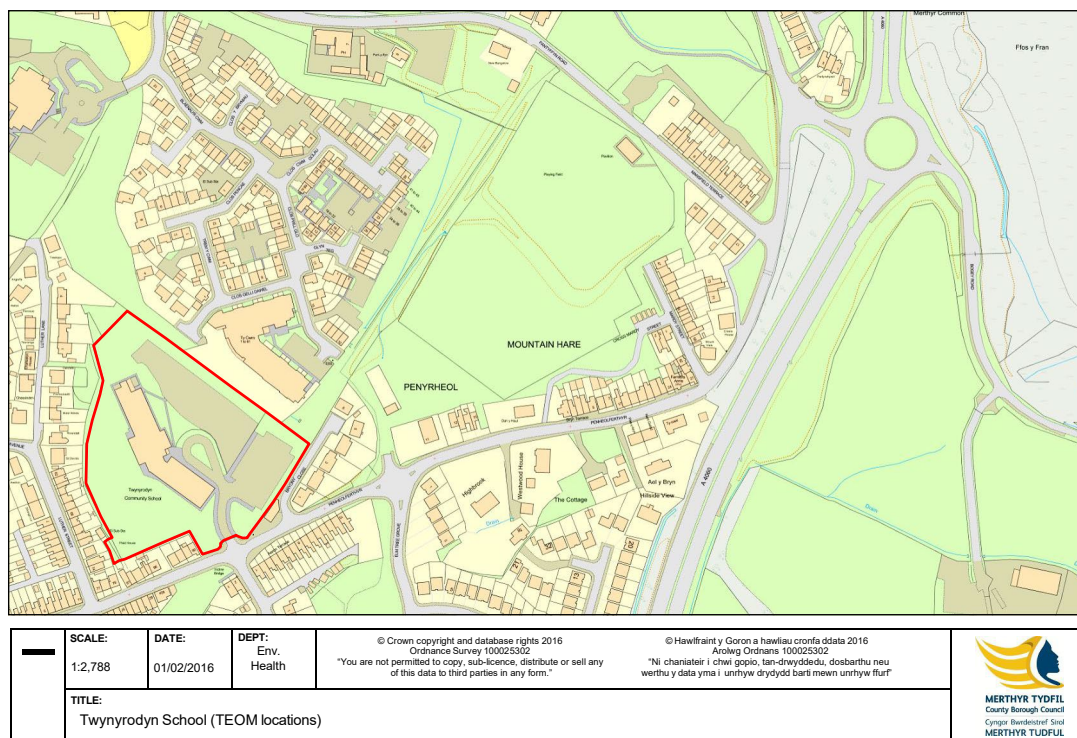


Figure 2.2 Maps of Automatic Monitoring Sites – ECC monitor (blue) and collocated diffusion tubes (green)

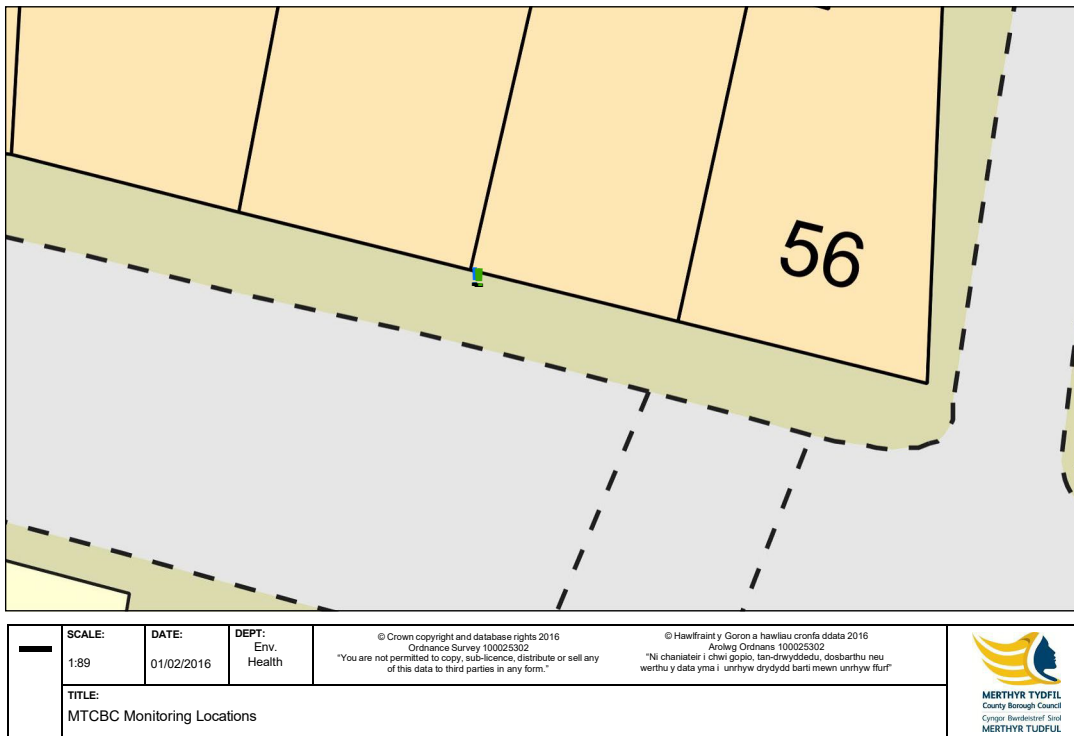


Table 2.1 Details of Automatic Monitoring Sites

Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Monitoring Technique	Relevant Exposure? (Y/N with distance (m) to relevant exposure)	Distance to kerb of nearest road (N/A if not applicable)	Does this location represent worst-case exposure?
APM1 Twynroddyn School	Twynroddyn School	305821	206008	PM ₁₀ PM _{2.5}	N	TEOM	Y (0m)	N/A	N
ECC	Kerbside	305416	205867	NO ₂	Y (proposed)	ECC	Y (1m)	N/A	Y

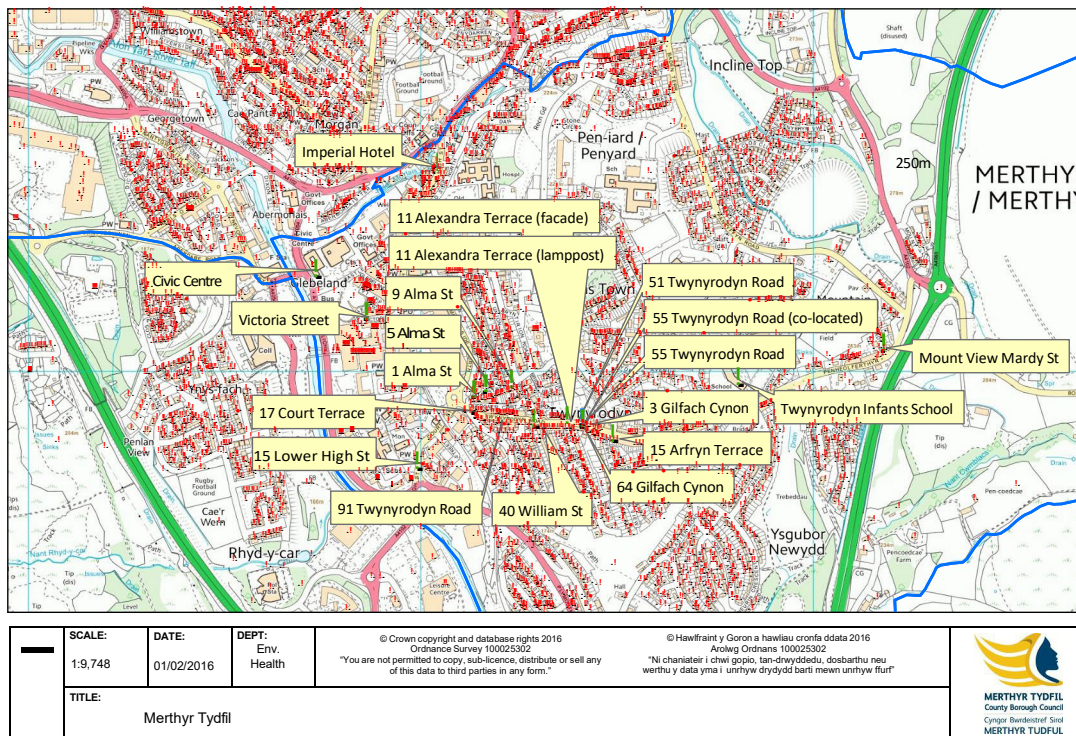
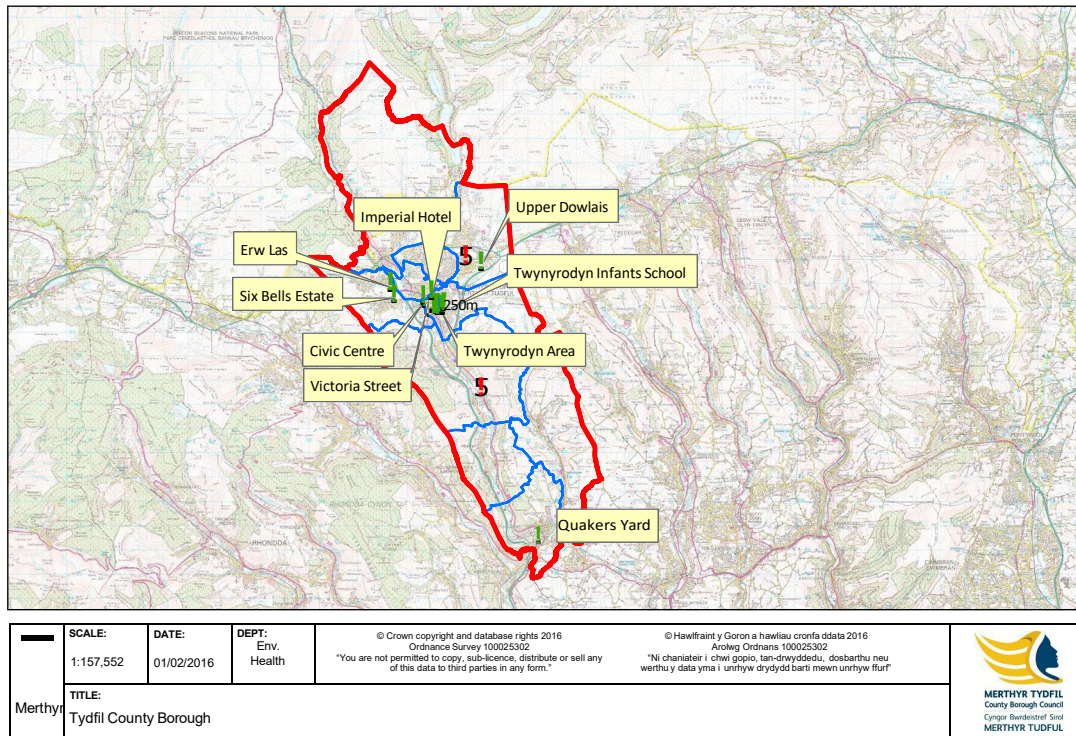
2.1.2 Non-Automatic Monitoring Sites

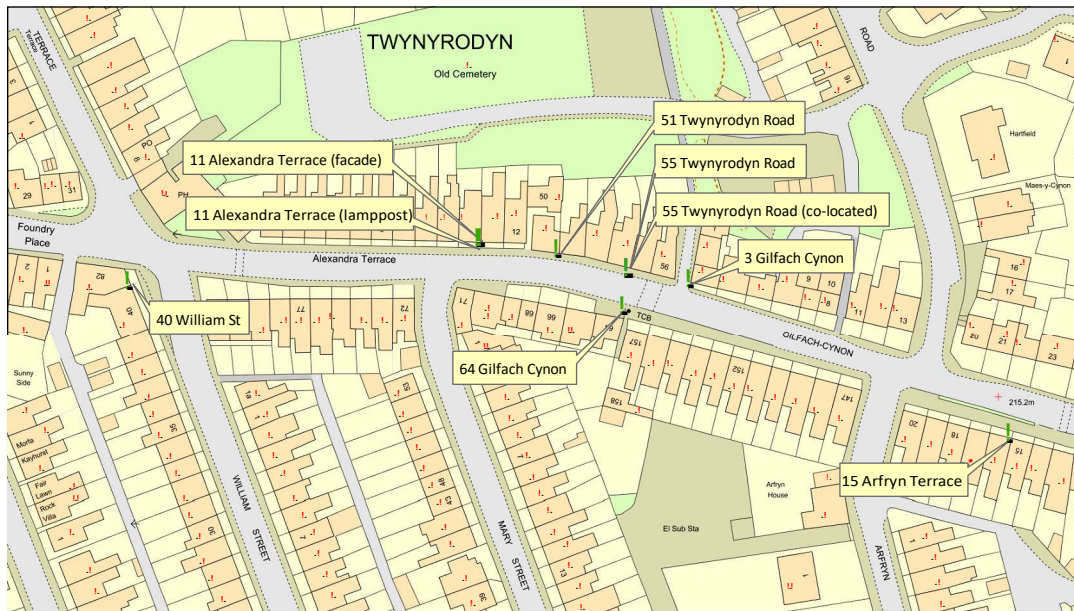
MTCBC has operated a network of NO₂ diffusion tube sites across the Borough for a number of years. These are generally located in areas where NO₂ levels are suspected of being elevated but other sites are operated where planning proposals have the potential to influence levels in future, to provide data on general long-term background levels in the area as a whole or insight into the fluctuation of NO₂ levels on particular road links.

Sites located in areas where NO₂ levels might exceed the AQO will remain operational for a year and will then be reviewed; closing to be opened elsewhere if the levels found are not considered significant.

At the moment, many sites are located on the Twynyrodyn Road link due to the elevated NO₂ levels found on one section of it. These sites reveal the general trend of NO₂ levels on the link and highlight deviations from the trend produced by the MTCBC's actions to reduce the NO₂ levels.

Figure 2.3 Maps of Non-Automatic Monitoring Sites







	SCALE:	DATE:	DEPT:	© Crown copyright and database rights 2016 Ordnance Survey 100025302 "You are not permitted to copy, sub-licence, distribute or sell any of this data to third parties in any form."	© Hawlfraint y Goron a hawliau cronfa ddata 2016 Arolwg Ordnans 100025302 "Ni chaniateir i chwi gopio, tan-dwyddedu, dosbarthu neu werthu y data yma i unrhyw drydydd parti mewn unrhyw flurf"	 MERTHYR TYDFIL County Borough Council Cyngr Bwrddrefn Sir MERTHYR TYDFUL
	1:905	01/02/2016	Env. Health			
TITLE: Twynnyrodyn Road - area around 55						

Table 2.2 Details of Non-Automatic Monitoring Sites

Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Is monitoring collocated with a Continuous Analyser (Y/N)	Relevant Exposure? (Y/N with distance (m) to relevant exposure)	Distance to kerb of nearest road (N/A if not applicable)	Does this location represent worst-case exposure?
Imperial Hotel (WAQF1)	Roadside	305044	206534	NO ₂	N	N	Y (2.6m)	2.3m	Y
Civic Centre (WAQF2)	Urban background	304743	206261	NO ₂	N	N	Y (135.0m)	42m	N
Twynnyroddyn Infants School (WAQF3)	Suburban	305832	205941	NO ₂	N	N	Y (56.0m)	57m	N
Victoria Street (WAQF15)	Urban Centre	304866	206137	NO ₂	N	N	Y (0.15m)	2.6m	Y

Merthyr Tydfil County Borough Council

Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Is monitoring collocated with a Continuous Analyser (Y/N)	Relevant Exposure? (Y/N with distance (m) to relevant exposure)	Distance to kerb of nearest road (N/A if not applicable)	Does this location represent worst-case exposure?
Six Bells Estate (WAQF16)	Suburban	303525	206388	NO ₂	N	N	Y(0.15m)	6.6m	N
Upper Dowlais (WAQF25)	Roadside	307171	207915	NO ₂	N	N	Y (0.15m)	1.5m	Y
55 Twynyrodyn Road (WAQF29)	Roadside	305410	205869	NO ₂	Y (proposed)	Y	Y (0.15m)	1.6m	Y
55 Twynyrodyn Road (collocated) (29J)	Roadside	305410	205869	NO ₂	Y (proposed)	Y	Y (0.15m)	1.6m	Y

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Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Is monitoring collocated with a Continuous Analyser (Y/N)	Relevant Exposure? (Y/N with distance (m) to relevant exposure)	Distance to kerb of nearest road (N/A if not applicable)	Does this location represent worst-case exposure?
91 Twynyrodyn Road (29A)	Roadside	305217	205880	NO ₂	Y (proposed)	N	Y (.15m)	2.2m	Y
15 Arfryn Terrace (29B)	Roadside	305147	205906	NO ₂	Y (proposed)	N	Y (0.15m)	4.85m	Y
17 Court Terrace (29D)	Roadside	305149	205906	NO ₂	Y (proposed)	N	Y (0.15m)	1.3m	Y
40 William Street (29E)	Roadside	305316	205872	NO ₂	Y (proposed)	N	Y (0.15m)	5.3m	Y
Mardy Street Mount View (29F)	Roadside	305521	205836	NO ₂	N	N	Y (0.15m)	3.3m	Y

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Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Is monitoring collocated with a Continuous Analyser (Y/N)	Relevant Exposure? (Y/N with distance (m) to relevant exposure)	Distance to kerb of nearest road (N/A if not applicable)	Does this location represent worst-case exposure?
64 Gilfach Cynon (29G)	Roadside	305415	205856	NO ₂	Y (proposed)	N	Y (2.0m)	1.5m	Y
51 Twynrodyn Road (29H)	Roadside	305431	205863	NO ₂	Y (proposed)	N	Y (0.15m)	1.55m	N
3 Gilfach Cynon (29I)	Roadside	305431	205863	NO ₂	Y (proposed)	N	Y (0.15m)	2.2m	Y
Quakers Yard (WAQF30)	Suburban	309573	196518	NO ₂	N	N	Y (0.15m)	4.0m	N
4 Erw Las (WAQF31)	Suburban	303360	206822	NO ₂	N	N	Y (0.15m)	37.0m	N
15 Lower High Street (36)	Roadside	305001	205763	NO ₂	N	N	Y (0.15m)	3.6m	Y

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Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Is monitoring collocated with a Continuous Analyser (Y/N)	Relevant Exposure? (Y/N with distance (m) to relevant exposure)	Distance to kerb of nearest road (N/A if not applicable)	Does this location represent worst-case exposure?
11 Alexandra Terrace (lamppost) (38)	Roadside	305382	205872	NO ₂	Y (proposed)	N	Y(1.6m)	1.45m	Y
11 Alexandra Terrace (facade) (39)	Kerbside	305382	205873	NO ₂	Y (proposed)	N	Y(0.15m)	2.9m	Y
1 Alma Street (44)	Roadside	305141	205940	NO ₂	N	N	Y(0.15m)	1.2m	Y
5 Alma Street (42)	Roadside	305181	205954	NO ₂	N	N	Y(0.15m)	1.3m	Y

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Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Is monitoring collocated with a Continuous Analyser (Y/N)	Relevant Exposure? (Y/N with distance (m) to relevant exposure)	Distance to kerb of nearest road (N/A if not applicable)	Does this location represent worst-case exposure?
9 Alma Street (43)	Roadside	305240	205965	NO ₂	N	N	Y(0.15m)	1.45m	Y

2.2 Comparison of Monitoring Results with Air Quality Objectives

2.2.1 Nitrogen Dioxide

Automatic Monitoring Data

The ECC monitor was in place by April 2016 and captured 9 months of data. Annual emissions limits for NO₂ are exceeded. The average is 52.3µg/m³, exceeding the limit of 40µg/m³. The hourly limit of 200µg/m³ is not exceeded. This is in line with diffusion tube readings.

Table 2.3 Results of Automatic Monitoring of Nitrogen Dioxide: Comparison with Annual Mean Objective

Site ID	Site Type	Within AQMA?	Valid Data Capture for period of monitoring % ^a	Valid Data Capture 2014 % ^b	Annual Mean Concentration $\mu\text{g}/\text{m}^3$				
					2010* ^c	2011* ^c	2012* ^c	2013* ^c	2014 ^c
ECC	Kerbside	Y (proposed)	89	67	-	-	-	-	52.3 (158.4)

^a i.e. data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

^b i.e. data capture for the full calendar year (e.g. if monitoring was carried out for six months the maximum data capture for the full calendar year would be 50%).

^c Means should be “annualised” as in Box 3.2 of TG(09), if monitoring was not carried out for the full year.

*Annual mean concentrations for previous years are optional.

Table 2.4 Results of Automatic Monitoring for Nitrogen Dioxide: Comparison with 1-hour mean Objective

Site ID	Site Type	Within AQMA?	Valid Data Capture for period of monitoring % ^a	Valid Data Capture 2014 % ^b	Number of Exceedences of Hourly Mean (200 $\mu\text{g}/\text{m}^3$)				
					2010* ^c	2011* ^c	2012* ^c	2013* ^c	2014 ^c
ECC	Kerbside	Y (proposed)	89	67	-	-	-	-	1

^a i.e. data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

^b i.e. data capture for the full calendar year (e.g. if monitoring was carried out for six months the maximum data capture for the full calendar year would be 50%).

^c If the period of valid data is less than 90%, include the 99.8th percentile of hourly means in brackets

*Number of exceedences for previous years are optional.

Figure 2.4 Trends in Nitrogen Dioxide Concentrations measures at Automatic Monitoring Site – variation in daily means throughout the year

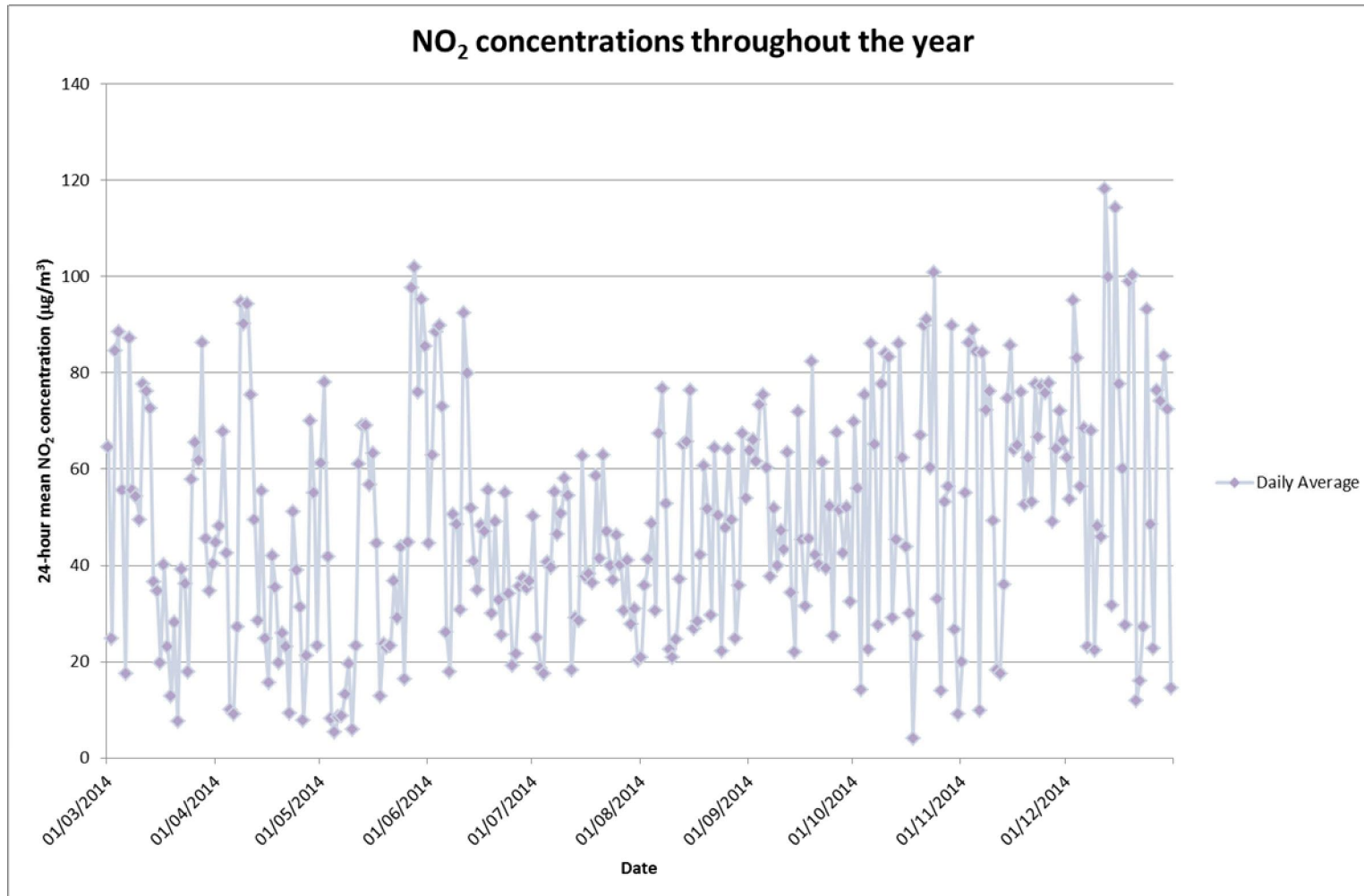


Figure 2.5 Trends in Nitrogen Dioxide Concentrations measures at Automatic Monitoring Site – variation in hourly Nitrogen Dioxide Concentrations measures at Automatic Monitoring Site

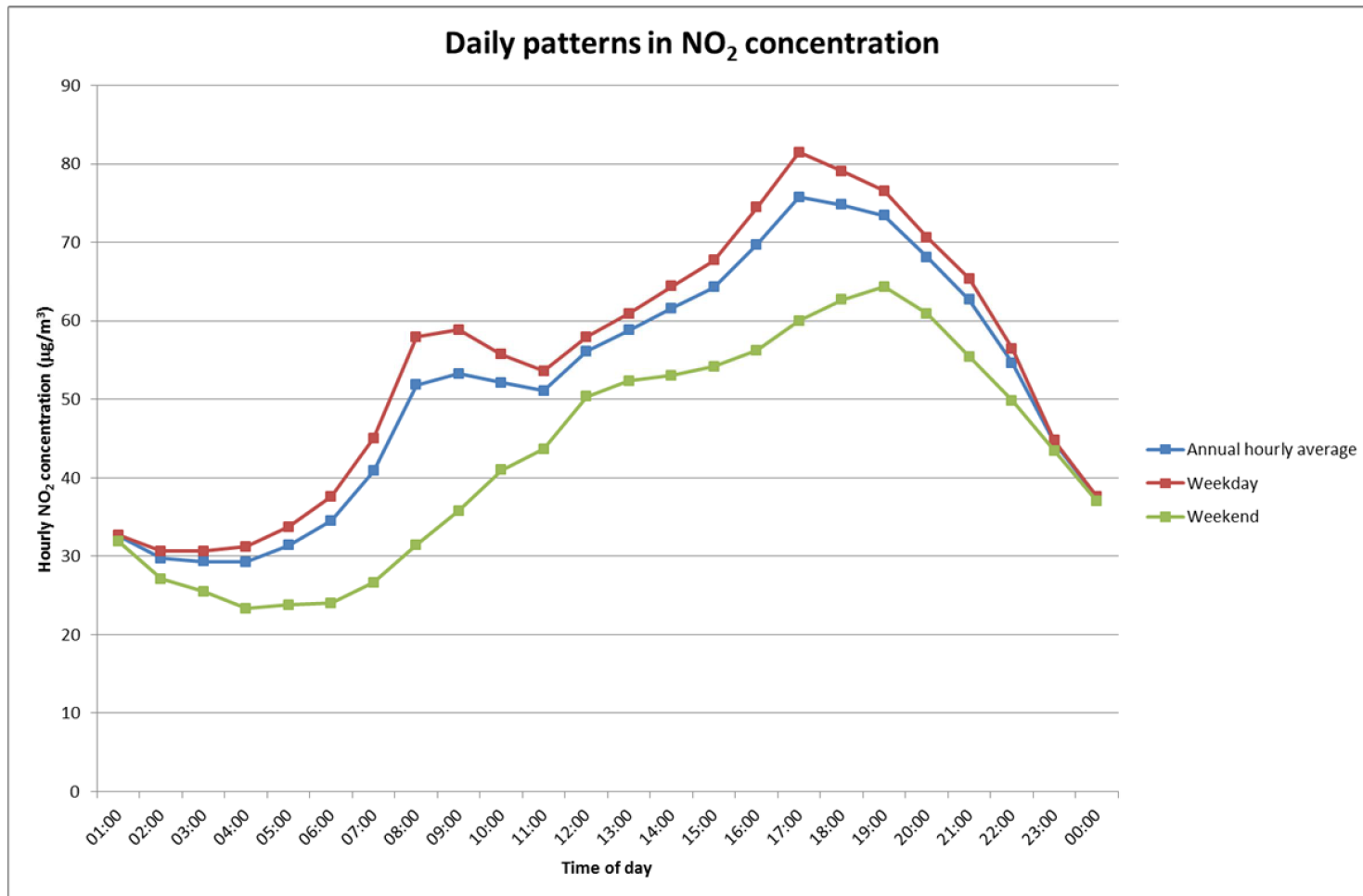


Table 2.3 shows the annual average NO₂ concentration exceeds 40µg/m³. Figure 2.4 shows that although there is significant variation in 24-hour NO₂ concentration throughout the year, the highest readings are in the winter months as expected. Figure 2.5 shows elevated NO₂ follows a diurnal pattern with a small morning peak and a larger evening peak. NO₂ concentrations are above average during the weekdays and below average at the weekend. This indicates NO₂ is associated with traffic, particularly working week traffic at the morning and evening rush-hour. As such reducing traffic flow along Twynyrodyn Road is predicted to result in reduced NO₂ concentrations. This is in line with the measures being considered for the AQAP.

Diffusion Tube Monitoring Data

Diffusion tube data for 2014 is summarised in Table 2.5, and annual trends in Table 2.6 and the associated figures. There are exceedences of the limit of 40µg/m³, specifically in the area around 55 Twynyrodyn Road.

Table 2.5 Results of Nitrogen Dioxide Diffusion Tubes in 2014

Site ID	Location	Site Type	Within AQMA?	Triplicate or Collocated Tube	Data Capture 2014 (Number of Months or %)	Data with less than 9 months has been annualised (Y/N)	Confirm if data has been distance corrected (Y/N)	Annual mean concentration (Bias Adjustment factor = 0.81)
								2014 ($\mu\text{g}/\text{m}^3$)
WAQF1	Imperial Hotel	Roadside	N	No	9	N	N	23.1
WAQF2	Civic Centre	Urban background	N	No	11	N	N	19.4
WAQF3	Twynnyrobyn Infants School	Suburban	N	No	11	N	N	12.4
WAQF15	Victoria Street	Urban Centre	N	No	8	N	N	24.3
WAQF16	Six Bells Estate	Suburban	N	No	12	N	N	11.4

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Site ID	Location	Site Type	Within AQMA?	Triplicate or Collocated Tube	Data Capture 2014 (Number of Months or %)	Data with less than 9 months has been annualised (Y/N)	Confirm if data has been distance corrected (Y/N)	Annual mean concentration (Bias Adjustment factor = 0.81)
								2014 ($\mu\text{g}/\text{m}^3$)
WAQF25	Upper Dowlais	Roadside	N	No	12	N	N	26.1
WAQF29	55 Twynyrodyn Road	Roadside	Y (proposed)	Collocated	12	N	N	45.7
29J	55 Twynyrodyn Road (collocated)	Roadside	Y (proposed)	Collocated	12	N	N	47.5
29A	91 Twynyrodyn Road	Roadside	Y (proposed)	No	11	N	N	29.1
29B	15 Arfryn Terrace	Roadside	Y (proposed)	No	11	N	N	33.4
29D	17 Court Terrace	Roadside	Y (proposed)	No	12	N	N	30.6

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Site ID	Location	Site Type	Within AQMA?	Triplicate or Collocated Tube	Data Capture 2014 (Number of Months or %)	Data with less than 9 months has been annualised (Y/N)	Confirm if data has been distance corrected (Y/N)	Annual mean concentration (Bias Adjustment factor = 0.81)
								2014 ($\mu\text{g}/\text{m}^3$)
29E	40 William Street	Roadside	Y (proposed)	No	11	N	N	22.2
29F	Mardy Street Mount View	Roadside	N	No	11	N	N	22.3
29G	64 Gilfach Cynon	Roadside	Y (proposed)	No	12	N	N	23.1
29H	51 Twynyrodyn Road	Roadside	Y (proposed)	No	12	N	N	45.9
29I	3 Gilfach Cynon	Roadside	Y (proposed)	No	12	N	N	36.5
WAQF30	Quakers Yard	Suburban	N	No	12	N	N	12.8

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Site ID	Location	Site Type	Within AQMA?	Triplicate or Collocated Tube	Data Capture 2014 (Number of Months or %)	Data with less than 9 months has been annualised (Y/N)	Confirm if data has been distance corrected (Y/N)	Annual mean concentration (Bias Adjustment factor = 0.81)
								2014 ($\mu\text{g}/\text{m}^3$)
WAQF31	4 Erw Las	Suburban	N	No	12	N	N	11.5
36	15 Lower High Street	Roadside	N	No	12	N	N	28.7
38	11 Alexandra Terrace (lamppost)	Roadside	Y (proposed)	No	12	N	N	43.3
39	11 Alexandra Terrace (façade)	Kerbside	Y (proposed)	No	12	N	N	35.4
44	1 Alma Street	Roadside	N	No	12	N	N	19.7
42	5 Alma Street	Roadside	N	No	12	N	N	17.1

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Site ID	Location	Site Type	Within AQMA?	Triplicate or Collocated Tube	Data Capture 2014 (Number of Months or %)	Data with less than 9 months has been annualised (Y/N)	Confirm if data has been distance corrected (Y/N)	Annual mean concentration (Bias Adjustment factor = 0.81)
								2014 ($\mu\text{g}/\text{m}^3$)
43	9 Alma Street	Roadside	N	No	12	N	N	17.8

In bold, exceedence of the NO₂ annual mean AQS objective of 40 $\mu\text{g}/\text{m}^3$

Underlined, annual mean > 60 $\mu\text{g}/\text{m}^3$, indicating a potential exceedence of the NO₂ hourly mean AQS objective

^a Means “annualised”

Table 2.6 Results of Nitrogen Dioxide Diffusion Tubes (2010 to 2014)

Site ID	Location	Site Type	Within AQMA?	Annual mean concentration (adjusted for bias) $\mu\text{g}/\text{m}^3$				
				2010* (Bias Adjustment Factor = 0.84)	2011* (Bias Adjustment Factor = 0.82)	2012* (Bias Adjustment Factor = 0.69)	2013* (Bias Adjustment Factor = 0.85)	2014 (Bias Adjustment Factor = 0.81)
WAQF1	Imperial Hotel	Roadside	N	28.0	27.1	24.2	26.3	23.1
WAQF2	Civic Centre	Urban background	N	22.0	22.1	16.8	21.8	19.4
WAQF3	Twynyrodyn Infants School	Suburban	N	16.0	13.8	11.2	15.1	12.4
WAQF15	Victoria Street	Urban Centre	N	28.0	23.6	20.8	26.2	24.3
WAQF16	Six Bells Estate	Suburban	N	17.0	13.2	10.8	14.5	11.4
WAQF25	Upper Dowlais	Roadside	N	27.0	24.8	22.6	28.7	26.1

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Site ID	Location	Site Type	Within AQMA?	Annual mean concentration (adjusted for bias) $\mu\text{g}/\text{m}^3$				
				2010* (Bias Adjustment Factor = 0.84)	2011* (Bias Adjustment Factor = 0.82)	2012* (Bias Adjustment Factor = 0.69)	2013* (Bias Adjustment Factor = 0.85)	2014 (Bias Adjustment Factor = 0.81)
WAQF29	55 Twynyrodyn Road	Roadside	Y (proposed)	56.0	52.0	41.9	49.8	45.7
29J	55 Twynyrodyn Road (co-located)	Roadside	Y (proposed)				57.0 ^a	47.5
29A	91 Twynyrodyn Road	Roadside	Y (proposed)	30.0	35.0	29.2	32.6	29.1
29B	15 Arfryn Terrace	Roadside	Y (proposed)	25.0	23.0	28.0	33.1	33.4
29D	17 Court Terrace	Roadside	Y (proposed)	23.0	20.6	28.4	31.2	30.6
29E	40 William Street	Roadside	Y (proposed)	37.0	33.1	21.7	24.7	22.2

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Site ID	Location	Site Type	Within AQMA?	Annual mean concentration (adjusted for bias) $\mu\text{g}/\text{m}^3$				
				2010* (Bias Adjustment Factor = 0.84)	2011* (Bias Adjustment Factor = 0.82)	2012* (Bias Adjustment Factor = 0.69)	2013* (Bias Adjustment Factor = 0.85)	2014 (Bias Adjustment Factor = 0.81)
29F	Mardy Street Mount View	Roadside	N	26.0	22.6	18.7	22.9	22.3
29G	64 Gilfach Cynon	Roadside	Y (proposed)		28.0	22.6	26.0	23.1
29H	51 Twynyroddyn Road	Roadside	Y (proposed)			41.3	51.1	45.9
29I	3 Gilfach Cynon	Roadside	Y (proposed)			34.7	38.0	36.5
WAQF30	Quakers Yard	Suburban	N	16.0	13.7	11.2	13.9	12.8
WAQF31	4 Erw Las	Suburban	N	15.0	12.7	11.5	14.0	11.5

Merthyr Tydfil County Borough Council

Site ID	Location	Site Type	Within AQMA?	Annual mean concentration (adjusted for bias) $\mu\text{g}/\text{m}^3$				
				2010* (Bias Adjustment Factor = 0.84)	2011* (Bias Adjustment Factor = 0.82)	2012* (Bias Adjustment Factor = 0.69)	2013* (Bias Adjustment Factor = 0.85)	2014 (Bias Adjustment Factor = 0.81)
36	15 Lower High Street	Roadside	N			26.4	32.8	28.7
38	11 Alexandra Terrace (lamppost)	Roadside	Y (proposed)				54.8^a	43.3
39	11 Alexandra Terrace (façade)	Kerbside	Y (proposed)				49.0^a	35.4
44	1 Alma Street	Roadside	N			19.0	23.4	19.7
42	5 Alma Street	Roadside	N			16.8	19.7	17.1
43	9 Alma Street	Roadside	N			15.5	20.4	17.8

*Optional

In bold, exceedence of the NO₂ annual mean AQS objective of 40µg/m³

Underlined, annual mean > 60µg/m³, indicating a potential exceedence of the NO₂ hourly mean AQS objective

^a Means “annualised”

Figure 2.6 Trends in Annual Mean Nitrogen Dioxide Concentrations measured at Diffusion Tube Monitoring Sites

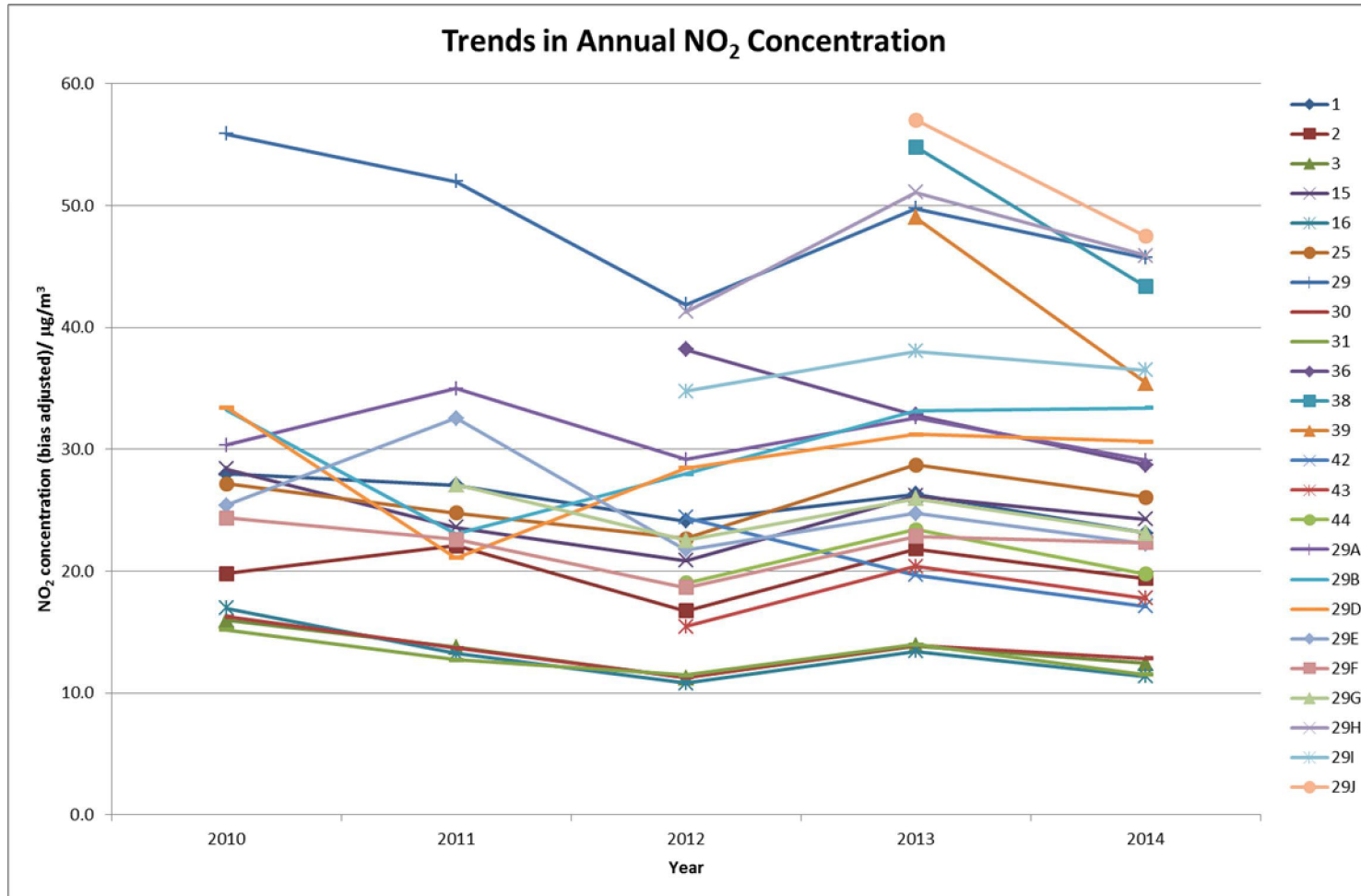


Figure 2.7 Trends in Annual Mean Nitrogen Dioxide Concentrations measured at Twynnyrodyn Road Diffusion Tube Monitoring

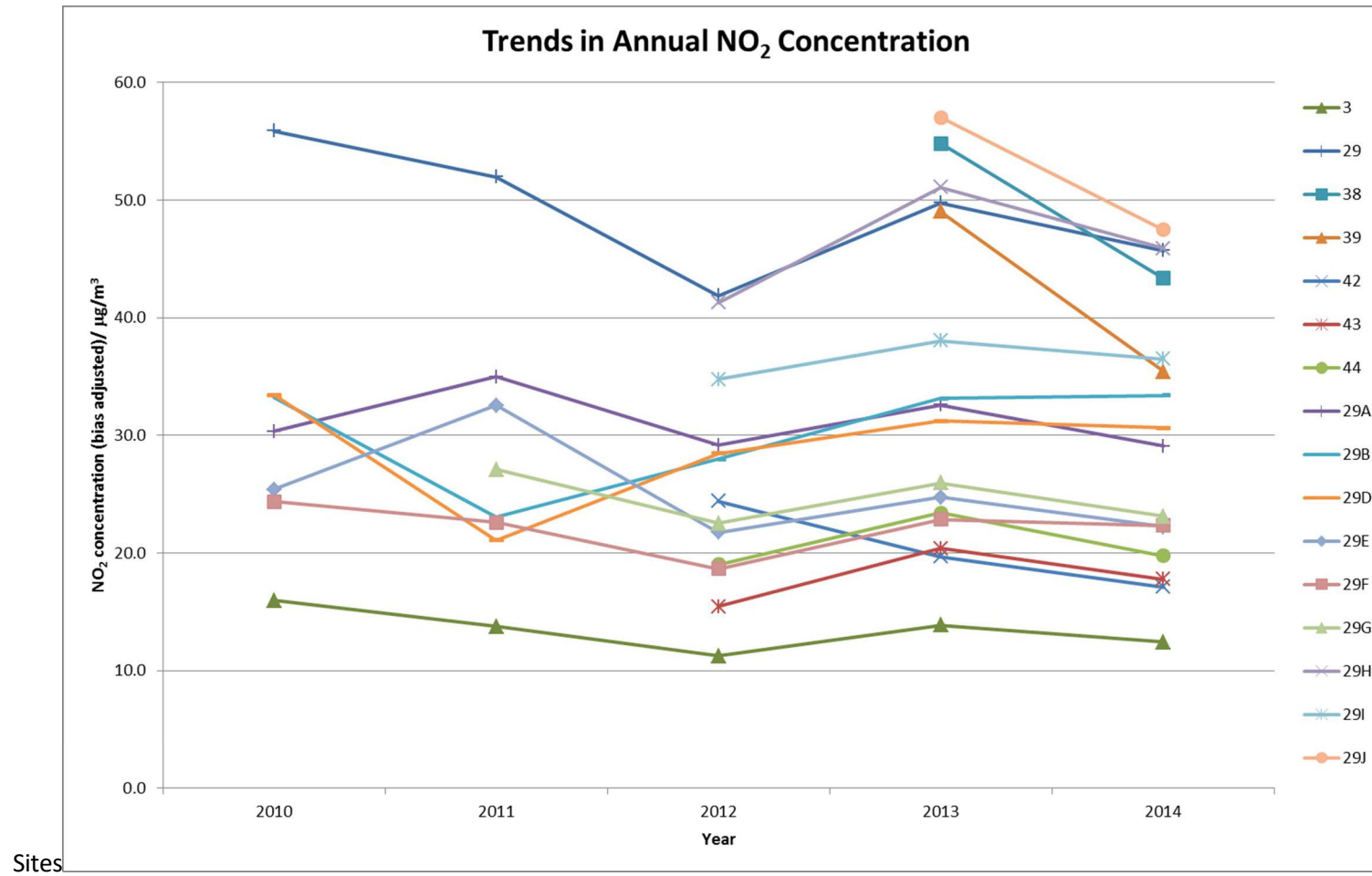


Figure 2.8 Trends in Annual Mean Nitrogen Dioxide Concentrations measured at Diffusion Tube Monitoring Sites within the proposed AQMA

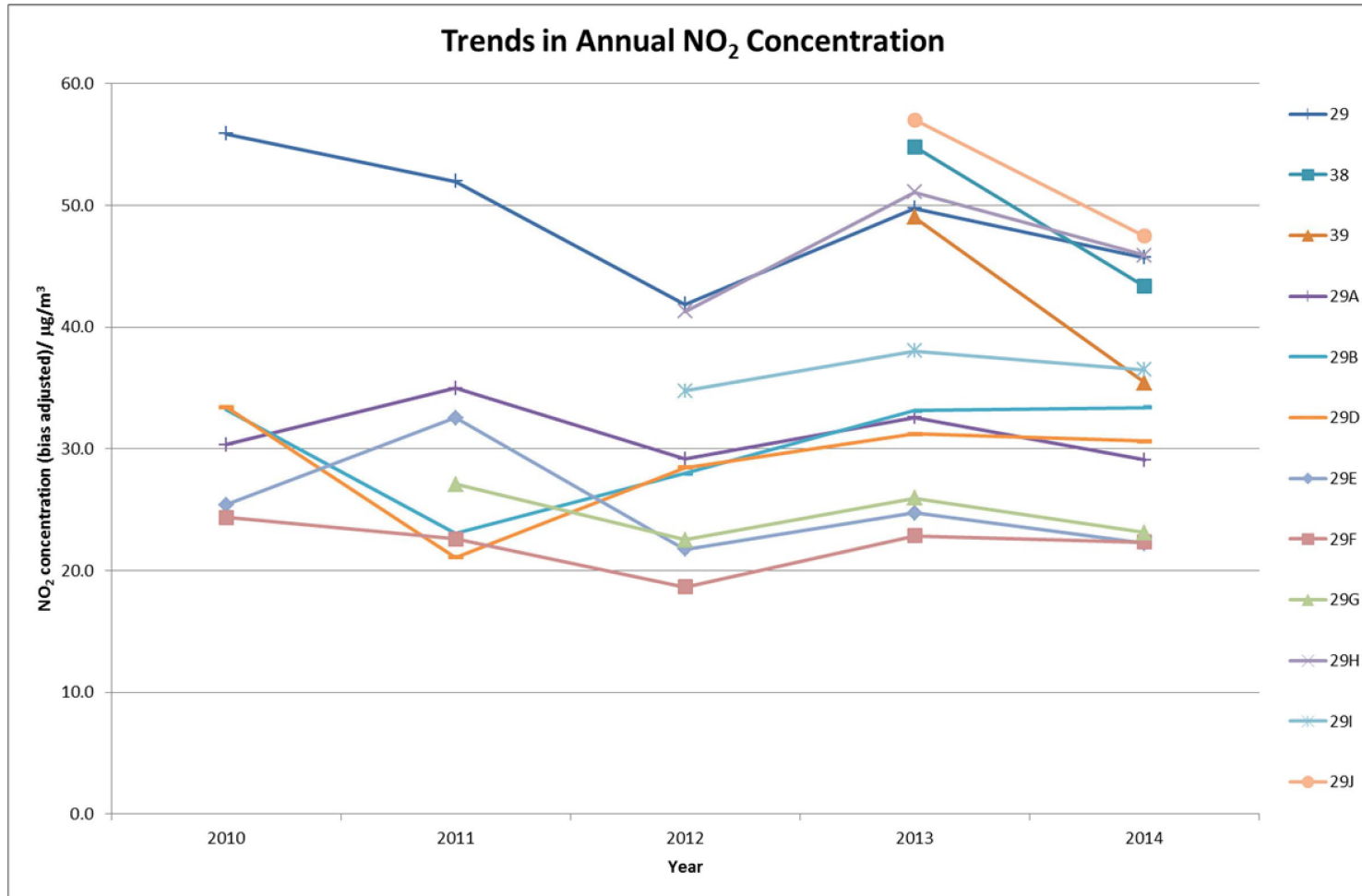


Figure 2.9 Trends in Annual Mean Nitrogen Dioxide Concentrations measured at Diffusion Tube Monitoring Sites outside of Twynyrodyn Road

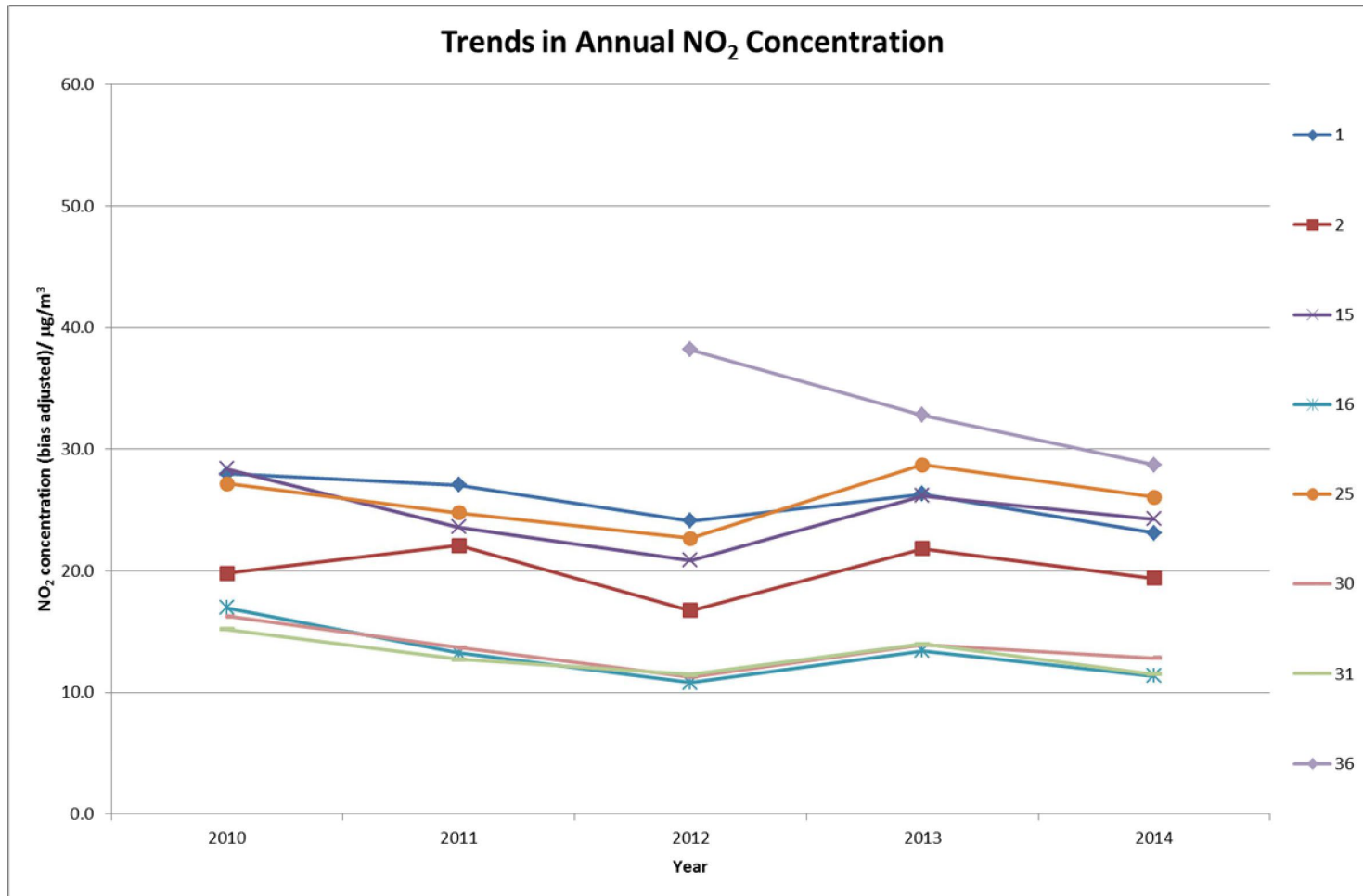


Table 2.6 shows an exceedence of the air quality standard for annual NO₂, 40µg/m³ at 4 sites, namely 55 Twynroddyn Road (collocated tubes), 51 Twynroddyn Road, and 11 Alexandra Terrace (lamp-post). The 4 sites are in close proximity to each other, and are within the proposed AQMA.

In 2013 Merthyr Tydfil underwent significant roadworks. New one way systems were introduced along Tramroadside North, which Twynroddyn Road feeds into, and along Avenue de Clichy creating a new gyratory, the River Taff Central Link. Additionally there have been roadworks along the A470 including works to the Cyfarthfa Retail Park junction. The roadworks were not completed until Autumn 2014. During the roadworks traffic flow throughout the borough was disrupted, and air quality throughout the borough deteriorated with the worst results in the previous 5 years seen in 2013. It is worth noting that although NO₂ concentrations reduced from 2013 to 2014, a number of tubes have NO₂ concentrations above the 2012 level, which may reflect the fact the road works were not completed until Autumn 2014 or that the alterations to traffic flow have had a slightly negative effect. The overall trend will become apparent when 2015 levels are analysed.

Results from 2014 show NO₂ concentrations at all sites along Twynroddyn Road have decreased or stayed roughly the same compared to 2013, however any decrease has not been sufficient for the air quality standard to be met in the area around 55 Twynroddyn Road. This shows although there are traffic calming measures in place along Twynroddyn Road, further works are needed to meet the air quality standard. A detailed assessment completed in 2015 showed it was necessary to declare an AQMA. This is currently in the process of being declared, after which the associated action plan will be followed with the aim of it achieving suitable improvements.

No annual mean NO₂ concentrations have exceeded 60µg/m³ and there is no indication the 1-hour mean objective was likely to have been exceeded. This is in line with findings from the ECC monitor, which did not record any concentrations above 200µg/m³

2.2.2 PM₁₀

The Tables below demonstrate continuing and consistent compliance with the relevant AQO. The site operators, Miller Argent (South Wales) Ltd., provide gravimetric equivalent data for PM₁₀ and TEOM data for PM_{2.5} on the Welsh Air Quality Forum. Only PM₁₀ is considered in this report.

Table 2.7 Results of Automatic Monitoring of PM₁₀: Comparison with Annual Mean Objective

Site ID	Site Type	Within AQMA?	Valid Data Capture for monitoring Period % ^a	Valid Data Capture 2014 % ^b	Confirm Gravimetric Equivalent (Y or NA)	Annual Mean Concentration µg/m ³				
						2010* ^c	2011* ^c	2012* ^c	2013* ^c	2014 ^c
APM1	Suburban	N	100	97	Y	13.8	16.0	13.3	13.0	9.63

^a i.e. data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

^b i.e. data capture for the full calendar year (e.g. if monitoring was carried out for six months the maximum data capture for the full calendar year would be 50%).

^c Means should be “annualised” as in Box 3.2 of TG(09), if monitoring was not carried out for the full year.

* Optional

Table 2.8 Results of Automatic Monitoring for PM₁₀: Comparison with 24-hour mean Objective

Site ID	Site Type	Within AQMA?	Valid Data Capture for monitoring Period % ^a	Valid Data Capture 2014 % ^b	Confirm Gravimetric Equivalent	Number of Exceedences of 24-Hour Mean (50 µg/m ³)				
						2010* ^c	2011* ^c	2012* ^c	2013* ^c	2014 ^c
APM1	Suburban	N	100	97	Y	5	8	2	0	0

^a i.e. data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

^b i.e. data capture for the full calendar year (e.g. if monitoring was carried out for six months the maximum data capture for the full calendar year would be 50%).

^c if data capture is less than 90%, include the 90th percentile of 24-hour means in brackets

* Optional

Figure 2.10 Trends in Annual Mean PM₁₀ Concentrations – PM₁₀ concentrations

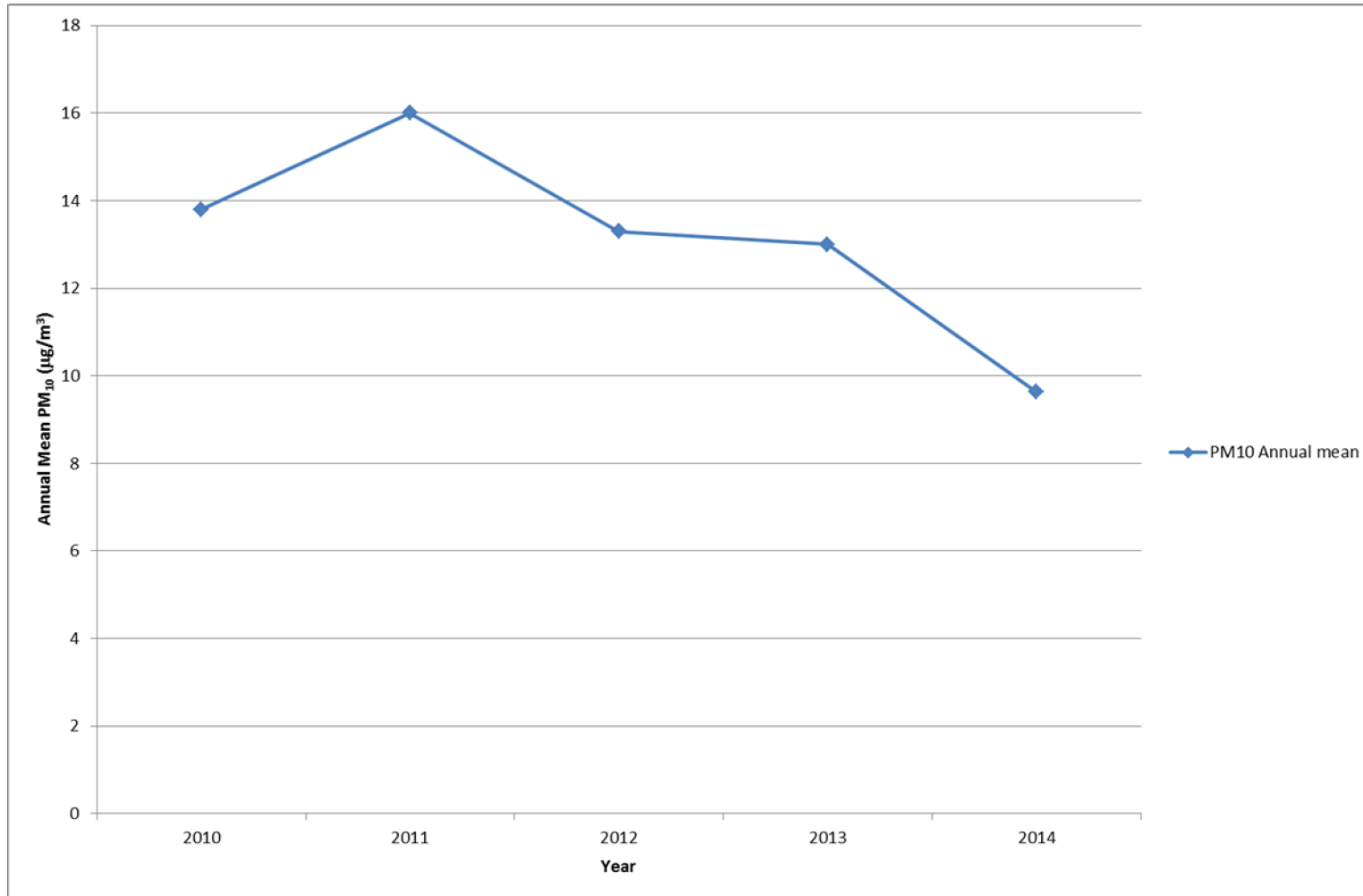


Figure 2.11 Trends in Annual Mean PM₁₀ Concentrations – 24-hour periods with of PM₁₀ concentration over 50µg/m³

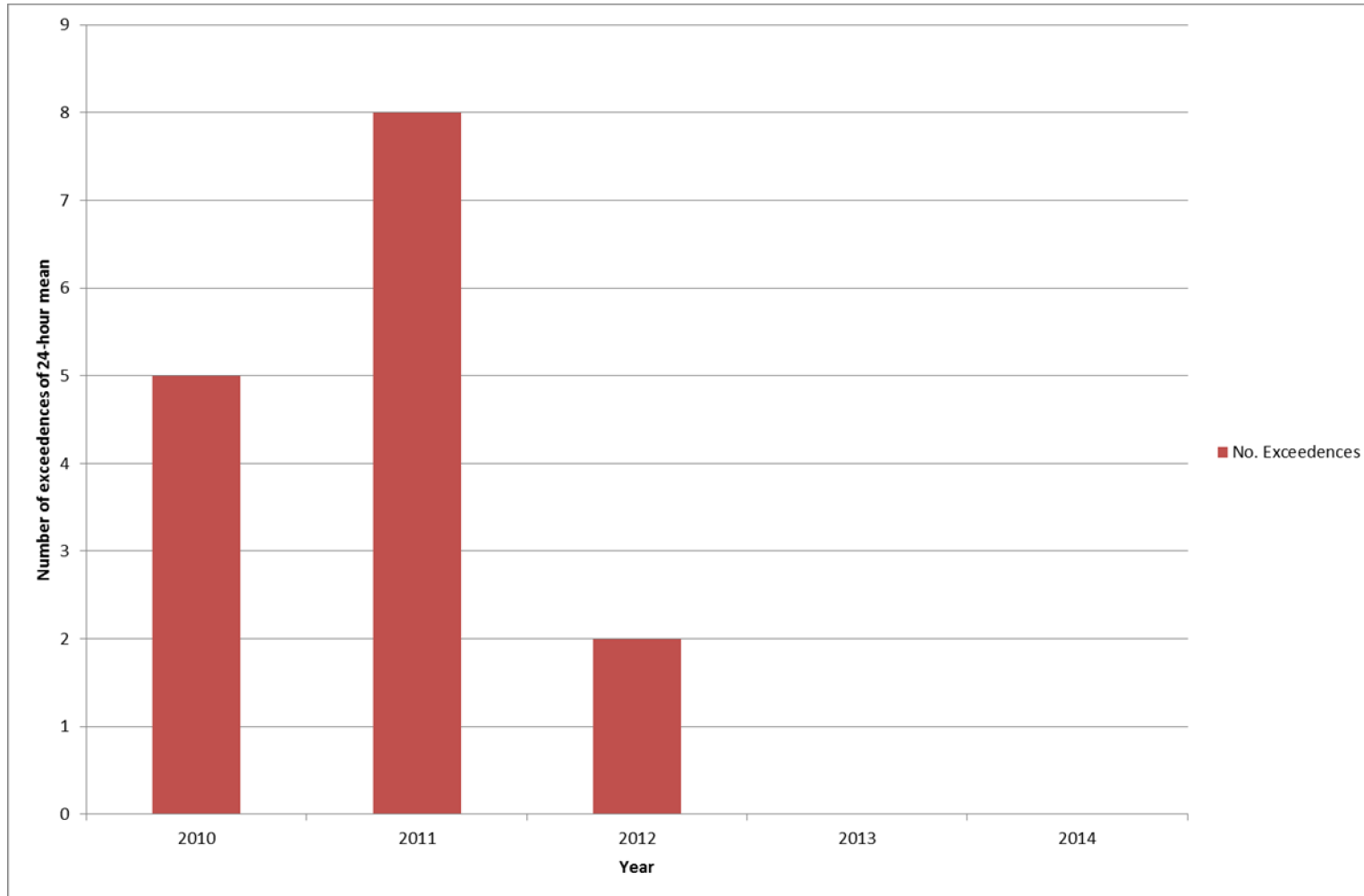


Table 2.7 and Figure 2.10 show PM₁₀ has consistently stayed below the air quality standard of 40µg/m³ annual mean. Table 2.8 and Figure 2.11 show there have been a reducing number of exceedences of 50µg/m³ 24-hour mean. PM₁₀ is not considered to pose a problem within Merthyr Tydfil.

2.2.3 Sulphur Dioxide

Merthyr Tydfil County Borough Council does not carry out sulphur dioxide monitoring.

2.2.4 Benzene

Merthyr Tydfil County Borough Council does not carry out benzene monitoring.

2.2.5 Other pollutants monitored

Merthyr Tydfil County Borough Council does not carry out monitor other pollutants.

2.2.6 Summary of Compliance with AQS Objectives

Merthyr Tydfil County Borough Council has examined the results from monitoring in the borough. Concentrations outside of the proposed AQMA are all below the objectives at relevant locations, therefore there is no need to proceed to a Detailed Assessment for any other areas within the borough.

A detailed assessment of the Twynyrodyn area has been carried out in 2015, and the authority is in the process of declaring an AQMA.

3 Road Traffic Sources

3.1 Narrow Congested Streets with Residential Properties Close to the Kerb

Twynyrodyn Road

As identified in previous progress reports and the Detailed Assessment 2015, Twynyrodyn Road is a narrow, busy street with residential properties close to the kerb. Around the area of 55 Twynyrodyn Road there have been breaches of the AQS for NO₂. This has been confirmed through extensive monitoring with diffusion tubes and a real time ECC monitor.

Following the Detailed Assessment MTCBC is in the process of declaring an AQMA, and will follow an air quality action plan with a view to improving air quality within the AQMA.

The aim of the action plan is to reduce traffic volumes thereby improving air quality. This will be through a range of traffic calming measures.

MTCBC confirms that there are no new/newly identified congested streets with a flow above 5,000 vehicles per day and residential properties close to the kerb, that have not been adequately considered in previous rounds of Review and Assessment. Twynyrodyn Road has been considered in a Detailed Assessment 2015, and MTCBC are in the process of declaring an AQMA.

3.2 Busy Streets Where People May Spend 1-hour or More Close to Traffic

The main shopping area in Merthyr is pedestrianised. Additionally there is a retail development where people may spend one hour or more, however they are not in close proximity to traffic.

MTCBC confirms that there are no new/newly identified busy streets where people may spend 1 hour or more close to traffic.

3.3 Roads with a High Flow of Buses and/or HGVs.

High levels of HDV usage within the Borough are limited to the A465, A4060 and A470. These do not have nearby sensitive properties and are not areas where people would be expected to spend 1 hour.

There are proposals to develop a new bus station in the area of Swan Street, which are discussed in more detail in section 3.7.

MTCBC confirms that there are no new/newly identified roads with high flows of buses/HDVs. However this will continue to be monitored through the Environmental Health Department's consultation on the planning process and its involvement in the Strategic Economic Regeneration and Tourism Board.

3.4 Junctions

MTCBC confirms that there are no new/newly identified busy junctions/busy roads.

3.5 New Roads Constructed or Proposed Since the Last Round of Review and Assessment

MTCBC confirms that there are no new/proposed roads.

3.6 Roads with Significantly Changed Traffic Flows

MTCBC confirms that there are no new/newly identified roads with significantly changed traffic flows.

3.7 Bus and Coach Stations

MTCBC are currently the applicant in a planning application to develop a new bus station. This will relocate the current bus station from Glebeland Street to a new bus station on the location of the Former Hollies Health Centre and Former Police Station, Swan Street.

As part of the planning application the Environmental Health Department has required the applicant, who have engaged Capita, to carry out air quality modelling for the proposed bus station. The most recent of draft of the Air Quality report for the development indicates air quality will be within AQOs. This will need monitoring as there was a limited amount of data used in preparing the report, specifically although 6 months data was obtained this did not include at least 3 months of winter data.

An agreement has been put in place between the Environmental Health Department and Town Centre Management that when the proposed bus station is brought into use diffusion tube monitoring will take place at nearby residential and commercial areas to determine whether the predicted levels of air quality are being achieved.

At this time the Environmental Health Department will not be carrying out a detailed assessment, as modelling is being addressed as part of the planning process.

MTCBC has assessed new/newly identified bus stations, specifically a proposal to develop a new bus station, and concluded that it will not be necessary to proceed to a Detailed Assessment.

4 Other Transport Sources

4.1 Airports

MTCBC confirms that there are no airports in the Local Authority area.

4.2 Railways (Diesel and Steam Trains)

4.2.1 Stationary Trains

MTCBC confirms that there are no locations where diesel or steam trains are regularly stationary for periods of 15 minutes or more, with potential for relevant exposure within 15m.

4.2.2 Moving Trains

MTCBC confirms that there are no locations with a large number of movements of diesel locomotives, and potential long-term relevant exposure within 30m.

4.3 Ports (Shipping)

MTCBC confirms that there are no ports or shipping that meet the specified criteria within the Local Authority area.

5 Industrial Sources

5.1 Industrial Installations

5.1.1 New or Proposed Installations for which an Air Quality Assessment has been Carried Out

MTCBC confirms that there are no new or proposed industrial installations for which planning approval has been granted within its area or nearby in a neighbouring authority.

5.1.2 Existing Installations where Emissions have Increased Substantially or New Relevant Exposure has been Introduced

MTCBC confirms that there are no industrial installations with substantially increased emissions or new relevant exposure in their vicinity within its area or nearby in a neighbouring authority.

5.1.3 New or Significantly Changed Installations with No Previous Air Quality Assessment

MTCBC confirms that there are no new or proposed industrial installations for which planning approval has been granted within its area or nearby in a neighbouring authority.

5.2 Major Fuel (Petrol) Storage Depots

There are no major fuel (petrol) storage depots within the Local Authority area.

5.3 Petrol Stations

MTCBC confirms that there are no petrol stations meeting the specified criteria.

5.4 Poultry Farms

MTCBC confirms that there are no poultry farms meeting the specified criteria.

6 Commercial and Domestic Sources

6.1 Biomass Combustion – Individual Installations

A biomass boiler has been introduced at Merthyr College. During the planning process stack height calculations indicated air quality would remain within the AQOs. It has been operational for over 12 months without any concerns. When in operation the plume can be seen disperse upwards as anticipated. There have been no complaints received and the NO₂ concentrations at the Civic Centre, the nearest monitoring location, have not increased.

MTCBC has assessed the biomass combustion plant, and concluded that it will not be necessary to proceed to a Detailed Assessment.

6.2 Biomass Combustion – Combined Impacts

There are a small number of biomass boilers, specifically log burning stoves, throughout the borough. These are sufficiently scattered that they do not have a cumulative effect at this time.

Through the consultation processes with Planning and Building Control, and through complaints received by the Environmental Health Department, we will continuously review the number and density of biomass boilers and consider the requirement for a detailed assessment on a periodic basis.

MTCBC has assessed the biomass combustion plant, and concluded that it will not be necessary to proceed to a Detailed Assessment.

6.3 Domestic Solid-Fuel Burning

There are no areas with significant levels of coal burning. The majority of properties within the Borough have access to mains gas, with a negligible number relying on solid fuel.

MTCBC confirms that there are no areas of significant domestic fuel use in the Local Authority area.

7 Fugitive or Uncontrolled Sources

MTCBC confirms that there are no potential sources of fugitive particulate matter emissions in the Local Authority area.

8 Conclusions and Proposed Actions

8.1 Conclusions from New Monitoring Data

Throughout the majority of the borough air quality is within the AQOs. However the area around 55 Twynyrodyn Road as identified in the detailed assessment has consistently exceeded the annual air quality objective for nitrogen dioxide. On this basis it has been decided an air quality management area will be designated. The council is in the process of declaring the AQMA at the time of writing.

The Environmental Health Department are in consultation with the Engineering Department. An action plan is being drafted, whereby traffic management solutions will be used to moderate traffic flow on Twynyrodyn Road and to encourage the use of alternative routes to and from the town centre. Modelling will be used to predict the effects of traffic management prior to it being implemented.

The ECC monitor will remain in use on Twynyrodyn Road to provide real time data, which can be used to monitor the effectiveness of traffic management solutions when they are implemented.

8.2 Conclusions from Assessment of Sources

The proposed new bus station will relocate an existing facility, moving NO₂ and PM₁₀ associated with the existing bus service to a new location, closer to residential properties. The developer has commissioned an air quality assessment, which currently indicates although it will result in increased NO₂, the effects are unlikely to result in a breach of the AQOs. This conclusion is being regarded cautiously as the model has been validated using a limited amount of monitoring data. On this basis a service level agreement is in place that once constructed and operational, it will be incorporated into the existing air quality network, and diffusion tubes will be used to monitor air quality at sensitive locations close to the bus station. This will include residential premises in relation to the annual average and

pedestrian routes from the bus station to the shopping areas for any indication the hourly average may have been exceeded.

8.3 Proposed Actions

A detailed assessment has been completed for Twynyrodyn Road, and it has been concluded an AQMA should be declared. Pending the declaration by the Council, the Environmental Health Department will continue to work with other departments in drafting an action plan.

There are no plans at present to close any current diffusion tube locations or to relocate the ECC NO₂ monitor. However this will be considered on a periodic basis.

A progress report will be submitted in 2016/2017 in relation to the AQMA.

9 References

Title	Author	Date
Particulate Measurement at Twynrobyn Primary School Monitoring Site. 2014 Data	AQ Data Services for Miller Argent (South Wales) Ltd	2014
Local Air Quality Management – Technical Guidance (LAQM TG(09))	DEFRA	2009
National Diffusion Tube Bias Adjustment Factor Spreadsheet (03/16)	DEFRA	2016
First Stage Review and Assessment	MTCBC	1998
Second Stage Review and Assessment	MTCBC	2000
Progress Report	MTCBC	2004
Updating and Screening Assessment	MTCBC	2004
Progress Report	MTCBC	2005
Updating and Screening Assessment	MTCBC	2006
Progress Report	MTCBC	2007
Progress Report	MTCBC	2008
Detailed Assessment of Air Quality at Twynrobyn Road, Merthyr Tydfil	AQC for MTCBC	2009
Updating and Screening Assessment	MTCBC	2009
Progress Report	MTCBC	2010
Prince Charles Hospital, Merthyr Tydfil Detailed Assessment of Air Quality	AEA for MTCBC	2011
Progress Report	MTCBC	2011
Updating and Screening Assessment	MTCBC	2012
Progress Report	MTCBC	2013
Progress Report	MTCBC	2014
Detailed Assessment of Air Quality at Twynrobyn Road, Merthyr Tydfil	MTCBC	2015

Appendices

Appendix A: QA/QC Data

Factor from Local Co-location Studies

None - no co-location studies are currently undertaken by Merthyr Tydfil County Borough Council. Although there is a continuous ECC NO₂ monitor collocated with 2 diffusion tube at 55 Twynyrodyn Road, the monitor is not suitable for a colocation study in that it is not a chemiluminescent monitor as specified in best practice.

Diffusion Tube Bias Adjustment Factors

Diffusion tubes may systematically under- or over-read NO₂ concentrations compared to a chemiluminescent analyser. This is known as bias and can be adjusted for using a suitable bias adjustment factor. Applying a bias adjustment factor improves the accuracy of the data. Merthyr Tydfil County Borough Council does not undertake any co-location studies and as such applies a National bias adjustment factor.

The National bias adjustment factor applied was obtained from National Diffusion Tube Bias Adjustment Factor Spreadsheet: Spreadsheet Version Number: 03/16. This is the most up to date version of the spreadsheet at the time of writing. The tubes used are supplied and analysed by ESG. They are analysed using 50% TEA in water. 31 co-location studies were undertaken in England and Wales in 2012, and an overall bias adjustment factor of 0.81 was obtained as shown in the abstract below.

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Analysed By ¹	Method To undo your selection, choose (All) from the pop-up list	Year ⁵ To undo your selection, choose (All)	Site Type	Local Authority	Length of Study (months)	Diffusion Tube Mean Conc. (Dm) ($\mu\text{g}/\text{m}^3$)	Automatic Monitor Mean Conc. (Cm) ($\mu\text{g}/\text{m}^3$)	Bias (B)	Tube Precision ⁶	Bias Adjustment Factor (A) (Cm/Dm)
ESG Didcot	50% TEA in acetone	2014	R	Cambridge City Council	12	47	37	25.5%	G	0.80
ESG Didcot	50% TEA in acetone	2014	UB	Falkirk	12	23	19	20.5%	G	0.83
ESG Didcot	50% TEA in acetone	2014	UB	Gravesham Borough Council	12	27	25	11.6%	P	0.90
ESG Didcot	50% TEA in acetone	2014	UB	Gravesham Borough Council	12	40	31	29.6%	G	0.77
ESG Didcot	50% TEA in acetone	2014	UB	Kingston upon Hull City Council	12	32	26	22.6%	G	0.82
ESG Didcot	50% TEA in acetone	2014	KS	Marylebone Road Intercomparison	12	109	80	35.2%	P	0.74
ESG Didcot	50% TEA in acetone	2014	R	North East Lincolnshire Council	11	34	33	3.8%	G	0.96
ESG Didcot	50% TEA in acetone	2014	R	North East Lincolnshire Council	12	37	34	9.7%	P	0.91
ESG Didcot	50% TEA in acetone	2014	R	North East Lincolnshire Council	12	58	47	22.1%	G	0.82
ESG Didcot	50% TEA in acetone	2014	B	Pembrokeshire Council	11	7	3	110.8%	P	0.47
ESG Didcot	50% TEA in acetone	2014	KS	South Northamptonshire Council	11	43	31	36.5%	G	0.73
ESG Didcot	50% TEA in acetone	2014	UI	Stockton on Tees	11	25	22	17.7%	P	0.85
ESG Didcot	50% TEA in acetone	2014	R	Stockton on Tees	12	21	16	35.2%	G	0.74
ESG Didcot	50% TEA in acetone	2014	R	Swale Borough Council	9	42	33	28.4%	P	0.78
ESG Didcot	50% TEA in acetone	2014	R	Swale Borough Council	12	50	38	31.7%	P	0.76
ESG Didcot	50% TEA in acetone	2014	SU	Thanet District Council	12	19	17	9.0%	P	0.92
ESG Didcot	50% TEA in acetone	2014	R	Thanet District Council	12	28	27	6.0%	P	0.94
ESG Didcot	50% TEA in acetone	2014	R	Wrexham County Borough Council	10	23	22	5.6%	G	0.95
ESG Didcot	50% TEA in acetone	2014	UB	City of York Council	11	24	19	28.4%	P	0.78
ESG Didcot	50% TEA in acetone	2014	R	City of York Council	10	37	27	36.7%	G	0.73
ESG Didcot	50% TEA in acetone	2014	R	City of York Council	11	32	28	12.4%	G	0.89
ESG Didcot	50% TEA in acetone	2014	R	City of York Council	11	40	36	12.7%	G	0.89
ESG Didcot	50% TEA in acetone	2014	R	Horsham District Council	12	30	27	11.7%	G	0.90
ESG Didcot	50% TEA in acetone	2014	R	Medway Council	12	32	26	26.0%	G	0.79
ESG Didcot	50% TEA in acetone	2014	B	Medway Council	12	21	15	43.3%	P	0.70
ESG Didcot	50% TEA in acetone	2014	R	Sandwell MBC	10	55	47	17.5%	G	0.85
ESG Didcot	50% TEA in acetone	2014	KS	Suffolk Coastal District Council	10	46	39	17.7%	G	0.85
ESG Didcot	50% TEA in acetone	2014	R	Vale of White Horse District Council	12	34	30	14.0%	G	0.88
ESG Didcot	50% TEA in acetone	2014	R	West Oxfordshire District Council (WO	12	48	36	32.4%	G	0.76
ESG Didcot	50% TEA in acetone	2014	R	Dumfries and Galloway Council	12	35	30	16.7%	G	0.86
ESG Didcot	50% TEA in acetone	2014	R	Hambleton District Council	12	24	20	20.4%	G	0.83
ESG Didcot	50% TEA in acetone	2014		Overall Factor ³ (31 studies)				Use		0.81

Discussion of Choice of Factor to Use

A national Bias Adjustment Factor has been used for the following reasons:

- There are currently no co-location studies undertaken in accordance with best practice in Merthyr Tydfil County Borough.
- The sites listed in the Bias Adjustment Factor spreadsheet are in generally comparable locations and;

- The diffusion tube mean concentrations measured at significant Merthyr sites are within the range of results obtained from the two specified national co-location sites;

Although there are general similarities between the sites there are also some significant differences. The derived bias adjustment factor is therefore used with a degree of caution.

QA/QC of diffusion tube monitoring

Diffusion tubes were manufactured and analysed by ESG. The absorbant is analysed for NO₂ concentration using 50% TEA in water. Diffusion tubes were kept and used in accordance with the manufacturer's instructions, and were left out for a minimum of 4 weeks.

Precision is the ability of a measurement to be consistently reproduced. Diffusion tubes are defined as having good precision when the coefficient of variation between triplicate tubes is <20% for eight periods out of 12, and <10% overall. In 2011 good precision was found in 20 out of 31 co-location studies. As such the precision for the diffusion tubes used in Merthyr Tydfil County Borough in 2011 is likely to be good.

Environmental Services Group participates in the AIR PT NO₂ proficiency testing, an independent scheme supported by the Health and Safety Laboratory (HSL). It uses artificially spiked Palmes type diffusion tubes on a quarterly basis to determine a laboratory's analytical performance. Tubes are doped with a known amount of nitrate to determine accuracy, with at least two of the tubes being duplicates, to determine precision. A different mass of nitrate is used each quarter and reflect the typical analytical range encountered in NO₂ monitoring in the UK. From this a performance score (z-score) is generated based on deviation between the known concentration and the value measured by the laboratory. Laboratories with 19 out of 20 (95%), from 5 rounds of testing, z-scores of $\leq \pm 2$ provide satisfactory performance. For the quarters from October – December 2013 to October – November 2014, Environmental Services Group has consistently (100%) achieved z-scores within this range, and as such can be described as satisfactory.

Appendix B: Quality Assurance and Quality Control Procedures for PM₁₀ and PM_{2.5} TEOM data

PM Monitoring Adjustment

Instrument Service Routine

Main QA and QC procedures for the Thermo Fisher TEOM analysers are carried out at the routine service visits, normally carried out at 6 monthly intervals by AQ Data Services.

Filter Change Procedures

At each site visit for exchange of the TEOM filters, a routine of record keeping has been established whereby the analyser operating parameters (flow, temperatures etc) are recorded before and after the filter change. This gives a reference datum of instrument performance at that time, and can often give good information on flows beginning to drop off etc, which can assist in arranging call-out of support engineers thereby preventing down time for the analyser.

Data Collection / Storage

Analog outputs from the 2 TEOM analysers are fed to the data logger system. To ensure correct analog to digital conversion, periodic checks are made to compare the data stored within the system against the internal data storage within each of the TEOM analyser control units.

Data Management

Data is downloaded from the data logger system using the Enviro2000 data management system. The data is initially “screened” to remove obvious spikes (both negative and positive spikes) caused by electrical disruption, after filter change, after analyser start-up etc.

PM Monitoring Adjustment

Equivalence Testing has shown that the TEOM can under read possible losses of volatile material from the TEOM filter.

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Data can be corrected for the loss of volatiles by applying the King's College London Volatile Correction Model – a spreadsheet for Correction. The VCM takes FDMS purge measurements from the two nearest FDMS equipped TEOM analysers, and an average of all the other FDMS purge measurements within 130 km. The two nearest sites are Port Talbot AURN at Margam Fire Station and Newport AURN. More information on the VCM can be found at <http://www.volatile-correction-model.info/>.

At the time of writing data from the FDMS purge measurements used had been ratified and the PM₁₀ and PM_{2.5} data should be considered reliable.

Appendix C: Monthly diffusion tube data; raw data, un-ratified and non-bias adjusted.

Site ID	Location	Nitrogen dioxide concentration ($\mu\text{g}/\text{m}^3$)												
		Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	Period 7	Period 8	Period 9	Period 10	Period 11	Period 12	Annual mean
WAQF 1	Imperial Hotel	31.9	34.4	26.8	22.0	27.1	20.4		18.3			42.3	33.4	28.5
WAQF 2	Civic Centre	31.3	33.4	25.6	22.3	22.3	19.3	18.2	16.5	24.1	24.9		25.6	24.0
WAQF 3	Twynnyrobyn Infants School	17.2	17.6	17.9	14.5	12.7	11.4	10.3	9.4	22	18.7		17.3	15.4
WAQF 15	Victoria Street Taxi Rank	30.9	31.1			20.1	19.2			26.8	27.9	39.6	44.0	30.0
WAQF 16	Six Bells Estate	23.6	17.5	12.5	13.4	7.7	9.0	7.8	7.4	15.2	14.1	19.2	20.8	14.0
WAQF 25	Dowlais Upper	32.7	28.2	31.4	31.7	36.4	23.0	27.2	25.7	43.2	31.6	40.4	34.5	32.2
WAQF 29	55 Twynnyrobyn Road	52.3	53.2	42.2	56.0	44.3	62.1	51.6	53.8	73.3	42.8	69.7	75.6	56.4
WAQF 30	Quakers Yard	20.7	17.4	12.8	15.3	13.1	10.3	11.8	9.8	16.2	16.5	23.6	22.7	15.9
WAQF 31	Erw Las	15.7	14.4	12.9	14.6	11.5	9.3	10.7	9.8	16.2	16.5	23.6	22.7	15.9

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36	15 Lower High Street	39.3	35.6	37.7	36.7	36.9	28.7	28.7	26.6	43.9	36.7	45.3	29.1	35.4
38	11 Alexandra Terrace - lamppost	51.0	48.5	49.5	43.7	49.1	59.3	40.7	47.8	67.8	54.6	59.6	70.4	53.5
39	11 Alexandra Terrace - facade	41.5	30.7	38.7	39.5	46.8	37.3	39.2	31.8	50.1	42.7	55.7	70.7	43.7
42	5 Alma Street	26.3	21.0	20.2	21.1	16.6	14.0	15.3	14.1	23.9	22.9	30.9	27.0	21.1
43	9 Alma Street	29.2	25.2	22.9	22.2	15.7	13.5	14.1	14.5	25.2	27.5	25.7	27.5	21.9
44	1 Alma Street	28.9	29.2	21.2	24.8	19.1	13.5	20.0	9.5	32.7	28.9	33.2	31.5	24.4
29A	91 Twynirodyn Road	27.8	43.2	34.8	39.0	35.1	28.7	34.0	31.9	41.9	36.1		42.5	35.9
29B	15 Arfryn Terrace	42.5	37.5	43.3	42.3	43.7	33.6	34.5	31.3		55.2	44.9	44.6	41.2
29D	17 Court Terrace	35.4	37.0	36.4	36.4	50.3	24.4	30.4	28.7	46.7	41.9	50.4	35.9	37.8
29E	40 William Street	26.4	26.7	27.3	27.2	22.0		26.6	19.2	29.0	31.8	30.8	35.1	27.5
29F	Mount View Mardy Street	31.3	27.2	27.2	28.8	29.9	20.1	20.2	16.2		32.6	38.1	31.8	28.5

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29G	64 Gilfach Cynon	32.5	31.8	25.8	22.0	22.6	20.9	20.2	16.2		32.6	38.1	31.7	28.5
29H	51 Twynyrodyn Road	38.3	56.2	68.8	57.8	42.9	48.9	54.9	53.3	66.3	62.9	68.6	60.6	56.6
29I	3 Gilfach Cynon	45.1	45.3	44.1	45.2	40.9	33.5	39.7	39.6	57.2	39.9	53.5	56.8	45.1
29J	55 Twynyrodyn Road, collocated tube	55.8	51.8	56.7	52.1	60.4	60.8	44.5	55.8	74.3	48.0	65.1	77.8	58.6

Appendix D: ECC readings – Summary of daily NO₂ concentrations

Date	NO ₂ average	Date	NO ₂ average	Date	NO ₂ average	Date	NO ₂ average	Date	NO ₂ average	Date	NO ₂ average	Date	NO ₂ average	Date	NO ₂ average	Date	NO ₂ average
01/03/2014	64.6	04/04/2014	42.6	08/05/2014	13.3	11/06/2014	92.3	15/07/2014	62.6	18/08/2014	42.2	21/09/2014	40.0	25/10/2014	33.0	28/11/2014	64.2
02/03/2014	24.9	05/04/2014	10.0	09/05/2014	19.6	12/06/2014	79.9	16/07/2014	37.6	19/08/2014	60.7	22/09/2014	61.5	26/10/2014	14.0	29/11/2014	72.1
03/03/2014	84.6	06/04/2014	9.2	10/05/2014	5.9	13/06/2014	51.9	17/07/2014	38.2	20/08/2014	51.6	23/09/2014	39.4	27/10/2014	53.2	30/11/2014	66.0
04/03/2014	88.5	07/04/2014	27.3	11/05/2014	23.2	14/06/2014	40.9	18/07/2014	36.4	21/08/2014	29.7	24/09/2014	52.3	28/10/2014	56.3	01/12/2014	62.4
05/03/2014	55.7	08/04/2014	94.6	12/05/2014	60.9	15/06/2014	34.9	19/07/2014	58.6	22/08/2014	64.4	25/09/2014	25.4	29/10/2014	89.8	02/12/2014	53.8
06/03/2014	17.6	09/04/2014	90.2	13/05/2014	69.1	16/06/2014	48.4	20/07/2014	41.5	23/08/2014	50.3	26/09/2014	67.5	30/10/2014	26.6	03/12/2014	95.0
07/03/2014	87.2	10/04/2014	94.2	14/05/2014	69.1	17/06/2014	47.1	21/07/2014	62.8	24/08/2014	22.1	27/09/2014	51.6	31/10/2014	9.1	04/12/2014	83.1
08/03/2014	55.6	11/04/2014	75.4	15/05/2014	56.7	18/06/2014	55.6	22/07/2014	47.0	25/08/2014	47.8	28/09/2014	42.5	01/11/2014	19.9	05/12/2014	56.3
09/03/2014	54.2	12/04/2014	49.5	16/05/2014	63.2	19/06/2014	30.0	23/07/2014	40.0	26/08/2014	64.0	29/09/2014	52.1	02/11/2014	55.1	06/12/2014	68.4
10/03/2014	49.4	13/04/2014	28.6	17/05/2014	44.5	20/06/2014	49.1	24/07/2014	36.9	27/08/2014	49.4	30/09/2014	32.4	03/11/2014	86.2	07/12/2014	23.1
11/03/2014	77.7	14/04/2014	55.4	18/05/2014	12.8	21/06/2014	32.8	25/07/2014	46.4	28/08/2014	24.7	01/10/2014	69.8	04/11/2014	88.8	08/12/2014	67.9
12/03/2014	76.2	15/04/2014	24.8	19/05/2014	23.6	22/06/2014	25.5	26/07/2014	40.1	29/08/2014	35.8	02/10/2014	56.0	05/11/2014	84.3	09/12/2014	22.4
13/03/2014	72.5	16/04/2014	15.6	20/05/2014	22.9	23/06/2014	55.1	27/07/2014	30.5	30/08/2014	67.3	03/10/2014	14.2	06/11/2014	9.9	10/12/2014	48.2
14/03/2014	36.6	17/04/2014	42.0	21/05/2014	23.3	24/06/2014	34.1	28/07/2014	41.1	31/08/2014	53.9	04/10/2014	75.5	07/11/2014	84.3	11/12/2014	46.0
15/03/2014	34.7	18/04/2014	35.5	22/05/2014	36.8	25/06/2014	19.1	29/07/2014	27.7	01/09/2014	63.9	05/10/2014	22.5	08/11/2014	72.1	12/12/2014	118.1
16/03/2014	19.8	19/04/2014	19.7	23/05/2014	29.0	26/06/2014	21.7	30/07/2014	31.0	02/09/2014	66.1	06/10/2014	86.1	09/11/2014	76.1	13/12/2014	99.9
17/03/2014	40.1	20/04/2014	25.9	24/05/2014	43.8	27/06/2014	35.6	31/07/2014	20.2	03/09/2014	61.5	07/10/2014	65.1	10/11/2014	49.3	14/12/2014	31.7
18/03/2014	23.1	21/04/2014	23.1	25/05/2014	16.3	28/06/2014	37.3	01/08/2014	20.9	04/09/2014	73.3	08/10/2014	27.5	11/11/2014	18.2	15/12/2014	114.2
19/03/2014	12.8	22/04/2014	9.2	26/05/2014	44.8	29/06/2014	35.3	02/08/2014	35.9	05/09/2014	75.5	09/10/2014	77.7	12/11/2014	17.5	16/12/2014	77.7
20/03/2014	28.1	23/04/2014	51.1	27/05/2014	97.6	30/06/2014	36.7	03/08/2014	41.2	06/09/2014	60.4	10/10/2014	84.1	13/11/2014	36.1	17/12/2014	60.1
21/03/2014	7.6	24/04/2014	38.9	28/05/2014	101.9	01/07/2014	50.1	04/08/2014	48.6	07/09/2014	37.7	11/10/2014	83.2	14/11/2014	74.7	18/12/2014	27.6
22/03/2014	39.1	25/04/2014	31.3	29/05/2014	76.1	02/07/2014	25.0	05/08/2014	30.5	08/09/2014	51.9	12/10/2014	29.0	15/11/2014	85.8	19/12/2014	99.0
23/03/2014	36.2	26/04/2014	7.8	30/05/2014	95.1	03/07/2014	18.6	06/08/2014	67.4	09/09/2014	39.8	13/10/2014	45.4	16/11/2014	64.0	20/12/2014	100.2
24/03/2014	18.0	27/04/2014	21.2	31/05/2014	85.5	04/07/2014	17.5	07/08/2014	76.7	10/09/2014	47.2	14/10/2014	86.1	17/11/2014	64.9	21/12/2014	11.8
25/03/2014	57.9	28/04/2014	70.0	01/06/2014	44.6	05/07/2014	40.7	08/08/2014	52.7	11/09/2014	43.3	15/10/2014	62.3	18/11/2014	75.9	22/12/2014	16.0
26/03/2014	65.5	29/04/2014	55.1	02/06/2014	62.9	06/07/2014	39.5	09/08/2014	22.6	12/09/2014	63.5	16/10/2014	43.8	19/11/2014	52.5	23/12/2014	27.2
27/03/2014	61.7	30/04/2014	23.4	03/06/2014	88.5	07/07/2014	55.3	10/08/2014	20.9	13/09/2014	34.4	17/10/2014	30.0	20/11/2014	62.4	24/12/2014	93.2
28/03/2014	86.2	01/05/2014	61.2	04/06/2014	89.7	08/07/2014	46.4	11/08/2014	24.7	14/09/2014	22.0	18/10/2014	4.1	21/11/2014	53.3	25/12/2014	48.5
29/03/2014	45.5	02/05/2014	78.0	05/06/2014	72.9	09/07/2014	50.8	12/08/2014	37.1	15/09/2014	71.8	19/10/2014	25.4	22/11/2014	77.6	26/12/2014	22.7
30/03/2014	34.7	03/05/2014	41.8	06/06/2014	26.1	10/07/2014	58.1	13/08/2014	65.1	16/09/2014	45.3	20/10/2014	67.1	23/11/2014	66.7	27/12/2014	76.4
31/03/2014	40.4	04/05/2014	8.1	07/06/2014	17.9	11/07/2014	54.5	14/08/2014	65.7	17/09/2014	31.5	21/10/2014	89.7	24/11/2014	77.3	28/12/2014	74.2
01/04/2014	44.7	05/05/2014	5.3	08/06/2014	50.5	12/07/2014	18.3	15/08/2014	76.3	18/09/2014	45.5	22/10/2014	91.1	25/11/2014	75.7	29/12/2014	83.4
02/04/2014	48.1	06/05/2014	8.6	09/06/2014	48.6	13/07/2014	29.0	16/08/2014	26.9	19/09/2014	82.2	23/10/2014	60.3	26/11/2014	77.8	30/12/2014	72.4
03/04/2014	67.7	07/05/2014	8.8	10/06/2014	30.8	14/07/2014	28.5	17/08/2014	28.3	20/09/2014	42.1	24/10/2014	100.7	27/11/2014	49.0	31/12/2014	14.5

Appendix E: ECC readings – Summary of monthly NO₂ concentrations compared to collocated diffusion tubes

Month	ECC NO ₂ average	Diffusion tube WAQF 29 NO ₂ average	Diffusion tube 29J NO ₂ average
Jan-14		52.3	55.8
Feb-14		53.2	51.8
Mar-14	48.3	42.2	56.7
Apr-14	41.1	56	52.1
May-14	43.4	44.3	60.4
Jun-14	46.5	62.1	60.8
Jul-14	39.7	51.6	44.5
Aug-14	45.3	53.8	55.8
Sep-14	50.8	73.3	74.3
Oct-14	54.1	42.8	48
Nov-14	61.9	69.7	65.1
Dec-14	61.1	75.6	77.8

Appendix F: ECC readings – Summary of hourly average NO₂ concentrations

Time of day	Overall Hourly average NO ₂	Weekday Hourly average NO ₂	Weekend Hourly average NO ₂
00:01-01:00	32.6	32.7	31.9
01:01-02:00	29.7	30.7	27.1
02:01-03:00	29.3	30.6	25.5
03:01-04:00	29.3	31.2	23.3
04:01-05:00	31.4	33.7	23.8
05:01-06:00	34.5	37.6	24.0
06:01-07:00	40.8	45.1	26.7
07:01-08:00	51.8	58.0	31.5
08:01-09:00	53.3	58.8	35.8
09:01-10:00	52.1	55.7	41.0
10:01-11:00	51.1	53.6	43.7
11:01-12:00	56.1	58.0	50.3
12:01-13:00	58.8	60.9	52.4
13:01-14:00	61.6	64.4	53.0
14:01-15:00	64.3	67.7	54.2
15:01-16:00	69.7	74.5	56.3
16:01-17:00	75.8	81.5	60.0
17:01-18:00	74.8	79.1	62.7
18:01-19:00	73.4	76.6	64.4
19:01-20:00	68.1	70.7	60.9
20:01-21:00	62.7	65.4	55.4
21:01-22:00	54.7	56.5	49.8
22:01-23:00	44.5	44.8	43.4
23:01-00:00	37.5	37.5	37.0