Agenda Item: 5

Meeting of:	**Cabinet**
Date of Meeting:	**Monday, 23 September 2019**
Relevant Scrutiny Committee:	Environment and Regeneration
Report Title:	Local Air Quality Management Annual Progress Report 2019
Purpose of Report:	To seek approval for the 2019 Local Air Quality Management Annual Progress Report (APR) on air quality undertaken in 2018 to enable its submission to Welsh Government
Report Owner:	Cabinet Member for Legal, Regulatory and Planning
Responsible Officer:	Miles Punter Director of Environment and Housing Services
Elected Member and Officer Consultation:	Head of Service for Shared Regulatory Service
Policy Framework:	This is a matter for Executive decision by Cabinet

Executive Summary:

- Under Section 82 of the Environment Act 1995 every local authority has an obligation to regularly review and assess air quality in their areas, and to determine whether or not air quality objectives are likely to be achieved.
- Welsh Government issues statutory policy guidance to Local Authorities under Section 88 of the Environment Act 1995 to bring the local air quality management system in Wales into line with the sustainable development principle outlined in Welsh Government's Well-being for Future Generations legislation, 2015. This guidance, with which local authorities must have regard to when carrying out their air quality functions under the Environment Act 1995, sets out that authorities in Wales have to produce an Annual Progress Report (APR) in draft by 30th September each year and publish it by 31st December at the latest. This report must include monitoring results for the previous calendar year, a progress report on action plan implementation and an update on any new policies or developments likely to affect local air quality.
- This report satisfies the above criteria examining results of air quality monitoring undertaken across the Vale during 2018.
- A draft copy of this report needs to be approved and issued to Welsh Government no later than the 30th September 2019.

- The report confirms that air quality within the Vale of Glamorgan continues to meet all the relevant air quality objectives, including within the existing Air Quality Management Area (AQMA) on Windsor Road, Penarth.
- As a result of continual compliance over a three year period with the national air quality objectives set for Nitrogen Dioxide (NO2) and in accordance with Local Air Quality Management in Wales Policy Guidance, June 2017, the Vale of Glamorgan Council will look to revoke the AQMA on Windsor Road, Penarth.
- As suggested by the previous APR published in 2018, the monitoring within the Windsor Road Air Quality Management Area (AQMA) shows continued compliance of the Air Quality Standard of 40 µg/m3 for NO2. Welsh Government Policy Guidance indicates that where compliance within an AQMA occurs over a period of 3 years or more then the local authority should consider revoking the need for the continued presence of the AQMA.
- A supporting detailed assessment has been undertaken by appointed external professional air quality consultants to support the decision to revoke the Windsor Road, Cogan, Penarth AQMA. The report, attached at Appendix 2 to this report outlines that predicted concentrations of NO2 and PM10 at all modelled receptors within the Windsor Road, Cogan, Penarth AQMA are compliant with both the annual mean and short term air quality objectives for all modelled year scenarios. Three modelling year scenarios were chosen for this study (2018, 2023 and 2028).
- Following an appropriate public consultation period, Cabinet will receive a further report requesting a formal decision on the revocation of the AQMA order for Windsor Road, Penarth.

Recommendations

1. That Cabinet notes the monitored results gathered in 2018 and recommends the finalisation of the 2019 Annual Progress Report, attached at Appendix 1 to this report, for submission to Welsh Government for approval.
2. That Cabinet notes that the detailed assessment in Appendix 2 supports the revocation of the Air Quality Management Area on Windsor Road and that Shared Regulatory Services (SRS) will undertake a public consultation in relation to this.
3. That Cabinet receives a report following the public consultation to make a formal decision on revoking the AQMA.

Reasons for Recommendations

1. **2 and 3.**
   To fulfil the requirements of the statutory Local Air Quality Management (LAQM) process under Part IV of the Environment Act 1995.

1. Background

1.1 The LAQM process places a statutory duty on all local authorities to regularly review and assess air quality in their areas and to determine whether the air quality objectives to protect health are likely to be achieved.

2. Key Issues for Consideration

2.1 There are no monitoring sites with nitrogen dioxide (NO2) concentrations in exceedance of the applicable LAQM air quality objectives for Wales in 2018; annual average (40µg/m3) and 1-hour (200µg/m3 not to be exceeded > 18 times per year).

2.2 The results of the monitoring indicate that the annual average particulate matter PM10 concentrations at the Windsor Road monitoring station is compliant with the air quality objective of 40µg/m3. This is the only location across the Vale where PM10 is actively monitored.

2.3 Although Ozone (O3) is not included in the Local Air Quality Management system, the results are included in the report for completeness. There are no exceedances of the 8-hour mean objective of 100µg/m3 on more than 10 days per year as set by the Expert Panel on Air Quality Standards (EPAQs). This is the only location across the Vale where O3 is actively monitored.

2.4 As suggested by the previous APR published in 2018, the monitoring within the Windsor Road Air Quality Management Area (AQMA) shows continued compliance with regards to the applicable air quality objectives for NO2 (annual average (40µg/m3) and 1-hour (200µg/m3 not to be exceeded > 18 times per year). Welsh Government Policy Guidance indicates that where compliance within an AQMA occurs over a period of 3 years or more then the local authority should consider revoking the need for the continued presence of the AQMA.

2.5 A supporting detailed assessment has been undertaken by appointed external professional air quality consultants to support the decision to revoke the Windsor Road, Cogan, Penarth AQMA. The report, attached at Appendix 2 to this report outlines that predicted concentrations of NO2 and PM10 at all modelled receptors within the Windsor Road, Cogan, Penarth AQMA are compliant with both the annual mean and short term air quality objectives for all modelled year scenarios. Three modelling year scenarios were chosen for this study (2018, 2023 and 2028).

2.6 Following an appropriate public consultation period, Cabinet will receive a further report requesting a formal decision on the revocation of the AQMA order for Windsor Road, Penarth.

2.7 The final decision to revoke the Windsor Road, Penarth AQMA will be made by Welsh Government.

3. How do proposals evidence the Five Ways of Working and contribute to our Well-being Objectives?

3.1 The Well-Being of Future Generations (Wales) Act 2015 places a 'well-being duty' on public bodies aimed at achieving seven national well-being goals for Wales - a Wales that is prosperous, resilient, healthier, more equal, has cohesive communities, a vibrant culture and thriving Welsh language, and is globally responsible.

3.2 In discharging its duties under the 2015 Act, the Council has set and published Well-being objectives designed to maximise its contribution to achieving the national Well-being goals. The Well-being objectives are set out in Vale Council's Well-being Objectives and Improvement Plan Part 1 2019/20: https://www.valeofglamorgan.gov.uk/Documents/Our%20Council/Achieving%20our%20vision/Improvement-Plan/Improvement-Plan-Part-1-Well-being-Objectives-2019-20-Final.pdf

3.3 When exercising its functions, the Council is required to take all reasonable steps to meet its Well-being objectives. This means that the decision makers should consider how the proposed decision will contribute towards meeting the Well-

being objectives and must be satisfied that all reasonable steps have been taken to meet those objectives.

3.4 The Well-being duty also requires the Council to act in accordance with a 'sustainable development principle'. This principle requires the Council to act in a way which seeks to ensure that the needs of the present are met without compromising the ability of future generations to meet their own needs. Put simply, this means that Council decision makers must take account of the impact of their decisions on people living their lives in Wales in the future. In doing so, the Council must:

- Look to the long term;
- Focus on prevention by understanding the root causes of problems;
- Deliver an integrated approach to achieving the seven national well-being goals;
- Work in collaboration with others to find shared sustainable solutions; and
- Involve people from all sections of the community in the decisions which affect them.

3.5 The Corporate Plan for the Vale of Glamorgan Council for 2016-2020, includes a Well-Being Outcome which is - An Environmentally Responsible and Prosperous Vale. A key part of this outcome states that The Vale of Glamorgan Council will look 'to protect our environment for future generations.'

3.6 This Progress Report demonstrates that currently Air Quality within the Vale meets air quality objectives set in Wales and exhibits that The Vale of Glamorgan Council is meeting its desired objectives and outcomes.

4. Resources and Legal Considerations

Financial

4.1 SRS has an existing budget to complete a programme of air quality monitoring across the Vale.

4.2 The public consultation can be met from existing budgets and resources.

Employment

4.3 There are no employment implications.

Legal (Including Equalities)

4.4 With regards to annual reporting requirements under the LAQM regime, Welsh Government issues statutory policy guidance to Local Authorities under section 88 of the Environment Act 1995 to bring the local air quality management system in Wales into line with the sustainable development principle in our Future Generations legislation. This guidance, with which local authorities must have regard to when carrying out their air quality functions under the 1995 Act, set out that authorities in wales have to produce an Annual Progress Report in draft by 30 September each year and publish it by 31 December at the latest. This must include monitoring results for the previous calendar year, a progress report on action plan implementation and an update on any new policies or developments likely to affect local air quality.

4.5 Section 82 of the Environment Act 1995 places a duty on all Local Authorities to review periodically air quality in their area. This includes assessment of compliance of present and likely future air quality to comply with the objectives of the Air Quality (Wales) Regulations 2010.

4.6 Where air quality is unlikely to meet the objectives Section 83 of the Environment Act 1995 requires that the Council declares an Air Quality Management Area.

4.7 Section 84 of the Environment Act 1995 places a duty on the Council to develop an Action Plan to address the situation.

4.8 The Authority has a statutory duty to produce and publish reports fulfilling 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 relevant Policy.

4.9 There are no equal opportunities implications from the publication of the report. Invitations to comment will be sent to all known stakeholders and interest groups to provide an opportunity for comments.

5. Background Papers

Vale of Glamorgan Annual Progress Report 2019 - Appendix 1 Vale of Glamorgan Council, Penarth, Detailed Modelling Study, June 2019- Appendix 2

VALE of GLAMORGAN
BRO MORGANNWG

Vale of Glamorgan Council
2019 Air Quality Annual Progress Report

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

August 2019

Local Authority Officer	Craig Lewis
Department	Specialist Enterprise Services
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Report Reference number	2019 Air Quality Progress Report for Vale of Glamorgan Council
Date	14th August 2019

Executive Summary: Air Quality in Our Area

Local authorities have a statutory duty under Part IV of the Environment Act 1995 & Air Quality Strategy for England, Scotland, Wales and Northern Ireland 2007 to manage local air quality. Under Section 82 of the Environment Act 1995 the Local Air Quality Management (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 air quality objectives are likely to be achieved.

The air quality objectives applicable to LAQM in Wales are set out in the Air Quality (Wales) Regulations 2000, No. 1940 (Wales 138) and Air Quality (Amendment) (Wales) Regulations 2002, No 3182 (Wales 298). Where the air quality reviews indicate that the air quality objectives may not be met the local authority is required to designate an Air Quality Management Area (AQMA). Action must then be taken at a local level and outlined in a specific Air Quality Action Plan (AQAP) to ensure that air quality in the identified area improves.

In line with the Vale of Glamorgan Council's (VoGC) statutory duties, under Part IV of the Environment Act 1995 Shared Regulatory Services (SRS) on behalf of VoGC undertakes regular air quality monitoring at specifically allocated locations across The Vale District using automated and non-automated principles for ambient air nitrogen dioxide (NO_2), particulate matter (PM_{10})) & ozone (O_3).

With regards to prioritising ambient air quality sampling locations, the Council adopts a risk based approach to any allocation of monitoring sites, considering the requirements of The Department for Environment, Food and Rural Affairs' (Defra) Local Air Quality Management Technical Guidance 16 (TG16), February 2018. The designated monitoring locations are assigned based on relevant exposure and where the certain Air Quality Objective levels for a particular pollutant applies. TG(16) states that annual mean objectives should apply at "All locations where members of the public might be regularly exposed. Building facades of residential properties, schools, hospitals, car homes etc."

Automatic Monitoring Site

In 2018 VoGC operated 1 automatic analyser located on Windsor Road, Penarth. The monitoring site measures on a 24/7 basis measuring levels of nitrogen dioxide, PM_{10} and ozone (o_3) and forms part of the Welsh Air Quality Network. The results of this air quality monitoring can be viewed online at http://www.welshairquality.co.uk.

In 2018, SRS gave commitment to enhance monitoring capabilities via purchasing two near real time indicative air quality analysers. The analysers have been specifically placed in the Barry locality of The Vale of Glamorgan Council area and represent relevant exposure. The analysers continuously monitor for Nitric Oxide, Nitrogen Dioxide & Ozone, PM10 & PM2.5, and do so every 15 minutes (data uploaded every hour). Information regarding the specification of the monitors can be viewed at https://www.aqmesh.com/product/. These monitors do not form part of the regulated Welsh automated monitoring network, but as specified they are an indicative form of monitoring and a useful tool to look at datasets on a high resolution basis.

Details of the monitoring sites and their collected datasets can be viewed via the SRS webpage at;

English: http://www.srs.wales/en/Environmental-Health/Noise-and-Air-Pollution/Air-quality-and-pollution/Air-Monitoring.aspx

Welsh: http://www.srs.wales/cy/Environmental-Health/Noise-and-Air-Pollution/Air-quality-and-pollution/Air-Monitoring.aspx

You will note that results are compared with the following air quality objectives;

Nitrogen Dioxide (NO_2)

Annual Average not to exceed 40µg/m^3 (microgrammes per metre cubed); and

1 Hour average not to exceed 200 µg/m^3 more than 18 times per year.

PM_{10}

Annual Average not to exceed 40µg/m^3; and

24 Hour Mean not to exceed 50 µg/m^3 more than 35 days per year.

$PM_{2.5}$

Annual Average not to exceed 25 µg/m^3.

Non-automatic Monitoring Sites

In 2018 there were 50 specifically allocated non automatic monitoring sites across the Vale District which monitored levels of nitrogen dioxide (NO_2). These sites are supported and maintained by SRS on behalf of the VoGC. The non-automatic sites do not provide live data; instead they consist of diffusion tubes which are placed at each of the sites, collected and replaced on a rolling monthly basis. The results derived from the tube sampling are then averaged over the year to enable a comparison of the results against the annual average **(40µg/m^3)** and 1-hour **(200µg/m^3 not to be exceeded > 18 times per year)** air quality objectives for NO_2.

For 2018 SRS on behalf of the VoGC revised the network of diffusion tubes to improve and add to the monitoring network by capturing annual datasets at "worst-case" sensitive receptors (residential facades).

This Annual Progress Report confirms that in 2018 air quality within the Vale of Glamorgan continues to meet the relevant air quality objectives, including within the existing Air Quality Management Area (AQMA) on Windsor Road, Penarth.

There were no recorded exceedences of the 1-hour NO_2 objective at any of the monitoring locations in 2018.

This Annual Progress Report confirms that air quality within the Vale of Glamorgan continues to meet the relevant air quality standards, including within the existing Air Quality Management Area (AQMA) on Windsor Road, Penarth. From the 50 locations monitored throughout the Vale with the use of passive diffusion tubes, no sites breach the national NO_2 annual objective of 40µg/m3 or the NO_2 1-hour objective (**200µg/m3, not to be exceeded more than 18 times per year).** Detailed in the Local Air Quality Management (LAQM) TG(16), Paragraphs 7.90 & 7.91 focus on predicting exceedences of the NO_2 1-hour objective (**200µg/m3, not to be exceeded more than 18 times per year)** with the use of NO_2 diffusion tubes. It is stated that ***"exceedances of the NO2 1-hour mean are unlikely to occur where the annual mean is below 60µg/m3."*** Therefore, based on the 2018 datasets it can be concluded that the NO_2 1 hour objective was not breached.

As highlighted by the findings in the VoGC's 2018 APR which considers datasets collected in 2017; due to the continual compliance over a three year period with the national air quality objectives set for nitrogen dioxide (NO_2) and in accordance with Local Air Quality Management in Wales Policy Guidance, June 2017, the Vale of Glamorgan Council would look to revoke the AQMA on Windsor

Road, Cogan, Penarth. At the time of review, Vale of Glamorgan Council's Cabinet approved the following recommendations;

RESOLVED –

(1) T H A T the Local Air Quality Management Annual Progress Report, attached at Appendix 1 to the report, be approved for submission to Welsh Government;

(2) T H A T the commencement of a public consultation on the removal of the Air Quality Management Area covering Windsor Road, Penarth, be approved; and

(3) T H A T following the consultation detailed in Resolution 2 above, a report be submitted to Cabinet to approve a formal submission to Welsh Government requesting the revocation of the Windsor Road Air Quality Management Area.

At the time of writing this report, a supporting detailed assessment has been undertaken by appointed external professional air quality consultants to support the decision to revoke the Windsor Road, Cogan, Penarth AQMA.

The assessment undertaken utilised best practise techniques and guidance to ensure a conservative outcome. In accordance with the air quality objectives applicable to LAQM in Wales, concentrations of NO_2 and PM_{10} were examined at 28 sensitive receptor locations geographical placed within and in close proximity to the established AQMA boundary. The report takes into consideration previous reporting levels as well as uses air quality dispersion modelling software (ADMS-Roads, Version 4.1.1) and latest emission factors (Version 9.0) to look at current pollutant concentrations and projected concentrations. Three modelling year scenarios were chosen for this study (2018, 2023 and 2028).

The report outlines that predicted concentrations of NO_2 and PM_{10} at all modelled receptors within the Windsor Road, Cogan, Penarth AQMA are compliant with both the annual mean and short term AQS objectives for all modelled year scenarios.

As continued compliance with the air quality standards is likely it is recommended to revoke the Windsor Road, Cogan, Penarth AQMA.

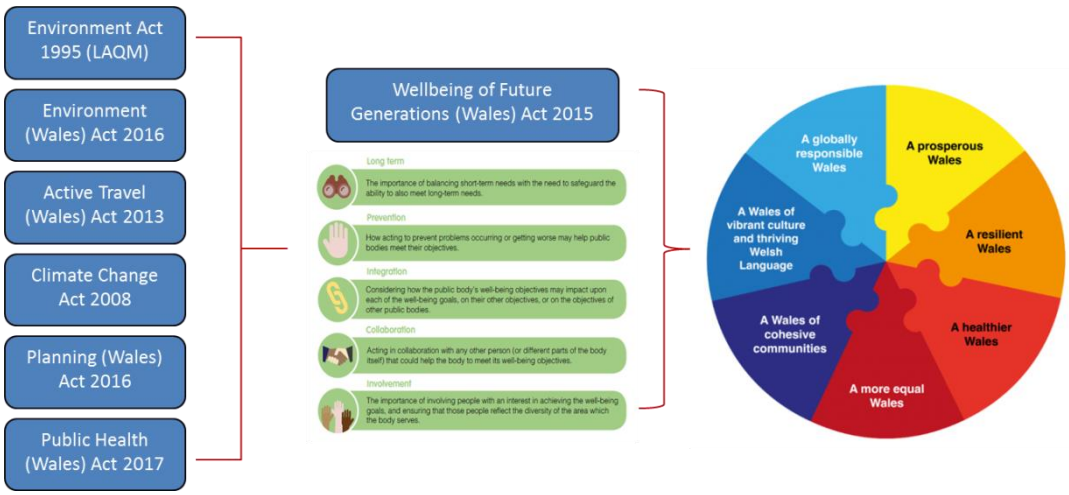
A copy of the discussed detailed assessment is provided as a supporting document to this Annual Progress Report.

In line with the recommendations of the 2018 APR Cabinet Report a Public Consultation will be undertaken to discuss the detailed assessment's findings and Council's next steps. SRS/ VoGC will be looking to initiate the public consultation as soon as possible with a view to complete by the end of 2019.

VoGC adopts the principles of The Well-being of Future Generations (Wales) Act 2015. The Act is a significant enabler to improve air quality as it calls for sustainable cross-sector action based on the principles of long-term, prevention-focused integration, collaboration and involvement. It intends to improve economic, social, environmental and cultural well-being in Wales to ensure the needs of the present are met without compromising the ability of future generations to meet their own needs. The Act places responsibilities on public bodies in Wales to work in new ways (including via Public Services Boards) towards national Well-being goals. Progress is measured against a suite of well-being and Public Health Outcomes Framework indicators; there is one specifically concerned with air pollution.

As Figure 1 illustrates below, the Act is the legislative vehicle for "Health in all Policies in Wales" and provides the underpinning principles for all policy and decision making, including economic development, in Wales. Reducing air pollution, health risks and inequalities can help contribute to most, if not all, of the well-being goals. As such, the Act presents excellent opportunities to change policy and practice to enhance air quality management arrangements across The Vale (and wider).

Figure 1- The Well- being of Future Generations (Wales) Act 2015 Matrix



Actions to Improve Air Quality

Improved monitoring

- In an effort to improve its monitoring capabilities, for 2018, as part of a yearly review SRS have amended and improved the network of diffusion tubes previously assigned in previous years used for the LAQM regime. The amendments include improved monitoring locations to represent the locality of monitoring objectives and implementation of additional sites.

- In 2018 SRS on behalf of the VoGC has commissioned two near real-time indicative automatic monitors. The AQ Mesh analysers continuously monitor for nitric oxide, nitrogen dioxide & ozone, PM10 & PM2.5, and do so every 15 minutes (data uploaded every hour). The data from the pod is sent to a cloud server where it is corrected for temperature, pressure and relative humidity as well as cross gas interference. Data is available to view via the SRS webpage in English and in Welsh using the following;

  English: http://www.srs.wales/en/Environmental-Health/Noise-and-Air-Pollution/Air-quality-and-pollution/Air-Monitoring.aspx

  Welsh: http://www.srs.wales/cy/Environmental-Health/Noise-and-Air-Pollution/Air-quality-and-pollution/Air-Monitoring.aspx

- For 2019; Shared Regulatory Services (SRS) on behalf of the Vale Council has been commissioned by Natural Resources Wales (NRW) to establish new air quality monitoring locations around school premises. The monitoring project will be used to examine and record levels of nitrogen dioxide (NO_2), a known traffic derived pollutant. The project is funded for one year. The datasets collected will be used a driver to work with the monitored schools to influence behavioural change and raise awareness for air quality concerns.

  After the data has been collected for a year, reporting of the data will be included in Vale Council's LAQM Annual Air Quality Progress Report 2020. As part of the LAQM process if levels are found to be encroaching upon or exceeding the air quality objectives set for NO_2, SRS/ VoGC will have a requirement to fulfil the requirements of LAQM and adopt formal procedures to start implementing an Air Quality Management Area (AQMA). SRS/ VoGC would work with the school to develop strategic measures that could be implemented to alleviate any concerns and improve air quality levels for NO_2.

Publications & Policies

Local Development Plan (2011- 2026)

On the 28th June 2017 the Council adopted the Vale of Glamorgan Local Development Plan 2011-2026. The LDP became operative on its adoption and supersedes the previous adopted Unitary Development Plan (UDP). The LDP will be the basis for decisions on land use planning in the Vale of Glamorgan and will be used by the Council to guide and manage new development proposals.

Cardiff and Vale University Health Board Report

The report issued in 2017 examines how making active travel alternatives can lead to sustainable improvements in our health and well-being. The report focuses upon Cardiff and Vale's air quality concerns and recognises that alternative sustainable transport is a key enabler to improving air quality.

Public Transport

Improving Bus Networks

The VoGC are committed to improving air quality. With the envisaged desire to improve traffic fleet composition and increase the uptake of sustainable alternatives and fuels, it is extremely encouraging to find out from the VoGC about adopted improved bus fleets and the routes these services use. The contracted bus company **New Adventure Travel (NAT)** currently runs a local bus service (89a & 89b). The service runs through Dinas Powys, Llandough, Penarth (including Windsor Terrace and Pill Street), and into Cardiff Bay and Cardiff. Approximately 6000 passenger journeys are undertaken on this service each month. The operator runs two hybrid buses on the service. These buses run on electric when doing speeds of 30 miles per hour or less. The buses then run off diesel when undertaking speeds above 30 miles per hour. Using hybrid buses on these routes reduces carbon emissions, specifically in areas where speeds are 30 miles per hour or less, in particular around Penarth, Llandough and Dinas Powys.

Improvements for Sustainable Transport & Infrastructure

Penarth Cardiff Barrage Sustainable Transport Corridor

For 2019 VoGC together with external consultants have completed a Welsh Transport Planning and Appraisal Guidance (WelTAG) Stage 1 'Strategic Outline Case' to develop various options for improving sustainable connectivity through the corridor between Penarth and Cardiff Barrage.

The key objectives of the project are;

- Enhance sustainable connectivity throughout the Penarth Cardiff Barrage transport corridor to achieve modal shift away from the private car towards public transport and active travel;
- Reduce barriers that constrain opportunities to increase travel by sustainable transport modes;
- Increase sustainable transport options that improve accessibility along the Penarth Cardiff Barrage transport corridor and support social inclusion, health and well-being;
- Deliver sustainable transport improvements that encourage increased economic activity and support long-term investment; and
- Introduce sustainable transport measures that protect and enhance the historic, built and natural environment.

The WelTAG Stage 1 looked at a number of possible options to improve sustainable transport within the study area and concluded by recommending three shortlisted options (plus a 'do minimum') for further appraisal at a WelTAG Stage 2.

- Option 1- Active travel proposals for Penarth within the Vale of Glamorgan's Active Travel Integrated Network Map;
- Option 2- Bus Park & Ride and sustainable transport links across Cardiff Barrage;
- Option 3- Multi-modal sustainable transport interchange; and
- Option 4- Do Minimum

The VoGC recently held a public consultation to provide a platform for the public to make comments on the proposals. The consultation is now closed however background information on the project can still be viewed at; https://www.valeofglamorgan.gov.uk/en/living/Roads/Transport-Studies/Penarth-Cardiff-Barrage-Sustainable-Transport-Corridor-Study.aspx

Local Priorities and Challenges

The main priorities for SRS and Vale of Glamorgan Council in the coming year are;

-Deliver a public consultation to revoke the Penarth, Windsor Road AQMA.

How to Get Involved

VoGC welcomes any correspondence relating to air quality enquiries or concerns. Shared Regulatory Services (SRS) Specialist Services Team represents VoGC for air quality management and therefore is contactable via the webpage www.srs.wales/en/Home.aspx. Hourly and monthly average monitoring data for pollutants measured at the Penarth, Windsor Road site is available at https://airquality.gov.wales/

Table of Contents

List of Figures

Tables

1. Actions to Improve Air Quality

1.1 Previous Work in Relation to Air Quality

First Round of Review and Assessment

Between 1999 and 2001, the Vale published reports corresponding to stages 1, 2 and 3 of the first round of review and assessment of air quality. These assessments predicted no exceedences of any of the objectives but concluded that monitoring should continue for nitrogen dioxide (NO_2), sulphur dioxide (SO_2) and particulate matter (PM_{10}).

Second Round of Review and Assessment

Following new technical and policy guidance issued by Defra, the Vale published its first Updating and Screening Assessment (USA) in June 2003. The USA concluded that no nitrogen dioxide or (PM_{10}) exceedences were likely but that monitoring should continue. However, it was suggested that there was a requirement to continue to a Detailed Assessment for the 15- minute limit of SO_2 in Rhoose.

The Council proceeded to publish Progress Reports in 2004 and 2005, which identified exceedences of the 15-minute SO_2 objectives in Rhoose. The Vale therefore proceeded to publish a Detailed Assessment in 2005 which concluded that there was no need to declare an AQMA but to continue monitoring.

Third Round of Review and Assessment

The Vale published its second USA in June 2006, which again concluded that there was no requirement to go onto the detailed stage. However, the USA did note that NO_2 concentrations were close to the limit at Penarth due to road works and recommend that a Detailed Assessment to be carried out if there was no change.

The Council published Progress Reports in 2007 and 2008, which identified that nitrogen dioxide concentrations continued to be close to the limit value at Penarth. A Detailed Assessment was recommended.

The Detailed Assessment of NO_2 in the Penarth area was published in June 2009. It concluded that there were no exceedences of either NO_2 limit but recommended continued monitoring.

Fourth Round of Review and Assessment

The Vale published it third USA in June 2009. Nitrogen Dioxide, Sulphur Dioxide and Particulate Matter (PM_{10}) were being monitored in the area by both the Vale and RWENpower. There were no recorded nitrogen dioxide exceedences however; annual mean concentration at Windsor Road in Penarth was close to the limit. There were no exceedences of SO_2 15-minute or 24-hour means. There were 6 exceedences of the PM_{10} daily mean concentration and no exceedences of the PM_{10} annual mean objective.

The 2010 Progress Report concluded that there were no exceedences of the relevant standards for any of the pollutants measured and that there was no need to proceed to a Detailed Assessment. The 2011 Progress Report concluded that there were no exceedences of the NO_2 or SO_2 objectives however; NO_2 concentrations remain close to objective in some places. A number of exceedences of the 24-hour mean for PM_{10} were recorded in Fonmon and Penarth but still remained within the permitted 35 exceedences per annum.

Fifth Round of Review and Assessment

The Vale published its fourth USA in April 2012, which again concluded that some locations continued to be at or close to the annual mean NO_2 concentrations. Appendix D of the report contains a Detailed Assessment of the air quality in Cogan.

The Detailed Assessment identified a number of locations on Windsor Road in Penarth, where the annual mean NO_2 objective was likely to be exceeded and that no exceedences of the 1-hour mean were likely. It was therefore recommended that an Air Quality Management Area (AQMA) be declared to include, as a minimum the residential properties with concentrations ≥36 µg/m^3. It was also recommended that the monitoring network be extended to include locations at the façade of properties on Windsor Road, the results of which could be used to inform a further assessment.

The 2013 Progress Report recommended that; diffusion tubes with consistently low, compliant concentrations, be re-deployed in new locations; additional tubes be placed at locations where the NO_2 concentrations are consistently close to the annual mean objective with relevant exposure; Penarth's automatic monitor be relocated to within the proposed AQMA; and that the indicative PM_{10} monitor be replaced with a gravimetric equivalence monitor. The 2014 Progress Report concluded that there was no need to proceed to a Detailed Assessment for any of the pollutants monitored.

An AQMA was declared on 1st August 2013 for a section of Windsor Road, Penarth with respect to the annual mean objective NO_2. NO_2 concentrations are high due to congested traffic moving through a partial 'street canyon' with residential exposure along the western flank. Current AQMA is highlighted in Figure 1.2.

Sixth Round of Review and Assessment

The Vale published its fifth USA in May 2015 which confirmed that air quality within the Vale of Glamorgan continued to meet the relevant air quality objectives, including within the existing Air Quality Management Area (Windsor Road, Penarth). 2015's USA also highlighted the need for further investigations with regards to three biomass boiler installations.

The **2016** Annual Progress Report confirmed that air quality within the Vale of Glamorgan continued to meet the relevant air quality objectives, including within the existing Air Quality Management Area (Windsor Road, Penarth). It was highlighted that it would be decided following the examination of the 2016 dataset whether to revoke the Windsor Road, Penarth AQMA. Three biomass boiler installations were investigated and it was ascertained if their emissions would breach targeted emission thresholds.

The **2017** Annual Progress Report confirmed that air quality within the Vale of Glamorgan continued to meet the relevant air quality objectives, including within the existing Air Quality Management Area (AQMA) on Windsor Road, Penarth.

Following a review of the 2016 NO_2 diffusion tube network, it was agreed to assign and relocate new monitoring locations. The new locations have been allocated based on known areas of particularly elevated traffic flows and foreseeable development, all with nearby relevant exposure. These newly monitored areas for 2017 are Llantwit Major, Gileston, St Athan, Rhoose (Fonmon), Barry Docks and Saint Brides Major.

The **2018** Annual Progress Report confirmed that air quality within the Vale of Glamorgan continued to meet the relevant air quality objectives, including within the existing Air Quality Management Area (AQMA) on Windsor Road, Penarth. It was made a priority that the decision to revoke the Windsor Road, Cogan, Penarth AQMA was supported by a detailed assessment and a public consultation was undertaken to review the supporting assessment prior to submission to Welsh Government to formalise the revocation of the AQMA Order.

1.2 Air Quality Management Areas

Where the air quality reviews indicate that the air quality objectives are not being achieved, or are not likely to be achieved, Section 83 of the 1995 Environment Act requires local authorities to designate an Air Quality Management Area ('AQMA'). Air Quality Management Areas (AQMAs) are declared when air quality is close to or above an acceptable level of pollution (known as the air quality objective (Please see Appendix A)). Section 84 of the Act ensures that action must then be taken at a local level which is outlined in a specific Air Quality Action Plan (AQAP) to ensure that air quality in the identified area improves. The authority must prepare a **DRAFT** Air Quality Action Plan (AQAP) within 18 months setting out measures it intends to put in place to improve air quality to at least the air quality objectives, if not even better. The AQAP must be **formally** adopted prior to 24 months has elapsed. AQMA(s) are seen by local authorities as the focal points to channel resources into the most pressing areas of pollution as a priority.

Based on monitoring results and further detailed assessments, there is currently one Air Quality Management Areas (AQMAs) declared in The Vale District, declared due to exceedances of the annual mean NO_2 Air Quality Standard (40ug/m^3), known to be derived from road transport derived NO_2.

-Windsor Road, Cogan, Penarth AQMA- declared 1st August 2013.

Figure 2- Boundary of the Windsor Road, Cogan, Penarth AQMA

1.3 Implementation of Action Plans

Due to the proposal and ongoing works to revoke the Penarth, Windsor Road AQMA, it is currently not necessary for the Vale of Glamorgan to produce an action plan. However if the Council is unable to successfully fulfil the requirements of Welsh Government and demonstrate future compliance with national air quality objectives then it will be necessary to revisit the Windsor Road AQMA and an appropriate Action Plan developed.

Although not formalised as an action plan, highlighted within the Executive Summary highlighted under the subsection "Actions to Improve Air Quality" there are a number of measures listed which do directly impact the designated Penarth, Windsor Road AQMA.

Welsh Government's Local Policy Guidance, "Local Air Quality Management in Wales" June 2017 states;

4.14 *Local Authorities wishing to revoke or reduce an AQMA* ***should only do so with the approval of the Welsh Government following a review and consultation with the local communities affected****. The review should* ***clearly demonstrate national air quality objectives are being met and will continue to be met****. In other words, the Local Authority* ***should have confidence the observed improvements will be sustained****. Typically this requires* ***three years or more of full compliance****, but once the revocation or reduction has been agreed by the Welsh Government,* ***it should occur without delay****. Following a revocation, the Local Authority should ideally put in place a local or regional air quality strategy to ensure air quality remains a high-profile issue and conditions are prevented from deteriorating in future.*

A separate report will be published following this Annual Progress Report which will underpin the decision to revoke the Windsor Road AQMA and will include a public consultation on these proposals.

As outlined earlier within this report, the AQMA Revocation Decision Report will demonstrate existing compliant levels and ensure compliance for future years based on projected levels. The report will also highlight any suggestions and proposed works the VoGC are committed to undertaking within the locality of Windsor Road.

2. Air Quality Monitoring Data and Comparison with Air Quality Objectives

2.1 Summary of Monitoring Undertaken in 2018

2.1.1 Automatic Monitoring Sites

The Vale Council operated one automatic monitor station during 2018.

As previously discussed, in 2018 SRS on behalf of the VoGC has commissioned two near real-time indicative automatic monitors. The AQMesh analysers continuously monitor for Nitric Oxide, Nitrogen Dioxide & Ozone, PM10 & PM2.5, and do so every 15 minutes (data uploaded every hour). The data from the monitor is sent to a cloud server where it is corrected for temperature, pressure and relative humidity as well as cross gas interference.

Penarth, Windsor Road

This monitor is operated by Shared Regulatory Services (SRS) on behalf of the Vale Council and is classified as a roadside monitor. It was commissioned in 2014 following a re-location from the site (Grid reference: 317550, 171483) to be within the Windsor Road AQMA. The monitoring site measures nitrogen dioxide, PM_{10} and ozone (o_3) and forms part of the Welsh Air Quality Network. The station is calibrated by a Local Authority Officer on a fortnightly basis and serviced and maintained by an approved contractor on a six monthly basis following QA/QC checks. Data obtained from the monitor is checked for validation and ratified by Ricardo-AEA. For 2018, data capture for NO_2 was recorded at 99.7% and 95% for PM_{10}.

There are three diffusion tubes co-located at the station, whereby at the end of year, depending on data capture and precision, a locally derived bias adjustment factor is calculated. The bias adjustment factor derived from the co-location study was 0.63. This adjustment has not been applied to the network of diffusion tubes due to the fact that the National Bias Adjustment Factor supplied by the LAQM DEFRA website, based on 28 studies, which appointed Socotec Didcot laboratory, was slightly higher at 0.76. In order to provide a conservative approach it was therefore decided to adopt the nationally derived bias adjustment factor as this would give slightly higher concentrations and fundamentally represent a worst case scenario.

Figure 3 Map of Penarth, Windsor Road Automatic Monitoring Site

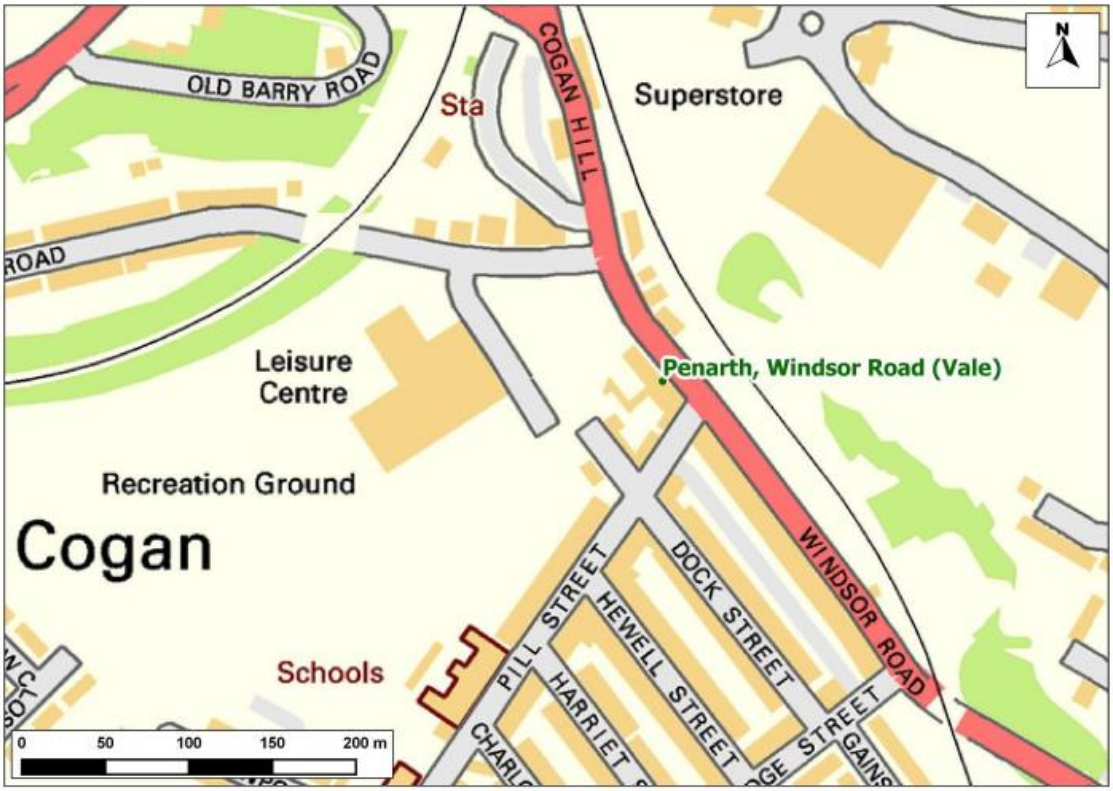


Table 1- Details of Automatic Monitoring Sites

Site ID	Site Name	Site Type	X OS Grid Reference	Y OS Grid Reference	Inlet Height (m)	Pollutants Monitored	In AQMA?	Monitoring Technique	Relevant Exposure? (Y/N with distance (m) from monitoring site to relevant exposure)	Distance to Kerb of Nearest Road (m) (N/A if not applicable)	Does this Location Represent Worst-Case Exposure?
Penarth, Windsor Road	Penarth, Windsor Road	Roadside	317598	172399	2.5	NO_2	Y	Chemiluminescent Analyser	Y (2m)	2m	Y
						PM_{10}		Beta Attenuation Monitor with Gravimetric Equivalence			
						O_3		UV absorption analyser			

2.1.2 Non-Automatic Monitoring Sites

Shared Regulatory Services (SRS) on behalf of the Vale of Glamorgan Council carries out monitoring of ambient air quality for Nitrogen Dioxide (NO_2). During the period since the Progress Report in 2018, monitoring of NO_2 using passive diffusion tubes has been carried out at 50 locations throughout the Vale. The locations of the diffusion tubes are described in Table 2 and shown in Figure 4- 14.

NO_2 Diffusion Tube Locations

The location of where NO_2 monitoring has taken place;

a. Cowbridge (Area A)
b. Llantwit Major (Area B)
c. St Athan (Area C)
d. Gileston (Area D)
e. Rhoose (Area E)
f. Saint Brides Major (Area F)
g. Culverhouse (Area G)
h. Dinas Powys (Area H)
i. Llandough (Area I)
j. Penarth (Area J)
k. Barry (Area K)

Laboratory Methods and Analysis of Diffusion Tubes

Analysis of the exposed tubes is carried out by Socotec UK Ltd Didcot operating procedure ANU/SOP/1015. The tubes are prepared by spiking acetone:triethanolomine (50:50) on the grids prior to the tubes being assembled. The tubes are desorbed with distilled water and the extract analysed using a segmented flow auto analyser with ultraviolet detection. As set out in the practical guidance the results were initially calculated assuming an ambient temperature of 11°C and then adjusted to 20°C to allow direct comparison with EU limits. The national bias correction factor for this laboratory was utilised as opposed to our own local co-location data. Adopting best practice guidance and adopting a conservative approach a bias correction factor of 0.76 was obtained and applied using the DEFRA website which is available using the following link; https://laqm.defra.gov.uk/bias-adjustment-factors/national-bias.html

Where valid data capture for the year is less than 75% (9 months), where necessary the continuous and NO_2 diffusion tube monitoring data have been ''annualised'' following the methods as described in Defra's LAQM (TG16), Boxes 7.9 & 7.10.

Where an exceedance is measured at a monitoring site not representative of public exposure, NO_2 concentration at the nearest relevant exposure has been estimated based on the "NO_2 fall-off with distance" calculator (http://laqm.defra.gov.uk/tools-monitoring-data/no2-falloff.html).The procedure is described in LAQM (TG16), Section 7.77-7.79.

Figure 4– AREA A – Cowbridge NO_2 Diffusion Tube Locations

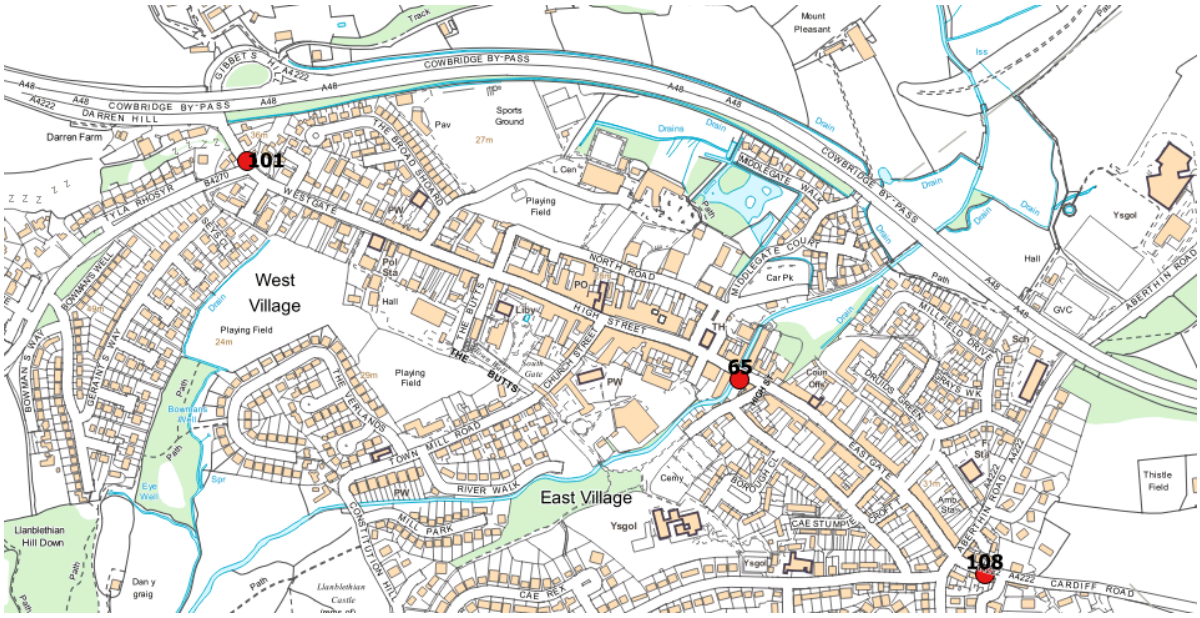


Figure 5– AREA B – Llantwit Major NO_2 Diffusion Tube Locations

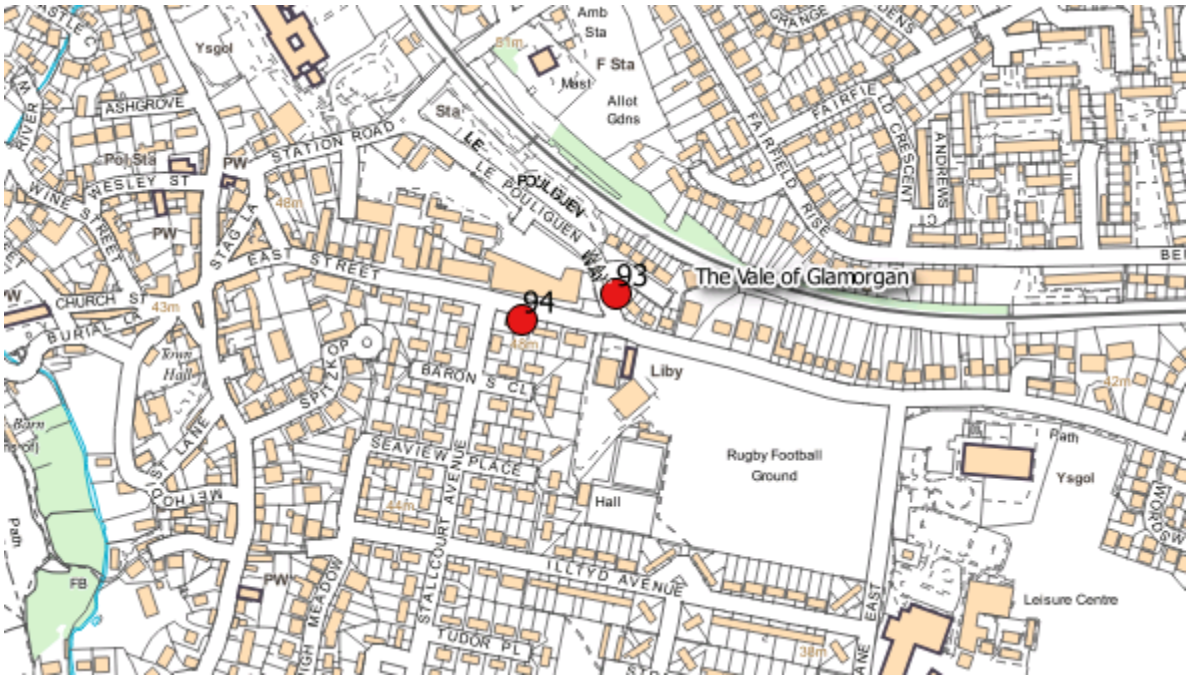


Figure 6– AREA C – St Athan NO_2 Diffusion Tube Locations

Figure 7– AREA D – Gileston NO_2 Diffusion Tube Locations

Figure 8– AREA E – Rhoose NO_2 Diffusion Tube Locations

Figure 9– AREA F – Saint Brides Major NO_2 Diffusion Tube Locations

Figure 10– AREA G – Culverhouse NO_2 Diffusion Tube Locations

Figure 11– AREA H – Dinas Powys NO_2 Diffusion Tube Locations

Figure 12– AREA I – Llandough & Cogan NO_2 Diffusion Tube Locations

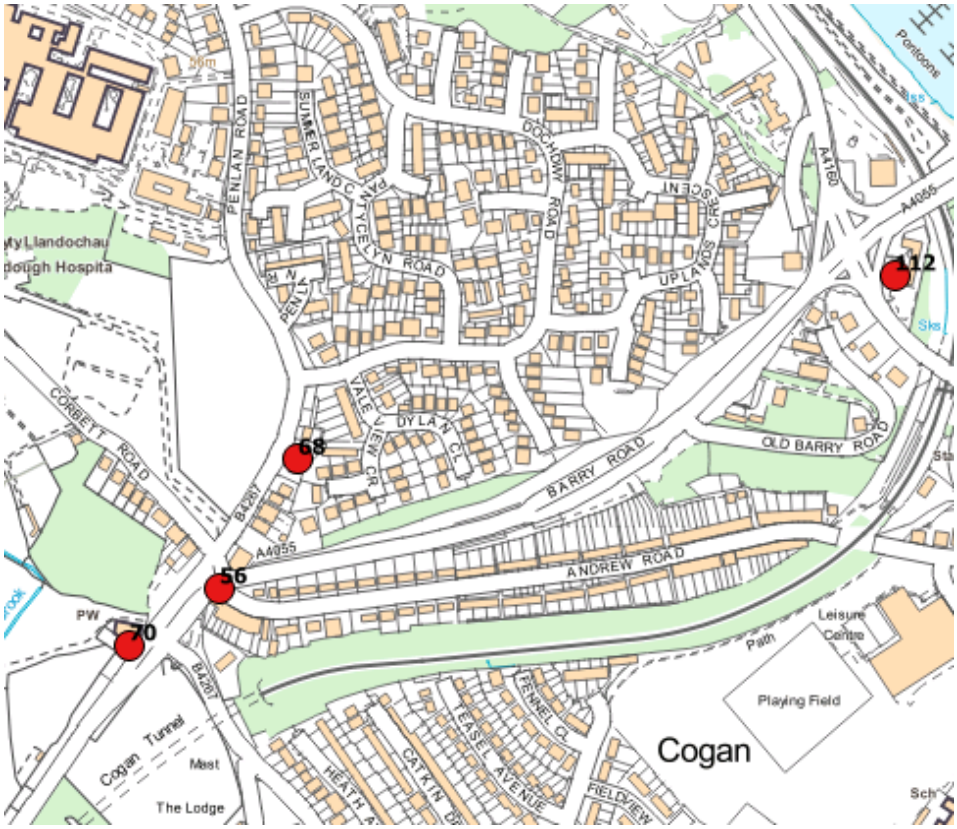


Figure 13– AREA J – Penarth NO_2 Diffusion Tube Locations

Figure 14– AREA K – Barry NO_2 Diffusion Tube Locations

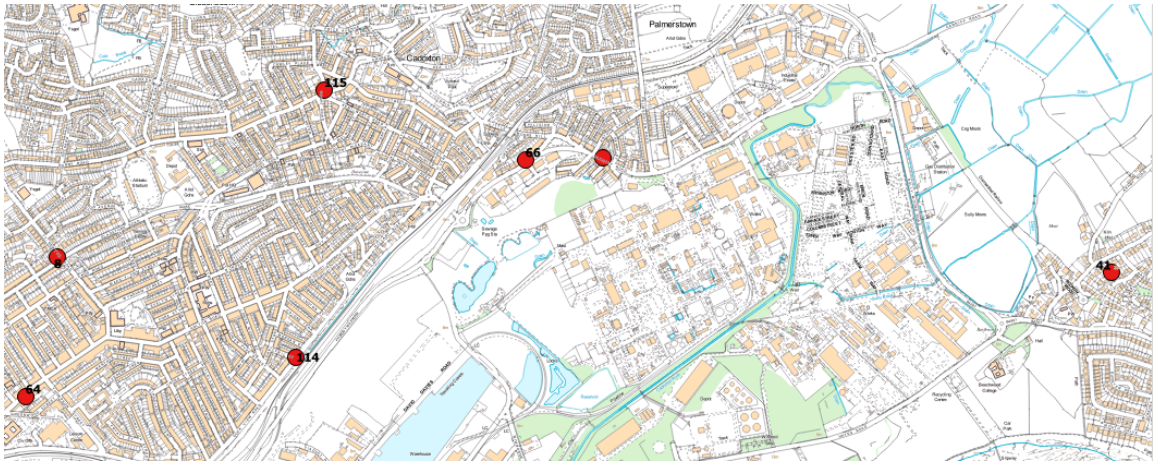


Table 2- Details of Non-Automatic Monitoring Sites 2018

Site ID	Site Name	Site Type	X OS Grid Reference	Y OS Grid Reference	Site Height (m)	Pollutants Monitored	In AQMA?	Is Monitoring Co-located with a Continuous Analyser (Y/N)	Relevant Exposure? (Y/N with (m) to relevant exposure)	Distance to Kerb of Nearest Road (m) (N/A if not applicable)	Does this Location Represent Worst-Case Exposure?
COWBRIDGE											
65	1 Riverside Mews, Cowbridge	Roadside	299614	174592	1.5	NO2	N	N	Y (0.00)	4m	Y
101	37 Westgate House	Kerbside	298903	174907	1.5	NO_2	N	N	Y (0.00)	0.75m	Y
108	4 Cardiff Road, Cowbridge	Kerbside	299967	174311	1.5	NO_2	N	N	Y (0.00)	0.75m	Y
LLANTWIT MAJOR											
93	Le Pouliguen Way	Roadside	297171	168741	1.5	NO2	N	N	Y (0.00)	4.8m	Y
94	5 Boverton Road	Roadside	297069	168715	1.5	NO2	N	N	Y (0.00)	7.4m	Y
95	Millands Caravan Park	Rural	298861	169236	1.5	NO_2	N	N	Y (0.00)	290m	Y
96	Old Froglands Farm	Suburban	299045	169126	1.5	NO_2	N	N	Y (0.00)	86m	Y
ST ATHAN											
97	7 Picketson Close	Urban Background	300460	169310	1.5	NO_2	N	N	Y (0.00)	30m	Y
GILESTON											
98	Orchard Way (Ivy Cottage)	Suburban/ Industrial	301899	167043	1.5	NO_2	N	N	Y (0.00)	450m	Y
RHOOSE											
99	Fonmon Road Lampost	Kerbside	304894	166898	1.5	NO_2	N	N	N (8.00)	0.9m	N
SAINT BRIDES MAJOR											
103	September Cottage	Roadside	289530	174896	1.5	NO2	N	N	Y (0.00)	6.5m	Y
104	Greengate Cottage	Roadside	289496	174858	1.5	NO2	N	N	Y (0.00)	12.5m	Y
105	St. Brides Primary School Walkway Entrance	Kerbside	289473	174752	1.5	NO_2	N	N	N (8.05)	0.95m	N
106	Dany Bryn House	Roadside	289454	174668	1.5	NO_2	N	N	Y (0.00)	2.1m	Y
107	Hillboro	Roadside	289512	174805	1.5	NO_2	N	N	Y (0.00)	7.5m	Y
CULVERHOUSE											

Site ID	Site Name	Site Type	X OS Grid Reference	Y OS Grid Reference	Site Height (m)	Pollutants Monitored	In AQMA?	Is Monitoring Co-located with a Continuous Analyser (Y/N)	Relevant Exposure? (Y/N with (m) to relevant exposure)	Distance to Kerb of Nearest Road (m) (N/A if not applicable)	Does this Location Represent Worst-Case Exposure?
38	2 Horseshoes	Roadside	311892	174513	1.5	NO2	N	N	Y (0.00)	2m	Y
DINAS POWYS											
47	Dinas Powys Health Centre	Urban Background	315710	171385	1.5	NO2	N	N	N (4.00)	16m	N
61	Railway Terrace	Roadside	316433	171932	2.5	NO2	N	N	Y (0.00)	2m	Y
67	2 Matthew Terrace	Roadside	316488	172004	1.5	NO2	N	N	Y (0.00)	2.5m	Y
72a	Dinas Powys Infants School	Roadside	315841	171527	1.5	NO2	N	Y	Y (0.00)	7m	Y
89	9 Wayside Cottages, Cardiff Road	Roadside	316447	171963	2.5	NO2	N	N	Y (0.00)	3m	Y
90	16 Railway Terrace, Cardiff Road	Roadside	316453	171945	1.5	NO2	N	N	Y (0.00)	3m	Y
109	85 Cardiff Road, Dinas Powys	Roadside	315739	171444	1.5	NO2	N	N	Y (0.00)	5m	Y
110	103 Cardiff Road, Dinas Powys	Roadside	31585	171555	1.5	NO2	N	N	Y (0.00)	4m	Y
111	203 Cardiff Road, Dinas Powys	Roadside	316366	171823	1.5	NO2	N	N	Y (0.00)	3m	Y
LLANDOUGH											
68	Glen View, 99 Penlan Road	Roadside	316886	172561	1.5	NO2	N	N	Y (0.00)	9m	Y
PENARTH											
22	Stanwell Road	Kerbside	318505	171496	1.5	NO2	N	N	N (8.00)	1m	N
53	168 Windsor Road	Roadside	317589	172411	1.5	NO2	Y	N	Y (0.00)	5m	Y

Site ID	Site Name	Site Type	X OS Grid Reference	Y OS Grid Reference	Site Height (m)	Pollutants Monitored	In AQMA?	Is Monitoring Co-located with a Continuous Analyser (Y/N)	Relevant Exposure? (Y/N with (m) to relevant exposure)	Distance to Kerb of Nearest Road (m) (N/A if not applicable)	Does this Location Represent Worst-Case Exposure?
55	159 Windsor Road	Roadside	317595	172435	1.5	NO2	Y	N	Y (0.00)	2m	Y
56	134 Andrew Road	Kerbside	316814	172443	1.5	NO2	N	N	Y (0.00)	10m	Y
62	154 Windsor Road	Roadside	317633	172357	1.5	NO2	Y	N	Y (0.00)	2m	Y
70	Ty-Isaf	Roadside	316731	172391	1.5	NO2	N	N	Y (0.00)	3m	Y
73a	Windsor Road Monitor 1	Roadside	317598	172399	1.5	NO2	Y	Y	2m	2m	Y
73b	Windsor Road Monitor 1	Roadside	317598	172399	1.5	NO2	Y	Y	2m	2m	Y
73c	Windsor Road Monitor 1	Roadside	317598	172399	1.5	NO2	Y	Y	2m	2m	Y
74	114 Windsor Road	Roadside	317708	172259	1.5	NO2	Y	N	Y (0.00)	2.5m	Y
76	160 Windsor Road	Roadside	317627	172371	1.5	NO2	Y	N	Y (0.00)	2.5m	Y
79	Marine Scene	Roadside	317549	172572	1.5	NO2	N	N	N (2.80)	1.2m	Y
82	98b Windsor Road	Roadside	318061	171944	1.5	NO2	N	N	Y (0.00)	8m	Y
88	134 Windsor Road	Roadside	317668	172312	1.5	NO2	Y	N	Y (0.00)	3.5m	Y
100	141 Plassey Street	Roadside	317968	172105	1.5	NO2	N	N	Y (0.00)	4.5m	Y
112	Cogan Hill Flats	Roadside	317434	172729	1.5	NO2	N	N	Y (0.00)	10m	Y
113	3 Plassey Street	Roadside	317999	172067	1.5	NO2	N	N	Y (0.00)	3m	Y
BARRY											
8	Tynewydd Road	Kerbside	311797	168503	1.5	NO2	N	N	N (4.00)	1m	N

Site ID	Site Name	Site Type	X OS Grid Reference	Y OS Grid Reference	Site Height (m)	Pollutants Monitored	In AQMA?	Is Monitoring Co-located with a Continuous Analyser (Y/N)	Relevant Exposure? (Y/N with (m) to relevant exposure)	Distance to Kerb of Nearest Road (m) (N/A if not applicable)	Does this Location Represent Worst-Case Exposure?
41	Dispenser Road	Urban Background	315278	168451	1.5	NO2	N	N	N	128m	N
64	Holton Road	Roadside	311690	168042	1.5	NO2	N	N	Y (0.00)	3m	Y
66	17 Churchill Terrace	Roadside	313342	168823	1.5	NO2	N	N	Y (0.00)	2.5m	Y
71	76 High Street (O'Donovans)	Roadside	310764	167505	1.5	NO2	N	N	Y (0.00)	2m	Y
83	24 Cardiff Road	Roadside	313597	168829	1.5	NO2	N	N	Y (4.5m)	1.5m	N
102	Powell Dyffryn Way	Roadside	311115	167041	1.5	NO2	N	N	N (3.40)	1m	N
114	107 Dock View Road	Roadside	312585	168171	1.5	NO2	N	N	Y (0.00)	3m	Y
115	20 Barry Road, Cadoxton	Kerbside	312677	168171	1.5	NO2	N	N	Y (0.00)	1m	Y

Notes:

1. 0m if the monitoring site is at a location of exposure (e.g. installed on the façade of a residential property**)**

2.2 2018 Air Quality Monitoring Results

Table 3– Non-automatic Annual Mean NO_2 Monitoring Results (2014- 2018)

Site ID	Site Type	Valid Data Capture 2018 (%) (1)	Within AQMA?	Annual Mean Concentration (µg/m³) - Adjusted for Bias (2)				
				2014 Bias Adjustment Factor = 0.91	2015 Bias Adjustment Factor = 0.88	2016 Bias Adjustment Factor = 0.78	2017 Bias Adjustment Factor = 0.77	2018 Bias Adjustment Factor = 0.76
COWBRIDGE								
65	Roadside	100	N	16.7	15.9	15.9	15.2	14.9
101	Kerbside	100	N	-	-	-	19.9	16.5
108	Kerbside	100	N	-	-	-	19.9	24.4
LLANTWIT MAJOR								
93	Roadside	92	N	-	-	-	11.3	10.9
94	Roadside	100	N	-	-	-	9.3	9.4
95	Rural	100	N	-	-	-	6.9	7.2
96	Suburban	92	N	-	-	-	9.4	10.2
ST ATHAN								
97	Urban Background	100	N	-	-	-	8.4	7.8
GILESTON								
98	Suburban/ Industrial	100	N	-	-	-	6.5	7.0
RHOOSE								
99	Kerbside	100	N	-	-	-	10.0 (2)	9.1/ 7.6(3)
SAINT BRIDES MAJOR								
103	Roadside	100	N	-	-	-	10.0	10.7
104	Roadside	75	N	-	-	-	10.5	11.2
105	Kerbside	92	N	-	-	-	12.3/ 9.3 (3)	12.1
106	Roadside	100	N	-	-	-	9.4	10.3
107	Roadside	92	N	-	-	-	7.3	7.7

Site ID	Site Type	Valid Data Capture 2018 (%) (1)	Within AQMA?	Annual Mean Concentration (µg/m^3) - Adjusted for Bias (2)				
				2014 Bias Adjustment Factor = 0.91	2015 Bias Adjustment Factor = 0.88	2016 Bias Adjustment Factor = 0.78	2017 Bias Adjustment Factor = 0.77	2018 Bias Adjustment Factor = 0.76
CULVERHOUSE CROSS								
38	Roadside	92	N	25.9	23.3	25.9(2)	19.6	19.4
DINAS POWYS								
46	Roadside	100	**N**	19.7	18.6	18.7	17.1	17.9
61	Roadside	100	N	31	30.1	31.5	30.4	31.0
67	Roadside	92	N	26	24.2	24.8(2)	21.4	23.6
72a	Roadside	83	N	27.8	23.8	21.9(2)	19.9	19.8
89	Roadside	83	N	31.2	30.8	31.8	28.3	27.9
90	Roadside	100	N	24.6	21.4	21.2	19.7	21.3
109	Roadside	92	N	-	-	-	-	19.4
110	Roadside	100	N	-	-	-	-	20.4
111	Roadside	100	N	-	-	-	-	23.6
LLANDOUGH								
68	Roadside	100	N	16.9	16.4	17.3	**15.1**	**15.2**
PENARTH								
22	Kerbside	100	N	24.4	23.7	23.6/ 20.0(3)	21.8/ 18.2 (3)	20.3/ 16.6(3)
53	Roadside	67	Y	31.2	30.8	31.5	29.8	27.7(2)

Site ID	Site Type	Valid Data Capture 2018 (%) (1)	Within AQMA?	Annual Mean Concentration (µg/m^3) - Adjusted for Bias (2)				
				2014 Bias Adjustment Factor = 0.91	2015 Bias Adjustment Factor = 0.88	2016 Bias Adjustment Factor = 0.78	2017 Bias Adjustment Factor = 0.77	2018 Bias Adjustment Factor = 0.76
55	Roadside	92	Y	27.1	27.7	28.9	26.3	26.3
56	Kerbside	100	N	33.9	**40.3/** 29.4(3)	17.5(2)	23.2	20.5
62	Roadside	83	Y	33.9	31.7	33.2	31.2	28.1
70	Roadside	100	N	21.9	23.2	24.6	20.3	22.3
73a	Roadside	92	Y	28.3	30.2	32.0	31.0	28.9
73b	Roadside	100	Y	28.3	29.8	31.0	30.6	29.7
73c	Roadside	100	Y	28.3	30	31.2	30.5	30.4
74	Roadside	67	Y	29.6	28	28.2	28.4	22.7(2)
76	Roadside	83	Y	33.9	32	32.4	30.7	29.9
79	Roadside	100	Y	39.6	37.5	**44.4**/ 37.2(3)	38.3/ 32.3 (3)	37.9/ 31.6(3)
82	Roadside	83	N	19.6	17.4	18.0	16.9	17.1
88	Roadside	75	Y	33.5	30.7	31.4	29.8	27.6
100	Roadside	100	N	-	-	-	23.9	24
112	Roadside	100	N	-	-	-	-	19.4
113	Roadside	92	N	-	-	-	-	21.7

Site ID	Site Type	Valid Data Capture 2018 (%) (1)	Within AQMA?	Annual Mean Concentration (µg/m^3) - Adjusted for Bias (2)				
				2014 Bias Adjustment Factor = 0.91	2015 Bias Adjustment Factor = 0.88	2016 Bias Adjustment Factor = 0.78	2017 Bias Adjustment Factor = 0.77	2018 Bias Adjustment Factor = 0.76
BARRY								
8	Kerbside	75	N	32.4	33.6(2)	23.5(2)	31.9/ 25.3 (3)	28.1/ 22.6(3)
41	Urban Background	100	N	13.1	13.1	14.5(2)	11.5	10.9
64	Roadside	100	N	20.2	20.8(2)	20.4(2)	17.5	16.6
66	Roadside	100	N	30.2	30.9	27.7	30.4	26.7
71	Roadside	92	N	17.8	18.4	17.9(2)	16.7	16.1
83	Roadside	92	N	23.2	23.2	24.9	27.7/ 22.4 (2 &3)	22.0/ 19.4(3)
102	Roadside	100	N	-	-	-	17.4 (2)	17.9/ 15.7(3)
114	Roadside	100	N	-	-	-	-	13.5
115	Kerbside	75	N	-	-	-	-	26.2

Notes:

Exceedances of the NO_2 annual mean objective of 40µg/m^3 are shown in **bold**.

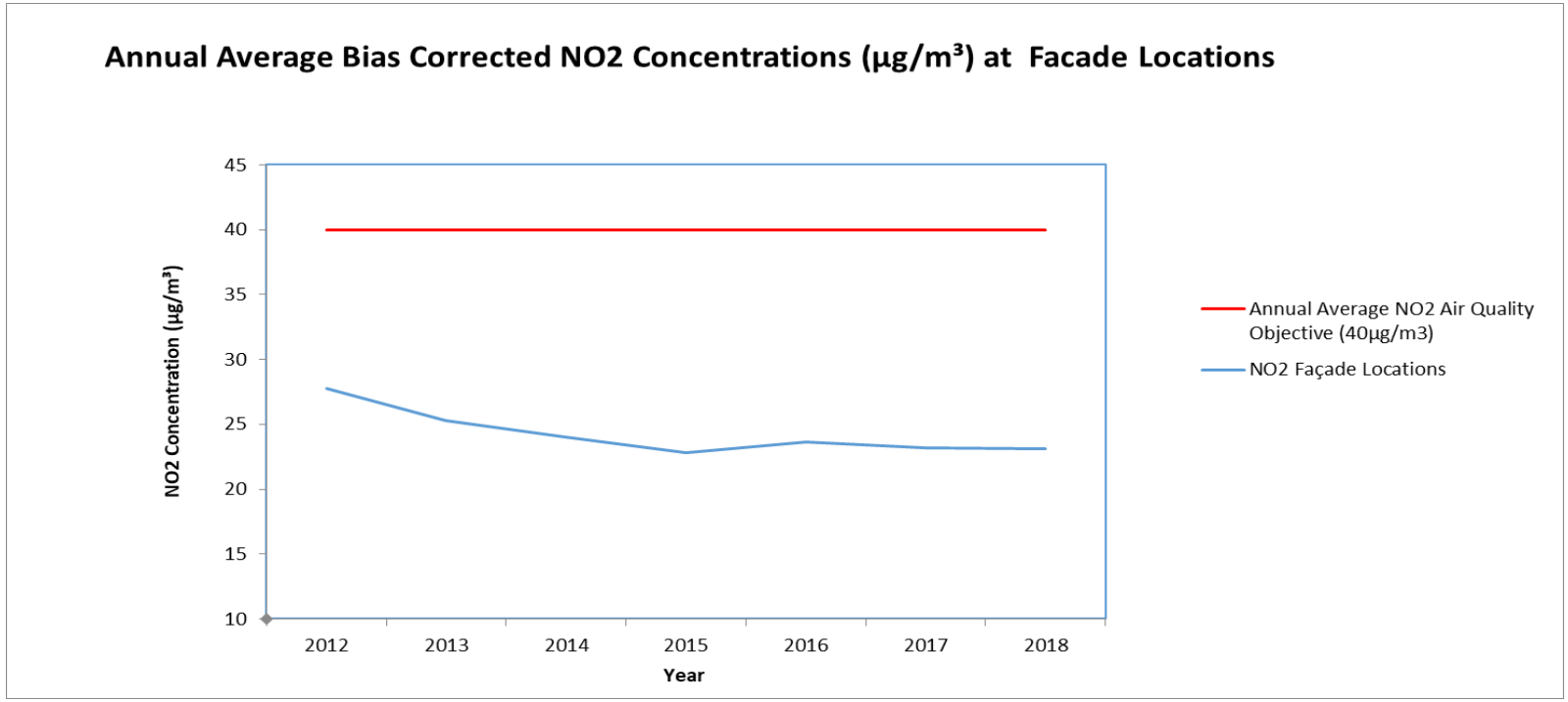
NO_2 annual means exceeding 60µg/m^3, indicating a potential exceedance of the NO_2 1-hour mean objective are shown in **bold and underlined.**

(1) Data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

(2) Diffusion tube data has been "bias adjusted" in accordance with Box 7.11 in LAQM.TG16 and "annualised" as per Boxes 7.9 and 7.10 in LAQM.TG16 if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

(3) Diffusion tube data has been corrected for distance to represent relevant exposure in accordance with Sections 7.77- 7.79 in LAQM.TG16 "Fall-off in NO2 concentrations with Distance from the Road"

Figure 15– Trends in Annual Mean Nitrogen Dioxide Concentrations Measured at Diffusion Tube Monitoring Sites



The graph represents annual average bias corrected NO_2 data since 2012. The locations examined represent worst case exposure due to the fact monitoring was undertaken at residential façade locations. The displayed average datasets indicate **compliant** NO_2 results in general for the Vale since 2012. The results are somewhat stable with a decreasing trend. As the network of diffusion tubes were amended for 2017 the graph does not capture a few previously included sites as these were decommissioned for 2017's monitoring.

Table 4– Automatic Annual Mean NO_2 Monitoring Results (2014- 2018)

Site ID	Site Type	Within AQMA?	Valid Data Capture for Monitoring Period % (1)	Valid Data Capture 2018 % (2)	Annual Mean Concentration (µg/m^3)				
					2014	2015	2016	2017	2018
Penarth, Windsor Road	Roadside	Y	100	99.7	27.7	26.5	28.3	26.5	24.5

Notes:
Exceedances of the Annual Average NO2 objective (40µg/m3) are shown in bold.
(1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.
(2) Data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).
(3) Data has been "annualised" as per Boxes 7.9 in LAQM.TG16 where valid data capture for the full calendar year is less than 75%. See Appendix C for details.

Table 5–Automatic 1-hour Mean NO_2 Monitoring Results (2014- 2018)

Site ID	Site Type	Within AQMA?	Valid Data Capture for Monitoring Period % (1)	Valid Data Capture 2018 % (2)	Number of Hourly Means (> 200µg/m^3)(3)				
					2014	2015	2016	2017	2018
Penarth, Windsor Road	Roadside	Y	100	99.7	0(86)	0	0	0	0

Notes:
Exceedances of the NO_2 1-hour mean objective (200µg/m^3 not to be exceeded more than 18 times/year) are shown in bold.
(1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.
(2) Data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).
(3) If the period of valid data is less than 85%, the 99.8th percentile of 1-hour means is provided in brackets.

Figure 16– Trends in Annual Mean NO_2 Concentrations Recorded at Windsor Road Automatic Monitoring Site

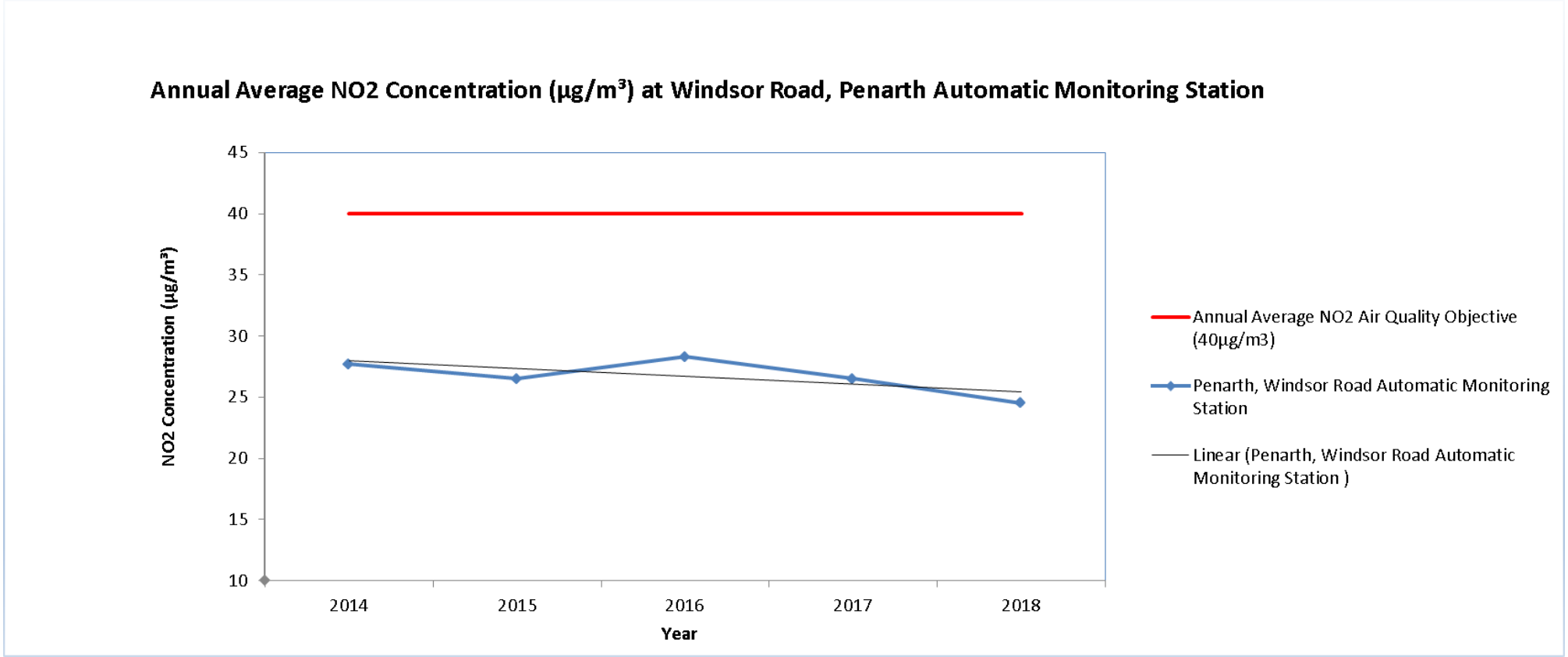


Figure 16 indicates a somewhat stable decreasing trend in annual average NO_2 concentrations recorded at the Penarth, Windsor Road AMS.

Table 6– Automatic Annual Mean PM_{10} Monitoring Results (2014- 2018)

Site ID	Site Type	Within AQMA?	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2018 (%) (2)	Confirm Gravimetric Equivalent (Y or N/A)	PM_{10} Annual Mean Concentration (µg/m^3) (3)				
						2014	2015	2016	2017	2018
Penarth, Windsor Road	Roadside	Y	100	95	Y	17.5(3)	20.8	21.4	15.6	21.7

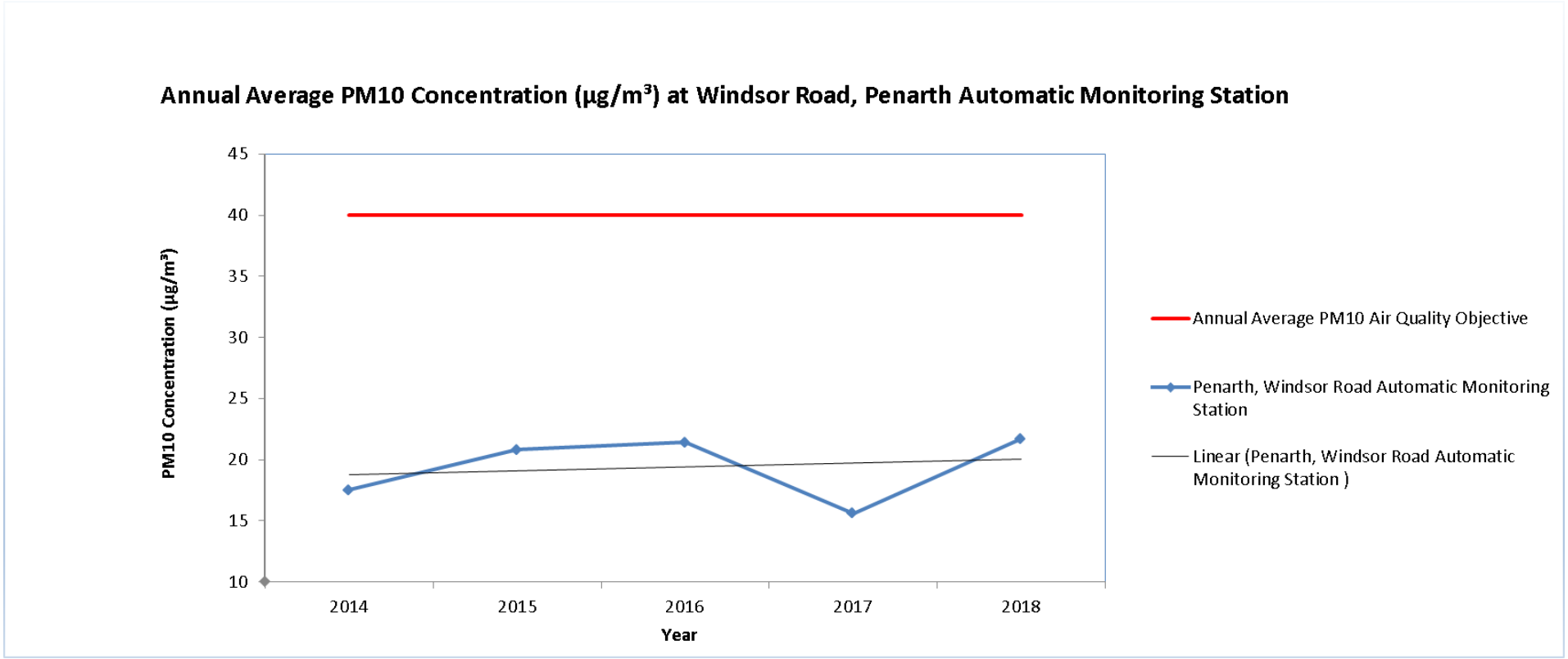
Notes:
Exceedances of the PM_{10} annual mean objective of 40µg/m^3 are shown in bold.
(1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.
(2) Data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).
(3) Data has been "annualised" as per Boxes 7.9 and 7.10 in LAQM.TG16 where valid data capture for the full calendar year is less than 75%. See Appendix C for details.

Table 7– Automatic 24-Hour Mean PM_{10} Monitoring Results (2014- 2018)

Site ID	Site Type	Within AQMA?	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2018 (%) (2)	Confirm Gravimetric Equivalent (Y or N/A)	Number of Daily Means > 50µg/m^3 (3)				
						2014	2015	2016	2017	2018
Penarth, Windsor Road	Roadside	Y	100	95	Y	0 (20.7)	4 (31.2)	1 (31.9)	2	0

Notes:
Exceedances of the PM_{10} 24-hour mean objective (50µg/m^3 not to be exceeded more than 35 times/year) are shown in **bold.**
(1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.
(2) Data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).
(3) If the period of valid data is less than 85%, the 90.4th percentile of 24-hour means is provided in brackets.

Figure 17– Trends in Annual Mean PM_{10} Concentrations Recorded at Windsor Road Automatic Monitoring Site



Examinig **Figure 17**; the displayed datasets indicate a compliant stable trend in PM_{10} levels at the Penarth, Windsor Road AMS.

Table 8– Automatic Ozone (O3) Monitoring Results: Comparison with Objectives

Site ID	Site Type	Within AQMA?	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2018 (%) (2)	Number of Exceedences
					Number of days where the 8-hour mean >100µg/m^3
Penarth, Windsor Road	Roadside	Y	100	81	0

Notes

(1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

(2) Data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

2.3 Comparison of 2018 Monitoring Results with Previous Years and the Air Quality Objectives

During 2018 monitoring was carried out for nitrogen dioxide (NO_2), particulate matter (PM_{10}), and ozone (O_3).

2.3.1 Nitrogen Dioxide (NO_2)

Nitrogen dioxide was measured during 2018 at one site equipped with an automatic NOx analyser and by a network of 52 passive diffusion tubes.

In order to ratify the 2018 diffusion tube dataset, a bias adjustment factor of 0.76 was applied to the annual average readings. The factor was derived from the Defra website which gave the average correction factor from 28 co-location studies across the UK, whereby the analytical laboratory and method used was the same as the VoGC. The national bias correction factor was utilized as it would provide results representative of a worst case scenario. The bias correction factor of 0.76 was obtained from the following website: http://laqm.defra.gov.uk/bias-adjustment-factors/national-bias.html

Automatic Monitoring Data

Monitoring of NO_2 has continued to be carried out at the Penarth, Windsor Road site. As previously discussed, 2018 saw the introduction of two near real time automated indicative monitoring commissioned by SRS on behalf of the VoGC and installed in the Barry area.

Datasets obtained from the Penarth, Windsor Road site have been cross referenced to the annual and 1-hour average objectives set for NO_2. The findings summarised in Table 4 Table 5 indicate compliance with both objectives.

Non- automated Monitoring Data

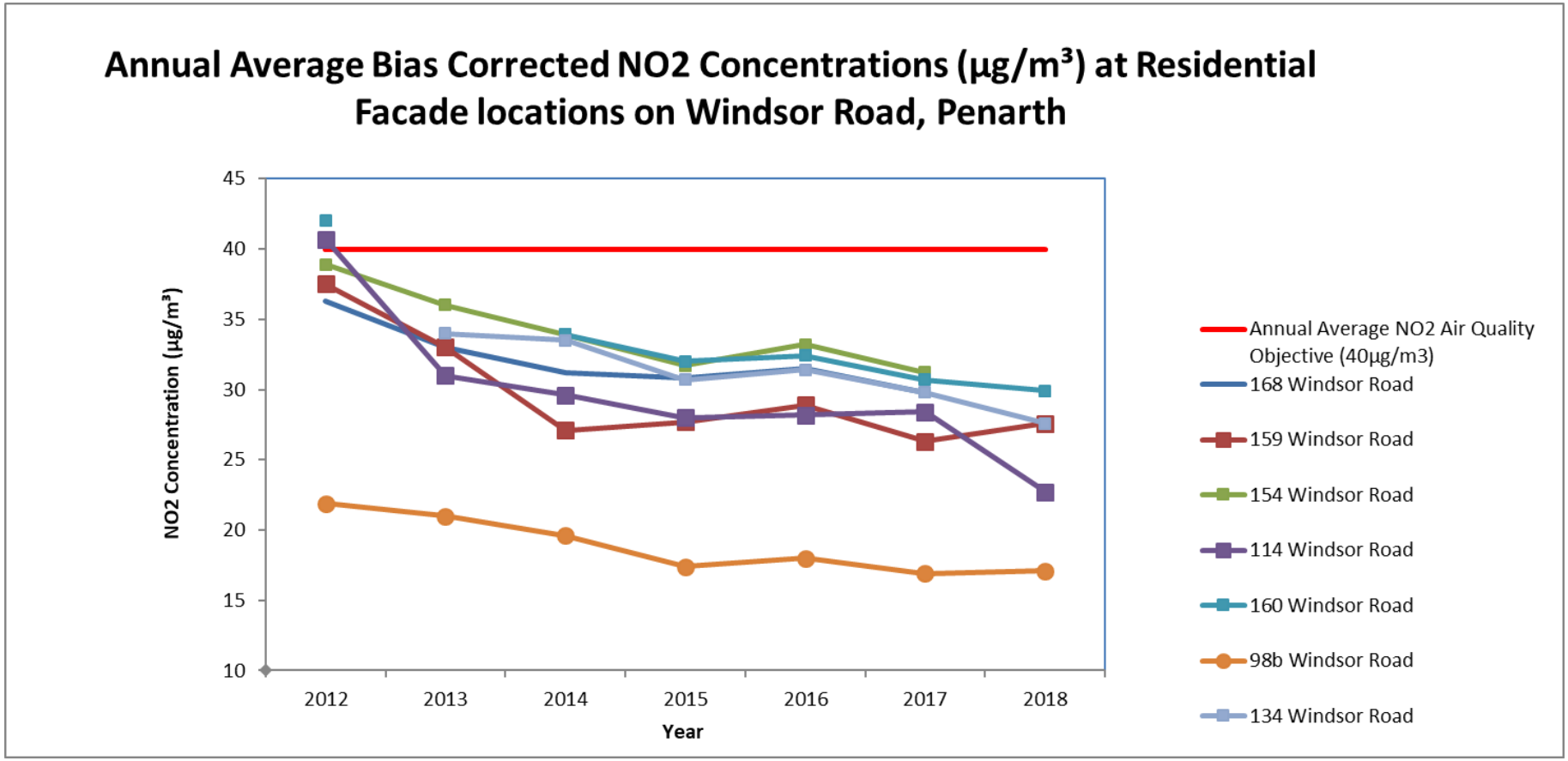
The nitrogen dioxide diffusion tube data is summarised in Table 3. The full dataset (raw monthly mean values) is included in Appendix A. All data displayed in Table 3 has been bias adjusted and where necessary annualised in accordance with Box 7.10 of LAQM TG(16), as well corrected for distance to the nearest sensitive receptor. Evidence of the sites annualised can be seen in Appendix C. The applied bias adjustment factor was 0.76, as described in Appendix C.

As outlined by Table 3; the nitrogen dioxide concentrations measured by the passive diffusion tubes show that there were no exceedences of the national air quality objectives for NO_2 (annual average 40µg/m^3 & 1-hour average 200µg/m^3 not be exceeded more than 18 times per year). In accordance with LAQM best practise guidance; there are no monitoring sites in the district with annual average concentrations above 60µg/m^3 in 2018. Therefore this indicates it is unlikely that the hourly nitrogen dioxide objective was exceeded.

As previously detailed, due to continual compliance with the national air quality objectives set for NO_2 the Vale of Glamorgan Council wish to revoke the Windsor Road, Cogan, Penarth AQMA.

Figure 18 illustrates the annual average NO_2 datasets recorded at residential facades within the Windsor Road AQMA. The graph indicates compliance with the annual average objective at every monitored location since 2013.

Figure 18- Trends in Annual Average NO_2 Concentrations Recorded at Façade Locations on Windsor Road, Penarth



2.3.2 Particulate Matter (PM_{10})

Continuous monitoring of PM_{10} is undertaken at one automatic monitoring site in The Vale District. The Penarth, Windsor Road site is located within the declared AQMA and calculates particulate matter using a gravimetric Beta Attenuation Monitor (BAM).

The PM_{10} data from Windsor Road monitor has been provided as gravimetric equivalence (applying the conversion factor of 0.83 as stipulated in Defra's LAQM TG(16), Section 7.151). The results are presented in Table 6 Table 7.

The results of the monitoring indicate that recorded PM_{10} concentrations at the Windsor Road monitoring station are compliant with both the annual mean (40µg/m^3) and 24-hour mean (>50 µg/m^3 not to be exceeded more than 18 times per year) AQS objectives set for PM_{10}.

2.3.3 Other Pollutants Monitored

Ozone (O_3)

The Vale monitors Ozone due to its potential correlations with other pollutants. In 2018, ozone was measured at the Windsor Road, Penarth monitoring site. Although Ozone is not included in the Local Air Quality Management system, the results are included in Table 8 for completeness. The results are compared with the running 8-hour mean objective as set by the Expert Panel on Air Quality Standards (EPAQs) which states the running 8-hour mean should not exceed 100µg/m3 on more than 10 days per year. There are no exceedences of the ozone objective in the Vale in 2018.

2.4 Summary of Compliance with AQS Objectives as of 2018

SRS have reviewed the results from the monitoring undertaken across the Vale of Glamorgan area in 2018.

The automated and non- automated datasets show compliance with the AQS objectives at **all locations.**

Based on continued compliance over a three year period with the national air quality objectives set for NO_2 (annual average 40µg/m^3 & 1-hour average 200µg/m^3 not be exceeded more than 18 times per year), in accordance with Local Air Quality Management in Wales, Policy Guidance, June 2017, the Vale of Glamorgan Council wish to revoke the Penarth, Windsor Road AQMA. As documented works are currently ongoing to revoke the Windsor Road, Cogan, Penarth AQMA Order and a public consultation is imminent to respond to the Council's decision.

3. New Local Developments

3.1 Road Traffic Sources (& other transport)

SRS on behalf of VoGC continue to work and engage with the Transport and Highways team in the Council, consulting upon any road network proposals that have the potential to influence local air quality levels.

3.1.1 Narrow Congested Streets with Residential Properties Close to the Kerb

SRS on behalf of the VoGC has considered road traffic sources extensively in both this and earlier reports; the monitoring network is very largely focused on measuring concentrations of nitrogen dioxide close to many of them. These have been discussed either in previous reports or earlier in this report.

There are no newly identified road traffic sources which need to be considered.

For 2018 SRS on behalf of the VoGC Council 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.

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

SRS on behalf of the VoGC confirms that there are no new/newly identified busy streets where people may spend 1 hour or more close to traffic.

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

SRS on behalf of the VoGC confirms that there are no new/newly identified roads with high flows of buses/HDVs.

3.1.4 Junctions

Junctions have been fully considered in previous annual reviews and assessments.

SRS on behalf of the VoGC can confirm that there are no new/newly identified busy junctions/busy roads where exceedences of either the NO_2 or PM_{10} objectives are likely.

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

Northern Access Road

As highlighted in the 2018 APR, SRS on behalf of the VoGC can confirm, following approval in late 2017, construction works had begun for the Northern Access Road (NAR) which will provide a link from the B4265 near Llantwit Major in the west to Eglwys Brewis Road in Picketston in the east. Works to construct these developments are currently ongoing.

As previously outlined in the 2017 APR, as highlighted by the supporting air quality assessment (AQA);

Predicted annual mean NO_2 and Particulate Matter (PM10 and PM2.5) concentrations are expected to be well below the annual mean objective at all receptors in the study area. Overall, receptors are predicted to experience a negligible effect in accordance with the Institute of Air Quality Management (IAQM) /Environmental Protection UK (EPUK) guidance (2015), which is considered to be not significant, in both the opening year of 2019 and the future year of 2034.

The AQA did indicate a degree of risk identified with respect to dust and PM_{10} as a result of construction phase activities. The report states;

> ***"There are estimated to be between ten and 100 dust sensitive properties within 20 m of potential construction work areas within the Site. The sensitivity of the area to dust soiling due to the construction activity is therefore considered to be high***."
>
> ***"The medium dust emission magnitude coupled with the high sensitivity to property and amenity effects suggests that the risk of dust impacts to property and amenity due to construction activity is medium."***

In response to these findings a pre commencement planning condition was implemented;

Condition: Dust Control

Prior to the commencement of development a scheme (Construction Environmental Management Plan) to minimise dust emissions arising from demolition and construction activities on site shall be submitted to and approved in writing by the Local Planning Authority. The scheme shall include details of dust suppression measures and the methods to monitor emissions of dust arising from the development. The construction phase shall be implemented in accordance with the approved

scheme, with the approved dust suppression measures being maintained in a fully functional condition for the duration of the construction phase.

Reason: To assess air quality and agree any mitigation measures that may be required to safeguard the amenity of nearby residents in the area.

The CEMP was received and condition was discharged.

Non-automatic NO_2 diffusion tube monitoring has continued at specific sensitive receptor locations in the vicinity of the proposed development.

A4226 '5 Mile Lane' road infrastructure improvement works

The A4226 (Five Mile Lane) connects Barry at the Waycock Cross roundabout with the Sycamore Cross junction on the A48, and comprises an essential part of the highway network leading to the Enterprise Zone. The proposed Five Mile Lane Highway Improvements stem from the Welsh Government's proposals to trunk the route Culverhouse Cross – Sycamore Cross – Five Mile Lane – Airport. The Council has previously received a Principal Road Grant from the Welsh Government to advance the Five Mile Lane Highway Improvement Scheme, and to date this work has involved the signalisation of Sycamore Cross junction, as well as initial design and feasibility work together with various environmental assessments.

In 2018 works have initiated for the improvement works on the A4226. These works are currently ongoing.

3.1.6 Roads with Significantly Changed Traffic Flows

The criteria for assessing roads with significantly changed traffic flows are set out in Table 7.1, row/point 6 of Defras' LAQM TG(16), 2018. Predictions of increased traffic do not approach 25% on roads with more than 10,000 vpd.

SRS on behalf of the VoGC confirms that there are no new/newly identified roads with significantly changed traffic flows.

3.1.7 Bus and Coach Stations

SRS on behalf of the VoGC confirms that there are no relevant bus stations in the Local Authority area.

3.1.8 Airports

The criteria for assessing airports are set out in Section 7.16 of Defra's LAQM TG(16), 2018. The Vale confirms that there are two airports in the Local Authority area: Cardiff Wales Airport and MOD St Athan. Neither of these airports meets the criteria for further consideration.

SRS on behalf of the VoGC confirms that there are no airports meeting the criteria in the Local Authority area.

3.1.9 Railways (Diesel and Steam Trains)

Defra's LAQM TG(16), 2018 suggests that SO_2 emissions from diesel locomotives may be significant if there are outdoor locations where locomotives are regularly stationary for more than 15minutes and where members of the public could be regularly exposed over this period at such locations.

Defra's LAQM TG(16), 2018 also requires consideration exposure to nitrogen dioxide within 30m of certain specified railway lines in those areas where the annual mean background concentration is above 25µgm^{-3}.

Stationary Trains

SRS on behalf of the VoGC 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.

Moving Trains

LAQM TG(09) introduced a new requirement to assess the potential for exceedence of nitrogen dioxide objectives. The assessment criteria are in relation to large numbers of diesel locomotive movements where there is relevant exposure within 30metres of the track in areas where the background annual mean concentration of nitrogen dioxide is above 25µm^3.

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

3.1.10 Ports (Shipping)

SRS on behalf of the VoGC confirms that there are no ports or shipping that meets the specified criteria within the Local Authority area.

3.2 Industrial / Fugitive or Uncontrolled Sources / Commercial Sources

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

Biomass Gasification Facility, Woodham Road, Barry

As previously outlined in the 2017 APR; on the 31st July 2015 the Vale Council approved planning permission for the construction and operation of a biomass gasification facility at Woodham Road, Barry, CF63 4JE (Grid Reference ST 12610 67683). It was noted in the 2017 APR that Natural Resources Wales (NRW) were going through a second round of consultation in regards to a permit application for the proposed operation, submitted by Biomass UK NO.2 Ltd. This second round of consultation was formed as a result of a Section 5 amendment direction sanctioned by NRW; "NRW Schedule 5 notice re Biomass requesting more information" dated 4 May 2017. As part of the amendment a revised air quality assessment (AQA) was submitted in July 2017. Following much dialogue involving comments passed by SRS on behalf of VoGC, NRW granted approval for the sites permit application in February 2018.

Cog Moors Wastewater Treatment Works

In the late part of 2017 a full permission was sought after for the following proposal;

2017/01203/FUL- for the change of use of land as an extension to the existing wastewater treatment works site and the construction of an Advanced Anaerobic Digestion (AAD) Plant, together with associated landscaping and mitigation measures and the formation of a temporary construction compound at Cog Moors Wastewater Treatment Works (WwTW), Cardiff Road, Dinas Powys.

Supporting AQA was submitted in accordance with the referenced planning application. The assessment concluded;

The results of the pollution model indicate that the AAD plant will not lead to exceedances of air pollution thresholds, and pollution levels are expected to be well below human health based thresholds with the plant in operation. The emissions from the AAD plant are also predicted to have no significant effects on ecology and habitats.

The application was approved in 2018.

3.2.2 Existing Installations where Emissions have Increased Substantially or New Relevant Exposure has been introduced

SRS on behalf of the VoGC can confirm 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.

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

There are no new or significantly changed industrial installations for which previous air quality assessments have not been carried out and which could give rise to potentially significant emissions of regulated pollutants either within the Vale or within neighbouring local authorities.

SRS on behalf of the VoGC can confirm that there are new or proposed industrial installations for which planning approval has been granted within its area or nearby in a neighbouring authority.

3.2.4 Major Fuel (Petrol) Storage Depots

SRS on behalf of the VoGC can confirm that there are major fuel (petrol) storage depots within the Local Authority area, but these have been considered in previous reports.

3.2.5 Petrol Stations

There are no new petrol stations in the Vale District with throughputs greater than 2000m^3 per annum with a busy road nearby where there is relevant exposure within 10m of the pumps.

It is not necessary, therefore, to consider this further.

SRS on behalf of the VoGC can confirm that there are no petrol stations meeting the specified criteria**.**

3.2.6 Poultry Farms

The criteria for assessing poultry farms are set out in Table 7.3, point 4 of TG(16) (Defra, 2016). No farms exceeding the relevant criteria (turkey units with greater than 100,000 birds, naturally ventilated units with greater than 200,000 birds or mechanically ventilated units with greater than 400,000) have been identified.

SRS on behalf of the VoGC can confirm that there are no poultry farms meeting the specified criteria.

3.3 Commercial and Domestic Sources

3.3.1 Biomass Combustion – Individual Installations

As highlighted in Section 3.2.1 a permit application for the biomass gasification facility at Woodham Road, Barry was approved by Natural Resources Wales (NRW). Commissioning works took place during 2018, however the facility is not currently operational.

The facility is regulated under a Natural Resources Wales Environmental Permit (Permit Number: EPR/AB3790ZB) which outlines an emissions to air schedule. This permit specifies emissions generated at the source, i.e. the stack exhaust. The schedule provides a monitoring time schedule and applicable emissions monitoring standards that are required. Monitoring undertaken to comply with the conditions within the permit will be facilitated by accredited personnel and equipment.

3.3.2 Biomass Combustion – Combined Impacts

Previous reports have confirmed that there are no known areas in The Vale District where coal or solid fuel burning provides a significant level or primary household heating. Nothing has changed in this regard since the 2018 APR, despite the potential for increasing popularity of solid fuel heating with increased fossil-fuel prices, and there is no need to consider this further at this time.

SRS on behalf of the VoGC can confirm that there are no biomass combustion plants in the Local Authority area.

3.3.3 Other Sources

3.3.4 Domestic Solid-Fuel Burning

Previous reports have confirmed that there are no known areas in The Vale District where coal or solid fuel burning provides a significant level or primary household heating. Nothing has changed in this regard since the 2018 APR, despite the potential for increasing popularity of solid fuel heating with increased fossil-fuel prices, and there is no need to consider this further at this time.

It should be noted that the Council receives a number of enquiries each year from residents in respect of national or local requirements were they to wish to install log-burners or similar appliances in their homes. There are no smoke control areas in The Vale and hence no legal requirements with regard to appliances that may be installed. However, residents are always reminded of the legislation in respect of statutory smoke nuisance and, where they can't be

persuaded otherwise for reasons of air quality and health, recommended to seek out an appliance certified for use in a smoke control area.

SRS on behalf of the VoGC can confirm that there are no areas of significant domestic fuel use in the Local Authority area.

3.4 New Developments with Fugitive or Uncontrolled Sources

There are no new locations where fugitive could occur which have not been covered by previous rounds of review and assessment and no locations where new relevant exposure has been introduced to existing locations.

It is not considered necessary to consider this further at this time.

SRS on behalf of the VoGC can confirm that there are no potential sources of fugitive emissions in the Local Authority area.

3.5 Planning Applications

2017/01136/HYB- St Cyres School, Murch Crescent, Dinas Powys Residential Development

Full application for residential development for 215 units, highways and drainage infrastructure and associated landscaping; and Outline application in respect of the community and recreational use zone.

The referenced proposal was received in 2017 and following review of the submitted documentation was approved at the start of 2018.

An AQA was submitted as part of the proposal.

The main outcomes to be drawn from the AQA report are;

1. The operational impact of the Proposed Development on existing receptors is predicted to be “negligible”
2. For the construction phase, the most important consideration is dust. Without appropriate mitigation, dust could cause temporary soiling of surfaces, particularly windows, cars and laundry. The mitigation measures provided within this report should ensure that the risk of adverse dust effects is reduced to a level categorised as “not significant”.

With regards to the element of risk associated with the construction phase of the development, it is therefore considered essential that a suitable Construction Environmental Management Plan outlining a detailed Dust Management Plan with appropriate measures be submitted and approved prior to the development proceeding.

Condition: Dust Control

Prior to the commencement of development a scheme (Construction Environmental Management Plan) to minimise dust emissions arising from demolition and construction activities on site shall be submitted to and approved in writing by the Local Planning Authority. The scheme shall include details of dust suppression measures and the methods to monitor emissions of dust arising from the development. The construction phase shall be implemented in accordance with the approved scheme, with the approved dust suppression measures being maintained in a fully functional condition for the duration of the construction phase.

Reason: To assess air quality and agree any mitigation measures that may be required to safeguard the amenity of nearby residents in the area.

2017/00564/FUL- Northern Access Road

As described in Section 3.1.5.

4. Polices and Strategies Affecting Airborne Pollution

4.1 Air Quality Planning Policies

Local Development Plan (LDP) 2011- 2026.

On the 28th June 2017 the Council adopted the Vale of Glamorgan Local Development Plan 2011-2026. The LDP became operative on its adoption and supersedes the previous adopted Unitary Development Plan (UDP). The LDP will be the basis for decisions on land use planning in the Vale of Glamorgan and will be used by the Council to guide and manage new development proposals.

The Plan sets out the vision, objectives, strategy and policies for managing development in the Vale of Glamorgan, and contains a number of local planning policies and makes provision for the use of land for the purposes of housing, employment, retailing, recreation, transport, tourism, minerals, waste, and community uses. It also seeks to identify the infrastructure that will be required to meet the growth anticipated in the Vale of Glamorgan up to 2026, and provides a monitoring framework for assessing the effectiveness of the Plan.

Also highlighted within the LDP document is Policy **MD7** (Environmental Protection);

POLICY MD7 -

ENVIRONMENTAL PROTECTION

Development proposals will be required to demonstrate they will not result in an unacceptable impact on people, residential amenity, property and / or the natural environment from either:

1. Pollution of land, surface water, ground water and the air;
2. Land contamination;
3. Hazardous substances;
4. Noise, vibration, odour nuisance and light pollution;
5. Flood risk and consequences;
6. Coastal erosion or land stability;
7. The loss of the best and most versatile agricultural land; or
8. Any other identified risk to public health and safety.

Where impacts are identified the Council will require applicants to demonstrate that appropriate measures can be taken to minimise the impact identified to an acceptable level. Planning conditions may be imposed or legal obligation entered into, to secure any necessary mitigation and monitoring processes.

Featured as a main objective of the adopted LDP;

Objective 4- To protect and enhance the Vale of Glamorgan's historic, built and natural environment

4.8 The historic, built and natural environment of the Vale of Glamorgan is highly valued by residents and visitors and includes European, National and local designations which provide local identity and distinctiveness and present opportunities for recreation and tourism. The LDP will ensure that these natural and built environmental assets are protected, conserved and where appropriate enhanced as an important resource for local people and which attract visitors and contributes to the local economy.

4.3 Local Transport Plans and Strategies

The Local Transport Plan (LTP) 2015- 2030.

The Vale of Glamorgan authority is part of the Capital Region which comprises of Cardiff and the nine south east unitary authorities. The implementation of this policy was carried out in order to support Welsh Government's vision in the future development of the Capital Region and commitment to a low carbon future.

"The Capital Region is committed to a low carbon future, which has a transport network and mobility culture that positively contributes to a thriving economy and the health and wellbeing of its citizens and where sustainable travel is the option of choice"

The LTP looks to tackle growing traffic levels (and hence air quality impacts) by providing strategies which focus upon providing efficient and effective transport networks. In order to be successful the plans need a collaborative approach for the future development of the Capital Region's transport needs, therefore providing improved mobility for both residents and visitors, enhanced accessibility to jobs and services and fundamentally sustainable economic growth.

"This Local Transport Plan (LTP) seeks to identify the sustainable transport measures required to ensure the Vale of Glamorgan Council adheres to current requirements and good practices to allow

for a sustainable transport environment for the period 2015 to 2020 as well as looking forward to 2030"

The LTP policy recognises the Council's objective to achieving sustainable travel (alternatives to using cars) and reducing negative impacts on the environment. The policy suggests that through improved transport infrastructure and transport services this can be achieved.

4.2 Active Travel Plans and Strategies

Walking and Cycling

Walking and Cycling are sustainable and practical alternatives to the private car, supporting healthy lifestyles and reducing the impact on the environment. An essential element in encouraging an increase in walking and cycling is the provision of a network of high quality dedicated routes that link communities and provide access to local retail, employment and recreation opportunities. The LDP will seek to encourage and give priority to those proposals that enhance opportunities for walking and cycling.

The LDP includes the following policy which draws upon specific projects targeted for the Vale District;

POLICY MG16 – TRANSPORT PROPOSALS

WALKING AND CYCLING

1. National Cycle Network Route 88 and associated local urban and rural connections
2. A4050 Port Road to Cardiff Airport.
3. A48 Culverhouse Cross to Bridgend.
4. Eglwys Brewis Road in conjunction with the proposed Northern Access Road, St Athan Enterprise Zone.
5. Barry waterfront to Dinas Powys.

The Council has a long standing commitment to develop the National Cycle Network within the Vale of Glamorgan. NCN Route 88 links NCN Route 4 at Margam Park in the County Borough of Bridgend, through the Vale of Glamorgan to the start of NCN Route 8 in Cardiff Bay. A feasibility study that

identifies an indicative but preferred route for NCN 88 has been prepared for the Vale of Glamorgan Council by Sustrans and this is shown on the LDP Proposals Map, found using the following link;

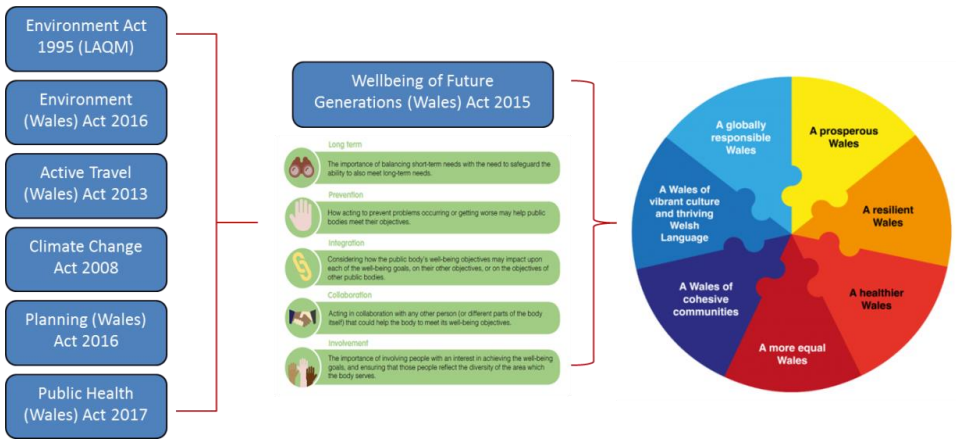
http://www.valeofglamorgan.gov.uk/Documents/Living/Planning/Policy/LDP/LDP-Adoption/Adopted-LDP-Proposals-Map.pdf

4.3 Local Authorities Well-being Objectives

In 2015 Welsh Government made a new law called the Well-being of Future Generations (Wales) Act. The new law has the sustainable development principle at its heart. This means that we need to work in a way that improves wellbeing for people today without doing anything that could make things worse for future generations.

As highlighted in the earlier Figure 1, there are seven national well-being goals that form the basis of the Act and five ways of working which support the goals.

Figure 1- The Well- being of Future Generations (Wales) Act 2015 Matrix



VoGC adopts the principles of The Well-being of Future Generations (Wales) Act 2015. The Act is a significant enabler to improve air quality as it calls for sustainable cross-sector action based on the principles of long-term, prevention-focused integration, collaboration and involvement. It intends to improve economic, social, environmental and cultural well-being in Wales to ensure the needs of the present are met without compromising the ability of future generations to meet their own needs.

4.4 Climate Change Strategies

Featured in the adopted LDP, a main objective of the LDP is;

To ensure that development within the Vale of Glamorgan makes a positive contribution towards reducing the impact of and mitigating the adverse effects of climate change.

The LDP will seek to ensure that new development makes a positive contribution towards reducing the impact of and mitigating the adverse effects of climate change. New development will be located in sustainable locations that minimise the need to travel, incorporate sustainable design and building solutions. The Council's Renewable Energy Assessment (2016) has identified opportunities in the Vale of Glamorgan for a range of renewable energy schemes, particularly from standalone solar PV developments, small clusters of wind energy potential, biomass, and micro generation including Building Integrated Renewables [BIR]. Accordingly, to contribute towards meeting national renewable energy targets the Plan includes monitoring targets to meet 21.19% of projected electricity demand and 1.48% of projected heat demand in the Vale of Glamorgan through renewable sources by 2026. Therefore, the LDP will also promote energy conservation and local renewable energy generation. To mitigate the adverse effects of climate change new development will avoid areas susceptible to flooding.

Green Dragon

The Council is committed to obtaining at least Green Dragon Level 1 across the whole of the Council. Green Dragon is a scheme that raises awareness of environmental issues among businesses and staff and promotes sustainable working practices including:-

- reduced waste disposal costs
- increased efficiency
- improved processes
- aids in the achievement of national legislation

5. Conclusions and Proposed Actions

5.1 Conclusions from New Monitoring Data

SRS on behalf of the VoGC has examined the results from monitoring in the district. There were no exceedences of any pollutant objective in 2018, including monitoring locations within the declared AQMA. As discussed, continual compliance over a three year period with the national air quality objectives set for NO_2 (annual average 40µg/m^3 & 1-hour average 200µg/m^3 not be exceeded more than 18 times per year), has been demonstrated and in accordance with Local Air Quality Management in Wales, Policy Guidance, June 2017, the Vale of Glamorgan Council wish to revoke the Windsor Road, Penarth AQMA.

As required a supporting detailed assessment will follow this annual progress report which will highlight the continued compliance and will demonstrate compliance for future years for the defined AQMA area. The final decision to revoke the Windsor Road, Penarth AQMA will be decided by Welsh Government following a review and consultation with the local communities affected. As mentioned the support detailed assessment has been completed.

The assessment undertaken utilised best practise techniques and guidance to ensure a conservative outcome. In accordance with the Welsh Air Quality Standards, concentrations of NO2 and PM10 were examined at 28 sensitive receptor locations geographical placed within and in close proximity to the established AQMA boundary. The report takes into consideration previous reporting levels as well as uses air quality dispersion modelling software (ADMS-Roads, Version 4.1.1) and latest emission factors (Version 9.0) to look at current pollutant concentrations and projected concentrations. Three modelling year scenarios were chosen for this study (2018, 2023 and 2028).

The predicted concentrations of NO_2 and PM_{10} at all modelled receptors within the Windsor Road, Cogan, Penarth AQMA are well below both the annual mean and short term AQS objectives for all modelled year scenarios.

As continued compliance with the air quality standards is likely it is recommended to revoke the Windsor Road, Cogan, Penarth AQMA.

5.2 Conclusions relating to New Local Developments

Section 3.5 details a number of local developments which have either gained planning consent recently or for which a planning application has been received.

These applications have been handled accordingly where Air Quality Assessments have been produced and conditions applied accordingly.

5.3 Other Conclusions

There are no other conclusions to be drawn from the information provided herein.

5.4 Proposed Actions

-The VoGC/ SRS will initiate the decision to revoke the Windsor Road, Cogan, Penarth AQMA;

-The detailed assessment and decision notice to revoke the AQMA will be made publically available for a 6 week consultation which will be extended if necessary. All information supporting the public consultation will be advertised via SRS'/ VoGC's webpages. Persons will be able to respond to the public consultation to a dedicated email address which will be managed by SRS' Specialist Services Team;

-The VoGC cabinet members will be briefed following the consultation period and pending approval of the recommendation to revoke the Windsor Road, Cogan, Penarth AQMA, the decision notice to revoke the AQMA will be formally submitted to WG;

-Non- automated monitoring with the use of diffusion tubes will continue along Windsor Road, Penarth, however the Windsor Road automated monitoring site will be decommissioned and replaced at an alternative location.

The Specialist Services Team of SRS will work with VoGC representatives from Highways & Transport and Planning Department and outline measures which have been undertaken, the effectiveness of these measures and future commitments/ initiatives that the Council may need to consider to be implemented in the area to ensure compliance is maintained and improved upon.

As a long term measure, SRS would recommend that the Vale of Glamorgan Council consider developing a Clean Air Strategy with its main objective to improve air quality and protect public health, whilst considering the sustainable development and future growth within the authority. .

References

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4. Vale of Glamorgan Planning Link
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5. UK National Air Quality Archive LAQM
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6. Vale of Glamorgan Local Development Plan 2011- 2026
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https://www.valeofglamorgan.gov.uk/en/living/planning_and_building_control/Planning/planning_policy/Local-Transport-Plan.aspx

8. Vale of Glamorgan Green Dragon
http://www.valeofglamorgan.gov.uk/en/living/environment/green_dragon/green_dragon.aspx

Appendices

Appendix A: Monthly Diffusion Tube Monitoring Results

Appendix B: A Summary of Local Air Quality Management

Appendix C: Air Quality Monitoring Data QA/QC

Appendix A: Monthly Diffusion Tube Monitoring Results

Table A.1 – Full Monthly Diffusion Tube Results for 2018

Site No	Nitrogen Dioxide Sites, VALE CBC	Grid Ref	Class	Distance of measurement from Kerb (m)	Distance from Kerb to Receptor	Relevant Exposure in m	Background Concentration (If required for distance correction)	02/01/2018 - 31/01/2018	31/01/2018 - 28/02/2018	28/02/2018 - 28/03/2018	28/03/2018 - 01/05/2018	01/05/2018 - 05/06/2018	05/06/2018 - 03/07/2018	03/07/2018 - 30/07/2018	30/07/2018 - 04/09/2018	04/09/2018 - 02/10/2018	02/10/2018 - 30/10/2018	30/10/2018 - 03/12/2018	03/12/2018 - 07/01/2019	AVERAGE SINCE JAN 18	Bias Corrected (Correction Factor 0.76)	Annualised	Distance corrected to Façade (If required)	Percentage of Data Capture
COWBRIDGE																								
108	4 Cardiff Road, Cowbridge	299967 174311	Kerbside	0.75	0.75	0.00		32.30	35.7	35.3	31.4	30.60	28.00	36.70	25.00	32.20	30.6	34.10	32.8	32.1	24.4	24.4	24	100
65	1 Riverside Mews, Cowbridge	299614 174592	Roadside	3.00	3.00	0.00		20.80	28.50	26.6	18.8	21.10	16.30	16.70	13.30	16.90	17.9	22.00	16.6	19.6	14.9	14.9	15	100
101	37 Westgate House	298903 174907	Kerbside	0.75	0.75	0.00		28.70	25..6	26.5	21.2	16.50	14.80	16.90	13.00	23.20	24.4	25.60	27.3	21.6	16.5	16.5	16	100
LLANTWIT MAJOR																								
93	Le Pouliguen Way	297171 168741	Roadside	4.80	4.80	0.00		16.50	20.50	19.4	13.5	13.00	10.90	11.80	8.90	12.60	13.5	16.00	15.6	14.4	10.9	10.9	11	100
94	5 Boverton Road	297069 168715	Roadside	7.40	7.40	0.00		15.40	16.30	15.5	11.8	11.20	8.60	10.20	8.00	10.00	12	15.60	14.4	12.4	9.4	9.4	9	100
95	Millands Caravan Park	298861 169236	Rural	290.00	290.00	0.00		10.90	10.80	13.1	8.3	8.00	9.20	7.70	6.50	6.60	7.5	14.60	10.4	9.5	7.2	7.2	7	100
96	Old Froglands Farm	299045 169126	Suburban	86.00	86.00	0.00		19.00	22.20	20.6	17.9	9.60	6.30		4.70	8.70	10.3	16.40	12.5	13.5	10.2	10.2	10	92
St. ATHAN																								
97	7 Picketson Close	300460 169310	Urban Background	30.00	30.00	0.00		11.60	14	15.7	7.7	7.8	7.4	7.1	6.3	8.2	9	15.4	12.3	10.2	7.8	7.8	7.8	100
GILESTON																								
98	Orchard Way (Ivy Cottage)	301899 167043	Suburban/ Industrial	450.00	450.00	0.00		12.30	12.7	12.3	8.3	7.5	6.4	6.7	5.2	7	8.8	13.3	9.7	9.2	7.0	7.0	7.0	100
RHOOSE																								
99	Fonmon Road Lampost	304894 166898	Kerbside	0.90	8.90	8.00	5.89	15.10	15.3	16.3	12	10.4	9.9	8.4	6.5	8.8	11	16.5	14	12.0	9.1	9.1	7.6	100
SAINT BRIDES MAJOR																								
103	September Cottage	289530 174896	Roadside	6.50	6.50	0.00		14.10	20.4	18	13.4	13	12.3	9.4	7.9	11	14.1	19.3	16.5	14.1	10.7	10.7	10.7	100
104	Greengate Cottage	289496 174858	Roadside	12.50	12.50	0.00		15.60	18.6		16.4	14		14.6	9.3	12.1	14.9	17.7		14.8	11.2	11.2	11.2	75
105	St. Brides Primary School Walway Entrance	289473 174752	Kerbside	0.95	9.00	8.05		17.50	18.6	21.4	16.1	14.7	12.9		7.9	13.1	15.4	20.6	16.3	15.9	12.1	12.1	12.1	92
106	Dany Bryn House	289454 174668	Roadside	2.10	2.10	0.00		11.90	17.1	18.2	14.5	11.5	11.9	10.3	7.9	11.9	14.4	17.7	15.5	13.6	10.3	10.3	10.3	100
107	Hillboro	289512 174805	Roadside	7.50	7.50	0.00		9.40	12.7	14.1	9.1	7.9	6.8	7.7	5.5		10.3	12.5	15	10.1	7.7	7.7	7.7	92
CULVERHOUSE																								
38	2 Horseshoes	311892 174513	Roadside	2.00	2.00	0.0		27.50	26.60	30.4	25.1	23.60	18.10	28.90		26.60	24.7	22.7	26.50	25.5	19.4	19.4	19	92
DINAS POWYS																								
46	46 Cardiff Road	315747 171369	Roadside	5.00	5.00	0.0		28.10	29.10	29.4	25	22.90	22.80	17.90	13.40	19.70	24.3	27.00	23.30	23.6	17.9	17.9	18	100
61	Railway Terrace	316433 171932	Roadside	2.00	2.00	0.0		45.90	45.50	40.7	38.3	42.20	34.40	43.60	34.80	40.60	42.9	38.20	42.70	40.8	31.0	31.0	31	100
67	2 Matthew Terrace	316488 172004	Roadside	2.50	2.50	0.0		32.80	37.60	33.7	34.3	33.20	35.90	29.40	21.30	25.00	32.5		25.90	31.1	23.6	23.6	24	92
72a	Dinas Powys Infants School	315841 171527	Roadside	7.00	7.00	0.0		27.00	34.10	34.8	25.6	24.20	21.70	23.20	16.60	23.90			29.90	26.1	19.8	19.8	20	83
89	9 Wayside Cottages, Cardiff Road	316447 171963	Roadside	3.00	3.00	0.0		40.10	41.60		32.6		31.10	35.90	28.80	35.70	41.4	40.90	38.60	36.7	27.9	27.9	28	83
90	16 Railway Terrace, Cardiff Road	316453 171945	Roadside	3.00	3.00	0.0		31.40	35.00	32.4	31.6	26.10	22.20	24.30	18.40	23.80	30.5	32.3	29.10	28.1	21.3	21.3	21	100
109	85 Cardiff Road, Dinas Powys	315739 171444	Roadside	5.00	5.00	0.0		31.20	31.10	30.5	22.8	23.70	20.40	23.40	19.70	24.00	26.2		27.20	25.5	19.4	19.4	19	92
110	103 Cardiff Road, Dinas Powys	31585 171555	Roadside	4.00	4.00	0.0		33.40	29.50	31.5	24.4	24.20	20.60	24.70	20.60	23.90	27.5	28.9	32.80	26.8	20.4	20.4	20	100
111	203 Cardiff Road, Dinas Powys	316366 171823	Roadside	3.00	3.00	0.0		30.20	35.40	34.1	30.9	31.70	28.10	32.50	23.70	29.40	33.1	32	32.10	31.1	23.6	23.6	24	100
LLANDOUGH																								
68	Glen View, 99 Penlan Road	316886 172561	Roadside	9.00	9.00	0.00		21.80	24.60	25.1	20.4	18.10	14.40	18.20	13.10	18.70	21.1	26.60	18.50	20.1	15.2	15.2	15	100
PENARTH																								
22	Stanwell Road	318505 171496	Roadside	1.00	9.00	8.0	11.94	31.70	33.00	28.9		17.90	20.00	23.60		24.90	31		29.40	26.7	20.3	20.3	16.6	75
112	Cogan Hill Flats	317434 172729	Roadside	10.00	10.00	0.0		31.90	32.40	28.2	24.3	22.60	17.00	22.90	17.90	26.30	27	26.30	29.60	25.5	19.4	19.4	19	100
53	168 Windsor Road	317589 172411	Roadside	5.00	5.00	0.0		44.00	46.40				38.40		34.60	36.30	37.5	32.80	39.60	38.7	29.4	27.7	28	67
55	159 Windsor Road	317595 172435	Roadside	2.00	2.00	0.0			36.90	42.6	36.2	35.80	34.20	35.20	26.80	31.90	33.90	31.50	35.20	34.6	26.3	26.3	26	92
56	134 Andrew Road	316814 172443	Roadside	10.00	10.00	0.0		33.80	31.40	28.4	26	25.00	19.50	20.70	23.10	29.70	26.9	27.9	31.5	27.0	20.5	20.5	21	100
62	154 Windsor Road	317633 172357	Roadside	2.00	2.00	0.0				47.8	40.2	40.90	32.90	36.90	29.70	36.60	36.3	26.2	41.60	36.9	28.1	28.1	28	83
70	Ty-Isaf	316731 172391	Roadside	3.00	3.00	0.0		28.70	36.10	35.5	32.3	26.40	28.50	27.40	15.50	20.90	29.90	39.2	32.30	29.4	22.3	22.3	22	100
73a	Windsor Road Monitor 1	317598 172399	Roadside	2.00	4.00	2.0		31.50	41.50	42.3	37.2	30.60	37.10		33	40.90	43.2	35.6	45.90	38.1	28.9	28.9	29	92
73b	Windsor Road Monitor 2	317598 172399	Roadside	2.00	4.00	2.0		40.70	40.10	44.6	39.3	40.10	36.50	36.80	30.4	37.60	41.9	36.1	44.20	39.0	29.7	29.7	30	100
73c	Windsor Road Monitor 3	317598 172399	Roadside	2.00	4.00	2.0		42.40	43.70	42.4	37.2	41.70	35.90	42.20	34.4	38.70	38.3	41.5	41.50	40.0	30.4	30.4	30	100
74	114 Windsor Road	317708 172259	Roadside	2.50	2.50	0.0		35.20	38.40	34.3					27.30	34.40	36.8	30.3	38.00	34.3	26.1	22.7	23	67
76	160 Windsor Road	317627 172371	Roadside	2.50	2.50	0.0		40.50	44.10	47.9	39	36.50	33.80	38.70	32.10	39.10	41.3			39.3	29.9	29.9	30	83
100	141 Plassey Street	317968 172105	Roadside	4.50	4.50	0.0		35.80	38.30	37	29.1	36.10	35.20	30.60	21.60	27.80	33.2	23.4	31.1	31.6	24.0	24.0	24	100
79	Marine Scene	317549 172572	Roadside	1.20	4.00	2.8	12.9	47.70	57.60	53.7	54	59.50	39.80	48.40	37.20	41.30	51.2	67	40.7	49.8	37.9	37.9	31.6	100
113	03 Plassey Street	317999 172067	Roadside	3.00	3.00	0.0		35.70	35.00	30.1	23.8	26.40	18.60	27.60	24.20	30.30	29.70	33.2		28.6	21.7	21.7	22	92
82	98b Windsor Road	318061 171944	Roadside	8.00	8.00	0.0		21.40	26.70	25.5	22.7	19.10			15.10	19.10	22	29.2	23.90	22.5	17.1	17.1	17	83
88	134 Windsor Road	317668 172312	Roadside	3.50	3.50	0.0		36.40				41.20	31.40	37.40	32.90	37.80	39.3	29.3	41.40	36.3	27.6	27.6	28	75
BARRY																								
8	Tynewydd Road	311797 168503	Kerbside	1.00	5.00	4	11.12	41.40		42.9		35.80		33.30	29.20	33.30	36.00	37.4	43.7	37.0	28.1	28.1	22.6	75
41	Despenser Road	315278 168451	Urban Background	128.00	128.00	0		19.20	16.80	20.8	13.00	10.40	9.10	9.00	8.60	13.90	13.4	20.4	18	14.4	10.9	10.9	11	100
64	Holton Road	311690 168042	Roadside	3.00	3.00	0		22.60	26.40	29.4	24.6	21.20	19.80	17.30	13.80	18.30	19.7	27	22.7	21.9	16.6	16.6	17	100
66	17 Churchill Terrace	313342 168823	Roadside	2.50	2.50	0		42.10	43.50	41.3	35.7	31.90	25.00	32.80	28.40	35.60	34.8	35.6	35.40	35.2	26.7	26.7	27	100
71	76 High Street (O'Donovans)	310764 167505	Roadside	2.00	2.00	0		24.00	24.90	29.5		20.20	17.30	16.10	12.70	16.40	18.7	27.2	26.40	21.2	16.1	16.1	16	92
83	24 Cardiff Road	313597 168829	Roadside	1.50	6.00	4.5	13.46	34.40	36.70	33.2	28.30	23.40	18.20	25.10	24.30	29.10	35		30.50	28.9	22.0	22.0	19.4	92
102	Powell Dyfryyn Way	311115 167041	Kerbside	1.00	4.40	3.4	10.68	33.60	28.10	31.2	21	20.80	17.40	18.70	14.80	20.90	22.8	28.2	24.60	23.5	17.9	17.9	15.7	100
114	107 Dock View Road	312585 168171	Roadside	3.00	3.00	0		20.40	24.70	23.70	18.80	18.20	14.10	9.70	9.80	13.60	15.5	25.4	19.90	17.8	13.5	13.5	13.5	100
115	20 Barry Road, Cadoxton	312677 169054	Kerbside	1.00	1.00	0		36.30	35.20	36.3		32.10			28.40	31.70	37.2	38	34.50	34.4	26.2	26.2	26.2	75

Notes:

Exceedances of the NO_2 annual mean objective of 40µg/m^3 are shown in **bold**.

NO_2 annual means exceeding 60µg/m^3, indicating a potential exceedance of the NO_2 1-hour mean objective are shown in **bold and underlined.**

(1) See Appendix C for details on bias adjustment and annualisation.

(2) Distance corrected to nearest relevant public exposure.

Appendix B: A Summary of Local Air Quality Management

Purpose of an Annual Progress Report

This report fulfils the requirements of the Local Air Quality Management (LAQM) process as set out in the Environment Act 1995 and associated government guidance. 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 being achieved. Where exceedances occur, or are likely to occur, the local authority must then declare an Air Quality Management Area (AQMA) and prepare a **DRAFT** Air Quality Action Plan (AQAP) within 18 months, setting out measures it intends to put in place to improve air quality in pursuit of the air quality objectives. The AQAP must be **formally** adopted prior to 24 months has elapsed. Action plans should then be reviewed and updated where necessary at least every 5 years.

For Local Authorities in Wales, an Annual Progress Report replaces all other formal reporting requirements and have a very clear purpose of updating the general public on air quality, including what ongoing actions are being taken locally to improve it if necessary.

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), Air Quality (Amendment) (Wales) Regulations 2002, No 3182 (Wales 298), and are shown in Table B.1

The table shows the objectives in units of micrograms per cubic metre µg/m3 (milligrammes per cubic metre, mg/m3 for carbon monoxide) with the number of exceedences in each year that are permitted (where applicable).

Table B.2 – 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 µg/m^3	Running annual mean	31.12.2003
	5.00 µg/m^3	Annual mean	31.12.2011
1,3-butadiene	2.25 µg/m^3	Running annual mean	31.12.2003
Carbon monoxide	10 mg/m^3	Running 8-hour mean	31.12.2003
Lead	0.50 µg/m^3	Annual mean	31.12.2004
	0.25 µg/m^3	Annual mean	31.12.2008
Nitrogen dioxide	200 µg/m^3 not to be exceeded more than 18 times a year	1-hour mean	31.12.2005
	40 µg/m^3	Annual mean	31.12.2005
Particulate matter (PM_{10}) (gravimetric)	50 µg/m^3, not to be exceeded more than 35 times a year	24-hour mean	31.12.2004
	40 µg/m^3	Annual mean	31.12.2004
Sulphur dioxide	350 µg/m^3, not to be exceeded more than 24 times a year	1-hour mean	31.12.2004
	125 µg/m^3, not to be exceeded more than 3 times a year	24-hour mean	31.12.2004
	266 µg/m^3, not to be exceeded more than 35 times a year	15-minute mean	31.12.2005

Appendix C: Air Quality Monitoring Data QA/QC

Diffusion Tube Bias Adjustment Factors

A database of bias adjustment factors determined from Local Authority co-location studies throughout the UK has been collated by the LAQM Helpdesk. The National Diffusion Tube Bias Adjustment Factor Spreadsheet (Version 06/19) was used to obtain an overall adjustment factor of 0.76 from the input data shown in the following screenshot. This overall factor is based on 28 co-location studies where the tube preparation method and analysis laboratory used were the same as those used by VoGC.

Figure C.1: National Diffusion Tube Bias Adjustment Factor Spreadsheet

National Diffusion Tube Bias Adjustment Factor Spreadsheet — Spreadsheet Version Number: 06/19

Follow the steps below in the correct order to show the results of relevant co-location studies
Data only apply to tubes exposed monthly and are not suitable for correcting individual short-term monitoring periods
Whenever presenting adjusted data, you should state the adjustment factor used and the version of the spreadsheet
This spreadhseet will be updated every few months: the factors may therefore be subject to change. This should not discourage their immediate use.

This spreadsheet will be updated at the end of September 2019
LAQM Helpdesk Website

The LAQM Helpdesk is operated on behalf of Defra and the Devolved Administrations by Bureau Veritas, in conjunction with contract partners AECOM and the National Physical Laboratory.

Spreadsheet maintained by the National Physical Laboratory. Original compiled by Air Quality Consultants Ltd.

Step 1: Select the Laboratory that Analyses Your Tubes from the Drop-Down List. If a laboratory is not shown, we have no data for this laboratory.

Step 2: Select a Preparation Method from the Drop-Down List. If a preparation method is not shown, we have no data for this method at this laboratory.

Step 3: Select a Year from the Drop-Down List. If a year is not shown, we have no data[2]

Step 4: Where there is only one study for a chosen combination, you should use the adjustment factor shown with caution. Where there is more than one study, use the overall factor[3] shown in blue at the foot of the final column.

If you have your own co-location study then see footnote[4]. If uncertain what to do then contact the Local Air Quality Management Helpdesk at LAQMHelpdesk@uk.bureauveritas.com or 0800 0327953

Analysed By[1]	Method (To undo your selection, choose (All) from the pop-up list)	Year[2] (To undo your selection, choose (All))	Site Type	Local Authority	Length of Study (months)	Diffusion Tube Mean Conc. (Dm) (µg/m³)	Automatic Monitor Mean Conc. (Cm) (µg/m³)	Bias (B)	Tube Precision[5]	Bias Adjustment Factor (A) (Cm/Dm)
Socotec Didcot	50% TEA in acetone	2018	KS	Marylebone Road Intercomparison	12	95	85	11.3%	G	**0.90**
Socotec Didcot	50% TEA in acetone	2018	B	Gravesham Borough Council	12	37	30	22.1%	G	**0.82**
Socotec Didcot	50% TEA in acetone	2018	B	Gravesham Borough Council	12	28	24	18.8%	G	**0.84**
Socotec Didcot	50% TEA in acetone	2018	UI	North Lincolnshire Council	12	24	16	53.5%	G	**0.65**
Socotec Didcot	50% TEA in acetone	2018	R	Swansea Council	12	33	24	39.0%	G	**0.72**
Socotec Didcot	50% TEA in acetone	2018	UB	Swansea Council	10	19	16	23.4%	G	**0.81**
Socotec Didcot	50% TEA in acetone	2018	R	Sevenoaks District Council	12	34	25	34.8%	G	**0.74**
Socotec Didcot	50% TEA in Acetone	2018	R	Wrexham County Borough Council	11	21	18	16.1%	G	**0.86**
SOCOTEC Didcot	50% TEA in acetone	2018		**Overall Factor[3] (28 studies)**				**Use**		**0.76**

Discussion of Choice of Factor to use

The bias adjustment factor applied to all 2018 data is 0.76. The applied bias adjustment factor has been calculated using the national diffusion tube bias adjustment factor spreadsheet version 06/19. The individual bias adjustment factor calculated using the Penarth, Windsor Road automatic monitoring system and the co-located triplicate diffusion tubes has not been adopted as the bias adjustment factor derived from the study was slightly less than the figure generated by the national, 0.63 compared to 0.76. Therefore it was deemed good practise to use the nationally derived bias adjustment factor as this would reflect a “worst-case scenario”.

PM Monitoring Adjustment

The PM monitor at the Penarth, Windsor Road site is a Beta Attenuation Monitor (BAM) with gravimetric equivalence. Therefore in order to present the data as gravimetric equivalence, a conversion factor of 0.83 has been applied, using the European Standards.

Short-Term to Long-Term Data Adjustment

Diffusion Tubes Adjustment

The Nitrogen Dioxide (NO_2) obtained via the use of passive diffusion tubes during January to December 2018 were annualised via the method described in Box 7.10 of LAQM TG(16). Two long-term AURN urban background continuous monitoring sites, within a distance of approximately 50 miles from The Vale were selected; Cwmbran and Bristol St Paul's.

Table C.1– Long term AURN site used for calculation of nitrogen dioxide annualisation ratio for Diffusion Tube 53

Site	Site Type	Annual Mean (µg/m^3)	Period Mean (µg/m^3)	Ratio
Cwmbran AURN	Urban Background	12.89	13.60	0.95
Bristol St Paul's AURN	Urban Background	23.93	25.58	0.94
Average Ratio				0.94

Table C.2 – Long term AURN site used for calculation of nitrogen dioxide annualisation ratio for Diffusion Tube 74

Site	Site Type	Annual Mean (µg/m^3)	Period Mean (µg/m^3)	Ratio
Cwmbran AURN	Urban Background	12.89	14.88	0.87
Bristol St Paul's AURN	Urban Background	23.93	27.41	0.87
Average Ratio				0.87

QA/QC of Diffusion Tube Monitoring

The diffusion tubes are supplied and analysed by Socotec UK Ltd Didcot, using the 50% triethanolamine (TEA) in water method. Socotec UK Ltd Didcot participates in the Annual Field Inter-Comparison Exercise and Workplace Analysis Scheme for Proficiency (WASP) inter-comparison scheme for nitrogen dioxide diffusion tube analysis. From April 2014 the WASP Scheme was combined with the STACKS scheme to form the new AIR scheme, which Socotec UK Ltd Didcot participates in. The AIR scheme is an independent analytical proficiency testing scheme operated by LGC Standards and supported by the Health and Safety Laboratory (HSL).

The laboratory Socotec UK Ltd Didcot is regarded ranked as the highest rank of satisfactory in relation to the WASP intercomparison scheme for spiked nitrogen dioxide diffusion tubes. Information regarding tube precision can be obtained via http://laqm.defra.gov.uk/diffusion-tubes/precision.html Information regarding WASP results can be obtained via http://laqm.defra.gov.uk/diffusion-tubes/qa-qc-framework.html

Glossary of Terms

Abbreviation	Description
AQAP	Air Quality Action Plan - A detailed description of measures, outcomes, achievement dates and implementation methods, showing how the LA intends to achieve air quality limit values'
AQMA	Air Quality Management Area – An area where air pollutant concentrations exceed / are likely to exceed the relevant air quality objectives. AQMAs are declared for specific pollutants and objectives
APR	Air quality Annual Progress Report
AURN	Automatic Urban and Rural Network (UK air quality monitoring network)
Defra	Department for Environment, Food and Rural Affairs
DMRB	Design Manual for Roads and Bridges – Air quality screening tool produced by Highways England
FDMS	Filter Dynamics Measurement System
LAQM	Local Air Quality Management
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides
PM_{10}	Airborne particulate matter with an aerodynamic diameter of 10µm (micrometres or microns) or less
$PM_{2.5}$	Airborne particulate matter with an aerodynamic diameter of 2.5µm or less
QA/QC	Quality Assurance and Quality Control
SO_2	Sulphur Dioxide
VoGC	Vale of Glamorgan Council

Vale of Glamorgan Council

Penarth

Detailed Modelling Study

June 2019

Move Forward with Confidence

BUREAU VERITAS

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Document Control Sheet

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Table of Contents

List of Tables

List of Figures

Executive Summary

Bureau Veritas have been commissioned by Vale of Glamorgan Council to complete a Detailed Modelling Study to assess the current pollutant concentrations experienced within the Councils' Windsor Road AQMA. The AQMA was declared in 2013 due to monitored and model predicted exceedances of the NO_2 annual mean Air Quality Strategy objective limit of 40 µg/m^3.

Since 2014, through the Review and Assessment annual reporting process, NO_2 annual mean concentrations within Penarth (specifically along Windsor Road) have stabilised below the AQS objective limit. Therefore, this has resulted in a requirement for further assessment as to whether concentrations are above Air Quality Strategy objective limits. The assessment focuses on concentrations of both NO_2 and PM_{10}, in accordance with the Welsh Air Quality Standards.

This Detailed Modelling Assessment focusses on the road network within and adjacent to the Windsor Road AQMA to establish any changes in the spatial extent of NO_2 and PM_{10} concentrations in order to identify any areas that are above, or within 10%, of the AQS annual mean objectives. The area was modelled using the advanced atmospheric dispersion model ADMS-Roads (Version 4.1.1) with vehicle emissions derived from the Emissions Factor Toolkit (Version 9.0), with annual mean NO_2 and PM_{10} concentration predictions produced at 28 discrete receptor locations for three scenario years (2018, 2023 and 2028).

All predicted concentrations of NO_2 and PM_{10} within Windsor Road AQMA, and adjacent to the modelled road network in Penarth are well below both the annual mean and short term AQS objectives for all modelled scenarios.

Based on the conclusions of the assessment above, the following recommendations are made:

- Revocation of the Windsor Road, Penarth AQMA; and
- Consider decommissioning and/or relocating of monitoring sites which have consistently reported NO_2 concentrations to be well below the respective AQS annual or short term mean objective.

1 Introduction

Bureau Veritas have been commissioned by The Vale of Glamorgan Council (the Council) to complete a Detailed Modelling Study to assess the current pollutant concentrations experienced within the Councils' Windsor Road Air Quality Management Area (AQMA). Windsor Road AQMA, located in Penarth, was declared in 2013 due to both monitored and model predicted exceedances of the NO_2 annual mean Air Quality Strategy (AQS) objective.

Since 2014, NO_2 annual mean concentrations within Penarth (specifically along Windsor Road) have stabilised below the annual mean AQS objective limit. Therefore, this has resulted in a requirement for further assessment as to whether concentrations are above Air Quality Strategy objective limits.

The assessment focuses on concentrations of both NO_2 and PM_{10}, in accordance with the Welsh Air Quality Standards[1].

Additionally, this report provides recommendations on matters related to NO_2 and PM_{10} exceedances within Penarth to inform the decision as to whether revocation of the Windsor Road AQMA is required.

1.1 Scope of Assessment

The assessment seeks to ascertain the extent of any exceedances of the AQS objectives for NO_2 and PM_{10} to inform the decision as to whether revocation of the Windsor Road AQMA is required.

The following are the objectives of the assessment:

- To assess the air quality at selected locations ("receptors") at façades of existing residential properties, representative of worst-case exposure, based on modelling of emissions of NO_2 and PM_{10} from road traffic on the local road network;
- To establish the spatial extent of any likely exceedances of the AQS objectives for NO_2 and PM_{10}, and also to identify the spatial extent of any areas within 10% of those objectives; and
- To put forward recommendations in relation to the re-assessment of the current Windsor Road AQMA boundary, and if necessary revocation.

The approach adopted in this assessment to assess the impact of road traffic emissions on air quality utilised the atmospheric dispersion model ADMS-Roads version 4.1.1, focusing on emissions of oxides of nitrogen (NO_x), which comprise of nitric oxide (NO) and nitrogen dioxide (NO_2), as well as PM_{10}.

In order to provide consistency with the Council's own work on air quality, the guiding principles for air quality assessments, as set out in the latest guidance provided by Defra for air quality assessment (LAQM.TG(16))[2], have been used.

[1] The Air Quality Standards Regulations (Amendment) 2016, Statutory Instrument No 1184, The Stationary Office Limited.

[2] LAQM Technical Guidance LAQM.TG(16) – February 2018. Published by Defra in partnership with the Scottish Government, Welsh Assembly Government and Department of the Environment Northern Ireland.

2 Air Quality – Legislative Context

2.1 Air Quality Strategy

The importance of existing and future pollutant concentrations can be assessed in relation to the national air quality standards and objectives established by Government. The Air Quality Strategy[3] (AQS) provides the over-arching strategic framework for air quality management in the UK and contains national air quality standards and objectives established by the UK Government and Devolved Administrations to protect human health. The air quality objectives incorporated in the AQS and the UK Legislation are derived from Limit Values prescribed in the EU Directives transposed into national legislation by Member States.

The CAFE (Clean Air for Europe) programme was initiated in the late 1990s to draw together previous directives into a single EU Directive on air quality. The CAFE Directive[4] has been adopted and replaces all previous air quality Directives, except the 4th Daughter Directive[5]. The Directive introduces new obligatory standards for $PM_{2.5}$ for Government but places no statutory duty on local government to work towards achievement of these standards.

The Air Quality Standards (Amendment) Regulations[1] 2016 came into force on 31 December 2016 in order to align and bring together in one statutory instrument the Government's obligations to fulfil the requirements of the new CAFE Directive.

The objectives for ten pollutants – benzene (C_6H_6), 1,3-butadiene (C_4H_6), carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO_2), sulphur dioxide (SO_2), particulate matter (PM_{10} and $PM_{2.5}$), ozone (O_3) and Polycyclic Aromatic Hydrocarbons (PAHs), have been prescribed within the AQS[3].

The EU Limit Values are considered to apply everywhere with the exception of the carriageway and central reservation of roads and any location where the public do not have access (e.g. industrial sites).

The AQS objectives apply at locations outside buildings or other natural or man-made structures above or below ground, where members of the public are regularly present and might reasonably be expected to be exposed to pollutant concentrations over the relevant averaging period. Typically these include residential properties and schools/care homes for long-term (i.e. annual mean) pollutant objectives and high streets for short-term (i.e. 1-hour) pollutant objectives. Table 2.1 taken from LAQM TG(16)[2] provides an indication of those locations that may or may not be relevant for each averaging period.

The assessment focuses on concentrations of both NO_2 and PM_{10}, in accordance with the Welsh Air Quality Standards[1]. Moreover, as a result of traffic pollution the UK has failed to meet the EU Limit Values for this pollutant by the 2010 target date. As a result, the Government has had to submit time extension applications for compliance with the EU Limit Values, which has since passed and its continued failure to achieve these limits is currently giving rise to infraction procedures being implemented. The UK is not alone as the challenge of NO_2 compliance at EU level includes many other Member States.

In July 2017, the Government published its plan for tackling roadside NO_2 concentrations[6], to achieve compliance with EU Limit Values. This sets out Government policies for bringing NO_2 concentrations within statutory limits in the shortest time period possible. Furthermore, the Clean Air Strategy was published in 2019, which outlines how the UK will meet international commitments

[3] Defra (2007), The Air Quality Strategy for England, Scotland, Wales and Northern Ireland.

[4] Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe.

[5] Directive 2004/107/EC of the European Parliament and of the Council of 15 December 2004 relating to arsenic, cadmium, mercury, nickel and polycyclic hydrocarbons in ambient air.

[6] Defra, DfT (2017), UK plan for tackling roadside nitrogen dioxide concentrations

to significantly reduce emissions of five damaging air pollutants by 2020 and 2030 under the adopted revised National Emissions Ceiling Directive (NECD)

The AQS objectives for these pollutants are presented in Table 2.2.

Table 2.1 – Examples of where the Air Quality Objectives should apply

Averaging Period	Objectives should apply at:	Objectives should generally not apply at:
Annual mean	All locations where members of the public might be regularly exposed Building facades of residential properties, schools, hospitals, care homes etc.	Building facades of offices or other places of work where members of the public do not have regular access. Hotels, unless people live there as their permanent residence. Gardens of residential properties. Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short term.
24-hour mean and 8-hour mean	All locations where the annual mean objectives would apply, together with hotels. Gardens or residential properties[1].	Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short term.
1-hour mean	All locations where the annual mean and 24 and 8-hour mean objectives would apply. Kerbside sites (e.g. pavements of busy shopping streets). Those parts of car parks, bus stations and railway stations etc. which are not fully enclosed, where the public might reasonably be expected to spend one hour or more. Any outdoor locations at which the public may be expected to spend one hour or longer.	Kerbside sites where the public would not be expected to have regular access.
15-minute mean	All locations where members of the public might reasonably be expected to spend a period of 15 minutes or longer.	

Note [1] For gardens and playgrounds, such locations should represent parts of the garden where relevant public exposure is likely, for example where there is seating or play areas. It is unlikely that relevant public exposure would occur at the extremities of the garden boundary, or in front gardens, although local judgement should always be applied.

Table 2.2 – Relevant AQS Objectives for the Assessed Pollutants in Wales

Pollutant	AQS Objective	Concentration Measured as:	Date for Achievement
Nitrogen dioxide (NO_2)	200 µg/m³ not to be exceeded more than 18 times per year	1-hour mean	31st December 2005
	40 µg/m³	Annual mean	31st December 2005
Particulate Matter (PM_{10})	50 µg/m³ not to be exceeded more than 35 times per year	24-hour mean	31st December 2005
	40 µg/m³	Annual mean	31st December 2005

2.2 Local Air Quality Management (LAQM)

Part IV of the Environment Act 1995[7] places a statutory duty on local authorities to periodically review and assess air quality within their area, and determine whether they are likely to meet the AQS objectives set down by Government for a number of pollutants – a process known as Local Air Quality Management (LAQM). The AQS objectives that apply to LAQM are defined for seven pollutants: benzene, 1,3-butadiene, CO, Pb, NO_2, SO_2 and PM_{10}.

Local Authorities were formerly required to report on all of these pollutants, but following an update to the regime in 2016, the core of LAQM reporting is now focussed around the objectives of three pollutants; NO_2, PM_{10} and SO_2. Where the results of the Review and Assessment process highlight an exceedance of the health-based objectives, the Local Authority is required to declare an AQMA, a geographic area defined by high concentrations of pollution and exceedances of health-based standards.

Following a declaration of an AQMA, the Local Authority is subsequently required to develop an Air Quality Action Plan (AQAP), which will contain measures to address the identified air quality issue, and bring the location into compliance with the relevant objective as soon as possible.

One of the objectives of the LAQM regime is for local authorities to enhance integration of air quality into the planning process. Current LAQM Policy Guidance[8] recognises land-use planning as having a significant role in term of reducing population exposure to elevated pollutant concentrations. Generally, the decisions made on land-use allocation can play a major role in protecting and improving the health of the population, particularly at sensitive locations such as schools, hospitals and dense residential areas.

[7] http://www.legislation.gov.uk/ukpga/1995/25/part/IV

[8] Local Air Quality Management Policy Guidance LAQM.PG(16). April 2016. Published by Defra in partnership with the Scottish Government, Welsh Assembly Government and Department of the Environment Northern Ireland.

3 Review and Assessment of Air Quality Undertaken by the Council

3.1 Local Air Quality Management

The most recent LAQM report completed by the Council was the 2018 Annual Progress Report (APR)[9]. The 2018 APR reported pollutant monitoring data, and progress made towards lowering pollutant concentrations within Vale of Glamorgan, throughout the preceding year of 2017. All monitoring results presented within this assessment have been sourced from the 2018 APR.

The Council currently has one AQMA (Windsor Road AQMA), declared in 2013 for the exceedance of the NO_2 annual mean UK AQS objective of 40 µg/m^3. This AQMA was declared in response to an assessment undertaken in 2012 which using dispersion modelling identified a stretch of Windsor Road to be in exceedance of the AQS objective limit. Windsor Road's strategic connection to several surrounding high capacity roads (A4055 – Barry Road, A4055 – Cardiff Road, A4160 – Penarth Road and A4232 – Ghrangetown Link), and subsequent vehicluar traffic, is detailed as a contributing factor to the declaration of the AQMA.

The 2018 APR recognises the need to assess current NO_2 concentrations within the Windsor Road AQMA due to compliance with the AQS annual mean NO_2 objective at all monitoring locations within the AQMA for the previous six years. This assessment is a part of this process, and the modelling results presented herein will inform the decision to revoke the AQMA.

3.2 Review of Air Quality Monitoring

3.2.1 Local Automatic Air Quality Monitoring

During 2018, the Council undertook automatic (continuous) monitoring at one site within the district, located along Windsor Road, Penarth, within the northern extent of the AQMA. The Windsor Road monitor records data for the following pollutants; NO_2 using a chemiluminescence analyser, PM_{10} using a Beta Attenuation Monitor (BAM) and O_3 using a UV absorption analyser.

Details of the automatic monitoring site are provided in Table 3.1, monitoring results for years 2014 to 2018 are presented in Table 3.2 - Table 3.5, whilst the location of the monitoring site is illustrated in Figure 3.2.

Table 3.1 – Automatic Monitor Penarth, Windsor Road

Site ID	Site Location	Site Type	OS Grid Ref (E, N)	In AQMA	Pollutants Monitored	Inlet Height (m)
Penarth, Windsor Road	Windsor Road, Penarth	Roadside	317600, 172399	Yes	NO_2, PM_{10} and O_3	1.5

Table 3.2 – Automatic Monitor Penarth, Windsor Road: NO_2 Annual Mean Concentrations

Site ID	Valid Data Capture for 2018 (%)	NO_2 Annual Mean Concentration (µg/m^3)				
		2014	2015	2016	2017	2018
Penarth, Windsor Road	99.7	27.7	26.5	28.3	26.5	24.3

[9] Vale of Glamorgan Council (2018), 2018 Annual Progress Report

Table 3.3 – Automatic Monitor Penarth, Windsor Road: Number of NO_2 Hourly Mean Exceedances

Site ID	Valid Data Capture for 2018 (%)	Hourly Means in Excess of the 1-hour Objective (200 µg/m³)				
		2014	2015	2016	2017	2018
Penarth, Windsor Road	99.7	0	0	0	0	0

Table 3.4 – Automatic Monitor Penarth, Windsor Road: PM_{10} Annual Mean Concentrations

Site ID	Valid Data Capture for 2018 (%)	PM_{10} Annual Mean Concentration (µg/m³)				
		2014	2015	2016	2017	2018
Penarth, Windsor Road	95.0	17.5	20.8	21.4	15.6	21.7

Table 3.5 – Automatic Monitor Penarth, Windsor Road: Number of PM_{10} 24-Hour Mean Exceedances

Site ID	Valid Data Capture for 2018 (%)	Daily Means in Excess of the 24-hour Objective (50 µg/m³)				
		2014	2015	2016	2017	2018
Penarth, Windsor Road	95.0	0	4	1	2	0

Between 2014 and 2018, there were no recorded exceedances of either the annual mean or short term AQS objectives for NO_2 or PM_{10} at the automatic monitor located along Windsor Road, Penarth. Both annual mean NO_2 and PM_{10} concentrations have remained consistent with a range of ± 5 µg/m³ since 2014, with a reduction observed over the five year period for annul mean NO_2 concentrations.

3.2.2 Local Non-Automatic Air Quality Monitoring

The Councils' non-automatic monitoring programme during 2018 consisted of recording NO_2 concentrations using a network of 52 passive diffusion tubes, located across the district. 17 of these diffusion tubes are located within Penarth forming 15 sites (including the provision of a collocated triplicate site). The details and results of the diffusion tube monitoring within Penarth for 2018 are provided in Table 3.6 and Table 3.7, whilst the locations are illustrated in Figure 3.2.

Table 3.6 – Details of Council Diffusion Tube Monitoring Undertaken in Penarth

Site ID	Site Location	Site Type	Within AQMA	OS Grid Ref (X, Y)
22	Stanwell Road	R	N	318505, 171496
53	168 Windsor Road	R	N	317589, 172411
55	159 Windsor Road	R	Y	317595, 172435
56	134 Andrew Road	R	N	316814, 172443
62	154 Windsor Road	R	Y	317633, 172357
70	Ty-Isaf	R	N	316731, 172391
73*	Windsor Road Monitor	R	Y	317598, 172399
74	114 Windsor Road	R	N	317708, 172259
76	160 Windsor Road	R	&	317627, 172371

Site ID	Site Location	Site Type	Within AQMA	OS Grid Ref (X, Y)
79	Marine Scene	R	N	317549, 172572
82	98b Windsor Road	R	N	318061, 171944
88	134 Windsor Road	R	Y	317668, 172312
100	141 Plassey Street	R	N	317968, 172105
112	Cogan Hill Flats	R	N	317434, 172729
113	03 Plassey Street	R	N	317999, 172067
* = Triplicate Site R = Roadside				

Table 3.7 – 2018 Monitoring Results of VGC Operated Diffusion Tube Monitoring Undertaken in Penarth

Site ID	Valid Data Capture for 2018 (%)	NO_2 annual mean concentration (µg/m³)				
		2014	2015	2016	2017	2018
22	75.0%	24.4	23.7	23.6	21.8	20.3
53**	66.7%	31.2	30.8	31.5	29.8	27.7
55	91.7%	27.1	27.7	28.9	26.3	26.3
56	100.0%	33.9	40.3	17.5	23.2	20.5
62	83.3%	33.9	31.7	33.2	31.2	28.1
70	100.0%	21.9	23.2	24.6	20.3	22.3
73*	91.7%	28.3	30.0	31.4	30.7	29.7
74**	66.7%	29.6	28.0	28.2	28.4	22.7
76	83.3%	33.9	32.0	32.4	30.7	29.9
79	100.0%	39.6	37.5	44.4	38.3	37.9
82	83.3%	19.6	17.4	18.0	16.9	17.1
88	75.0%	33.5	30.7	31.4	29.8	27.6
100	100.0%	-	-	-	23.9	24.0
112	100.0%	-	-	-	-	19.4
113	91.7%	-	-	-	-	21.7
Notes * Triplicate site ** Annualisation performed due to data capture less than 75% All values reported are bias adjusted and represent the monitoring location (i.e. absence of distance correction calculations)						

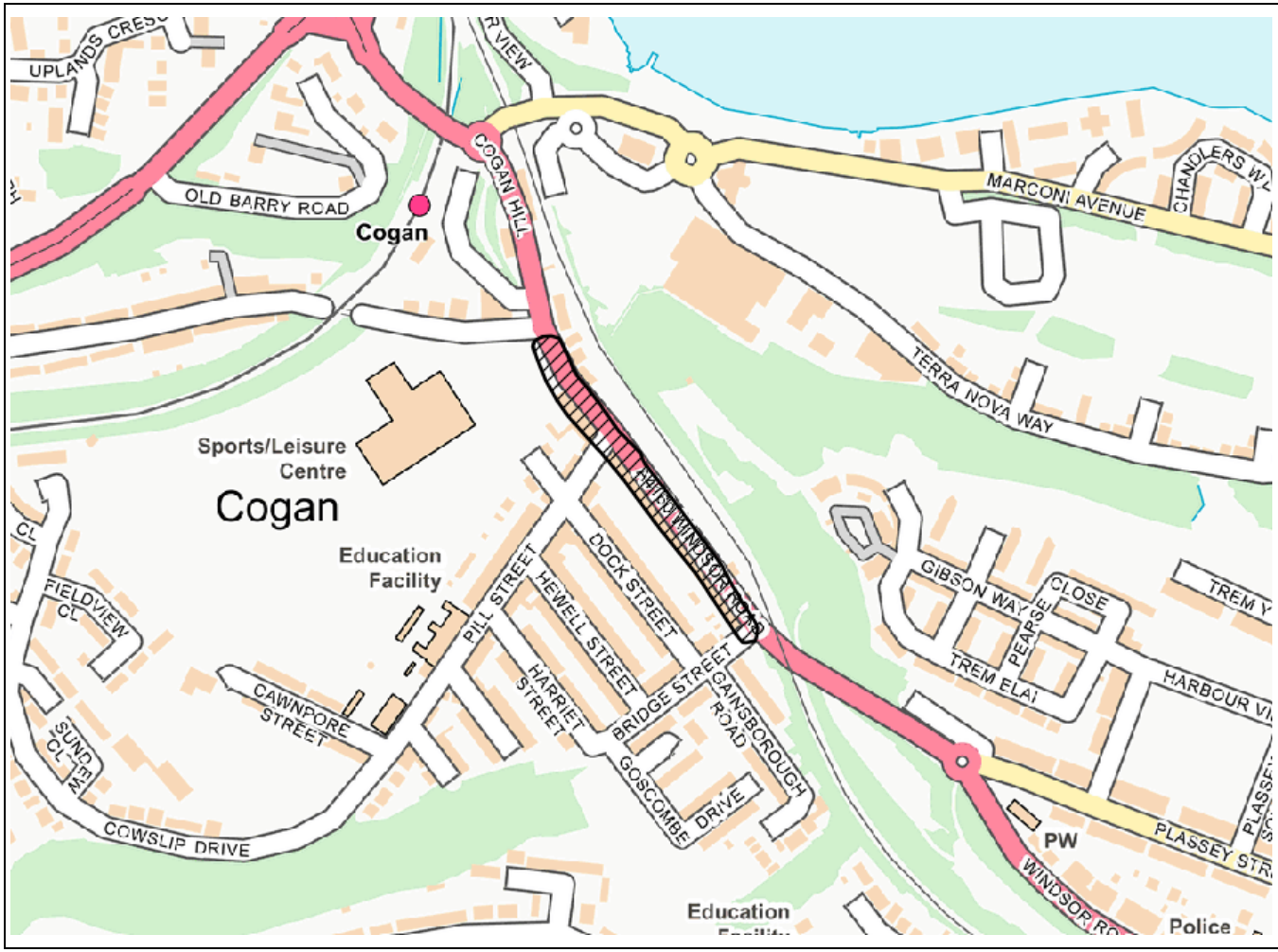
All monitoring locations during 2018, reported annual mean NO_2 concentrations to be below the AQS objective limit. Site 79, located north of the Windsor Road AQMA, along the A4160 (Cogan Hill) reported annual mean NO_2 concentrations to be within 10% of the AQS objective limit. However, Site 79 is not located at relevant exposure, and as a result distance correction was performed, resulting in the concentration of 31.6 µg/m³ at the nearest point of relevant exposure. Annual mean NO_2 concentrations observed at Site 79 have been within 10% or above 40 µg/m³ for all years since 2014, except 2016 when an exceedance observed. Site 79 is located along the A4160 (Windsor Road) north of the AQMA on a stretch of road likely to experience congestion.

Between 2014 and 2018 the maximum recorded NO_2 annual mean was 44.4 µg/m³ at Site 79 in 2016. In accordance with LAQM TG.16[2], this indicates that an exceedance of the 1-hour mean objective is unlikely to have occurred at any monitoring site between 2014 and 2018.

All non-automatic monitors located within the Windsor Road AQMA have reported annual mean NO_2 concentrations below 10% of the AQS objective limit since 2014, with the highest reported concentration recorded at Site 76 in 2014 (33.9 µg/m^3).

The Windsor Road AQMA boundary, alongside all 2018 council operated monitoring locations are presented in Figure 3.1 and Figure 3.2, respectively.

Figure 3.1 – Windsor Road, Penarth AQMA Boundary



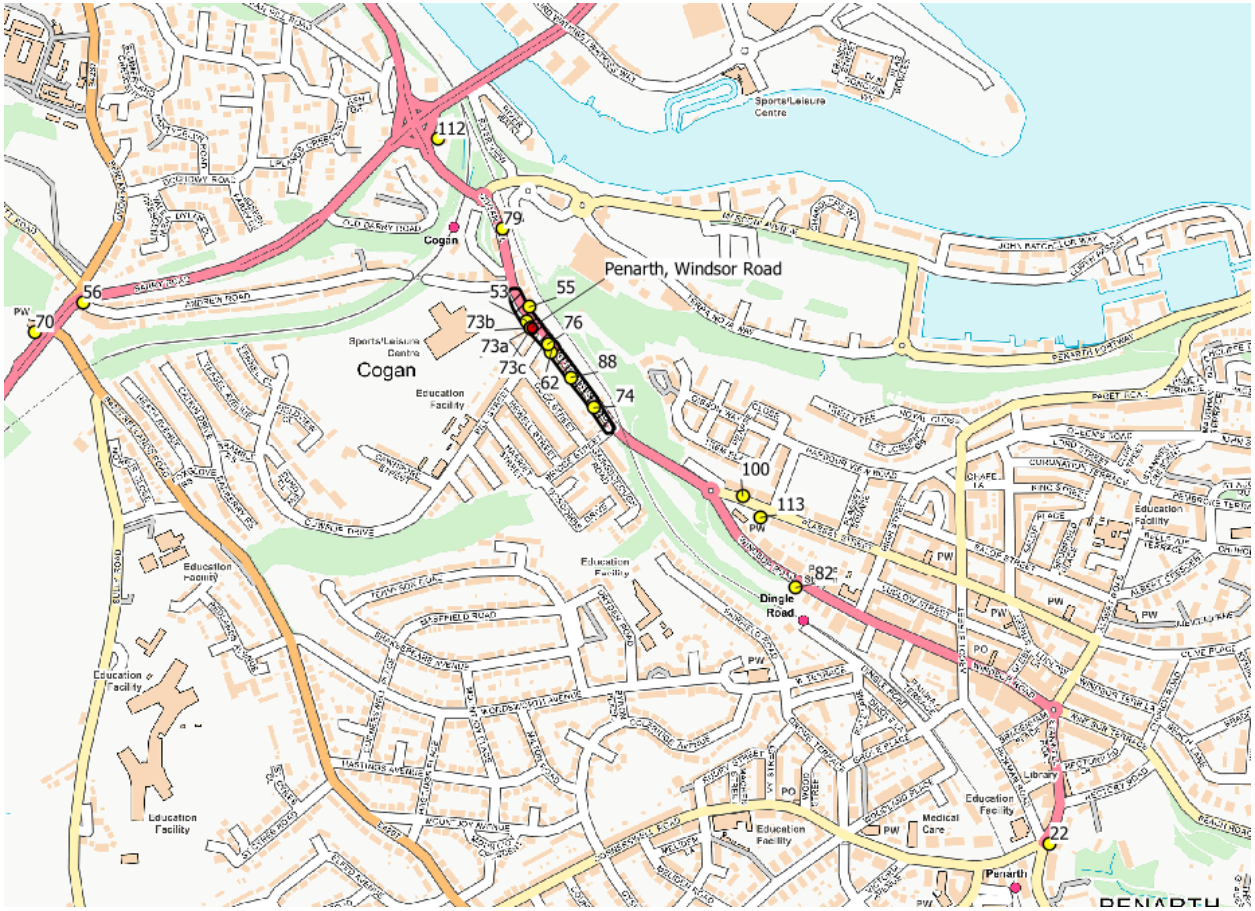
Legend

Windsor Road AQMA

Air Quality
Bureau Veritas
5th Floor
66 Prescot Street
London, E1 8HG

Location	
Penarth	
Title	
Windsor Road AQMA Boundary	
By	**Approved**
BT	PB
Scale	**Job Ref**
Not to Scale	6486686
Date	**Figure No.**
May 2019	3.1

Figure 3.2 – Local Monitoring Locations



Legend

- Windsor Road AQMA
- Automatic Monitor
- Diffusion Tube

Air Quality
Bureau Veritas
5th Floor
66 Prescot Street
London, E1 8HG

Location	
Penarth	
Title	
Local Monitoring Locations	
By	**Approved**
BT	PB
Scale	**Job Ref**
Not to Scale	6486686
Date	**Figure No.**
May 2019	3.2

3.3 Defra Background Concentration Estimates

Defra maintains a nationwide model of existing and future background air pollutant concentrations at a 1km x 1km grid square resolution. This data includes annual average concentration for NO_x, NO_2, PM_{10} and $PM_{2.5}$, using a base year of 2017 (the year in which comparisons between modelled and monitoring are made). The model used to determine the background pollutant levels is semi-empirical in nature: it uses the National Atmospheric Emissions Inventory (NAEI) emissions to model the concentrations of pollutants at the centroid of each 1km grid square, but then calibrates these concentrations in relation to actual monitoring data.

Annual mean background concentrations have been obtained from the Defra published background maps, based on the 1km grid squares which cover the modelled area and the affected road network. The Defra mapped background concentrations for base year of 2018, which cover the modelled domain, are presented in Table 3.8.

All of the mapped background concentrations presented are well below the respective annual mean AQS objectives.

Due to the absence of local background monitoring within Penarth, pollutant background concentrations used for the purposes of this assessment have been obtained from the 2017 Defra supplied background NO_x, NO_2 and PM_{10} maps for the relevant 1km x 1km grid squares covering the modelled domain. The relevant annual mean background concentration will be added to the predicted annual mean road contributions in order to predict the total pollutant concentration at each receptor location. The total pollutant concentration can then be compared against the relevant AQS objective to determine the event of an exceedance.

In order to avoid duplication of road sources within the model, contributions from 'Trunk A Roads' and 'Primary A Roads' have been removed from the overall background concentrations for NO_x, NO_2 and PM_{10}. As the relationship between NO_2 and NO_x is not linear, the most recent version of the NO_2 Adjustment for NO_x Sector Removal Tool[10] has been used. No adjustment for background concentration variability at different receptor heights has been made.

Table 3.8 – Defra Background Pollutant Concentrations Covering the Modelled Domain

Grid Square (E, N)	Year	Revised Annual Mean Background Concentration (µg/m³)		
		NO_x	NO_2	PM_{10}
317500, 172500	2018	15.3	11.2	11.3
	2023	12.0	9.0	10.8
	2028	10.2	7.8	10.5
318500, 172500	2018	16.9	12.4	11.5
	2023	13.4	10.0	10.9
	2028	11.2	8.5	10.7
318500, 171500	2018	15.7	11.6	11.0
	2023	12.6	9.4	10.4
	2028	10.5	8.0	10.2
All values presented account for the removal of the identified road contributions. For NO_2, this has been calculated using the NO_2 adjustment for NO_x sector removal tool (V7.0)				

[10] Defra NO_2 Adjustment for NO_x Sector Removal Tool version 7.0 (2019), available at https://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html#NOxsector

4 Assessment Methodology

To predict pollutant concentrations of road traffic emissions the atmospheric model ADMS Roads version 4.1.1 was utilised. The following scenarios have been assessed to reflect both NO_2 and PM_{10} concentrations in 2018, 2023 and 2028.

- 2018 Baseline (2018) – Baseline year predictions.
- 2023 Baseline (2023) – Future year predictions.
- 2028 Baseline (2028) – Future year predictions.

In order to provide consistency with the Council's previous work on air quality, the guiding principles for air quality assessments as set out in the latest guidance and tools provided by Defra for air quality assessment (LAQM.TG(16)[2] have been used.

The approach used in this assessment has been based on the following:

- Prediction of NO_2 and PM_{10} concentrations to which existing identified receptors may be exposed to, and a comparison with the relevant AQS objectives; and
- Determination of the geographical extent of any potential exceedances.

4.1 Traffic Inputs

The dispersion model utilised both 2017 Department for Transports (DfT) traffic count data[11] (due to the absence of published 2018 data at the time of writing), as well as Council monitored data comprising of Automatic Traffic Counts (ATC) collected in February 2015. Both datasets were adjusted to 2018, 2023 and 2028 using conversion factors derived from the DfT TEMPro Version 7.2[12]. Table 4.1 provides details of the TEMPro growth factors employed throughout the assessment.

Table 4.1 – TEMPro Growth Factors Employed

Scenarios	2015 Council ATC Data	2017 DfT Data
2018	1.00	1.00
2023	0.99	1.00
2028	0.99	0.99

The Emissions Factors Toolkit (EFT) version 9.0 developed by Defra[13] has been used to determine vehicle emission factors for input into the ADMS-Roads model.

Details of the traffic flows used in this assessment are provided Table 4.2, whilst the entire modelled road network across Penarth is presented in Figure 4.1.

[11] DfT, Traffic Count Database. https://www.dft.gov.uk/traffic-counts/

[12] DfT, TEMPro Version 7.2.

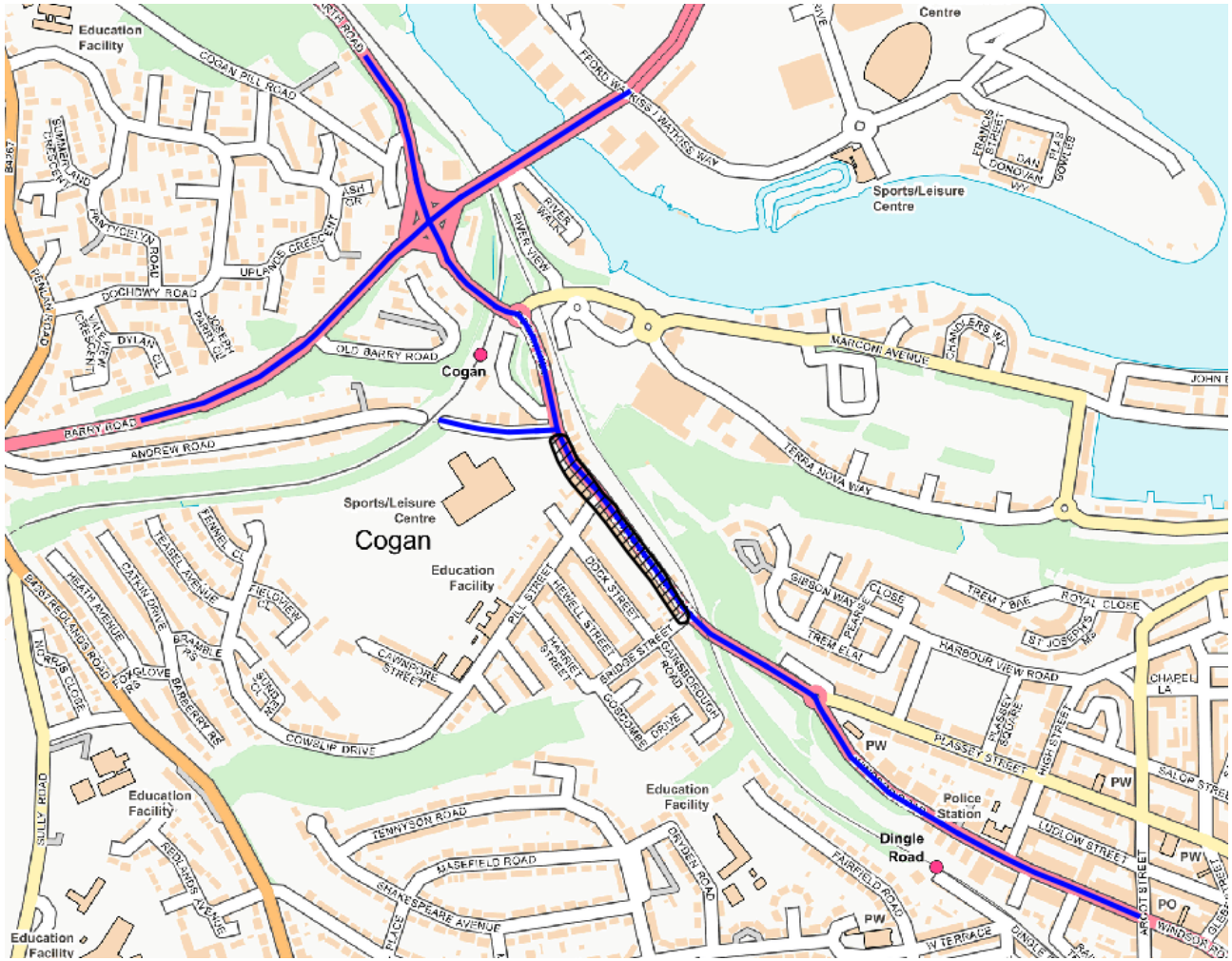
[13] Defra, Emissions Factors Toolkit (2019). http://laqm.defra.gov.uk/review-and-assessment/tools/emissions-factors-toolkit.html

Table 4.2 – Traffic Data used in the Detailed Assessment

Road Name	AADT	Car (%)	LGV (%)	Rigid HGV (%)	Artic HGV (%)	Bus and Coaches (%)	Motorcycles (%)	Average Speed (kph)
Windsor Road [a]	11,967	86.4	11.2	0.7	0.1	1.2	0.3	48.3
Windsor Road 2 [b]	20,503	79.3	9.0	6.1	3.4	0.3	2.1	47.2
Windsor Road 3 (Cogan Hill) [b]	21,332	92.1	5.1	1.2	0.9	0.2	0.5	38.1
Barry Road [a]	23,757	85.2	12.0	1.5	0.5	0.3	0.5	64.4
Barry Road 2 [a]	33,357	87.7	9.7	1.4	0.5	0.3	0.3	64.4
Andrew Road [b]	2,313	92.7	5.7	0.7	0.1	0.1	0.8	30.7
Penarth Road [a]	15,404	76.7	19.3	1.8	0.3	1.4	0.5	64.4

Notes:
[a] DfT data (2017 reference year)
[b] Council ATC monitored data (2015 reference year)
[c] Speeds based upon National Speed Limits.
Traffic speeds have been reduced at junctions and stretches of roads where queues are thought to be prevalent in accordance with Defra's TG16[2]

Figure 4.1 – Modelled Roads in Penarth



Legend

Windsor Road AQMA

Modelled Road Link

Air Quality
Bureau Veritas
5th Floor
66 Prescot Street
London, E1 8HG

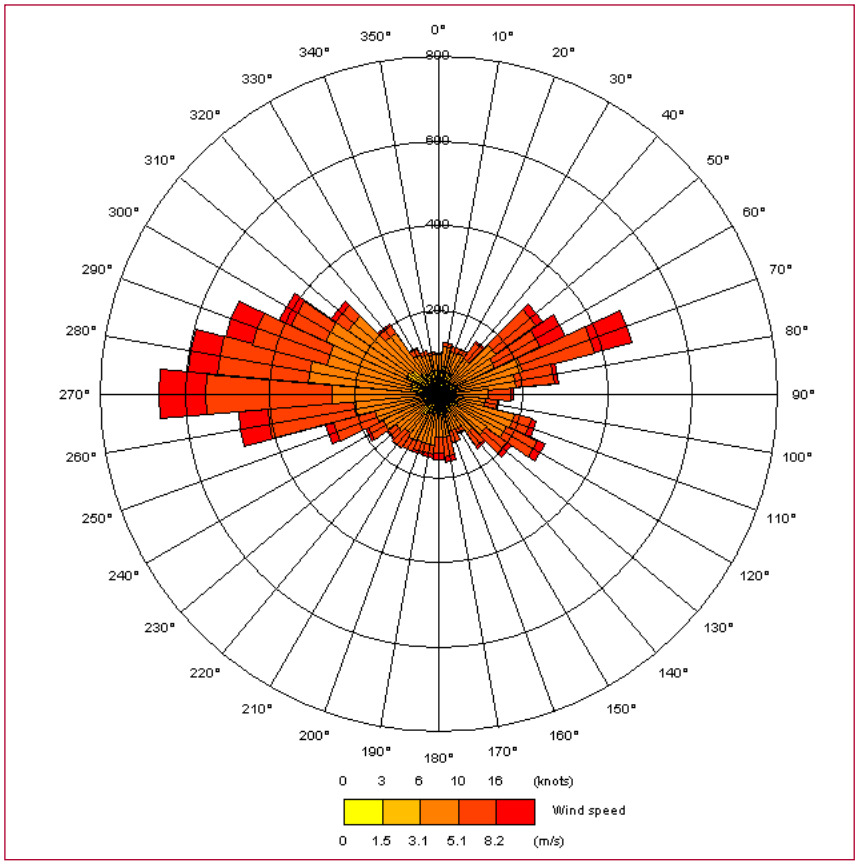
Location Penarth	
Title Modelled Roads In Penarth	
By BT	**Approved** PB
Scale Not to Scale	**Job Ref** 6486686
Date May 2019	**Figure No.** 4.1

4.2 General Model Inputs

A site surface roughness value of 0.6m was entered into the ADMS-roads model, consistent with the topographic nature of the modelled domain - an open urban environment. One year of hourly sequential meteorological data from a representative synoptic station is required by the dispersion model. 2018 meteorological data from Rhoose (Cardiff Airport) weather station, located approximately 12.0km southwest of Penarth, has been used in this assessment.

A wind rose for this site for the year 2018 is presented in Figure 4.2 below. A meteorological site surface roughness value of 0.5m was entered into the ADMS-roads model – reflective of the open rural environment surrounding Cardiff Airport.

Figure 4.2 – Wind rose for Rhoose (Cardiff Airport) Meteorological Data 2018



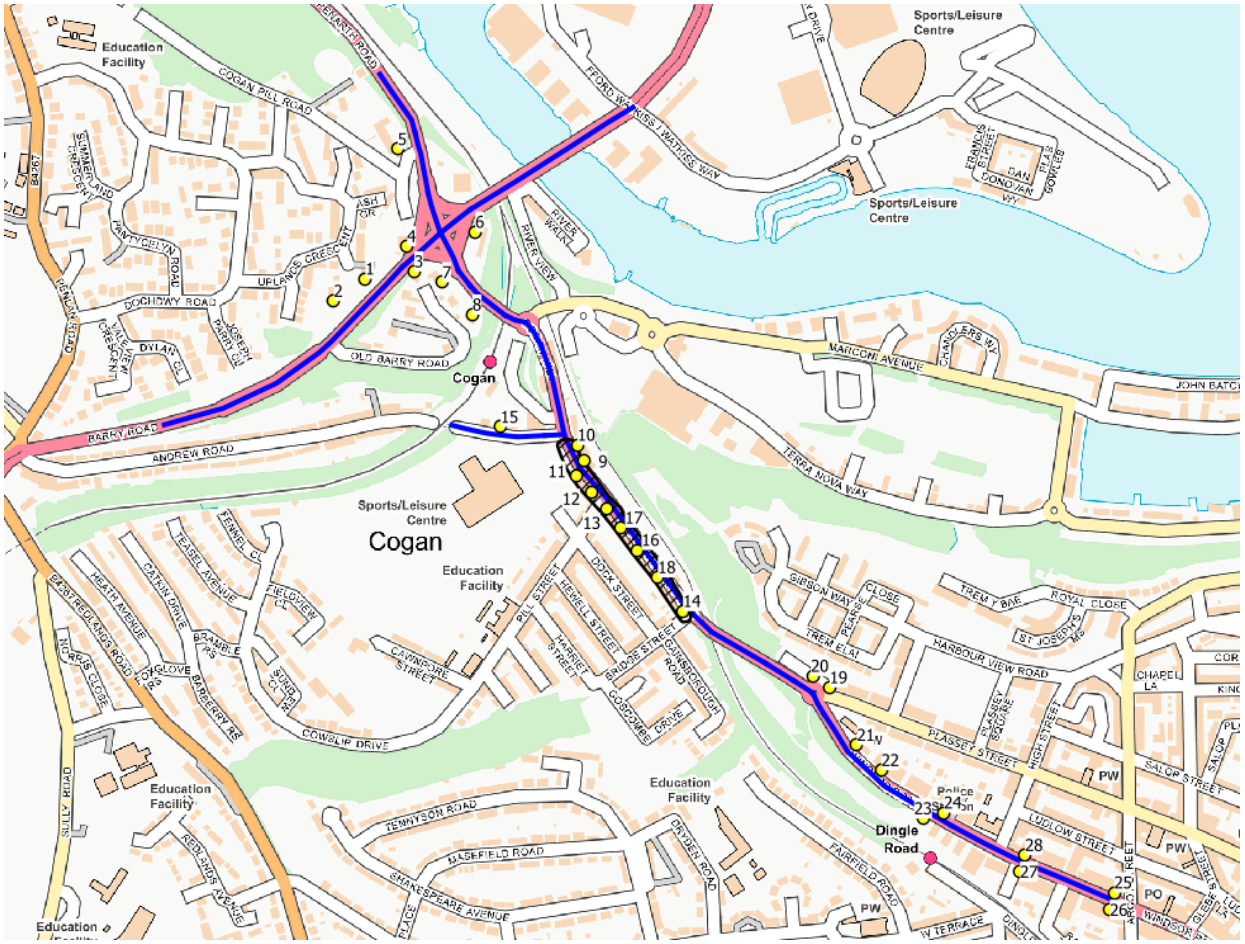
Most dispersion models do not use meteorological data if they relate to calm winds conditions, as dispersion of air pollutants is more difficult to calculate in these circumstances. ADMS-Roads treats calm wind conditions by setting the minimum wind speed to 0.75m/s. It is recommended in LAQM.TG(16)[2] that the meteorological data file be tested within a dispersion model and the relevant output log file checked, to confirm the number of missing hours and calm hours that cannot be used by the dispersion model. This is important when considering predictions of high percentiles and the number of exceedances LAQM.TG(16) recommends that meteorological data should only be used if the percentage of usable hours is greater than 75%, and preferably 90%. 2018 meteorological data from Rhoose (Cardiff Airport) includes 8539 lines of usable hourly data out of the total 8,760 for the year, i.e. 97.5% usable data. This is therefore suitable for the dispersion modelling exercise.

4.3 Sensitive Receptors

Pollutant concentrations at 28 specific receptors have been predicted within the assessment to represent locations of relevant exposure within the study area (i.e. residential properties closest to

the roadside). Details of the receptors are presented within Appendix 3 in Table A7, and their locations are illustrated in Figure 4.3.

Figure 4.3 – Receptor Locations Considered in the Assessment



Legend

Receptor Location

Modelled Road Link

Air Quality
Bureau Veritas
5th Floor
66 Prescot Street
London, E1 8HG

Location Penarth	
Title Receptor Locations Considered in the Assessment	
By BT	**Approved** PB
Scale Not to Scale	**Job Ref** 6475940
Date May 2019	**Figure No.** 4.3

4.4 Model Outputs

The background pollutant values discussed in Section 3.3 have been used in conjunction with the concentrations predicted by the ADMS-Roads model to calculate predicted total annual mean concentrations of NO_x, NO_2 and PM_{10}.

For the prediction of annual mean NO_2 concentrations for the modelled scenarios, the output of the ADMS-Roads model for road NO_x contributions has been converted to total NO_2 following the methodology in LAQM.TG(16)[2], using the NO_x to NO_2 conversion tool developed on behalf of Defra. This tool also utilises the total background NO_x and NO_2 concentrations. This assessment has utilised version 7.1 (May 2019) of the NO_x to NO_2 conversion tool[14]. The road contribution is then added to the appropriate NO_2 background concentration value to obtain an overall total NO_2 concentration.

For the prediction of short term NO_2 impacts, LAQM.TG(16)[2] advises that it is valid to assume that exceedances of the 1-hour mean AQS objective for NO_2 are only likely to occur where the annual mean NO_2 concentration is 60 µg/m^3 or greater. This approach has thus been adopted for the purposes of this assessment.

Annual mean PM_{10} road contributions were also output from the model and processed in a similar manner, i.e. combined with the relevant background annual mean PM_{10}/$PM_{2.5}$ concentrations to obtain an overall total PM_{10}/$PM_{2.5}$ concentrations.

For the prediction of short term PM_{10}, LAQM.TG(16)[2] provides an empirical relationship between the annual mean and the number of exceedances of the 24-hour mean AQS objective for PM_{10} that can be calculated as follows:

$$Number\ of\ 24\ hour\ Mean\ Exceedences = -18.5 + 0.00145 * annual\ mean^3 + \frac{206}{annual\ mean}$$

This relationship has thus been adopted to determine whether exceedances of the short-term PM_{10} AQS objective are likely in this assessment.

Verification of the ADMS-Roads assessment has been undertaken using a number of local authority diffusion tube monitoring locations. All NO_2 results presented in the assessment are those calculated following the process of model verification - using a factor of 4.102, Concentrations of PM_{10} have been adjusted using a factor of 10.4. Full details of the verification process are provided in Appendix 1 – ADMS Model Verification.

4.5 Uncertainty

Due to the number of inputs that are associated with the modelling of the study area there is a level of uncertainty that has to be taken into account when drawing conclusions from the predicted concentrations of NO_2. The predicted concentrations are based upon the inputs of traffic data, background concentrations, emission factors, street canyon calculations, meteorological data, modelling terrain limitations and the availability of monitoring data from the assessment area.

4.5.1 Uncertainty in NO_x and NO_2 Trends

Historical monitoring data within the UK shows a disparity between measured concentration data and the projected decline in concentrations associated with emission forecasts for future years[15].

[14] Defra NO_x to NO_2 Calculator (2019), available at https://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html#NOxNO2calc

[15] Carslaw, D, Beevers, S, Westmoreland, E, Williams, M, Tate, J, Murrells, T, Steadman, J, Li, Y, Grice, S, Kent, Aand Tsagatakis, I. 2011, Trends in NO_x and NO_2 emissions and ambient measurements in the UK, prepared for Defra, July 2011.

Ambient concentrations of NO_x and NO_2 have shown two distinct trends over the past twenty five years:

- A decrease in concentrations from around 1996 to 2002/04; followed by
- A period of more stable concentrations from 2002/04 rather than the further decline in concentrations that was expected due to the improvements in vehicle emissions standards.

The reason for this disparity is related to the actual on-road performance of vehicles, in particular diesel cars and vans, when compared with calculations based on the Euro emission standards. Preliminary studies suggest the following:

- NO_x emissions from petrol vehicles appear to be in line with current projections and have decreased by 96% since the introduction of 3-way catalysts in 1993;
- NO_x emissions from diesel cars, under urban driving conditions, do not appear to have declined substantially, up to and including Euro 5. There is limited evidence that the same pattern may occur for motorway driving conditions; and
- NO_x emissions from HDVs equipped with Selective Catalytic Reduction (SCR) are much higher than expected when driving at low speeds.

This disparity in the historical national data highlights the uncertainty of future year projections of both NO_x and NO_2.

Defra and the Devolved Administrations have investigated these issues and have since published an updated version of the EFT (version 9.0) utilising COPERT 5 emission factors, which may go some way to addressing this disparity, but it is considered likely that a gap still remains. This assessment has utilised the latest EFT version 9.0 and associated tools published by Defra to help minimise any associated uncertainty when forming conclusions from the results.

Notwithstanding the above, consideration was given to the incorporation of two conservative scenarios to complement the future year studies (2023 and 2028), holding background concentrations and emission factors at 2018 (i.e. assuming that there is no improvement in vehicle emission factors or pollutant concentrations within Penarth for future years). However, a growth factor of 1.00 and 0.99 was obtained from TEMPro Version 7.2 to adjust 2018 traffic flows to 2023 and 2028 flows – as detailed in Table 4.1.

Therefore it is not necessary to undertake the supplementary conservative scenarios for 2023 and 2028 as the results would be identical (as a worst case) to the 2018 scenario. Notwithstanding this, 2023 and 2028 scenarios (with corresponding background concentrations and emission factors) will be assessed.

5 Results

The assessment has considered emissions of NO_x/NO_2 and PM_{10} from road traffic at 28 existing receptor locations representing locations of relevant exposure. The results of the dispersion modelling are summarised below, for those receptor locations detailed in Table A7 and illustrated in Figure 4.3.

5.1.1 Assessment of Nitrogen Dioxide (NO_2)

Table 5.1 presents the annual mean NO_2 concentrations predicted at existing receptor locations for 2018, 2023 and 2028 scenarios, and a comparison against the 40 µg/m^3 annual mean AQS objective.

The maximum predicted annual mean NO_2 concentration at existing receptor locations for the 2018 scenario was at receptor R6 with a predicted concentration of 31.6 µg/m^3, 79% of the annual mean NO_2 AQS objective. Similarly, the annual mean concentrations predicted for the future 2023 and 2028 scenarios at R6 was found to be the highest (22.8 µg/m^3 and 16.6 µg/m^3 respectively). Receptor R6 is located along Elizabeth Court, approximately 12m from the road junction where the A4055 Barry Road meets the A4160 Penarth Road and the A4160 Cogan Hill via a network of slip roads.

The empirical relationship given in LAQM.TG(16)[2] states that exceedances of the 1-hour mean objective for NO_2 are only likely to occur where annual mean concentrations are 60 µg/m^3 or above. Given that the NO_2 annual mean concentrations predicted at all receptor locations are below this limit for all scenarios, exceedances of the 1-hour NO_2 AQS objective are unlikely.

The maximum annual mean NO_2 concentration predicted at existing receptor locations within the Windsor Road AQMA was at receptors R16 and R18 with a predicted concentration of 31.2 µg/m^3, 78% of the annual mean NO_2 AQS objective. Similarly, the maximum annual mean concentrations predicted in the future year scenarios (2023 and 2028) were at receptors R16 and R18 (21.4 µg/m^3 and 15.7 µg/m^3 respectively). Both receptors are located on the façade of a property bordering the A4160 (Windsor Road), located along the south-western extent of the AQMA.

Table 5.1 – Predicted Annual Mean Concentrations of NO_2

ID	Annual Mean NO_2 Concentration (µg/m^3)			
	AQS Objective	2018	2023	2028
R1	40	19.9	14.9	11.5
R2	40	17.3	13.1	10.4
R3	40	27.8	20.2	15.0
R4	40	15.9	12.1	9.7
R5	40	17.6	13.2	10.4
R6	40	31.6	22.8	16.6
R7	40	22.7	16.8	12.7
R8	40	19.2	14.4	11.2
R9	40	28.0	20.6	15.3
R10	40	27.9	20.5	15.2
R11	40	25.1	18.6	13.9
R12	40	25.4	18.7	14.0
R13	40	29.1	20.5	15.1
R14	40	31.0	21.3	15.6
R15	40	15.8	12.2	9.8
R16	40	31.2	21.4	15.7

R17	40	30.6	21.2	15.5
R18	40	31.2	21.4	15.7
R19	40	18.2	13.4	10.5
R20	40	18.6	13.5	10.6
R21	40	19.4	14.5	11.2
R22	40	20.8	15.7	12.0
R23	40	20.5	15.4	11.8
R24	40	21.8	16.3	12.3
R25	40	19.6	14.8	11.4
R26	40	17.7	13.5	10.6
R27	40	19.2	14.6	11.2
R28	40	20.9	15.7	12.0

5.1.2 Assessment of Particulate Matter (PM_{10})

Table 5.2 presents the annual mean PM_{10} concentrations predicted at existing receptor locations for 2018, 2023 and 2028 scenarios, and a comparison against the 40 µg/m^3 annual mean AQS objective.

The maximum predicted annual mean PM_{10} concentration at existing receptor locations for the 2018 scenario was at receptors R16 and R18 with a predicted concentration of 21.8 µg/m^3, 54.5% of the annual mean PM_{10} AQS objective. Similarly, the maximum annual mean concentrations predicted in the future year scenarios (2023 and 2028) were at receptors R16 and R18 (20.6 µg/m^3 and 20.1 µg/m^3 respectively). Both receptors are located within the Windsor Road AQMA.

Table 5.3 shows the number of predicted exceedances of the 24-hour PM_{10} 50µg/m^3 AQS objective predicted at all receptor locations, for the 2018, 2023 and 2028 scenarios.

The number of days where PM_{10} concentrations were predicted to be above the 24-hour PM_{10} 50µg/m^3 AQS objective was less or equal to 6 days for all modelled scenarios at all receptor locations. This is well below the 35 permitted exceedances.

Table 5.2 – Predicted Annual Mean Concentrations of PM_{10}

ID	Annual Mean NO_2 Concentration (µg/m3)			
	AQS Objective	2018	2023	2028
R1	40	15.3	14.5	14.2
R2	40	14.2	13.5	13.2
R3	40	18.1	17.0	16.6
R4	40	13.2	12.5	12.2
R5	40	14.2	13.4	13.1
R6	40	19.4	18.2	17.8
R7	40	16.1	15.2	14.9
R8	40	15.1	14.3	13.9
R9	40	19.7	18.6	18.2
R10	40	19.6	18.5	18.1
R11	40	18.1	17.2	16.8
R12	40	18.4	17.4	17.0
R13	40	20.6	19.4	19.0
R14	40	21.6	20.4	20.0
R15	40	13.4	12.7	12.5
R16	40	21.8	20.5	20.1
R17	40	21.5	20.2	19.8
R18	40	21.8	20.6	20.1
R19	40	14.6	13.9	13.6
R20	40	14.9	14.1	13.8
R21	40	15.2	14.4	14.1
R22	40	15.5	14.7	14.4
R23	40	15.1	14.3	14.0
R24	40	15.6	14.7	14.4
R25	40	14.8	14.0	13.7
R26	40	13.8	13.1	12.8
R27	40	14.6	13.8	13.5
R28	40	15.4	14.6	14.2

Table 5.3 – Predicted Number of Exceedances of 24-hour PM_{10} 50 µg/m^3 AQS objective

ID	Number of allowed exceedances of PM_{10} 50 µg/m^3 AQS Objective		
	2018	2023	2028
R1	1	1	1
R2	1	1	1
R3	1	1	1
R4	1	1	1
R5	1	1	1
R6	3	2	1
R7	1	1	1
R8	1	1	1
R9	3	2	2
R10	3	2	1
R11	2	1	1
R12	2	1	1
R13	4	3	2
R14	6	4	3

R15	1	1	1
R16	6	4	4
R17	5	4	3
R18	6	4	4
R19	1	1	1
R20	1	1	1
R21	1	1	1
R22	1	1	1
R23	1	1	1
R24	1	1	1
R25	1	1	1
R26	1	1	1
R27	1	1	1
R28	1	1	1

6 Conclusions and Recommendations

Bureau Veritas have been commissioned by Vale of Glamorgan Council to complete a Detailed Modelling Study to assess the current pollutant concentrations experienced within the Councils' Windsor Road AQMA. The AQMA was declared in 2013 due to monitored and model predicted exceedances of the NO_2 annual mean Air Quality Strategy objective limit of 40 µg/m^3.

Since 2014, NO_2 annual mean concentrations within Penarth (specifically along Windsor Road) have stabilised below the AQS objective limit. Therefore, this has resulted in a requirement for further assessment as to whether concentrations are above Air Quality Strategy objective limits.

This Detailed Modelling Assessment focusses on the road network within and adjacent to the Windsor Road AQMA to establish any changes in the spatial extent of NO_2 and PM_{10} concentrations in order to identify any areas that are above, or within 10%, of the AQS annual mean objectives. The road links defined as the modelled domain were modelled using the advanced atmospheric dispersion model ADMS-Roads (Version 4.1.1) and latest emissions from the Emissions Factor Toolkit (Version 9.0), with annual mean NO_2 and PM_{10} concentrations predicted at 28 discrete receptor locations for three scenario years (2018, 2023 and 2028).

The predicted concentrations of NO_2 and PM_{10} at all modelled receptors within the Windsor Road AQMA, and adjacent to the modelled road network in Penarth are well below both the annual mean and short term AQS objectives for all modelled scenarios.

Based on the conclusions of the assessment, the following recommendations are made:

- Revoke the Windsor Road, Penarth AQMA;
- Consider decommissioning and/or relocating of monitoring sites which have consistently reported NO_2 concentrations to be well below the respective AQS annual or short term mean objective.

Appendices

Appendix 1 – ADMS Model Verification

The ADMS-Roads dispersion model has been widely validated for this type of assessment and is specifically listed in the Defra's LAQM.TG(16)[2] guidance as an accepted dispersion model.

Model validation undertaken by the software developer (CERC) will not have included validation in the vicinity of the proposed development site. It is therefore necessary to perform a comparison of modelled results with local monitoring data at relevant locations. This process of verification attempts to minimise modelling uncertainty and systematic error by correcting modelled results by an adjustment factor to gain greater confidence in the final results.

The predicted results from a dispersion model may differ from measured concentrations for a large number of reasons, including uncertainties associated with:

- Background concentration estimates;
- Source activity data such as traffic flows and emissions factors;
- Monitoring data, including locations; and
- Overall model limitations.

Model verification is the process by which these and other uncertainties are investigated and where possible minimised. In reality, the differences between modelled and monitored results are likely to be a combination of all of these aspects.

Model setup parameters and input data were checked prior to running the models in order to reduce these uncertainties. The following were checked to the extent possible to ensure accuracy:

- Traffic data;
- Distance between sources and monitoring as represented in the model;
- Speed estimates on roads;
- Background monitoring and background estimates; and
- Monitoring data.

The traffic data for this assessment has been collated using a combination of data provided by the highways department at Vale of Glamorgan Council and DfT traffic count data, as outlined in Section 4.1.

NO_2 Model Verification

Concentrations of NO_2 are monitored at 15 sites across Penarth, comprising 17 diffusion tubes and one continuous monitor (Penarth, Windsor Road), with the provision of a triplicate colocation study (Table A1). Five diffusion tubes were sited outside of the modelled road network so were therefore removed from the verification process:

- Site 22;
- Site 56;
- Site 70;

- Site 100; and
- Site 113.

The details of the all the LAQM monitoring sites used for the purposes of model verification are presented in Table A1.

Table A1 - Local Monitoring Data Available for Model Verification

Site ID	OS Grid Reference		2018 Annual Mean NO_2 ($\mu g/m^3$)	2018 Data Capture (%)
	X	Y		
22	318505	171496	20.3	75.0
53	317589	172411	27.7	66.7
55	317595	172435	26.3	91.7
56	316814	172443	20.5	100.0
62	317633	172357	28.1	83.3
70	316731	172391	22.3	100.0
73*	317598	172399	29.7	97.2
74	317708	172259	22.7	66.7
76	317627	172371	29.9	83.3
79	317549	172572	37.9	100.0
82	318061	171944	17.1	83.3
88	317668	172312	27.6	75.0
100	317968	172105	24.0	100.0
112	317434	172729	19.4	100.0
113	317999	172067	21.7	91.7
Penarth, Windsor Road*	317600	172399	24.3	99.7
* Triplicate Colocation Site				

NO_2 Verification calculations

The verification of the modelling output was performed in accordance with the methodology provided in Chapter 7 of LAQM.TG(16)[2].

For the verification and adjustment of NO_x/NO_2, the 2018 monitoring data was used, as presented in Table A1. Two diffusion tubes reported data capture to be below 75% for the duration of 2018, with annualisation subsequently performed to derive the reported NO_2 annual mean concentration. On the basis of the added uncertaintiy annualisation adds to monitored values, both sites were removed from the verification process. These include:

- Site 53; and
- Site 74.

In addition the Windsor Road automatic monitor has also been removed from the verification process. Within 2018 a national bias adjustment factor (0.76), rather than a local bias factor derived from the colocation study, was used to adjust the diffusion tube data. Due to this the NO_2 annual mean concentrations reported at the triplicate Site 73 are higher than those reported at Windsor Road. Due to the application of a national bias adjustment factor to the 2018 diffusion tube concentrations, a conservative approach has been taken to verification by removing the Windsor Road site from the verification process

Verification was completed using the 2018 (2017 reference year) Defra background mapped concentrations for the relevant 1km x 1km grid squares within The Vale of Glamorgan (i.e. those

within which the model verification locations are located), as displayed in Table 3.8. These values have been corrected to avoid duplication of road sources within the model (i.e. contributions from 'Trunk A Roads' and 'Primary A Roads' have been removed from the overall background concentrations for NO_X and NO_2). As the relationship between NO_2 and NO_x is not linear, the most recent version of the NO_2 Adjustment for NO_x Sector Removal Tool[16] has been used.

Table A2 below shows an initial comparison of the monitored and unverified modelled NO_2 results for the year 2018, in order to determine if verification and adjustment was required.

Table A2 – Comparison of Unverified Modelled and Monitored NO_2 Concentrations

Site ID	Background NO_2	Monitored total NO_2 (µg/m^3)	Unverified Modelled total NO_2 (µg/m^3)	% Difference (modelled vs. monitored)
55	11.2	26.3	15.9	-39.5
62	11.2	28.1	15.3	-45.3
73	11.2	29.7	15.7	-47.1
76	11.2	29.9	15.6	-47.9
79	11.2	37.9	17.7	-53.2
82	11.6	17.1	14.2	-17.1
88	11.2	27.6	15.9	-42.3
112	11.2	19.4	16.3	-16.1

The model was under predicting at all verification points, with the highest under prediction between the modelled and monitored concentrations observed at Site 79 (-53.2%). Following a review of the model inputs including road widths, prominence of urban canyons and monitoring locations no further improvement of the modelled results could be obtained on this occasion. At all sites apart from two, the difference between modelled and monitored concentrations was greater than ±25%, meaning adjustment of the results was necessary. The relevant data was then gathered to allow the adjustment factor to be calculated.

Model adjustment needs to be undertaken based for NO_x and not NO_2. For the Council operated monitoring results used in the calculation of the model adjustment, NO_x was derived from NO_2; these calculations were undertaken using a spreadsheet tool available from the LAQM website.

Table A3 provides the relevant data required to calculate the model adjustment based on regression of the modelled and monitored road source contribution to NO_x.

Table A3 - Data Required for Adjustment Factor Calculation

Site ID	Monitored total NO_2 (µg/m^3)	Monitored total NO_x (µg/m^3)	Background NO_2 (µg/m^3)	Background NO_x (µg/m^3)	Monitored road contribution NO_2 (total - background) (µg/m^3)	Monitored road contribution NO_x (total - background) (µg/m^3)	Modelled road contribution NO_x (excludes background) (µg/m^3)
55	26.3	45.1	11.2	15.3	15.0	29.8	8.8
62	28.1	48.9	11.2	15.3	16.8	33.6	7.7
73	29.7	52.4	11.2	15.3	18.4	37.1	8.4
76	29.9	52.9	11.2	15.3	18.6	37.6	8.2
79	37.9	71.3	11.2	15.3	26.6	56.0	12.4
82	17.1	26.2	11.6	15.7	5.5	10.5	4.8
88	27.6	48.0	11.2	15.3	16.4	32.7	8.9
112	19.4	30.9	11.2	15.3	8.2	15.7	9.5

[16] Defra NO_2 Adjustment for NO_x Sector Removal Tool version 7.0 (2019), available at https://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html#NOxsector

Figure A.1 provides a comparison of the Unverified Modelled Road Contribution NO_x versus Monitored Road Contribution NO_x, and the equation of the trend line based on linear regression through zero. The equation of the trend lines presented in Figure A.1 gives an adjustment factor for the modelled results of 3.742.

Figure A.1 – Comparison of the Modelled Road Contribution NO_x versus Monitored Road Contribution NO_x across all verification points

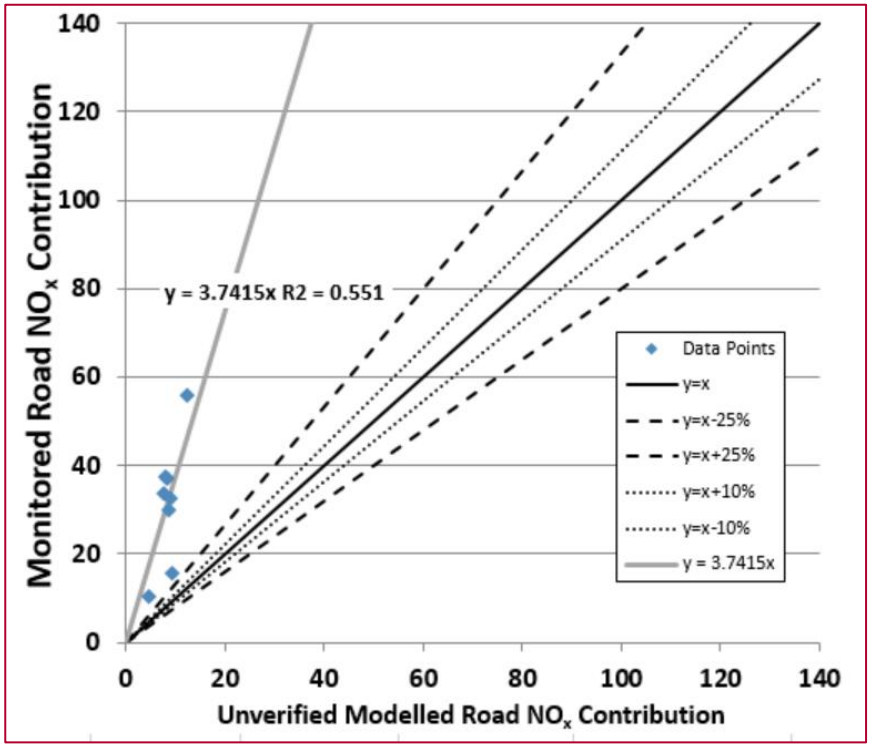


Table A4 and Figure A.1 show the ratios between monitored and modelled NO_2 for each monitoring location after using an adjustment factor of 3.742. LAQM.TG(16)[2] states that:

> *"In order to provide more confidence in the model predictions and the decisions based on these, the majority of results should be within 25% of the monitored concentrations, ideally within 10%."*

Although the model was performing well at most monitoring sites, the model was not performing well or was not showing consistency across similar monitoring sites, in particular at Site 112, where a 49.5% difference was observed. As a result, an adjustment factor of 3.742 could not be used. Site 112 is located along Elizabeth Court, adjacent to a major junction where the A4055 Barry Road meets the A4160 Penarth Road and the A4160 Cogan Hill via a network of slip roads. Due to the resolution of traffic data available, the emissions contribution from vehicles using the slips, have not been modelled. As a result, Site 112 was removed from the verification process

Table A4 - Adjustment Factor and Comparison of Verified Results against Monitoring Results (Initial)

Site ID	Ratio of monitored road contribution NO_x / modelled road contribution NOx	Adjustment factor for modelled road contribution NO_x	Adjusted modelled road contribution NO_x (µg/m³)	Adjusted modelled total NO_x (including background NO_x) (µg/m³)	Modelled total NO_2 (based upon empirical NO_x / NO_2 relationship) (µg/m³)	Monitored total NO_2 (µg/m³)	% Difference (adjusted modelled NO_2 vs. monitored NO_2)
55	3.39	3.742	32.9	48.2	27.7	26.3	5.5
62	4.35		28.9	44.2	25.9	28.1	-7.8
73	4.41		31.5	46.8	27.1	29.7	-8.7
76	4.60		30.6	45.8	26.6	29.9	-10.8
79	4.52		46.4	61.6	33.8	37.9	-10.8
82	2.16		18.1	33.8	20.9	17.1	22.5
88	3.67		33.3	48.6	27.9	27.6	1.0
112	1.64		35.7	51.0	29.0	19.4	49.5

Figure A.2 provides a comparison of the Unverified Modelled Road Contribution NO_x versus Monitored Road Contribution NO_x, and the equations of the trend line based on linear regression through zero with Site 112 removed (Final Verification). The equation of the trend line presented in Figure A.2 gives an adjustment factor of 4.076.

Figure A.3 show the ratios between monitored and modelled NO_2 for each monitoring locations in the Final Verification. All sites considered show acceptable agreement between the ratios of monitored and modelled NO_2 all being within ±25% (apart from Site 82 which marginally lays outside of this guideline). A verification factor of 4.102 was therefore used to adjust the model results. A factor of 4.102 reduces the Root Mean Square Error (RMSE) from a value of 13.2 to 2.5, within the recommended limit (4.0) highlighting there are consistencies in the model performance at all verification locations.

The adjustment factor of 4.102 was applied to the road-NO_x concentrations predicted by the model to arrive at the final NO_2 concentrations.

Table A.1 – Model Verification (Final)

Site ID	Ratio of monitored road contribution NO_x / modelled road contribution NO_x	Adjustment factor for modelled road contribution NO_x	Adjusted modelled road contribution NO_x (µg/m³)	Adjusted modelled total NO_x (including background NO_x) (µg/m³)	Modelled total NO_2 (based upon empirical NO_x / NO_2 relationship) (µg/m³)	Monitored total NO_2 (µg/m³)	% Difference (adjusted modelled NO_2 vs. monitored NO_2)
55	3.39	4.102	36.1	51.3	29.2	26.3	11.0
62	4.35		31.7	47.0	27.2	28.1	-3.1
73	4.41		34.6	49.8	28.5	29.7	-4.0
76	4.60		33.5	48.8	28.0	29.9	-6.3
79	4.52		50.8	66.1	35.7	37.9	-5.8
82	2.16		19.8	35.5	21.8	17.1	27.5
88	3.67		36.5	51.8	29.4	27.6	6.3

Figure A.2 – Comparison of the Unverified Modelled Road Contribution NO_x versus Monitored Road Contribution NO_x (Final)

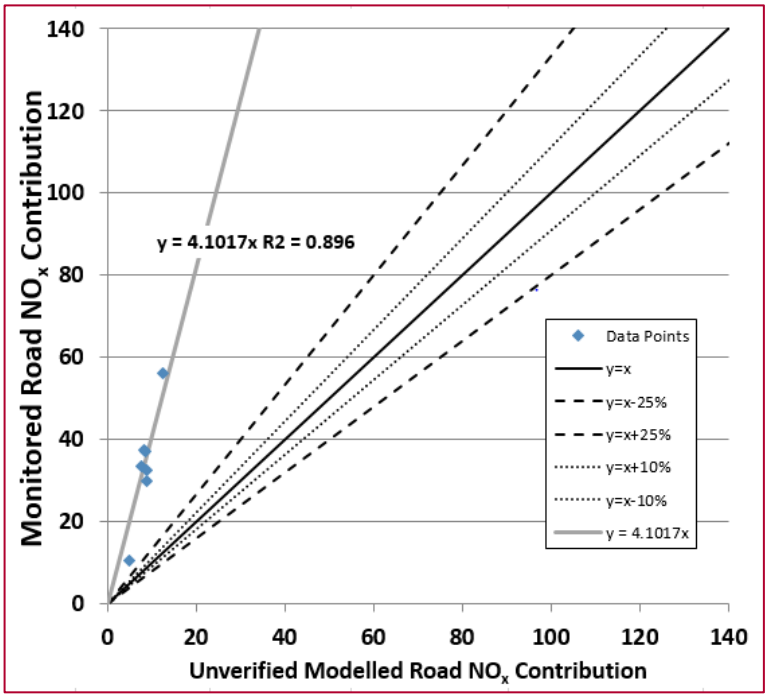
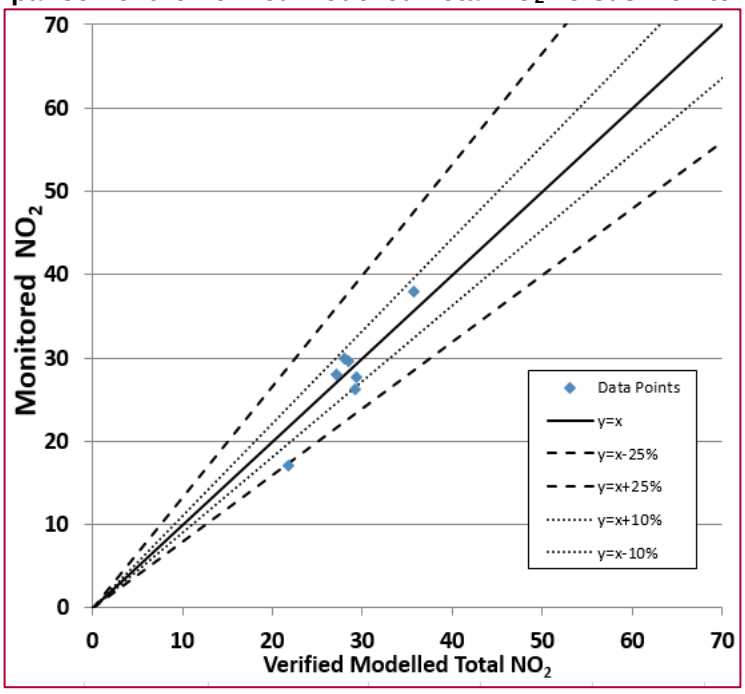


Figure A.3 – Comparison of the Verified Modelled Total NO_2 versus Monitored NO_2 (Final)



PM_{10} Verification

Vale of Glamorgan Council undertook PM_{10} monitoring within Penarth at one site during 2018 (Penarth, Windsor Road), a roadside site located adjacent to Windsor Road. Details of Penarth, Windsor Road for the purposes of PM_{10} are provided in Table A5.

Table A5 - Local PM_{10} Monitoring Data Available for Model Verification

Site ID	OS Grid Reference		2018 Annual Mean PM_{10} ($\mu g/m^3$)	2018 Data Capture (%)
	X	Y		
Penarth, Windsor Road	317600	172399	21.7	95.0%

Verification was completed using the 2018 (2017 reference year) Defra background mapped concentrations for the relevant 1km x 1km grid squares within The Vale of Glamorgan (i.e. those within which the model verification locations are located), as displayed in Table 3.8. These values have been corrected to avoid duplication of road sources within the model (i.e. contributions from 'Trunk A Roads' and 'Primary A Roads' have been removed from the overall background concentrations for PM_{10}).

As shown in Table A6, a ratio of 10.4 is derived from comparing ratio between monitored and modelled road contributed PM_{10} for Penarth, Windsor Road. The adjustment factor of 10.4 was applied to the road-PM_{10} concentrations predicted by the model to arrive at the final PM_{10} concentrations.

Table A6 – Modelled Output Comparison Against Monitored

Site ID	Monitored total PM_{10} ($\mu g/m^3$)	Background PM_{10} ($\mu g/m^3$)	Monitored road contribution PM_{10} (total - background) ($\mu g/m^3$)	Modelled road contribution PM_{10} (excludes background) ($\mu g/m^3$)	Ratio of monitored road contribution PM_{10} / modelled road contribution PM_{10}
Penarth, Windsor Road	21.7	11.3	10.4	0.8	10.4

Appendix 2 – Receptor Locations

Table A7 – Receptor Locations considered in the Assessment

Receptor ID	Within AQMA?	X	Y	Height
1	N	317289	172691	1.5
2	N	317245	172660	1.5
3	N	317357	172701	3.5
4	N	317347	172736	10.0
5	N	317334	172871	1.5
6	N	317442	172756	1.5
7	N	317396	172686	3.5
8	N	317438	172641	3.5
9	N	317594	172439	1.5
10	N	317584	172460	1.5
11	Y	317582	172418	1.5
12	Y	317603	172394	1.5
13	Y	317625	172371	1.5
14	Y	317731	172229	1.5
15	Y	317477	172485	1.5
16	Y	317668	172314	1.5
17	Y	317645	172345	1.5
18	Y	317696	172276	1.5
19	N	317935	172123	2.5
20	N	317912	172139	4.0
21	N	317973	172043	1.5
22	N	318007	172008	1.5
23	N	318065	171941	1.5
24	N	318094	171949	1.5
25	N	318331	171838	1.5
26	N	318325	171814	1.5
27	N	318200	171867	1.5
28	N	318207	171890	1.5