Shared Regulatory Services
Gwasanaethau Rheoliadol a Rennir

Cyngor Bwrdeistref Sirol
Pen-y-bont ar Ogwr
BRIDGEND
County Borough Council

Bridgend Park Street
Air Quality Action Plan (AQAP)

Shared Regulatory Services
Gwasanaethau Rheoliadol a Rennir

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1 Background to Local Air Quality Management in Bridgend

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 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 Bridgend County Borough Council's (BCBC) statutory duties under Part IV of the Environment Act 1995, Shared Regulatory Services (SRS) on behalf of BCBC regularly undertake air quality monitoring at specifically allocated locations across Bridgend using automated and non-automated principles for ambient air nitrogen dioxide (NO_2), particulate matter (PM_{10}) & sulphur dioxide (SO_2).

With regard 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 (LAQM) Technical Guidance[1]. The designated monitoring locations are assigned based on relevant exposure and where the certain Air Quality Objective levels for a particular pollutant applies. LAQM guidance 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, care homes etc."

Bridgend County Borough Council's 2018 Annual Progress Report (APR) documented and made the recommendation to implement and raise an Order for an Air Quality Management Area (AQMA), designated to Park Street, Bridgend. On 18th September 2018 BCBC's Cabinet approved the 2018 LAQM APR for Bridgend County Borough. The report examined datasets captured during 2017 and noted that Park Street, Bridgend was an area of particular concern and subsequently an Air Quality Management Area (AQMA) was required. It was reported that two nitrogen dioxide (NO_2) non-automated monitoring locations situated at residential facades on Park Street, recorded elevated levels and exceeded annual averages when

[1] https://laqm.defra.gov.uk/wp-content/uploads/2022/08/LAQM-TG22-August-22-v1.0.pdf

compared to the annual mean NO_2 Air Quality Objective of 40 µg/m^3.

Table 1 - National Air Quality Objectives

Pollutant	Air Quality Objective: Concentration	Air Quality Objective: Measured as	Date to be achieved by
Nitrogen Dioxide (NO_2)	200µg/m^3 not to be exceeded more than 18 times a year	1-hour mean	31.12.2005
Nitrogen Dioxide (NO_2)	40µg/m^3	Annual mean	31.12.2005
Particulate Matter (PM_{10})	50µg/m^3, not to be exceeded more than 35 times a year	24-hour mean	31.12.2010
Particulate Matter (PM_{10})	40µg/m^3	Annual mean	31.12.2010
Sulphur dioxide (SO_2)	350µg/m^3, not to be exceeded more than 24 times a year	1-hour mean	31.12.2004
Sulphur dioxide (SO_2)	125µg/m^3, not to be exceeded more than 3 times a year	24-hour mean	31.12.2004
Sulphur dioxide (SO_2)	266µg/m^3, not to be exceeded more than 35 times a year	15-minute mean	31.12.2005
Benzene	16.25µg/m^3	Running annual mean	31.12.2003
Benzene	5µg/m^3	Annual mean	31 12 2010
1,3 Butadiene	2.25µg/m^3	Running annual mean	31.12.2003
Carbon Monoxide	10.0mg/m^3	Maximum Daily Running 8-Hour mean	31.12.2003
Lead	0.25µg/m^3	Annual Mean	31.12.2008

2. Elevated & Exceeding Levels of NO_2

NOx emissions are made up from both primary nitrogen dioxide (NO_2) and nitric oxide (NO), and are formed by the burning of fossil fuels, such as diesel and petrol. NOx emissions are also associated with industrial and domestic sources such as wood burners. Due to atmospheric chemical reactions NO reacts with oxidants such as Ozone (O_3) to produce secondary NO_2.

Although non-transport sources of NOx are considerable contributors, according to the National Atmospheric Emissions Inventory, road transport accounts for one third of the UK's NOx emissions. Diesel vehicles are examined as the main source of road transport influencing these levels.

In 2017, Bridgend's network of non-automated NO_2 monitoring locations were reviewed and ten additional monitoring locations were commissioned. These additional locations were sited based within known areas of particularly elevated traffic flows, introduction of traffic management systems and foreseeable development, all with nearby relevant exposure. The newly commissioned sites were allocated to Park Street, Coity Road, Cowbridge Road and Bridgend Town Centre's Market Street.

On 18th September 2018 BCBC's Cabinet approved the 2018 Local Air Quality Management Annual Progress Report (APR) for Bridgend[2], as produced by SRS on behalf of BCBC[3], The report examined datasets captured during 2017 and noted that Park Street, Bridgend was an area of particular concern and subsequently an Air Quality Management Area (AQMA) was required. It was reported that two nitrogen dioxide (NO_2) monitoring locations situated at residential facades on Park Street as shown in Table 2 & Figure 1 recorded elevated and exceeding annual average levels of NO_2 when compared to the annual mean NO_2 Air Quality Objective of 40 µg/m^3. The annual average levels were recorded in 2017 as:

2 https://www.srs.wales/Documents/Air-Quality/Bridgend/7294-7279-Bridgend-Council-2018-Air-Quality-Progress-Report.pdf
3 https://democratic.bridgend.gov.uk/documents/s17130/18.09.11%20Air%20Quality%2018%20Sep%20Cabine

Table 2 - 2017 Annual Mean NO_2 Concentrations

Site ID	Annual Mean Concentration ($\mu g/m^3$) 2017
OBC- 102	23.7
OBC- 103	37.6
OBC- 104	**41.5**

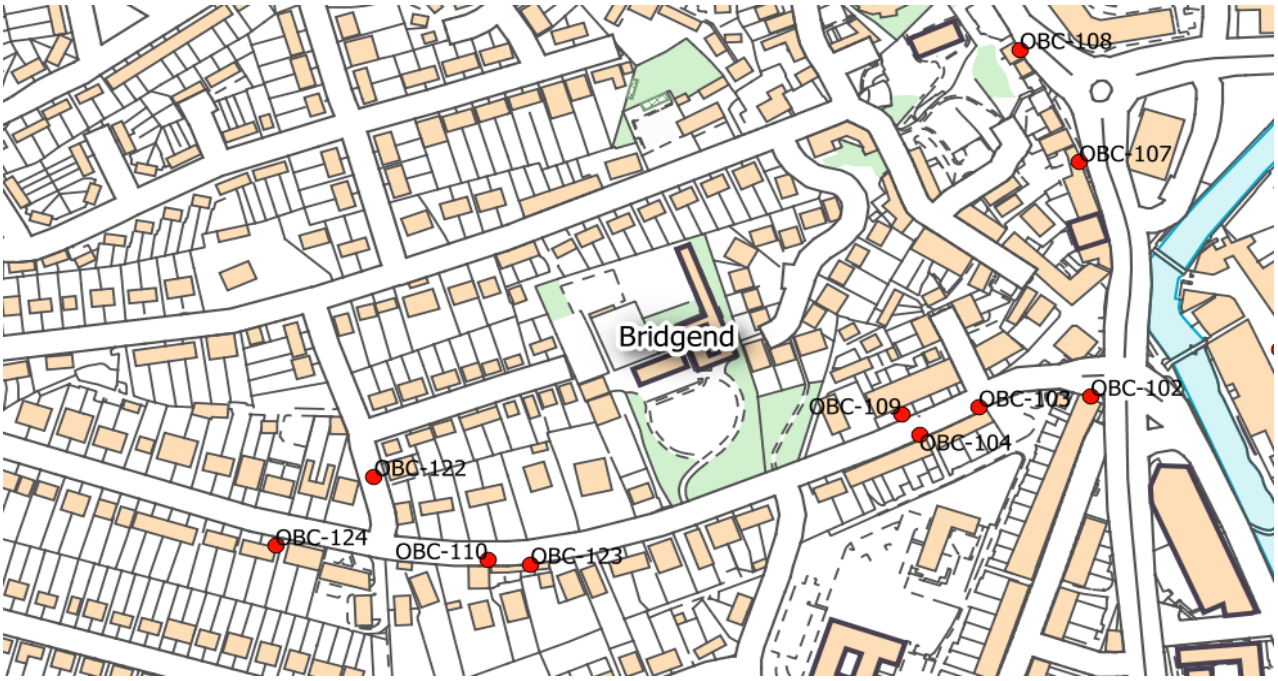
Notes:

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.**

Figure 1 - 2017 NO_2 Monitoring Locations

Figure 2 - NO_2 monitoring locations since 2020.

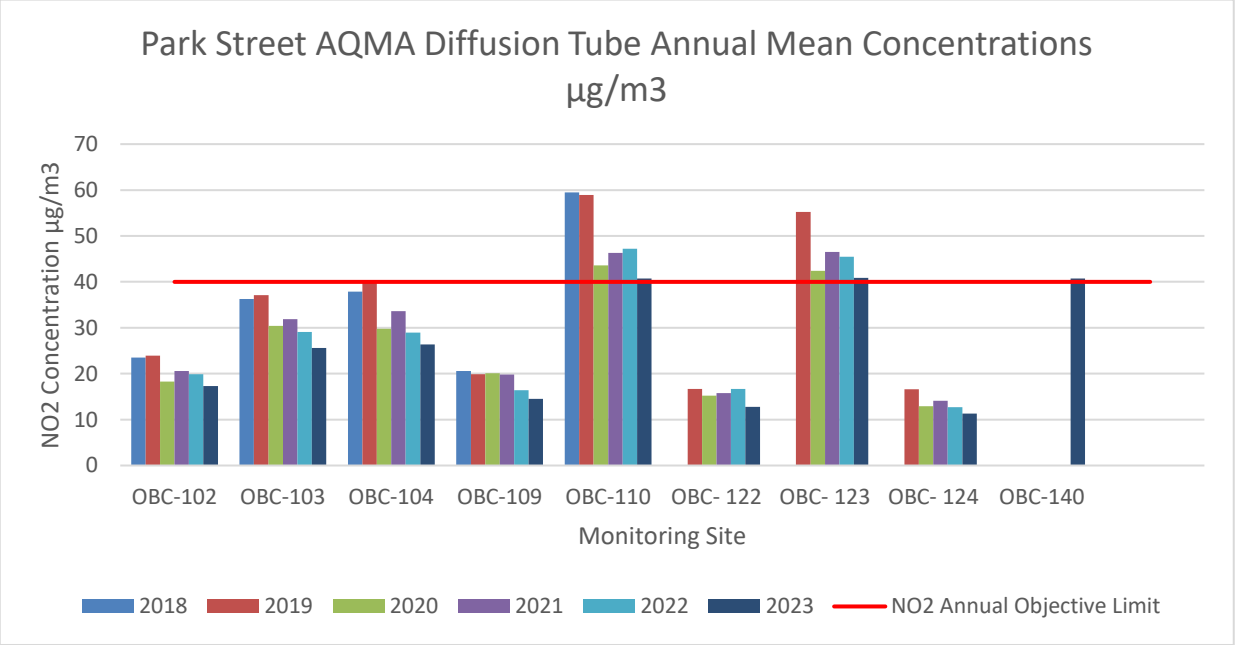


1.1 Nitrogen Dioxide Datasets

Figure 3 illustrates the annual average NO_2 datasets recorded at sensitive receptor locations within and in close proximity to the Park Street AQMA boundary from 2016 to 2023. It is notable that air quality is a prevalent concern along Park Street, which coincides with the boundary of the AQMA Order raised on 1st January 2019. It is also noted that elevated annual average NO_2 air quality levels exist near Park Street along adjoining road networks where relevant exposure is apparent.

In 2019, monitoring undertaken at established sites OBC-110 & OBC-123 located at 101/103 Park Street & 93 Park Street, not only demonstrated annual average levels in exceedance of the annual average air quality objective set at (40µg/m^3) for NO_2, but levels captured were also encroaching upon the 1-hour objective; 200µg/m^3 not to be exceeded > 18 times per year. **OBC-110 & OBC-123** recorded annual average figures in 2019 of **53.7µg/m^3 & 55.2µg/m^3.**

Figure 3 - Annual average NO_2 concentrations at receptors within and close to Park Street AQMA boundary 2018 - 2023



Data for 2023 is currently provisional and may change once QA/QC adjustment factors are updated.

It is also noted that in 2023, monitoring undertaken at sites OBC-110 & OBC-123, located on Park Street residential facades, exceed the annual average air quality objective set at (40µg/m^3) for NO_2. **OBC-110 & OBC-123 recorded provisional annual average figures in 2023 of 40.7µg/m^3 & 40.9µg/m^3**. This represents a significant reduction in NO_2 concentrations of 30% and 25% at these receptors since 2019.

Sites currently exceeding annual air quality objectives are isolated to one area of Park Street. This area of Park Street, between no.91 – 107, experience higher concentrations of pollutants due to the proximity of houses to a heavily trafficked primary route with congestion issues. These issues are compounded by gradients increasing engine load and poor dispersion caused by buildings. All other monitoring locations within Park Street AQMA and across Bridgend currently demonstrate compliance with the applicable air quality objectives.

Figure 4 - Picture of area within Park Street AQMA exceeding the annual NO_2 objective.

2 Automatic Air Quality Monitoring

With particular focus on nitrogen dioxide (NO_2), in December 2020, BCBC introduced an automated air quality monitoring system within the Park Street AQMA. The equipment allows air quality trends to be examined on a high temporal resolution basis and therefore will be able to assist with underpinning those short-term periods whereby raised levels of NO_2 and PM_{10} are particularly prevalent. This data will be particularly useful in assigning traffic control measures for certain time periods.

SRS on behalf of BCBC examined potential locations along Park Street within the AQMA boundary to implement the automated air quality monitoring equipment. Following preliminary site visits with air quality monitoring equipment suppliers and the local authority's Highways Team, it was evident that Park Street presented as a rather difficult area in which to implement an air quality monitor. This was due to narrow foot ways and the fact that Park Street is designated as traffic sensitive, thus only allowing highway works between restricted hours.

To overcome these concerns, it was noted that the Quaker's Meeting House (Bridgend Quaker Meeting, 87 Park St, Bridgend, CF31 4AZ) car park offered a preferable location and would be a representative location for data collection.

Table 3 to Table 7 present information and pollutant concentration data gathered by the air quality monitoring station to January 2024. **Data is currently provisional**.

Table 3 - Details for Park Street Air Quality Monitoring Station

Site ID	Site Name	Site Type	Associated with (Named) AQMA?	X OS Grid Reference	Y OS Grid Reference	Pollutants Monitored	Monitoring Technique	Inlet Height (m)	Distance from monitor to nearest relevant exposure (m) (1)	Distance from Kerb to Nearest Relevant Exposure (m)	Distance from Kerb to Monitor (m)
AQMA 1	Bridgend Park Street AQMA	Roadside	Y	290040	179704	NO2, PM10	Chemiluminescence / Beta Attenuation Monitor with Gravimetric Equivalence	1.5	4	5.5	1.5

Table 4 - Automatic Monitoring Results for Nitrogen Dioxide

Site ID	Site Type	Within AQMA?	Valid Data Capture 2023 %	Annual Mean Concentration (µg/m^3)		
				2021	2022	2023
Park Street Automatic Monitor	Roadside	Y	92	27	28	27

Table 5 - 1-Hour Mean NO_2 Monitoring Results, Number of 1-Hour Means >200 µg/m^3.

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%)	Valid Data Capture 2023 (%)	2021	2022	2023
Park Street Automatic Monitor	Roadside	Automatic	92	100	0	0	0

Table 6 - Annual Mean PM_{10} Monitoring Results (µg/m^3)

Site ID	Site Type	Within AQMA?	Valid Data Capture 2023 %	Annual Mean Concentration (µg/m^3)		
				2021	2022	2023
Park Street Automatic Monitor	Roadside	Y	94	17	18	18

Table 7 - 24-Hour Mean PM_{10} Monitoring Results, Number of PM_{10} 24-Hour Means > 50 µg/m^{3}.

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%)	Valid Data Capture 2023 (%)	2021	2022	2023
Park Street Automatic Monitor	Roadside	Automatic	95	95	0	0	2

Automatic monitoring carried on Park Street demonstrates compliance with the annual air quality objective for NO_2. This automatic monitor also showed no exceedances of the 1-hour NO_2 objective of **200 µg/m³** not to be exceeded more than eighteen times annually for both periods. Particulate matter (PM_{10}) monitoring was carried out by the automatic monitoring station. The annual average figure shown at this site in 2022 and 2023 is compliant with the PM_{10} annual average objective of **40 µg/m³.** There were also no exceedances of the 24-hour PM_{10} objective of **50 µg/m³** not to be exceeded more than thirty-five times annually.

Compliance of air quality objectives at the automatic monitoring station confirms the varied impact of pollutant emissions on Park Street. Two non-automatic monitoring sites located approximately seventeen metres from the monitoring station show exceedances of the annual air quality objective for NO_2. As discussed previously, air quality issues are exacerbated in the location of non-compliance by the proximity of terrace housing to the road and poor dispersion of pollutants.

Figure 5 - non-automatic sites exceeding NO_2 objective and Air Quality Monitoring Station

3 Impacts of COVID-19 on Air Quality within Bridgend

As stated in the Bridgend 2021 APR[4], during Covid-19 restrictions in 2020, an average reduction of 22% in NO_2 annual mean concentration was experienced at roadside diffusion tube monitoring sites across the County Borough relative to 2019.

[4] https://www.srs.wales/Documents/Air-Quality/Bridgend/Bridgend-APR-2021.pdf

Although still exceeding the NO_2 annual objective of 40 µg/m^3, sites OBC-010 and OBC-123 in the Park Street AQMA, saw a reduction in NO_2 annual mean concentration of 21.2% and 24.1% respectively, relative to 2019. There was a slight rise in NO_2 concentrations in 2021 relative to 2020. This reflects the lifting of Covid-19 restrictions during this period. In 2022, Concentrations of NO_2 are still below levels experienced in 2019 at all locations in Park Street.

Remote and Hybrid working has remained higher than pre-pandemic levels. These working practices contribute towards decreased traffic and emission on our roads. Data is presented by the ONS (Office of National Statistics) for the UK Annual Population Survey[5] in 2019. In the 12-month period from January to December 2019, in the UK there were an estimated 1.7 million people who said that they work mainly from home; this represents just over 5% of the total workforce.

Levels of working from home peaked during the pandemic, with almost half of working adults (49%) reporting having worked from home at some point in the past seven days in the first half of 2020 (3 to 13 April and 11 to 14 June 2020). Two years later (27 April to 8 May 2022), when guidance to work from home was lifted in Great Britain, around 38% of working adults reported having worked from home. In the most recent period (25 January to 5 February 2023) around 40% of working adults reported having worked from home at some point in the past seven days.

Analysis was also undertaken by air quality consultants Ricardo, on behalf of Welsh Government[6], to assess the impact of lockdown on air quality during the period of the 16th of March 2020 to 31st of May 2020. This analysis showed decreases in nitrogen oxides during this period due to reduced emissions with less traffic on our roads. Analysis of a limited sample of traffic data shows a significant drop in vehicle flows at the time of the lockdown, mostly in the Car/Light Van and Bus categories as expected. The fall-off in vehicle counts for the heavier goods vehicles is less significant.

5 https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/employmentandemployeetypes/articles/coronavirusandhomeworkingintheuklabourmarket/2019

6 https://airquality.gov.wales/sites/default/files/documents/2020-08/Analysis_of_Welsh_Air_Quality_Data_Impacts_of_Covid-19_Final_Issue2.pdf

4 Declaration of an Air Quality Management Area (AQMA)

Welsh Government's (WG) Policy Guidance 7 states.

4.8 A Local Authority must by order designate as an AQMA any part of its area in which it appears one or more of the national air quality objectives is not being achieved or is not likely to be achieved.

4.11 Local Authorities should declare or extend an AQMA as soon as possible after recognising the need for it to be declared or extended. A copy of the new or amended AQMA order should be submitted to the Welsh Government and Defra, together with a GIS shape file of the AQMA boundary. The order must also be made public and drawn to the attention of people living and working within the AQMA boundary.

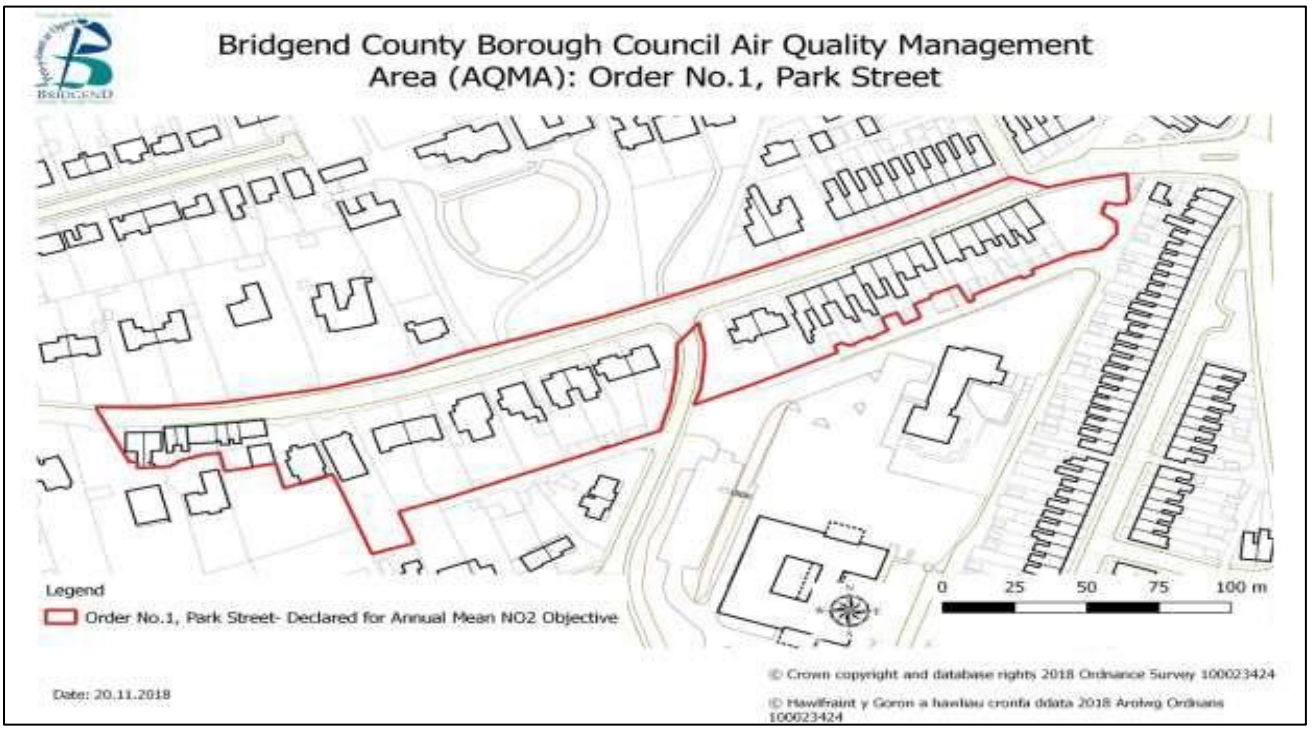
Based on the 2017 NO_2 datasets, in accordance with WG's Policy Guidance and Section 83 of the Environment Act 1995, SRS/ BCBC is legally required to declare an Air Quality Management Area (AQMA) for Park Street, and in doing so raise an AQMA order that defines the detail and locality of the AQMA.

The Park Street, Bridgend AQMA Order was officially implemented on the 1st of January 2019. The area comprising the Bridgend County Borough Council Air Quality Management Area Order No. 1, Park Street is that contained within the following boundary.

The designated area borders the green space area prior to the rear entrance of properties located on Sunnyside Road. The designated area incorporates all north facing properties, including their open space areas between 39 Park Street and 105 Park Street. The boundaries' northern side borders the open space areas that front the south facing properties encapsulating the public access pathway.

7 https://gov.wales/sites/default/files/publications/2019-04/local-air-quality-management-in-wales.pdf

Figure 6 - Park Street AQMA



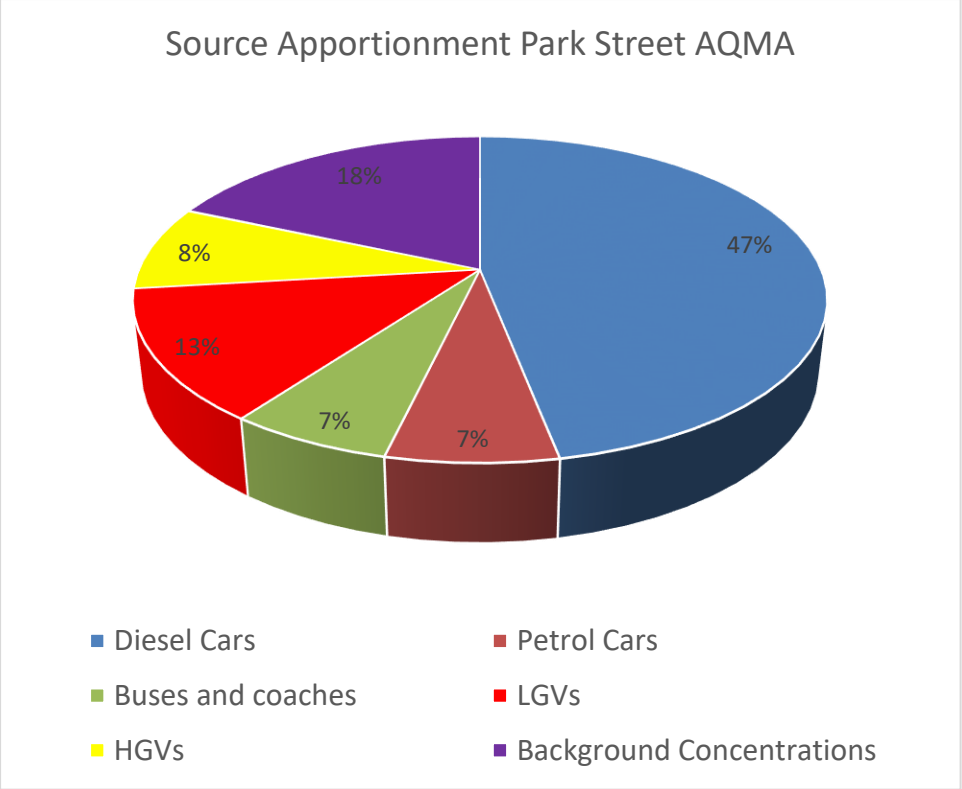
4.1 Source Apportionment Analysis

The AQAP measures presented in this report are intended to be targeted towards the predominant sources of emissions within the Park Street AQMA.

As stated in paragraph 7.104 of LAQM.TG22, source apportionment need not be carried out with absolute precision but should be detailed enough to allow the authority to identify the predominant sources that contribute the air quality exceedances within its AQMA. An important initial separation, in most cases, will be into:

- Regional background, which the authority is unable to influence.
- Local background, which the authority should have some influence. over, and
- Local sources, which will add to the background to give rise to the hotspot area of exceedances. These will be the principal sources for the local authority to control within the Action Plan.

Figure 7 - Park Street NO_2 Source Apportionment Assessment



The key findings of the source apportionment study were:

Traffic is the main contributor to poor air quality on Park Street

- Traffic sources are estimated to contribute around 82% to the total NO_2 on Park Street.
- Background NO_2 makes up 18% of the NO_2 on Park Street.
- Cars are the predominant source of NO_2 on Park Street.
- Collectively, cars contribute over 50% of the NO_2 on Park Street (54%).
- Diesel cars contribute approximately seven times that of petrol cars.

Heavy Goods Vehicles (HGVs) have a disproportionate impact on air quality in Park Street

- Collectively, all heavy diesel vehicle categories (including buses and HGVs) contribute 15% of the NO_2 on Park Street but only make up 2.4% of vehicle movements.
- HGVs contribute 8% of the NO_2 on Park Street.

- Buses contribute around 7% of the NO_2 on Park Street.
- Light Goods Vehicles are estimated to contribute 13% of the NO_2 on Park Street.
- The NO_2 contribution from motorcycles is less than 0.1% and is therefore considered negligible.

Contribution from other sources is considered negligible.

4.2 Required Reduction in Emissions

Table 8 displays the reduction in NO_2 concentrations and road NOx emissions required in Park Street AQMA. This is based on 2023 worst-case modelled value from the 'do minimum' scenario within the detailed assessment, carried out as part of this AQAP. The required reduction in emissions has been calculated in accordance with Chapter 7 (Box 7.6) of the LAQM Technical Guidance using DEFRA's latest NOx to NO_2 Calculator Tool v8.1. The target value used in these calculations is 36 µg/m3 to consider the requirement for concentrations to be at least 10% below the objective for revocation of the AQMA to be considered based on monitoring data alone.

Table 8 - Required Reduction in Emissions

Location	NO_2 Concentrations (µg/m3)		Road NOX Emissions (µg/m3)
	2023 Modelled Concentration	Required Reduction	Reduction Required
Receptor 27	47.5	11.5	18.18

4.3 Diesel Cars and Increased NO_2

The high contribution of diesel cars to NOx emissions and the resulting concentrations of NO_2 is something that has been widely acknowledged and is an unwanted consequence of a greater uptake of diesel cars due, in part, to government incentives to reduce emissions of carbon dioxide.

Although NOx emissions overall have been declining because of improved engine technology and the transition to electric vehicles, primary NO_2 emissions have increased due to technology designed to lower the emissions of particulate. This is explained in the scientific article 'Emission reduction versus NO_2 air quality concentrations, a trade-off?' by Peter J Sturm and Stefan Hausberger of Graz University of Technology, Austria[8].

8 https://online.tugraz.at/tug_online/voe_main2.getVollText?pDocumentNr=145519&pCurrPk=52228

'The reasons for increasing NO_2 *shares are mainly a catalytic exhaust gas after treatment such as diesel oxidation catalysts and coated diesel particulate filter (DPF) and the increasing exhaust gas recirculation rates for modern vehicles. High* NO_2 *levels at the raw exhaust gas are desired for the passive regeneration of the DPF at lower exhaust gas temperatures. Thus, the exhaust gas after treatment to reduce fine particle emissions is at least partly responsible for the actual* NO_2 *situation.*

4.4 Key Priorities

After considering the findings provided by source apportionment analysis, the following actions were prioritised for development as part of the action plan.

- **Priority One** - Reduce queuing and congestion on Park Street. Improve queuing in areas adjacent to receptors in exceedance of air quality objectives. Improve traffic flows travelling from Park Street towards the Tondu Road/Angel Street junction and reduce queuing from right hand turning traffic into St Leonards Road. These options have been assessed and are found to improve NO_2 concentrations by up to 12% at the worst effected receptors if implemented in 2023. Measure twenty of this action plan, which involves the optimisation of traffic signals at the Tondu Rd/ Park Street/ Angel Street Junction, was implemented in August 2022.

- **Priority Two –** Ensure future planning proposals consider the full impact of the air quality impacts on Park Street AQMA in adherence to planning policy guidance. Develop Supplementary Planning Guidance (SPG) to provide a specific guidance for air quality in accordance with new developments.

- **Priority Three** – Implement public health campaigns and raise awareness to encourage modal shift. Investigate improvements to bus services, active travel planning, walking, and cycling strategies to encourage these changes.

5 Development of an Air Quality Action Plan

In accordance with WG's Policy Guidance:

*4.12 A draft action plan must be produced for review by the Welsh Government within **18 months** of the coming-into-force date of the AQMA order, and the action plan must be **formally adopted before two years have elapsed.** A Local Authority failing to produce a draft action plan for review by the Welsh Government within two years of declaring or extending an AQMA will, in the absence of a compelling explanation, be issued with a direction from the Welsh Ministers under section 85(3) of the 1995 Act.*

5.1 National and Local Policy and Guidance

In order to develop the AQAP a number of key national and Local Policy and Guidance documents have been considered as summarised below:

5.1.1 Welsh Government Local Air Quality Management in Wales Policy Guidance, June 2017

SRS & BCBC recognises that in order to tackle pockets of poor air quality, a more suitable and constructive approach is required to target the whole of Bridgend, improving overall air quality. With the implementation of correct long-term measures, highlighted road networks and identified areas of concern should be able to benefit from improved air quality. Welsh Government guidance on local air quality management recommended two clear goals:

(1) Achieve compliance with the national air quality objectives in specific hotspots; and
(2) Reduce exposure to pollution more widely, to achieve the greatest public health benefit.

Collective efforts, therefore, should look beyond targeted action in localised air pollution hotspots and do this in parallel with universal action to reduce risks for everyone.

As stated by WG's policy guidance the following ways of working should be incorporated when devising any AQAP.

- looking to the **long term** so we do not compromise the ability of future generations to meet their own needs.
- taking an **integrated** approach.
- **involving** a diversity of the population in the decisions affecting them.
- working with others in a **collaborative** way to find shared sustainable solutions; and

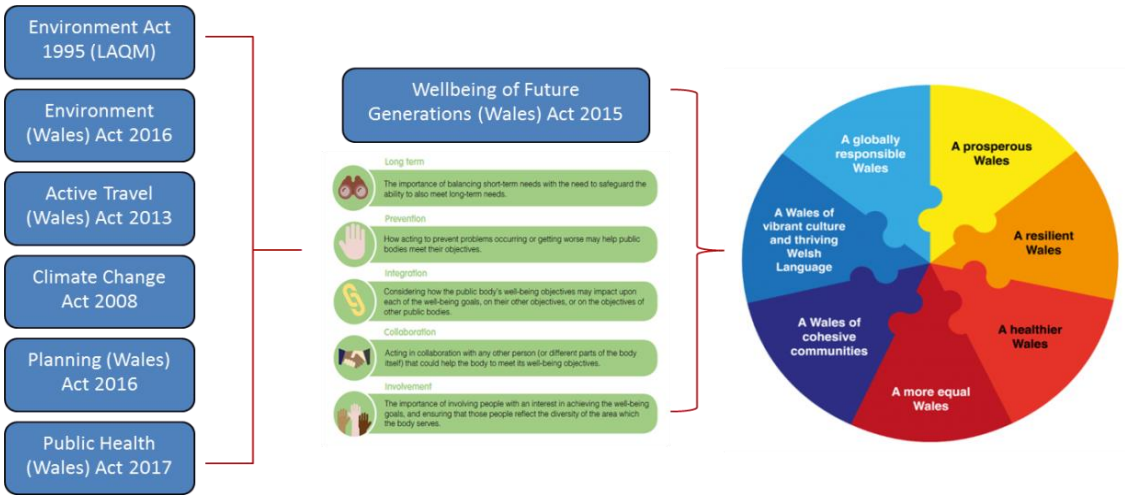
- acting to **prevent** problems from occurring or getting worse.

5.1.2 The Well-Being of Future Generations (Wales) Act 2015

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 figure 7 there are seven national well-being goals that form the basis of the Act and five ways of working which support the goals:

Figure 8 - The Well Being Of Future Generation (Wales) Act 2015



Public and business sectors have come together in Bridgend to form a Public Services Board (PSB). Bridgend PSB is committed to working together to improve wellbeing in Bridgend County Borough now and in the future. Bridgend PSB has used the sustainable development principle and the new five ways of working to develop a Well-Being Plan (2018-2023).

The plan outlines the things that Bridgend PSB will work on together, over the next five years, well- being objectives and steps, and provide a vision for how Bridgend will look in 10 years' time. The plan is seen as a mechanism that provides the best possible means of working to help understand the underlying causes of problems and prevent those problems getting worse or happening in the future.

The declaration of the AQMA on Park Street and the subsequent production of an Action Plan, will ensure that future decision making in terms of air quality complies with the WFG, and the Council meets the five ways of working, as detailed below:

- **Long term** – The action plan will balance short-term needs of improving air quality and will also look at measures to safeguard the ability of meeting long-term needs.
- **Prevention** – By implementing measures which will be set out in the Action Plan, the Council should ensure improvements in air quality and will be able to prevent air quality deteriorating in the future.
- **Integration** – SRS will look to ensure that the work undertaken as part of the Action Plan integrates with public body's environmental well-being objectives.
- **Collaboration** –The Action Plan will be developed in collaboration with many departments within the Council and other external organisations, i.e., Public Health Wales; and
- **Involvement** – The action plan will be subject to public consultation and will ensure that those who have a strong interest in improving air quality will be fully involved and their ideas considered.

Contributing to the seven national well-being goals and long-term vision for Bridgend, Bridgend PSB has developed four main objectives as detailed in figure 7.

Figure 9 - Bridgend PSB Well-being Objectives

In accordance with air quality, as part of the objective for **"Healthy Choices in a Healthy Environment"** Bridgend PSB outlines those resources are best utilised and collaborative working ensures that the built, cultural, and natural environment remains resilient in future. The priority areas to endorse and encourage the success of the objective will include working together to maximise benefit from cultural, built, and natural assets. It will also look at promoting a more resource and energy efficient way of living and working. To measure the success of promoting a more resource effective and energy saving way of improving air quality, particularly NO_2 levels will be examined.

5.1.3 BCBC's Local Development Plan (LDP) 2006- 2019

The document provides a framework for sustainable development within the County Borough of Bridgend, outlining strategies and policies for future land use and development.

One of the main strategic LDP objectives is highlighted in **Strategic Policy 4 (SP4)** which promotes the conservation and enhancement of the natural environment. SP4 illustrates that development proposals will not be permitted where they have an adverse impact upon the quality of natural resources, including water, air, and soil.

Also highlighted within the LDP document is Policy **ENV 7** (Natural Resource Protection and Public Health).

"***Development proposals will only be permitted where it can be demonstrated that they would not cause a new, or exacerbate an existing, unacceptable risk of harm to health, biodiversity and/or local amenity due to air pollution."***

Where proposed developments indicate negative impacts, measures and mitigation methods must be detailed to enable impacts to be minimised to an acceptable level. For example, in terms of air quality, measures can include the production of an Air Quality Assessment and the implementation of conditions.

5.1.4 BCBC's The Local Transport Plan (LTP) 2015- 2030

The Welsh Government now requires local authorities in Wales to prepare and adopt a Local Transport Plan (LTPs) as the framework for identifying local transport schemes for improvements. LTPs therefore replace Regional Transport Plans.

Under guidance from the Welsh Government, local authorities have the choice to develop and adopt either joint LTPs with neighbouring local authorities or a stand-alone LTP for their own geographical area.

Bridgend County Borough Council has opted for the latter approach in view of the uncertainty of the future of local authority boundaries and structures amid discussions of reorganisation of local government.

The LTP looks to tackle growing traffic levels (and hence air quality impacts) by providing strategies which focus upon providing efficient and effective transport

9 https://www.bridgend.gov.uk/residents/planning-and-building-control/development-planning/replacement-bridgend-local-development-plan-2018-to-2033/

networks.

“The Council is mindful of the broader negative impact of transport related emissions on health and the natural environment.”

“To reduce the environmental impact of transport, the LTP includes measures and interventions thatwill increase opportunities for active travel, encourage the use of public transport and promote modal integration.”

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

5.1.5 Welsh Government, Clean Air Plan for Wales, Healthy Air Healthy Wales

At the time of drafting this report WG has published its latest plan which underpins its commitment and long-term ambition to improve air quality in Wales. The plan sets out WG’s policy direction and proposed actions to reduce air pollution to support improvement in public health and the natural environment. Actions are proposed across four thematic themes, examined as People, Environment, Prosperity, and Place.

SRS/ BCBC support the aspirations of the plan and welcome the development of more stringent mitigation measures that will enable a cohesive approach to air quality management and protecting public health and the natural environment.

6 Consultation and Stakeholder Engagement

In developing/updating this AQAP, we have worked with other local authorities, agencies, businesses, and the local community to improve local air quality. In September 2022, a 3-month public consultation period was undertaken for the draft AQAP. The consultation was advertised online via BCBC social media and through the BCBC website. During the consultation period, Stakeholders, members of the public and businesses were encouraged to give their views on the AQAP and its proposed measures via an online survey. A leaflet drop was carried out inviting residents to two ‘drop in’ sessions carried out at the BCBC Angel Street Office.

Figure 10 - AQAP consultation leaflet

7 Consultation Results

The results of the public consultation were positive and in general supportive of the key priority areas of intervention and air quality actions developed in this AQAP.

- Thirty-three respondents (47%) confirmed that before reading the draft action plan, they were seriously concerned about air quality within Park Street and Bridgend. Seventeen respondents (24%) selected Moderately concerned about the air quality, and a further twelve respondents (17%) stated they were slightly concerned. Whereas nine respondents (13%) selected that they were not concerned at all
- Forty-three respondents (61%) confirmed they were seriously concerned about the air quality after reading the draft action plan. Thirteen respondents (18%) stated they were Moderately concerned, and ten respondents (14%) selected Slightly concerned. Five respondents (7%) still felt they were Not at all Concerned about the air quality in Park Street and Bridgend after reading the draft action plan.
- For the Implementation and optimization of 4-phase junction at the Park Street /

Angel Street / Tondu Road Junction, this proposal was as ranked High importance by thirty-two respondents (47%). Twenty-three respondents (34%) felt that that this proposal was of medium importance, whereas eleven respondents (16%) ranked this as Low importance. Two respondents (3%) selected Don't know what importance should be given.

- For Anti-idling implemented as TROs specific to sensitive areas such as outside schools, hospitals, care homes, as well as Park Street AQMA, twenty-six respondents (38%) rated this proposal as High importance. Twenty-two respondents (32%) felt Anti-idling was of medium importance, whereas nineteen respondents (28%) rated the proposal as Low importance. Two respondents (3%) selected Don't Know.
- For denying access onto St Leonards Road from Park Street, thirty respondents (44%) rated this proposal as a High Importance. However, twenty-four respondents (35%) feel denying access to St Leonard's Road is of Low importance. A further eleven respondents (16%) rated the proposal as medium importance, and four respondents (6%) selected Don't Know.

The full consultation report can be found in Appendix C.

8 Proposed mitigation measures for Park Street AQMA

To develop ideas and ensure an effective AQAP which considers all aspects prioritising public health, an AQAP Work Steering Group has been established consisting of representatives from Bridgend's internal departments of interest, as well as persons from the local PSBs.

Collaborating the ideas and suggestions made to date, a list of proposed mitigation measures has been compiled. Table 9 documents the proposed list of mitigation measures for the Park Street AQMA.

A qualitative cost benefit analysis assessment has also been provided for each action as detailed in Table 10. The potential actions have been scored for cost benefit and the resulting rank to identify the most deliverable actions. Estimated costs (1 for high cost to 5 for low cost) were multiplied by a sum of the likely benefit from reducing pollution and people's exposure to the pollution (10 for high and 1 for low) to provide a score. The highest score shows the greatest cost benefit according to the opinions of the project team. The measures in Table 10 are listed in order of their ranking score.

It is acknowledged that some measures may score highly despite not affecting air pollution, because they instead may help reduce people's exposure to the pollution.

To note; following this indicative Cost Benefit Analysis it was agreed by the AQAP

Work Steering Group to assess in more detail mitigation options that will manage and improve traffic flows through the Park Street AQMA. As previously outlined queuing and inconsistent traffic flows would appear to be the principal cause of the portrayed poor air quality levels. It was necessary that to proceed with the development of a successful and meaningful AQAP the Council needed to undertake detailed transport and air quality assessments to ensure that correct mitigation measures are considered before any implementation. Detailed assessments include the impact of any approved and committed to local developments. The Air Quality Action Plan is a live document and measures will be added, developed, and assessed accordingly throughout the lifetime of this plan.

Table 9 - Proposed AQAP mitigation measures for Park Street AQMA

Measure No.	Measure	Category	Classification	Estimated Year Measure to be Introduced	Estimated / Actual Completion Year	Organisations Involved	Funding Source	Defra AQ Grant Funding	Funding Status	Estimated Cost of Measure	Measure Status	Target Reduction in Pollutant / Emission from Measure	Key Performance Indicator	Progress to Date	Comments / Potential Barriers to Implementation
1	Public Health information campaign including additional automatic monitoring	Public Information	Via the Internet	Unknown	Uknown	. Local Authority Environmental Health, BCBC, Local Communities Forum	Proposed DEFRA AQ Grant Funding		Unknown	Unknown	Subject to approval	Unknown.	The number of hits on website. Number of initiatives delivered. Delivery of a public education campaign. Cross reference obtained air quality results to the applicable air quality objectives. Improvements to those figures outlined in Bridgend LTP 2015 using data acquired by 2011 Census.	No progress to date.	Requires ongoing grant funding.

Measure No.	Measure	Category	Classification	Estimated Year Measure to be Introduced	Estimated / Actual Completion Year	Organisations Involved	Funding Source	Defra AQ Grant Funding	Funding Status	Estimated Cost of Measure	Measure Status	Target Reduction in Pollutant / Emission from Measure	Key Performance Indicator	Progress to Date	Comments / Potential Barriers to Implementation
2	Support the creation of a local "Air Quality Action Group."	Public Information	Via the Internet/Leaflets/Other	2023	Unknown	Local Communities Forum	Measure could be included in funding for measure one.			As above	Subject to approval	Unknown.	Number of associated members.	No progress to date	
3	Increase the monitoring capabilities of the Council with investment in more air quality monitoring techniques. Creation of an online platform linked to the Air Quality Index.	Public Information	Via the internet	2023	2027	. Local Authority Environmental Health, BCBC, Local Communities Forum	DEFRA AQ Grant Funding			£10 - £50k	Subject to approval by	Unknown.	Cross reference obtained air quality results to the applicable air quality objectives.		
4	Electronic "pollutant signage" within AQMA and local area	Public Information/Traffic management	Other	Unknown		. Local Authority Environmental Health, BCBC	Unknown			£50k - £250k		Not directly applicable – NOx reduction not estimated	Improved Public awareness/ Increase in the use of sustainable alternatives.	No progress to date	

Measure No.	Measure	Category	Classification	Estimated Year Measure to be Introduced	Estimated / Actual Completion Year	Organisations Involved	Funding Source	Defra AQ Grant Funding	Funding Status	Estimated Cost of Measure	Measure Status	Target Reduction in Pollutant / Emission from Measure	Key Performance Indicator	Progress to Date	Comments / Potential Barriers to Implementation
5	Signs and banners for engine idling. Signage at key intersections, near junctions and on public transport / taxis encouraging people to switch off engines when traffic comes to a stop.	Public Information/Traffic management	Other	Unknown	Unknown	Local Communities Forum	Unknown			£50k - £250k		Not directly applicable – NOx reduction not estimated	Improved Public awareness/ Increase in the use of sustainable alternatives.	No progress to date	
6	Develop Supplementary Planning Guidance (SPG) to provide a specific guidance for air quality in accordance with new developments.	Policy Guidance and Development Control	Air Quality Planning and Policy Guidance	Unknown	Unknown	. Local Authority Environmental Health, BCBC	Unknown			< £10k		Not directly applicable – NOx reduction not estimated	Production of an SPG.	No progress to date	.

Measure No.	Measure	Category	Classification	Estimated Year Measure to be Introduced	Estimated / Actual Completion Year	Organisations Involved	Funding Source	Defra AQ Grant Funding	Funding Status	Estimated Cost of Measure	Measure Status	Target Reduction in Pollutant / Emission from Measure	Key Performance Indicator	Progress to Date	Comments / Potential Barriers to Implementation
7	Planning guidance for the provision of Electric Vehicle Charging Points. To note; EV points are now compulsory in England	Policy Guidance and Development Control	Other	Unknown		BCBC	Unknown			< £10k		Not directly applicable – NOx reduction not estimated	Number of properties where a power spur for an electric vehicle charge point is installed. Number of planning applications approved with a vehicle charge point as an advisory or required condition.	No progress to date	
8	Revise BCBC's Walking and Cycling Strategy; Revise the existing 2009 document	Policy Guidance and Development Control/	Promotion of cycling	Unknown	Unknown	BCBC	Unknown			< £10k		Not directly applicable – NOx reduction not estimated	Production of a revised document.	No progress to date	
9	Endorse SP19, Biodiversity and Development. Further influence the use of green infrastructure for new developments.	Policy Guidance and Development Control	Other	Unknown	Unknown	BCBC	Unknown			< £10k		Not directly applicable – NOx reduction not estimated	Number of trees planted.	No progress to date	.

Measure No.	Measure	Category	Classification	Estimated Year Measure to be Introduced	Estimated / Actual Completion Year	Organisations Involved	Funding Source	Defra AQ Grant Funding	Funding Status	Estimated Cost of Measure	Measure Status	Target Reduction in Pollutant / Emission from Measure	Key Performance Indicator	Progress to Date	Comments / Potential Barriers to Implementation
10	Implement 'smoke control zone' for Bridgend. Wood burners installations would need authorisation to operate and receive permissions in accordance with the Clean Air Act.	Policy Guidance and Development Control	Other	Unknown		BCBC	Unknown			Cost unknown		Not directly applicable – NOx reduction not estimated. . Not necessarily applicable to reduction of emissions on Park Street as source of problem is from vehicles. Unlikely to impact NO_2 exceedances at effected receptors	Number of nuisance complaints generated.	No progress to date	
11	School Active Travel Plans	Promoting Travel Alternatives	Incentivise active travel campaign & infrastructure	Unknown	Unknown	BCBC	Unknown			< £10k		Not directly applicable – NOx reduction not estimated	BCBC/ SRS/ Living Streets "WOW" Scheme/ Sustrans/ WG Young Dragons Educational Package/ Global Action Plan	No progress to date	

Measure No.	Measure	Category	Classification	Estimated Year Measure to be Introduced	Estimated / Actual Completion Year	Organisations Involved	Funding Source	Defra AQ Grant Funding	Funding Status	Estimated Cost of Measure	Measure Status	Target Reduction in Pollutant / Emission from Measure	Key Performance Indicator	Progress to Date	Comments / Potential Barriers to Implementation
12	Encourage/ Facilitate homeworking. BCBC/ SRS is one of the largest employers in Bridgend and therefore could look to adopt more flexible/ agile working patterns	Promoting Travel Alternatives	Encourage / Facilitate home working.	Unknown	Unknown	BCBC	Unknown			< £10k		Not directly applicable – NOx reduction not estimated	Produce Healthy Travel Charter. Number of individuals enrolled on programme.	No progress to date	.
13	Work with local businesses to develop active travel to work programmes. Cardiff Staff Travel Charter currently being rolled out but only for public sector establishments.	Promoting Travel Alternatives	Other	Unknown		BCBC/ Cwm Taf Morgannwg University Health Board/ Public Health Wales.	Unknown			< £10k		Not directly applicable – NOx reduction not estimated	Produce Healthy Travel Charter. Number of individuals enrolled on programme.	No progress to date	

Measure No.	Measure	Category	Classification	Estimated Year Measure to be Introduced	Estimated / Actual Completion Year	Organisations Involved	Funding Source	Defra AQ Grant Funding	Funding Status	Estimated Cost of Measure	Measure Status	Target Reduction in Pollutant / Emission from Measure	Key Performance Indicator	Progress to Date	Comments / Potential Barriers to Implementation
14	Park and Ride facilities to be implemented at strategic sites (Broadlands)/ Shuttle bus service linking Bridgend train station to strategic points (Broadlands/ Hospital/ Coity/ McArthur Glen). There is also the potential to look at shared shuttle service for persons accessing proposed Health Centres.	Alternatives to private vehicle use	Bus Park and Ride scheme	Unknown	Unknown	BCBC	Unknown			£250k - £1m		NOx reduction not estimated although a reduction in cars will mean benefits in air quality and congestion.	Bus patronage figures.	No progress to date	
15	Anti-idling implemented as TROs specific to sensitive areas such as outside schools, hospitals, care homes, as well as Park Street AQMA	Traffic Management	Anti-idling enforcement	Unknown	Unknown	BCBC	Unknown			<10k		Not directly applicable – NOx reduction not estimated	Cross reference obtained air quality results on Park Street to the applicable air quality objectives.	No progress to date	.

Measure No.	Measure	Category	Classification	Estimated Year Measure to be Introduced	Estimated / Actual Completion Year	Organisations Involved	Funding Source	Defra AQ Grant Funding	Funding Status	Estimated Cost of Measure	Measure Status	Target Reduction in Pollutant / Emission from Measure	Key Performance Indicator	Progress to Date	Comments / Potential Barriers to Implementation
16	Introduce a pilot scheme “20mph speed limit” to Park Street.	Traffic Management	Anti-idling enforcement	Unknown	Unknown	BCBC	Unknown			Cost unknown		Unlikely to improve air quality on Park Street, as the air quality issue is caused by slow moving and queuing traffic.	Evaluation of annual air quality datasets for NO_2. Reduction in vehicle speeds via traffic flow analysis Any marked improvement in collision/ incident rates. Cross reference obtained air quality results on Park Street to the applicable air quality objectives.	Nationwide implementation of 20mph limit in residential September 2023.	
17	Ghost right hand turn onto Heol-Y-Nant.	Traffic Management	Strategic highway improvement			BCBC				<£10k		Exact reduction unknown. However, improvements in NO_2 reductions are evident since the implementation of the measure	Cross reference obtained air quality results on Park Street to the applicable air quality objectives.	Measure completed in February 2022.	Measure included in AQAP detailed assessment as part of 'do minimum' scenario.

Measure No.	Measure	Category	Classification	Estimated Year Measure to be Introduced	Estimated / Actual Completion Year	Organisations Involved	Funding Source	Defra AQ Grant Funding	Funding Status	Estimated Cost of Measure	Measure Status	Target Reduction in Pollutant / Emission from Measure	Key Performance Indicator	Progress to Date	Comments / Potential Barriers to Implementation
18	Deny all access onto St Leonard's Road from Park Street for all traffic movements.	Traffic Management	Strategic highway improvement	Unknown	Unknown	BCBC	Unknown			£10k - £50k		Modelling for 'do something' scenario predicts a decrease in NO2 emissions of up to 5.8µg/m3 when with addition of measure twenty.	Cross reference obtained air quality results on Park Street to the applicable air quality objectives.	No progress to date	Measure included in AQAP detailed assessment as part of 'do something' scenario.
19	Deny a through route movement from Angel Street onto Park Street.	Traffic Management	Strategic highway improvement	Unknown	Unknown	BCBC	Unknown			Cost unknown		Unknown.	Reduced capacity on Park Street captured via traffic flow analysis.		
20	Optimise the traffic signals at the Tondu Rd/ Park Street/ Angel Street Junction- Adopt a MOVA system.	Traffic Management	Strategic highway improvement			BCBC				£10k - £50k		Modelling for 'do something' scenario predicts a decrease in NO2 emissions of up to 5.8µg/m3 as part of a 'do something' scenario with measure eighteen	Cross reference obtained air quality results on Park Street to the applicable air quality objectives.	Measure completed in February 2022.	Completed September 2022. Measure included in AQAP detailed assessment as part of 'do something' scenario.

Measure No.	Measure	Category	Classification	Estimated Year Measure to be Introduced	Estimated / Actual Completion Year	Organisations Involved	Funding Source	Defra AQ Grant Funding	Funding Status	Estimated Cost of Measure	Measure Status	Target Reduction in Pollutant / Emission from Measure	Key Performance Indicator	Progress to Date	Comments / Potential Barriers to Implementation
22	Bus Programme- Strategic Bus Network. Buses not to use St Leonard's Road due to the experienced access constraints onto and off Park Street.	Transport Planning and Infrastructure	Bus Route Improvements	Unknown	Unknown	BCBC	Unknown			£50k - £250k		Unknown.	Customer satisfaction questionnaires from the bus operators.	No progress to date	
23	HGV restrictions for Park Street.	Traffic Management / Promoting Low Emission Transport	UTC, Congestion management, traffic reduction	Unknown	Unknown	BCBC	Unknown			£10k - £50k		Dispersion modelling indicates this option will have little effect on reducing NO2 concentrations at the worst effected receptors.	Cross reference obtained air quality results on Park Street to the applicable air quality objectives. Review data gathered via modelling assessment	Modelling has carried out to assess measure	
24	Bus Electrification for buses using Park Street	Promoting Low Emission Transport	Public Vehicle Procurement - Prioritising uptake of low emission vehicles	Unknown	Unknown	BCBC	Unknown			£250k - £1m		Dispersion modelling indicates this option will have little effect on reducing NO2 concentrations at the worst effected receptors.	Cross reference obtained air quality results on Park Street to the applicable air quality objectives. Review data gathered via modelling assessment	Modelling has carried out to assess measure	

Table 10 - Cost benefit Analysis for Park Street AQAP Mitigation Measures

Measure No.	Cost benefit (cost x [pollution reduction + exposure reduction] = score)					
	Measure	**Cost** 1 = >£1m 2 = £250k-1m 3 = £50k - 250k 4 = £10k - £50k 5 = <£10k	**Air pollution reduction** 10 = greatest air quality gain 1 = least air quality gain	**Exposure reduction** 10 = greatest exposure reduction 1 = least exposure reduction	**Score = cost x benefit**	**Rank** **1 = most cost benefit effective**
20	Optimise the traffic signals at the Tondu Rd/ Park Street/ Angel Street Junction.	4	6	2	32	1
1	Public health informationcampaign.	5	2	4	30	2
15	Anti-idling implemented as TROs specific to sensitive areas such as outside schools, hospitals, care homes, as well as Park Street AQMA.	5	4	2	30	2
18	Deny all access onto Leonard's Road from Park Street for all traffic movements.	4	5	2	28	3

Measure No.	Cost benefit (cost x [pollution reduction + exposure reduction] = score)					
	Measure	**Cost** 1 = >£1m 2 = £250k-1m 3 = £50k - 250k 4 = £10k - £50k 5 = <£10k	**Air pollution reduction** 10 = greatest air quality gain 1 = least air quality gain	**Exposure reduction** 10 = greatest exposure reduction 1 = least exposure reduction	**Score = cost x benefit**	**Rank** **1 = most cost benefit effective**
17	Ghost right hand turn onto Heol-Y-Nant.	5	4	2	25	3
6	Develop Supplementary Planning Guidance (SPG).	5	3	2	25	4
16	Introduce a pilot scheme "20mph speed limit" to Park Street.	5	3	2	25	5

Measure No.	Cost benefit (cost x [pollution reduction + exposure reduction] = score)					
	Measure	**Cost** 1 = >£1m 2 = £250k-1m 3 = £50k - 250k 4 = £10k - £50k 5 = <£10k	**Air pollution reduction** 10 = greatest air quality gain 1 = least air quality gain	**Exposure reduction** 10 = greatest exposure reduction 1 = least exposure reduction	**Score = cost x benefit**	**Rank** **1 = most cost benefit effective**
7	Planning guidance for the provision of Electric VehicleCharging Points.	5	3	1	20	6
2	Support the creation of a local "Air Quality Action Group."	5	2	1	15	7
10	Implement 'smoke control zone' for Bridgend.	5	2	1	15	7
12	Encourage/ Facilitate homeworking.	5	2	1	15	7

Measure No.	Cost benefit (cost x [pollution reduction + exposure reduction] = score)					
	Measure	**Cost** 1 = >£1m 2 = £250k-1m 3 = £50k - 250k 4 = £10k - £50k 5 = <£10k	**Air pollution reduction** 10 = greatest air quality gain 1 = least air quality gain	**Exposure reduction** 10 = greatest exposure reduction 1 = least exposure reduction	**Score = cost x benefit**	**Rank** **1 = most cost benefit effective**
14	Park and Ride facilities to be implemented at strategic sites.	2	4	3	14	8
4	Electronic "pollutant signage" within AQMA and local area.	3	2	2	12	9
5	Signs and banners for engine idling	3	2	2	12	9
11	School Active Travel Plans	4	2	1	12	9
22	Bus Programme- Strategic Bus Network.	3	2	2	12	9
3	Increase the monitoring capabilities of the Council.	4	1	2	12	9
19	Deny a through route movement from Angel Street onto Park Street.	4	2	1	12	9

Measure No.	Cost benefit (cost x [pollution reduction + exposure reduction] = score)					
	Measure	**Cost** 1 = >£1m 2 = £250k-1m 3 = £50k - 250k 4 = £10k - £50k 5 = <£10k	**Air pollution reduction** 10 = greatest air quality gain 1 = least air quality gain	**Exposure reduction** 10 = greatest exposure reduction 1 = least exposure reduction	**Score = cost x benefit**	**Rank** **1 = most cost benefit effective**
23	HGV restrictions for Park Street.	4	2	1	12	9
24	Bus Electrification for buses using Park Street	1 -2	2	1	4	11

9 Detailed Transport and Air Quality Assessment

As previously discussed, queuing and inconsistent traffic flows are the principal cause of the measured poor air quality levels in the Park Street AQMA. After the Cost Benefit Analysis, it has been agreed by the AQAP Work Steering Group to assess in more detail mitigation options that will manage and improve traffic flows through the Park Street AQMA, with the principal objective to reduce NO_2 concentrations in line with air quality objectives.

The preferred options of the initial draft AQAP included the following three options under a Do Minimum and Do Something Scenario:

Do Minimum

- Introduction of a right turn holding lane at the Junction of Park Street with Heol y Nant (Measure 17). This was implemented by the developer (Persimmon) of the former Ysgol Bryn Castell site (Llangewydd Road, Cefn Glas) under the requirement of Condition 27 of Planning consent P/18/1006/FUL. It was opened to traffic in February 2022.

Do Something

- Deny all access onto St Leonards Road from Park Street (Measure 18).
- Implementation and optimization of 4-phase junction at the Park Street/ Angel Street/ Tondu Road Junction (Measure 20). This was completed in August 2022.

In addition to the above measures, in 2023 restrictions for HGVs and electrification of all buses using Park Street were assessed. The results from these modelled scenarios were added to any reductions achieved by the 'Do Something' scenario.

SRS/ BCBC commissioned external consultants to undertake transport and air quality modelling work for the above options to illustrate any benefits to nitrogen dioxide currently identified as exceeding objective limits. Since the above measures work in conjunction with one another, the two scenarios where transport and air quality modelling have been undertaken would assess two options cumulatively as one preferred scenario.

9.1 Assessment update for 2023

Due to delays in publishing the final AQAP to meet the original modelling assessments implementation date of 2023, further modelling assessments have

been carried out to investigate the predicted year of compliance with the measures already assessed.

Available traffic and fleet data were used to forecast concentrations of nitrogen dioxide (NO_2) from the road for the following scenarios:

- Identify the year estimated to comply with the NO_2 annual mean air quality objective (AQO) of 40 µg/m^3 using governmental fleet projections (DfT and Defra). The compliance year was identified by forecasting traffic volumes from the 2023 do-minimum traffic model.
- A re-run of the model for the year found to comply with the NO_2 annual mean AQO with consideration of introducing road schemes in the do something scenario. This model was amended by estimating emissions from the DS traffic volumes assuming the fleet mix forecasted in the compliance year.
- A re-run of the model for the year found to comply with the NO_2 annual mean AQO with consideration to the impacts of converting the entire bus fleet to electric. This model was amended by converting the entire bus fleet within the 2023 do-something traffic model to electric.

9.2 Modelling Results

To fully assess the impacts on air quality, the air quality dispersion model has identified thirty-five receptor points along Park Street and surrounding streets in addition to modelling concentrations at the existing monitoring locations on Park Street. These locations allow an assessment of relevant exposure across a wider area to assess the impact of the interventions.

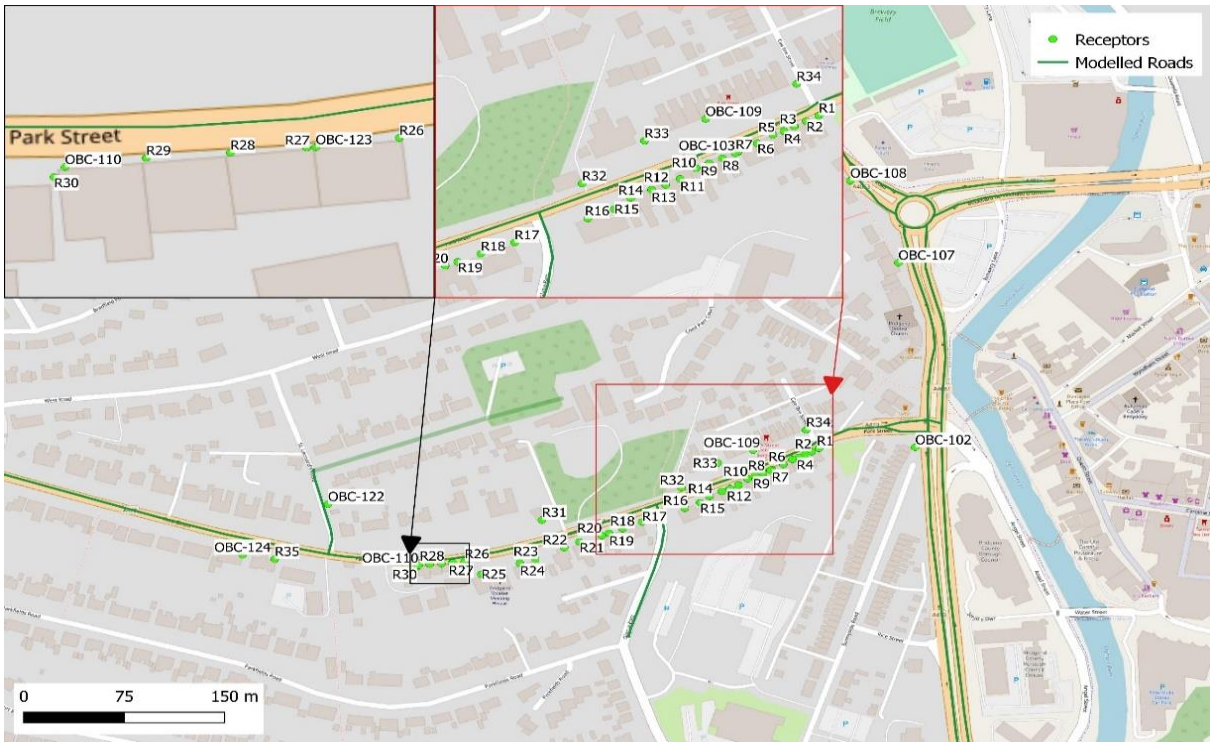
The study area includes all roads within two hundred metres of the AQMA in the traffic model and the A473 between Boulevard de Villenave d'Ornon/Tondu Road roundabout and the junction with Merthyr Mawr Road. Traffic changes have been screened between the DM and DS scenario to establish if there is the potential for traffic flow increases to cause a significant worsening of air quality. Traffic flow changes were compared against screening criteria within Table 6.2 of the Institute for Air Quality Management's Land-Use, Planning & Development Control: Planning for Air Quality[10]. There was only one other location outside of study area which breached the traffic screening thresholds, which is Tondu Road north of Boulevard de Villenave d'Ornon/Tondu Road roundabout which is estimated to experience an approx. 1,000 AADT increase. However, OBC-108 (presented in

Figure 1) is estimated to experience concentrations of 24.8 µg/m3 NO_2 in 2023.

[10] https://www.iaqm.co.uk/text/guidance/air-quality-planning-guidance.pdf

OBC-108 is considered a conservative representation of NO_2 concentrations along Tondu Road and 1,000 AADT is not considered a compliance risk for NO_2 air quality objectives given existing concentrations are 24.8 µg/m3.

Figure 11 - Air Quality Modelling Locations



As detailed in Table 11 below, the implementation of the dedicated right turn from Park Street onto Heol-y-Nant under the DM 2023 scenario provides an improvement in NO_2 concentrations at the worst affected receptors along Park Street, when compared to the base year of 2019. However, several of the **modelled receptor** locations demonstrate continued exceedances of the air quality objective for NO_2.

Table 11 also demonstrates the results of the do something scenario. This includes denying access to St Leonards Road from Park Street, and Tondu Road/Park Street signalling improvements with the addition of the Heol-Y-Nant right turn. The modelled concentrations show further improvements with only two **modelled receptors** slightly exceeding the annual objective limit for NO_2 of 40 µg/m^3. Concentrations of NO_2 at all existing monitoring locations are identified to be compliant with the annual air quality objective.

Table 11 - Modelled Air Quality Results NO_2 µg/m^3 Park Street AQMA

Receptor ID	NO_2 (µg/m^3) Base 2019	NO_2 (µg/m^3) DM 2023	NO_2 (µg/m^3) DS 2023	NO_2 (µg/m^3) DS-DM
R26	56.8	44.6	39.3	-5.4
R27	60.2	47.3	41.6	-5.7
R28	60.5	47.5	41.8	-5.8
R29	57.4	44.9	39.3	-5.6
R30	49.0	38.3	33.6	-4.7
R35	22.0	16.1	16.4	0.3
OBC-110	50.7	39.6	34.7	-4.9
OBC-123	56.4	44.3	39.0	-5.3
OBC-124	19.9	14.6	14.9	0.4
OBC-108	29.5	23.7	24.8	1.1

9.3 HGV Restrictions and Bus Electrification

Three additional measures were modelled for the current version of this report. In addition to the traffic management schemes described above, the following measures were assessed.

- Buses in Bridgend are 100% electric.
- HGVs are restricted from driving on Park Street
- The combination of both additional measures related to electric buses and HGV restrictions.

9.4 Updated Modelling Results

NO_2 results from the additional modelling scenarios were compared to the 2023 DS results.

Table 12 presents modelled NO_2 concentrations at receptor locations where there were exceedances or an increase in concentrations in previous modelling scenarios. Results at all receptor locations are presented in Appendix 2.

In all three additional scenarios, there are still exceedances of the 40 µg/m^3 NO_2 objective at receptors R27 and R28. When model uncertainty is considered, in this case model uncertainty is 3.5 µg/m^3, there is a high likelihood that receptors R26 and

R29 will remain in exceedance.

Table 12 - Additional 2023 Scenarios NO_2 Concentrations µg/m^3

Receptor ID	NO_2 (µg/m^3) DS 2023	NO_2 (µg/m^3) Electric buses	Electric buses – DS 2023	NO_2 (µg/m^3) HGV restriction	HGV restriction – DS 2023	NO_2 (µg/m^3) Combined	Combined – DS 2023
R26	39.3	38.6	-0.6	39.2	0.0	38.6	-0.6
R27	41.6	40.9	-0.7	41.6	0.0	40.9	-0.7
R28	41.8	41.1	-0.7	41.8	0.0	41.1	-0.7
R29	39.3	38.6	-0.7	39.3	0.0	38.6	-0.7
R30	33.6	33.0	-0.6	33.6	0.0	33.0	-0.6
R35	16.4	16.2	-0.3	16.3	-0.1	16.1	-0.4
OBC-110	34.7	34.1	-0.6	34.7	0.0	34.1	-0.6
OBC-123	39.0	38.3	-0.6	38.9	0.0	38.3	-0.6
OBC-124	14.9	14.7	-0.2	14.8	-0.1	14.6	-0.3
OBC-108	24.8	24.8	0.0	24.8	0.0	24.7	-0.1

Table 12 presents reductions in NO_2 concentrations from each scenario compared to the DS 2023. There were small reductions in all scenarios (<1 µg/m^3), with the maximum reductions in the combined scenario on the eastern side of the Park St AQMA (1 – 2 µg/m^3). The HGV restriction had no effect on the western side of the Park St AQMA as HGVs were not predicted to be present on these road links in the DS 2023.

Table 13 displays the natural compliance study results at locations that were identified to exceed the 40 µg/m^3 limit value in the 2023 do minimum scenario previously assessed. The 2019 and 2023 results are from the previous studies, whereas the 2025 to 2027 results are from the current study exploring when NO_2 is compliant (≤40 µg/m^3) and when the AQMA could be revoked (<36 µg/m^3).

Table 13 - Annual averaged NO_2 concentrations ($\mu g/m^3$) at each receptor from the 2025 – 2027 natural compliance models

Receptor ID	2019	2023	2025	2026	2027
R26	56.8	44.6	37.6	35.3	33.2
R27	60.2	47.3	39.9	37.5	35.3
R28	60.5	47.5	40.1	37.7	35.4
R29	57.4	44.9	39.1	36.7	34.5
OBC-123	56.4	44.3	37.4	35.2	33.1

The results from
Table 13 show that:

- NO_2 concentrations are estimated to fall below the 40 $\mu g/m^3$ limit value at all locations in 2026.
- NO_2 concentrations are estimated to be eligible for AQMA revocation consideration to begin (<36 $\mu g/m^3$) in 2027.

Table 14 displays results from the two additional tests undertaken alongside the 2026 model results detailed in
Table 13 and the absolute change in NO_2 brought about by the measures considered.

Table 14 - Annual averaged NO_2 concentrations ($\mu g/m^3$) at each receptor from the 2026 DM, DS and 100% electric buses model

Receptor ID	2026 DM	2026 DS	NO_2 reduction (DM minus DS)	2026 DS with 100% Electric buses	NO_2 reduction (DS minus electric bus)
R26	35.3	34.7	0.6	34.4	0.3
R27	37.5	36.9	0.6	36.5	0.4
R28	37.7	37.0	0.7	36.6	0.4
R29	36.7	36.1	0.6	35.7	0.4
OBC-123	35.2	34.6	0.6	34.2	0.4

The results show that:

- Concentrations of annual averaged NO_2 fell at each receptor in the 2026 do-something model compared to the concentrations predicted by the 2026 do-minimum model.
- Concentrations fell by 0.6 µg/m^3 on average at each receptor.
- Concentration reductions with the DS scheme do not make any additional receptors eligible for AQMA revocation (< 36 µg/m^3).
- Concentrations of annual averaged NO_2 fell at each receptor in the 2026 100% electric buses model.
- Concentrations fell by 0.4 µg/m^3 on average at each receptor.
- Concentration reductions with the DS scheme 100% electric buses brings forward the year one receptor (R29) is eligible for AQMA revocation (< 36 µg/m^3).

10 Conclusions

The results of the natural compliance assessment suggest that without additional measures in place, the annual mean NO_2 concentrations will fall below the 40 µg/m^3 threshold in 2026 and that the local authority could start to make a case for revoking the AQMA at these locations from 2027 onwards.

At present, the 'do something' scheme has the potential to bring forward compliance to 2025. However, this is unlikely due to the fact that the implementation of Measure 18, denying all access onto St Leonards Road from Park Street, will require a consultation process due to the introduction of a traffic order. It is important to consider this in terms of timescale for implementation in comparison to the predicted year of natural compliance of 2026. Although this option would provide further air quality benefits in terms of the overall reduction of NO_2.

The implementation of HGV restrictions and bus electrification is predicted to have little effect on NO_2 concentrations at the receptors forecast to exceed the NO_2 annual objective with the DS scheme in place. The electrification of all buses using Park Street is predicted to result in a maximum reduction of **0.7µg/m^3** at modelled receptors R27-29 if implemented in 2023.

Section 3.57 of the LAQM.TG22 document states:

'*The revocation of an AQMA should be considered following three consecutive years of compliance with the relevant objective as evidenced through monitoring. Where NO_2 monitoring is completed using diffusion tubes, to account for the inherent uncertainty associated with the monitoring method, it is recommended that revocation of an AQMA*

should be considered following three consecutive years of annual mean NO_2 concentrations being lower than 36µg/m^3 (i.e. within 10% of the annual mean NO_2 objective). There should not be any declared AQMAs for which compliance with the relevant objective has been achieved for a consecutive five-year period.'

This statement suggests that in all likelihood, the local authority may need to wait until at least 2030 before it can justify revoking the current AQMA in place. It is also worth considering some of the limitations in the study.

Defra's NAEI dataset was used to underpin the future fleet composition and calculate emissions from the road network, however this was published in 2019. As a result, the modelling results are likely to be optimistic as the predicted turnover of vehicles is likely to be impacted by both the pandemic and economic concerns experienced across the UK between 2020 to date.

11 Next Steps

It is predicted that compliance could be met at all locations within Park Street by 2026. The 'do something' scheme has the potential to bring forward compliance to 2025. BCBC will continue to explore alternative options to assess whether the forecasted year of compliance can be bought forward, in addition to measures implemented to date. Monitoring will continue at all locations within the AQMA.

The implementation of measure 18, denying all access onto St Leonards Road from Park Street, will need to be considered further due to the length of statutory consultation period for this change under the Road Traffic Regulation Act 1984 when compared to the predicted year of compliance of 2026.

12 Responsibilities and Commitment

This AQAP was prepared by Shared Regulatory Services on behalf of Bridgend County Council. This AQAP will be subject to an annual review, appraisal of progress and reporting to Cabinet. Progress each year will be reported in the Annual Progress Reports (APRs) produced by Shared Regulatory Services, as part of the statutory Local Air Quality Management duties. The Air Quality Action Plan is a live document and measures will be added, developed, and assessed accordingly throughout the lifetime of this plan.

If you need further information regarding the AQAP, please contact SRS at:

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Holton Road
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CF63 4RU

Tel: 0300 123 6696

Email: environment-srswales@valeofglamorgan.gov.uk

13 References

Bridgend Annual Progress Report Air Quality and Pollution (SRS.Wales)

Provisional Analysis of Welsh Air Quality Monitoring Data – Impacts of Covid-19
https://airquality.gov.wales/sites/default/files/documents/2020-08/Analysis_of_Welsh_Air_Quality_Data_Impacts_of_Covid-19_Final_Issue2.pdf

Local Air Quality Management in Wales
https://gov.wales/sites/default/files/publications/2019-04/local-air-quality-management-in-wales.pdf

Well Being of Future Generation (Wales) Act 2015
https://www.futuregenerations.wales/about-us/future-generations-act/

Local Air Quality Technical Guidance (LAQM.TG22)
https://laqm.defra.gov.uk/wp-content/uploads/2022/08/LAQM-TG22-August-22-v1.0.pdf

Appendices

Appendix A: Detailed Assessment of Park Street AQMA Analysis of Air Quality Impact

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RICARDO

Analysis of Air Quality Impact

A Technical Note for Bridgend Council

ED 13681100 | Issue number 1 | Date 04/04/2022

1 Introduction

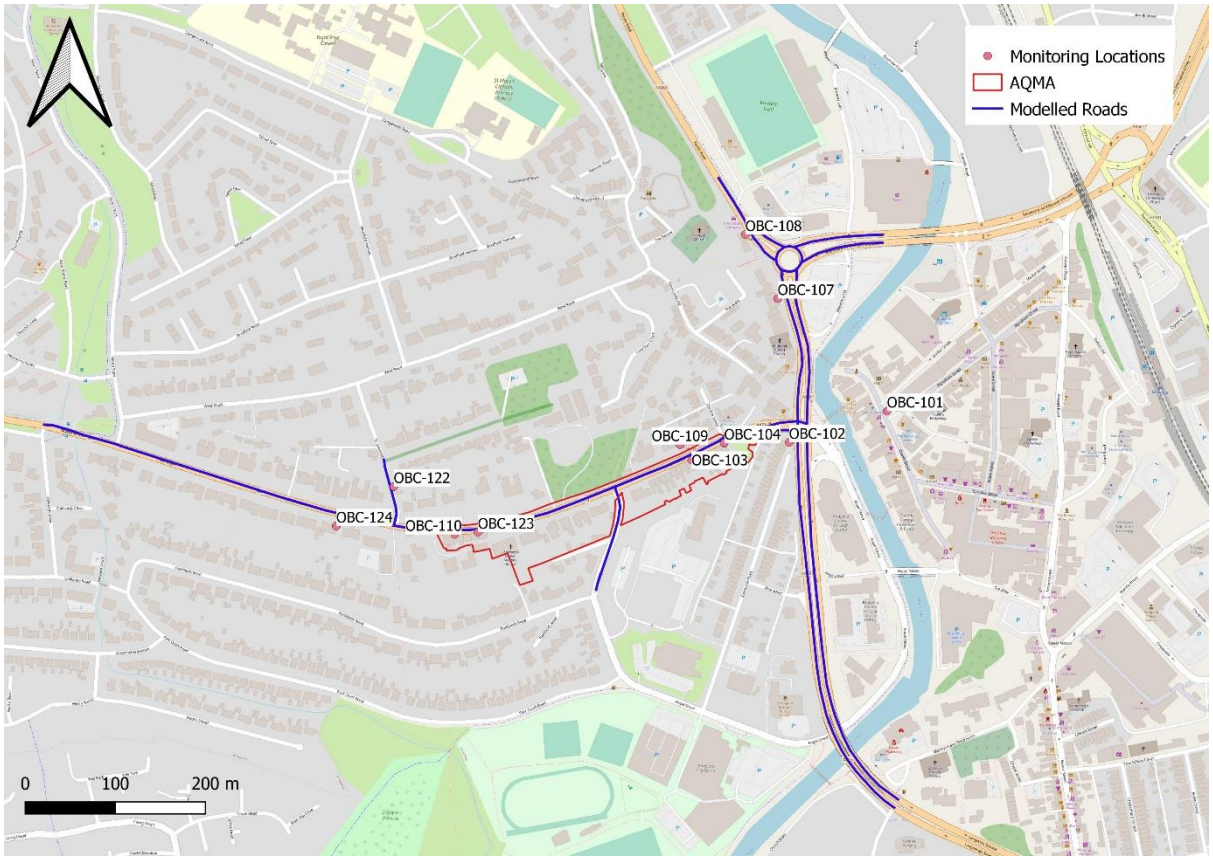
Bridgend Council (the Council) has declared an Air Quality Management Area (AQMA) for a section of Park Street, encompassing a number of properties between Park Street's junction with the A473 to the east, and the junction with St Leonard's Road to the west. The AQMA has been declared for an exceedance of the annual mean NO_2 Air Quality Objective (AQO) of 40 µg/m^3; although there are measurements which are close to exceeding the 1-hour NO_2 objective of 200 µg/m^3 as well. The issues relate to the proximity of houses to a heavily trafficked primary route (Park Street) which also suffers congestion issues. These issues are compounded by gradients increasing engine load and poor dispersion caused by buildings.

This report presents the findings of a detailed assessment (DA) in support of the Council's Air Quality Action Plan (AQAP). This DA evaluates the potential air quality benefits associated with three proposed traffic management schemes; two 4-phase junctions, one at Heol-y-Nant junction and the other at the Tondu Road/Park Street junction and no access to St Leonards Road from Park Street.

2 Existing air quality in Bridgend

There is 1 automatic monitoring location and 30 non-automatic monitoring locations across Bridgend. The automatic monitoring location measures SO_x using API AMX monitoring equipment. The 30 non-automatic monitoring locations measure NO_2 using passive diffusion tubes. Figure 12 shows the monitoring locations and AQMAs within the study area.

Figure 12 Monitoring and AQMAs in Bridgend



The measured data set out in **Table 15** shows that 2 locations were in exceedance of the NO_2 annual mean (OBC-123 and OBC-110) in 2019. These exceedances relate to the section of Park Street to the west end of the AQMA boundary near St Leonards Road. The monitoring results in **Table 15** were used to carry out verification of the air quality model and ensure that it provides a robust representation of measured concentrations in Bridgend following the approach set out in Appendix 1 – Model Verification.

Table 15: NO_2 **Monitoring Results**

Site ID	Site Name	Type	X	Y	2019 Data Capture (%)	2019 (µg m^3)
OBC-101	Bridgend Town Centre	Urban centre	290469	179837	83	18.6
OBC-102	Sunnyside Street	Roadside	290354	179807	100	23.9
OBC-103	Park Street	Roadside	290250	179782	100	37.1
OBC-104	Park Street	Roadside	290286	179800	92	39.8
OBC-109	Park Street	Roadside	290239	179795	92	19.9
OBC-110	Park Street	Kerbside	289988	179701	100	53.7
OBC-122	St Leonards Road	Kerbside	289919	179755	75	16.7
OBC-123	Park Street	Roadside	290014	179698	100	55.2
OBC-124	Park Street	Roadside	289859	179710	100	16.6
OBC-107	Tondu Road	Roadside	290347	179959	92	32
OBC-108	Tondu Road	Kerbside	290311	180032	100	36.2

3 Methodology for air quality impact assessment

3.1 Traffic schemes

This DA has included three traffic scenarios; a baseline year of 2019, future year without scheme (do-minimum (DM)) and with scheme (do-something (DS)) both set in 2023. All traffic scenarios include traffic flows and speeds in the format of annual average daily traffic (AADT) for the following vehicle categories: cars, light goods vehicles (LGVs), heavy goods vehicles (HGVs) and buses. The baseline year of 2019 was developed to ensure projections were

based on a year without the impacts of Covid-19. The baseline year includes all existing road schemes and is used in the air quality assessment to validate air quality model estimates against measured concentrations.

The DM 2023 scenario includes all existing and committed schemes, with the most pertinent committed development being a right turn lane associated with a Persimmon housing development at the Heol-y-Nant junction. Traffic modelling has shown that this right turn lane decreases congestion on Park Street close to this junction.

The do-something 2023 scenario includes all existing, committed schemes and the proposed road traffic scheme. Transport modelling undertaken by Mott Macdonald demonstrates that there was a worsening of congestion associated with the 4-phase junction at Heol-y-Nant. As such, it was agreed with the Council that the DS scenario will only include no access onto St Leonards Road and one 4-phase junction at the Tondu Road/Park Street junction. Mott Macdonald completed transport modelling for Bridgend's local development plan (LDP). The LDP transport model was amended to include the aforementioned DS traffic schemes. For further information on the traffic modelling, refer to Mott Macdonald's LDP modelling report.

3.2 Study area

The study area includes all roads within 200 metres of the AQMA in the traffic model and the A473 between Boulevard de Villenave d'Ornon/Tondu Road roundabout and the junction with Merthyr mawr Road. Traffic changes have been screened between the DM and DS scenario to establish if there is the potential for traffic flow increases to cause a significant worsening of air quality. Traffic flow changes were compared against screening criteria within Table 6.2 of the Institute for Air Quality Management's Land-Use, Planning & Development Control: Planning for Air Quality[11]. There was only one other location outside of study area which breached the traffic screening thresholds, which is Tondu Road north of Boulevard de Villenave d'Ornon/Tondu Road roundabout which is estimated to experience an approx. 1,000 AADT increase. However, OBC-108 (presented in Figure 12) is estimated to experience concentrations of 24.8 µg/m^3 NO_2 in 2023. OBC-108 is considered a conservative representation of NO_2 concentrations along Tondu Road and 1,000 AADT is not considered a compliance risk for NO_2 air quality objectives given existing concentrations are 24.8 µg/m^3.

3.3 Road traffic emission calculations

Emissions were calculated using Ricardo's in-house software called RapidEMs, which calculates vehicular emissions using the latest Copert emission factors. Three essential inputs are required for RapidEms to calculate emissions: fleet mix, traffic flow and speed (kph). Fleet mix provides a % for each vehicle category such as petrol car and euro standard. The fleet mix is implemented by applying the % split fleet mix to the total number of vehicles in that category, for example 1,000 cars with the assumption of 60% petrol and 40% diesel would result in 600 petrol and 400 diesel cars. Traffic flows are presented in this assessment in the format of annual average daily traffic flows for different vehicle categories, for example car, LGV, HGV and buses. Speed is the average speed across the different vehicle type categories (kph). The fleet mix used for Bridgend's DA comes from an Automatic Number Plate Recognition (ANPR) survey undertaken for Caerphilly Council in 2019. This is considered an improvement over the default approach using national fleet mixes (National Atmospheric Emission Inventory (NAEI)[12]) as it will be more representative of fleet in South Wales and therefore Bridgend's

[11] https://www.iaqm.co.uk/text/guidance/air-quality-planning-guidance.pdf
[12] https://naei.beis.gov.uk/data/ef-transport

fleet. The 2019 Caerphilly fleet mix was forecasted to 2023 using the same fleet turnover projections as in the NAEI.
Road traffic data was taken from the approach described in section 3.1. An optional input for emission calculations is gradient as the inclusion depends on the topography of the local area. Park Street has a gradient with the potential to impact emission calculation, which is greater than a 1:10 slope and gradient effects are required to better represent vehicular emissions. To consider the impact of gradient on engine load and therefore emissions per vehicle, terrain elevation data in the format of 1m DTM lidar data was procured from the Welsh Government's Geo-Portal[13]. The road traffic data, vehicle fleet mix and gradient data were used in the RapidEms process to calculate emissions in grams per second per kilometre (g/s/km).

3.4 Dispersion modelling

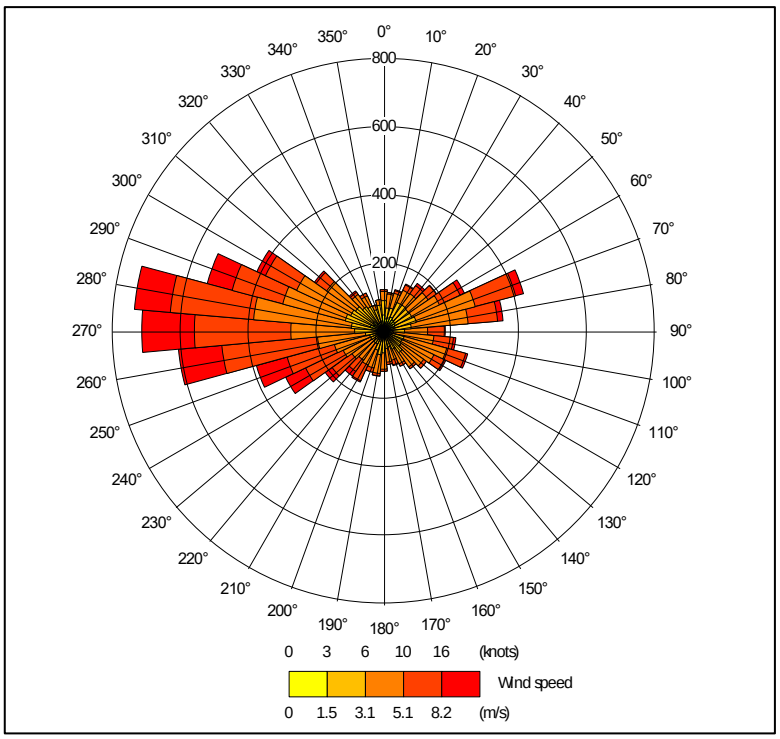
3.4.1 Dispersion model selection

ADMS-Roads is a Gaussian dispersion model with inputs for local observations such as the surrounding terrain, meteorological data for example wind speed, wind direction and solar radiation to reflect the local dispersion environment. ADMS-Roads has been extensively validated and is commonly used for air quality assessments of road schemes in the UK.

3.4.2 Meteorological data

Annual meteorological data for 2019 was procured from the RAF St Athan weather station. The data capture is 100% for temperature, wind speed and wind direction, whereas cloud cover has a data capture of 91%. A wind rose of 2019 met data from RAF St Athan can be seen in Figure 13. This demonstrates that the prevailing wind direction is westerly, which is typical of coastal locations to the west of the UK.

Figure 13 Wind rose for RAF St Athan 2019 meteorological data

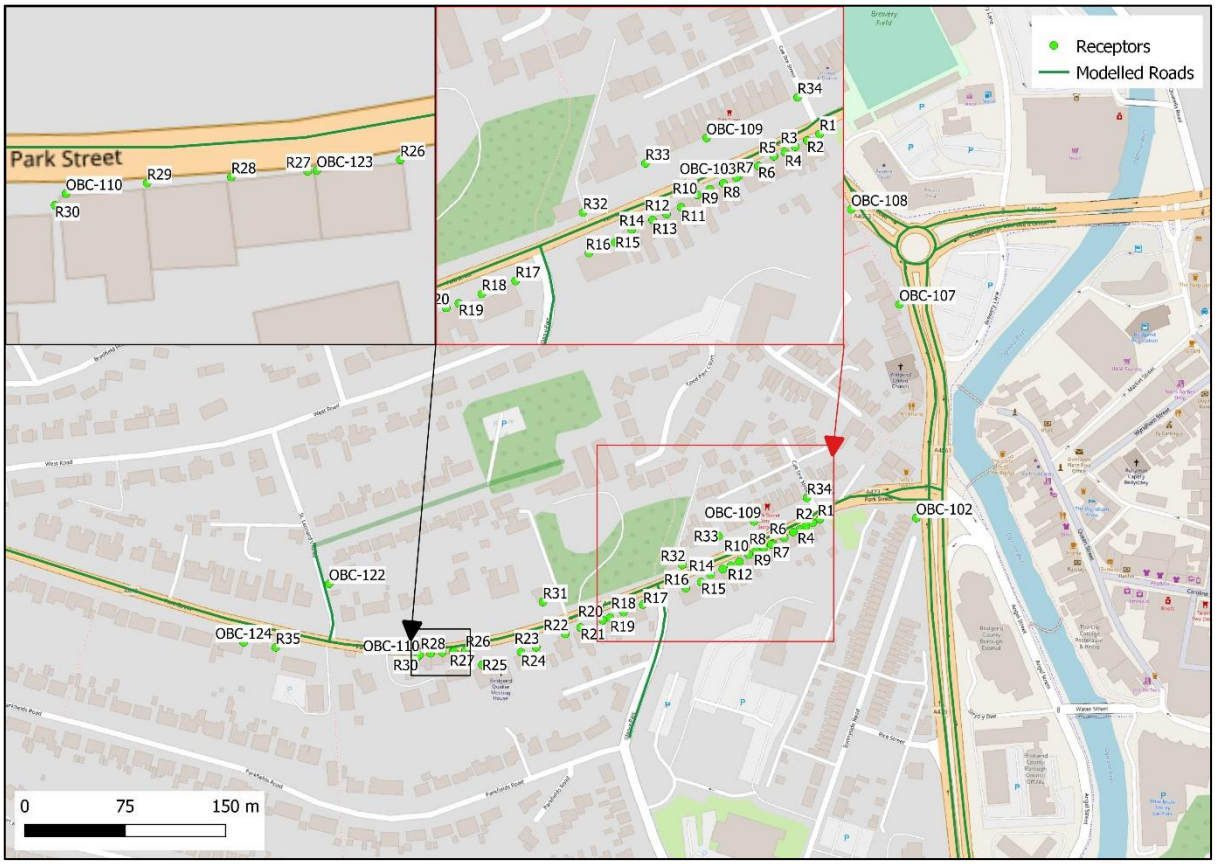


[13] https://lle.gov.wales/GridProducts#data=LidarCompositeDataset

3.4.3 Modelled receptors

There are two types of receptors, those that are representative of sensitive receptors such as residential dwellings and monitoring locations. Sensitive receptors have a prefix of 'R' and monitoring locations have a prefix of 'OBC'. The Park Street AQMA has residential dwellings to the south and North of the Road, with residential dwellings to the north all being within close proximity of the road (<2 metres) and therefore at greater risk of exceeding the NO_2 annual mean AQO. To ensure the full extent of exceedances are captured in this project, all residential dwellings south of Park Street in the AQMA have been included. The dwellings north of Park Street are setback much further from the road, typically at 14 metres, there is one exception at approx. 4 metres. The closest residential dwelling to the north of each unique Park Street Road link has been included in the dispersion model as a receptor. Sensitive receptors were placed at building facades and at a height of 1.5 metres, whereas monitoring locations were placed at a combination of building facades and street furniture such as lampposts. Monitoring locations heights were taken from Bridgend's Annual Status Report, in this study area all monitoring location heights were 2 metres. Receptor locations have been presented in Figure 14.

Figure 14 Bridgend Study Area and modelled Receptors



3.4.4 Street canyon

Bridgend has historic housing built nearby to roads, in some instances less than 1 metre, these tall buildings are built either side or on one side of the road. In both scenarios the presence of buildings close to the road will cause an impact on emission dispersion. Buildings on either side of the road with the same height are classed as a symmetrical street canyon. Whereas buildings on one side of the road, or where the height varies on either side are classed as asymmetrical street canyons. Symmetrical street canyons are identified when the height of buildings either side of the road is twice the road width. ADMS-Roads can be programmed to

model these symmetrical canyons with the simple canyon's module, however this would not reflect scenarios in Bridgend where there is only one side of the road with a tall building. As such, to reflect the varied impact of Bridgend's buildings street canyons on dispersion only asymmetrical canyons were included. The advanced street canyon module has been used in ADMS to estimate the impact on NO_2 concentrations from asymmetrical street canyons. Asymmetrical street canyons may affect dispersion by altering the channel of flow by the canyon walls and a recirculating flow region drive by the canopy flow perpendicular to the street. The area of recirculation by the building walls can lead to elevated pollutant concentrations. The location of asymmetrical canyons has been detailed in Figure 15.

Figure 15 Street canyons in Bridgend

3.4.5 Background concentrations

Background pollutant concentrations for a modelling study within an urban environment in England can be sourced from either a local monitoring location classified as an urban background site, or the background maps produced by Ricardo Energy & Environment for Defra. The background maps provide estimates of annual mean background concentrations of key pollutants at a resolution of 1 x 1km for England projected from a base year of 2018 and can be projected forward to future years up to 2030. These annual mean pollutant maps combine pollutant measurement data with the emissions information from the UK's National Atmospheric Emissions Inventory (NAEI) to provide estimated pollutant concentrations for the whole of England.

In this case, no nearby background pollutant measurements were available; therefore, Defra's background maps were used as the best available estimate of current and future background pollutant concentrations. For Bridgend's baseline year (2019) Defra's background maps were downloaded and the background concentrations for the appropriate grid squares extracted. The background concentrations for NO_2 are presented in Table 16. Background concentrations

are significantly less than the respective AQOs assessed, 40 µg/m^3 for NO_2.

Table 16: Mapped Background NO_x and PM_{10} Concentrations in Bridgend 2019

Easting	Northing	Background NOx (µg.m^{-3})
290500	179500	14.2
289500	179500	10.6
290500	180500	13.6

3.4.6 Model verification

The root mean square error (RMSE) is a measure of uncertainty in dispersion modelling, Defra's LAQM.TG (16) guidance highlights that the RMSE should ideally be within 10% of the objective being assessed, which is 4 µg/m^3 for the NO_2 annual mean of 40 µg/m^3. The RMSE for the Bridgend Detailed Assessment is 3.5 µg/m^3, which is within the ideal range specified by Defra. Further details on model verification can be found within Appendix 1 – Model Verification. The fractional bias is a measure of the model's tendency to over or under predict, with negative values representing the former and positive values the latter. The fractional bias is 0.015 which means the model has a tendency to slightly under-predict.

4 Results of air quality assessment

The impacts from the DS schemes; no vehicular access to St Leonard's way and the 4-phase junction at Tondu Road/Park Street on NO_2 concentrations are discussed in this section. Estimated air quality concentrations at receptors are described in relation to air quality objectives. Consistent with the approach set out in Table 7.1 of Defra's LAQM.TG(16) guidance document, a receptor is identified as being at risk of exceeding the air quality objectives if the modelled concentration of pollutants is 90% or more of the AQOs. For example, for the NO_2 annual mean this would be a concentration above 36 µg/m^3. Only receptors which are classed as 'at risk of exceeding' or above (≥ 36 µg/m^3) in the DM or DS scenario and where the DS scheme has resulted in increased concentrations have been presented in Table 17. The remaining receptors included in this assessment are presented in Appendix 2 – All model results.

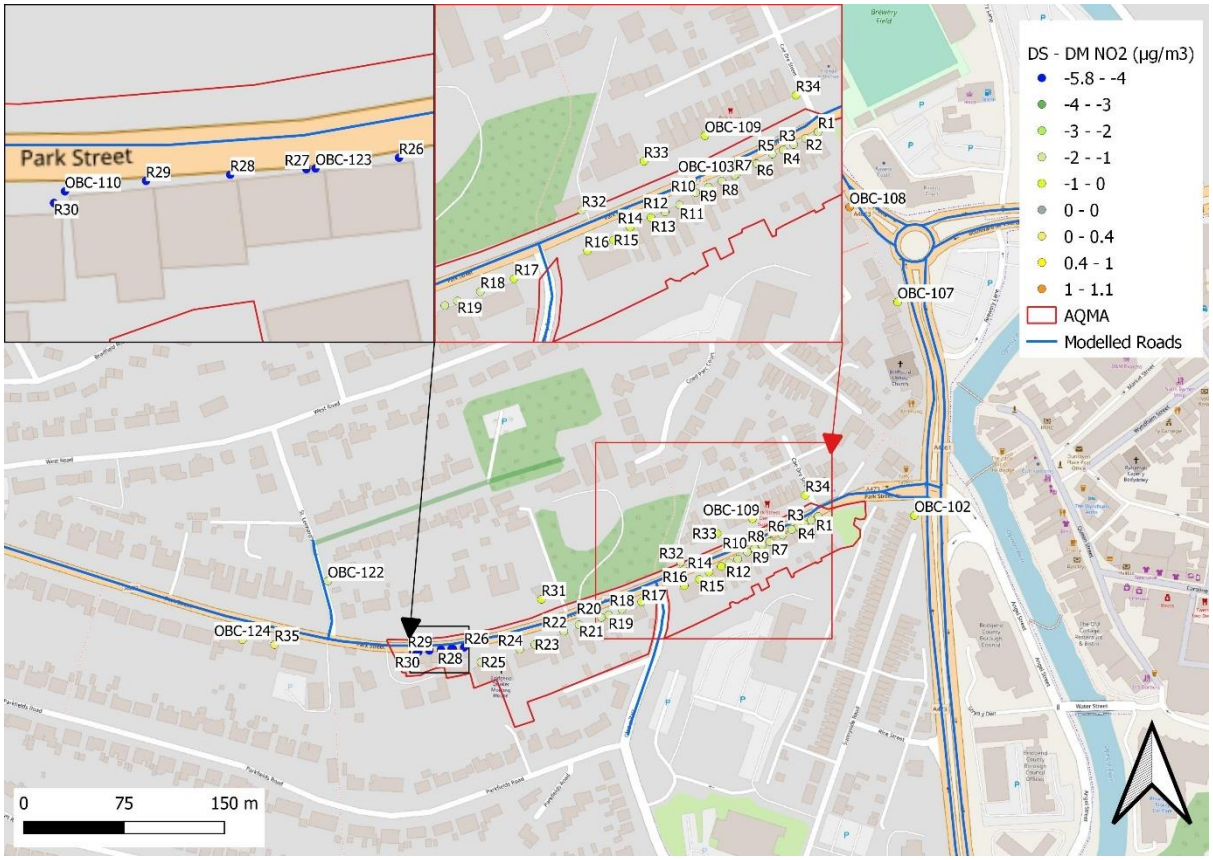
Table 17 Baseline 2019, and 2023 DM and DS Estimated NO_2 concentrations

Receptor ID	NO_2 (µg/m^3) Base 2019	NO_2 (µg/m^3) DM 2023	NO_2 (µg/m^3) DS 2023	NO_2 (µg/m^3) DS-DM
R26	56.8	44.6	39.3	-5.4
R27	60.2	47.3	41.6	-5.7
R28	60.5	47.5	41.8	-5.8
R29	57.4	44.9	39.3	-5.6
R30	49.0	38.3	33.6	-4.7
R35	22.0	16.1	16.4	0.3
OBC-124	19.9	14.6	14.9	0.4
OBC-108	29.5	23.7	24.8	1.1

Two receptors (R26 and R29) are forecast to become compliant with the NO_2 annual mean after the DS schemes (St Leonard's and 4-phase junction road) are introduced. Whilst receptors are no longer classed as exceeding the NO_2 annual mean, they are now classed as 'at risk of exceeding' the NO_2 annual mean. When model uncertainty is considered, in this case model uncertainty is 3.5 µg/m^3, there is a high likelihood that receptors R26 and R29 will remain in exceedance. However, the remaining receptors are estimated to experience NO_2 concentrations less than 36 µg/m^3, when model uncertainty is taken into account and are not considered to be at risk of exceeding the NO_2 annual mean after the DS schemes are introduced. R30 would be classed as 'at risk of exceeding' the NO_2 annual mean if the DS schemes are not introduced. There shows all modelled receptors and an inset map towards the top left, which highlights the location where receptors are estimated to remain in exceedance of the NO_2 annual mean in the DS scenario. Receptors R26, R29 and R30 are estimated to experience lower NO_2 concentrations compared to R27 and R28 even though they are on the same row of housing. This is likely a result of distance of receptors to Park Street.

There are mostly decreases in NO_2 concentrations across Bridgend, with some exceptions occurring at receptor R35 and monitoring locations OBC-124 and OBC-108. OBC-124 and R35 are both west of St Leonard's Road, and as vehicles can no longer access St Leonards from Park Street, vehicles have been redistributed west of this junction. Monitoring location OBC-108 is anticipated to experience a more significant increase of 1.1 µg/m^3 due to an approx. 1,000 AADT increase on Tondu Road. The impact is not considered significant as the absolute concentration is substantially below the NO_2 annual mean at this location (23.7 µg/m^3) in the DM scenario.

Figure 16 Change in NO_2 concentrations associated with the Do-Something scenario



5 Conclusions

The majority of receptors in Bridgend are classed as being compliant and two receptors remain in exceedance of the NO_2 annual mean after the DS schemes have been introduced. However, when model uncertainty is factored an additional two receptors in the Park Street AQMA are still likely to be in exceedance. The non-compliant and 'at risk' receptors all feature on one row of houses along Park Street, high concentrations are due to receptors being close to the road (<1 metre). Further measures are required to improve air quality for a small section of Park Street to achieve compliance with the NO_2 annual mean. Additional measures need to be explored in this location, potential measures for consideration are electrification of bus services, review of the speed limit, and emission standards for HGVs. These additional measures are recommended as the likelihood of achieving compliance with the NO_2 annual mean would be straightforward to quantify with the existing dispersion model and data.

Appendix 1 – Model Verification

Verification of the model involves comparison of the modelled results with any local monitoring data at relevant locations; this helps to identify how the model is performing and if any adjustments should be applied. The verification process involves checking and refining the model input data to try and reduce uncertainties and produce model outputs that are in better agreement with the monitoring results. This can be followed by adjustment of the modelled results if required. The LAQM.TG(16) guidance recommends making the adjustment to the road contribution of the pollutant only and not the background concentration these are combined with.

The approach outlined in LAQM.TG (16) section 7.508 – 7.534 has been used in this case eleven diffusion tube NO_2 sites in Bridgend have been used for model verification. A single road NOx adjustment factor was derived and used to calculate:

- Modelling results at receptor points adjacent to relevant affected road links.

It is appropriate to verify the performance of the ADMS model in terms of primary pollutant emissions of nitrogen oxides ($NOx = NO + NO_2$). To verify the model, the predicted annual mean Road NOx concentrations were compared with concentrations measured at the various monitoring sites during 2019. The model output of Road NOx (the total NOx originating from road traffic) was compared with measured Road NOx, where the measured Road NOx contribution is calculated as the difference between the total NOx and the background NOx value. Total measured NOx for each diffusion tube was calculated from the measured NO_2 concentration using the current version of the Defra NOx/NO_2 calculator (v8.1).

The initial comparison of the modelled vs measured Road NOx identified that the model was under-predicting the Road NOx contribution at most locations. Refinements were subsequently made to the model inputs to improve model performance where possible.

The gradient of the best fit line for the modelled Road NOx contribution vs. measured Road NOx contribution was then determined using linear regression and used as a domain wide Road NOx adjustment factor. This factor was then applied to the modelled Road NOx concentration at each discretely modelled receptor point to provide adjusted modelled Road NOx concentrations. A linear regression plot comparing modelled and monitored Road NOx concentrations before and after adjustment is presented figure 16.

The total annual mean NO_2 concentrations were then determined using the NOx/NO_2 calculator to combine background and adjusted road contribution concentrations.

Only monitoring location OBC-101 was excluded from model verification as the roads near this monitoring location were excluded from the traffic modelling study and is also considered to be more representative of an urban background location.

A primary NOx adjustment factor (PAdj) of 3.47 based on model verification using all of the 2019 NO_2 measurements was applied to all modelled Road NOx data prior to calculating an NO_2 annual mean.

A plot comparing modelled and monitored NO_2 concentrations before and after adjustment during 2019 is presented in Figure 18.

Figure 17: Comparison of modelled Road NO_x Vs Measured Road NO_x before and after adjustment

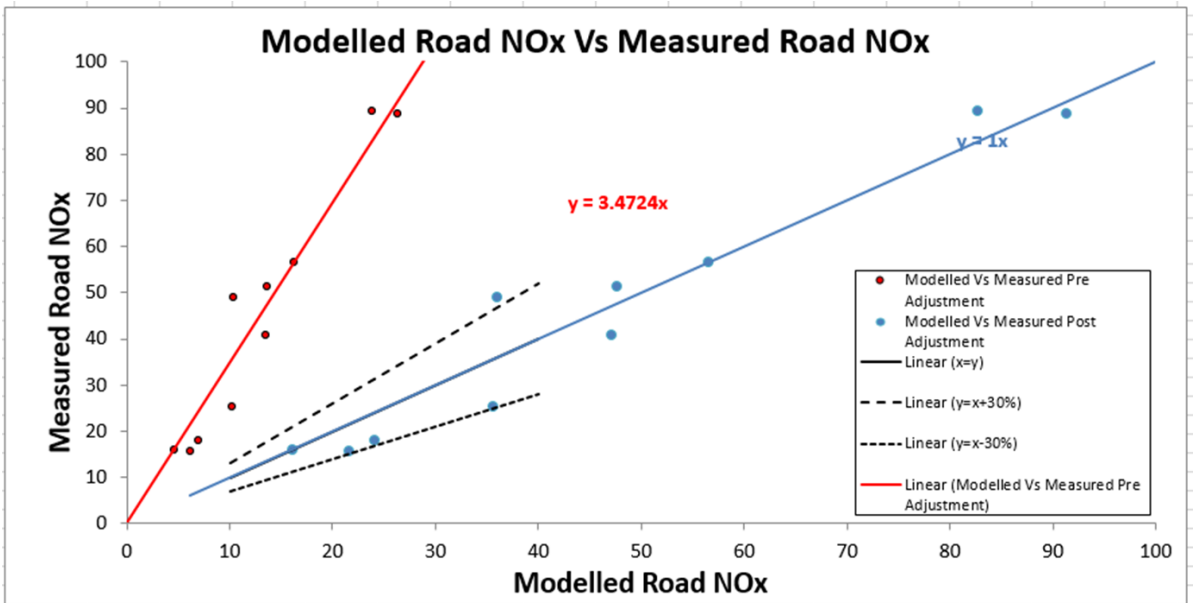
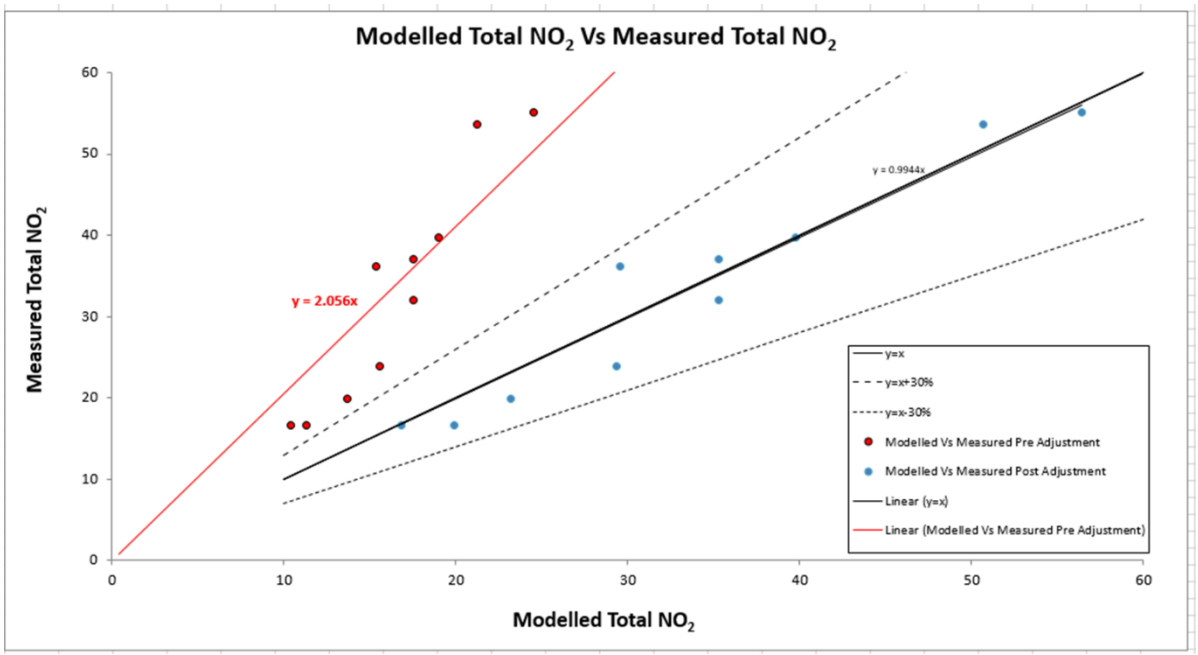


Figure 18 Modelled vs. measured NO_2 annual mean 2018 before and after adjustment



Model performance

To evaluate the model performance and uncertainty, the Root Mean Square Error (RMSE) for the observed vs predicted NO_2 annual mean concentrations was calculated, as detailed in Technical Guidance LAQM.TG(16). This guidance indicates that an RMSE of up to 4 $\mu g/m^3$ is ideal, and an RMSE of up to 10 $\mu g/m^3$ is acceptable. The calculated RMSE is presented in Table 18. In this case the RMSE was calculated at 3.5 $\mu g.m^{-3}$ which is within the ideal range suggested by the guidance.

Table 18 Comparison of measured and modelled concentrations at measurement locations in 2019, and the model root mean square error.

NO_2 monitoring location	Measured NO_2 annual mean concentration 2019 ($\mu g.m^{-3}$)	Modelled NO_2 annual mean concentration 2019 ($\mu g.m^{-3}$)
OBC-103	37.1	35.3
OBC-123	55.2	56.4
OBC-124	16.6	19.9
OBC-110	53.7	50.7
OBC-122	16.7	16.9
OBC-107	32.0	35.3
OBC-108	36.2	29.5
OBC-104	39.8	39.8
OBC-109	19.9	23.2
OBC-102	23.9	29.3
RMSE (all sites)		3.5 $\mu g/m^3$

Appendix 2 – All model results

ID	Base 2019	DM 2023	DS 2023	DS-DM 2023
R1	**41.6**	32.7	31.4	-1.3
R2	**42.0**	33.1	31.7	-1.4
R3	**41.1**	32.4	31.0	-1.4
R4	39.9	31.4	30.0	-1.4
R5	**41.5**	32.6	31.2	-1.5
R6	39.0	30.6	29.3	-1.4
R7	37.0	29.1	27.7	-1.4
R8	36.2	28.4	27.1	-1.4
R9	36.2	28.4	27.0	-1.4
R10	36.2	28.4	27.0	-1.4
R11	36.3	28.3	27.1	-1.2
R12	35.2	27.5	26.3	-1.2
R13	22.1	17.5	17.0	-0.6
R14	21.6	17.2	16.6	-0.6
R15	20.3	16.2	15.7	-0.5
R16	21.4	17.0	16.5	-0.5
R17	27.5	21.8	20.9	-0.9
R18	27.5	21.9	20.7	-1.1
R19	27.1	21.5	20.3	-1.2
R20	26.9	21.4	20.1	-1.3
R21	25.4	20.1	18.7	-1.4
R22	24.1	19.1	17.7	-1.4
R23	21.8	17.4	16.1	-1.3

R24	21.5	17.1	15.9	-1.2
R25	20.0	15.9	14.9	-1.1
R26	**56.8**	**44.6**	39.3	-5.4
R27	**60.2**	**47.3**	**41.6**	-5.7
R28	**60.5**	**47.5**	**41.8**	-5.8
R29	**57.4**	**44.9**	39.3	-5.6
R30	**49.0**	38.3	33.6	-4.7
R31	17.6	14.1	13.4	-0.7
R32	37.8	29.5	28.1	-1.4
R33	19.6	15.6	15.2	-0.4
R34	27.1	21.5	20.8	-0.7
R35	22.0	16.1	16.4	0.3
OBC-103	35.3	27.8	26.4	-1.3
OBC-123	**56.4**	**44.3**	39.0	-5.3
OBC-124	19.9	14.6	14.9	0.4
OBC-110	**50.7**	39.6	34.7	-4.9
OBC-122	16.9	13.1	11.3	-1.9
OBC-107	35.3	29.3	29.1	-0.1
OBC-108	29.5	23.7	24.8	1.1
OBC-104	39.8	31.3	30.1	-1.3
OBC-109	23.2	18.4	17.7	-0.7
OBC-102	29.3	23.5	23.1	-0.4

Appendix B - Detailed assessment of Park Street AQMA Analysis of Air Quality Impact with additional HGV and Bus electrification assessment

Analysis of Air Quality Impact

A Technical Note for Bridgend Council

1 Introduction

Bridgend Council (the Council) has declared an Air Quality Management Area (AQMA) for a section of Park Street, encompassing a number of properties between Park Street's junction with the A473 to the east, and the junction with St Leonard's Road to the west. The AQMA has been declared for an exceedance of the annual mean NO_2 Air Quality Objective (AQO) of 40 µg/m^3; although there are measurements which are close to exceeding the 1-hour NO_2 objective of 200 µg/m^3 as well. The issues relate to the proximity of houses to a heavily trafficked primary route (Park Street) which also suffers congestion issues. These issues are compounded by gradients increasing engine load and poor dispersion caused by buildings.

This report presents the findings of a detailed assessment (DA) in support of the Council's Air Quality Action Plan (AQAP). This DA first evaluated the potential air quality benefits associated with three proposed traffic management schemes: one 4-phase junction at the Tondu Road/Park Street junction, a ghost right hand at the Heol-y-Nant junction and no access to St Leonards Road from Park Street.

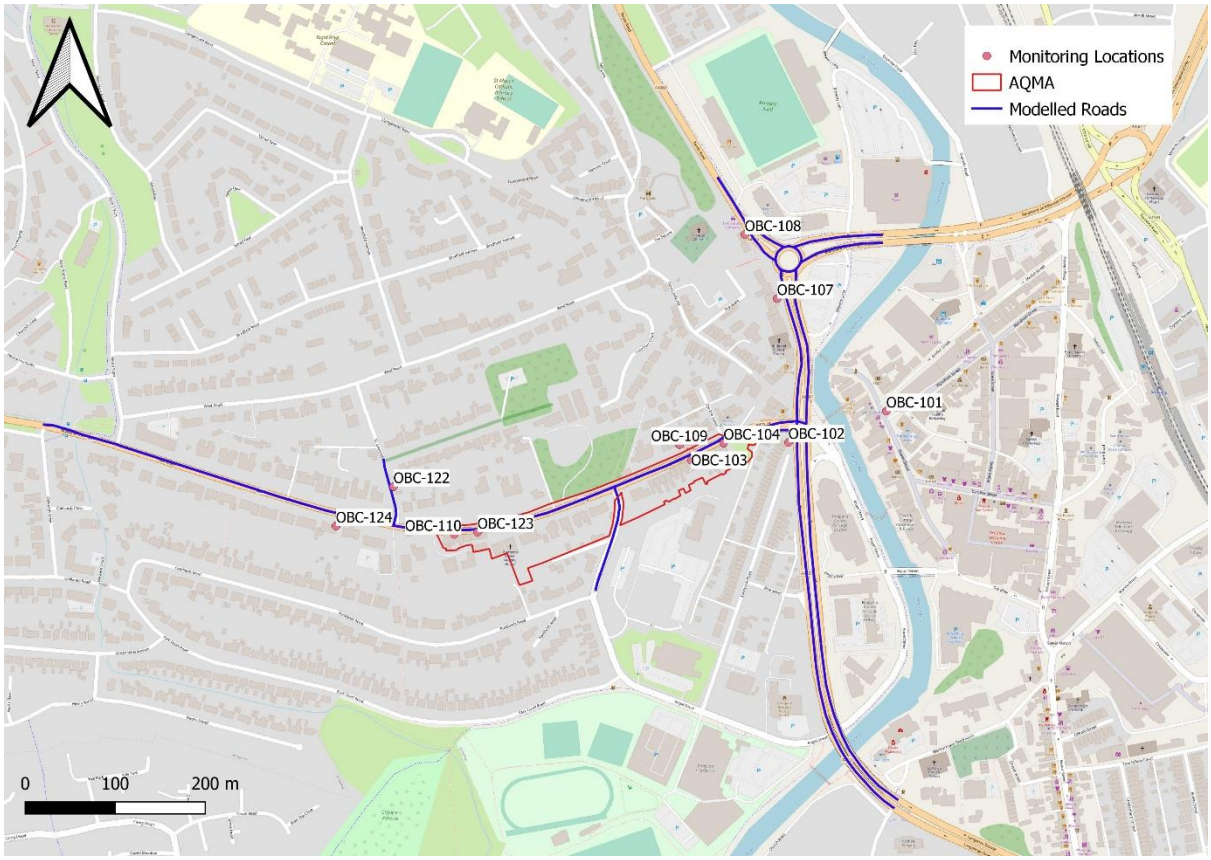
The 4-phase junction, ghost right hand and St Leonards Road traffic schemes did not bring the entirety of Park Street AQMA into compliance with the NO_2 annual mean. As such, three additional measures were modelled for the current version of this report. In addition to the traffic management schemes described above, measures were:

- Buses in Bridgend are 100% electric
- HGVs are restricted from driving on Park Street
- The combination of both additional measures related to electric buses and HGV restrictions

2 Existing air quality in Bridgend

There is 1 automatic monitoring location and 30 non-automatic monitoring locations across Bridgend. The automatic monitoring location measures SO_x using API AMX monitoring equipment. The 30 non-automatic monitoring locations measure NO_2 using passive diffusion tubes. Figure 12 shows the monitoring locations and AQMAs within the study area.

Figure 19 Monitoring and AQMAs in Bridgend



The measured data set out in **Table 15** shows that 2 locations were in exceedance of the NO_2 annual mean (OBC-123 and OBC-110) in 2019. These exceedances relate to the section of Park Street to the west end of the AQMA boundary near St Leonards Road. Monitoring locations OBC-123 and OBC 110 are close to the road and the proximity to the road is a cause of the high measured NO_2 concentrations.

The monitoring results in **Table 15** were used to carry out verification of the air quality model and ensure that it provides a robust representation of measured concentrations in Bridgend following the approach set out in Appendix 1 – Model Verification.

Table 19: NO_2 Monitoring Results

Site ID	Site Name	Type	X	Y	2019 Data Capture (%)	2019 (µg m^3)
OBC-101	Bridgend Town Centre	Urban centre	290469	179837	83	18.6
OBC-102	Sunnyside Street	Roadside	290354	179807	100	23.9
OBC-103	Park Street	Roadside	290250	179782	100	37.1
OBC-104	Park Street	Roadside	290286	179800	92	39.8
OBC-109	Park Street	Roadside	290239	179795	92	19.9
OBC-110	Park Street	Kerbside	289988	179701	100	53.7
OBC-122	St Leonards Road	Kerbside	289919	179755	75	16.7
OBC-123	Park Street	Roadside	290014	179698	100	55.2
OBC-124	Park Street	Roadside	289859	179710	100	16.6
OBC-107	Tondu Road	Roadside	290347	179959	92	32
OBC-108	Tondu Road	Kerbside	290311	180032	100	36.2

3 Methodology for air quality impact assessment

3.1 Traffic schemes

The initial DA has included three traffic scenarios; a baseline year of 2019, future year without scheme (do-minimum (DM)) and with scheme (do-something (DS)) both set in 2023. All traffic scenarios include traffic flows and speeds in the format of annual average daily traffic (AADT) for the following vehicle categories: cars, light goods vehicles (LGVs), heavy

goods vehicles (HGVs) and buses. The baseline year of 2019 was developed to ensure projections were based on a year without the impacts of Covid-19. The baseline year includes all existing road schemes and is used in the air quality assessment to validate air quality model estimates against measured concentrations.

The DM 2023 scenario includes all existing and committed schemes, with the most pertinent committed development being a right turn lane associated with a Persimmon housing development at the Heol-y-Nant junction. Traffic modelling has shown that this right turn lane decreases congestion on Park Street close to this junction.

The do-something 2023 scenario includes all existing, committed schemes and the proposed road traffic scheme. Transport modelling undertaken by Mott Macdonald demonstrates that there was a worsening of congestion associated with the 4-phase junction at Heol-y-Nant. As such, it was agreed with the Council that there will be a ghost right hand at Heol-y-Nant, no access onto St Leonards Road and one 4-phase junction at the Tondu Road/Park Street junction. Mott Macdonald completed transport modelling for Bridgend's local development plan (LDP). The LDP transport model was amended to include the aforementioned DS traffic schemes. For further information on the traffic modelling, refer to Mott Macdonald's LDP modelling report.

Traffic data for the additional 3 scenarios was derived from the 2023 DS traffic flows. The numbers of buses and/or HGVs on Park Street were removed from the AADT and vehicle fleet split calculations to simulate the electrification of buses (which do not produce NOx emissions) and HGV restrictions on Park Street. HGV flows were not redistributed to surrounding roads, as this would require additional traffic modelling.

3.2 Study area

The study area includes all roads within 200 metres of the AQMA in the traffic model and the A473 between Boulevard de Villenave d'Ornon/Tondu Road roundabout and the junction with Merthyr mawr Road. Traffic changes have been screened between the DM and DS scenario to establish if there is the potential for traffic flow increases to cause a significant worsening of air quality. Traffic flow changes were compared against screening criteria within Table 6.2 of the Institute for Air Quality Management's Land-Use, Planning & Development Control: Planning for Air Quality[14]. There was only one other location outside of study area which breached the traffic screening thresholds, which is Tondu Road north of Boulevard de Villenave d'Ornon/Tondu Road roundabout which is estimated to experience an approx. 1,000 AADT increase. However, OBC-108 (presented in Figure 12) is estimated to experience concentrations of 24.8 µg/m^3 NO_2 in 2023. OBC-108 is considered a conservative representation of NO_2 concentrations along Tondu Road and 1,000 AADT is not considered a compliance risk for NO_2 air quality objectives given existing concentrations are 24.8 µg/m^3.

3.3 Road traffic emission calculations

Emissions were calculated using Ricardo's in-house software called RapidEMs, which calculates vehicular emissions using Copert V emission factors. Three essential inputs are required for RapidEms to calculate emissions: fleet mix, traffic flow and speed (kph). Fleet mix provides a % for each vehicle category such as petrol car and euro standard. The fleet

[14] https://www.iaqm.co.uk/text/guidance/air-quality-planning-guidance.pdf

mix is implemented by applying the % split fleet mix to the total number of vehicles in that category, for example 1,000 cars with the assumption of 60% petrol and 40% diesel would result in 600 petrol and 400 diesel cars. Traffic flows are presented in this assessment in the format of annual average daily traffic flows for different vehicle categories, for example car, LGV, HGV and buses. Speed is the average speed across the different vehicle type categories (kph).

The fleet mix used for Bridgend's DA comes from an Automatic Number Plate Recognition (ANPR) survey undertaken for Caerphilly Council in 2019. This is considered an improvement over the default approach using national fleet mixes (National Atmospheric Emission Inventory (NAEI)[15]) as it will be more representative of fleet in South Wales and therefore Bridgend's fleet. The 2019 Caerphilly fleet mix was forecasted to 2023 using the same fleet turnover projections as in the NAEI.

Road traffic data was taken from the approach described in section 3.1. An optional input for emission calculations is gradient as the inclusion depends on the topography of the local area. Park Street has a gradient with the potential to impact emission calculation, which is greater than a 1:10 slope and gradient effects are required to better represent vehicular emissions. To consider the impact of gradient on engine load and therefore emissions per vehicle, terrain elevation data in the format of 1m DTM lidar data was procured from the Welsh Government's Geo-Portal[16]. The road traffic data, vehicle fleet mix and gradient data were used in the RapidEms process to calculate emissions in grams per second per kilometre (g/s/km).

All tools and input data for the additional 2023 modelling scenarios were consistent with the baseline modelling to ensure the impact of the scenarios were quantified without other differences in modelling methods affecting the results.

3.4 Dispersion modelling

3.4.1 Dispersion model selection

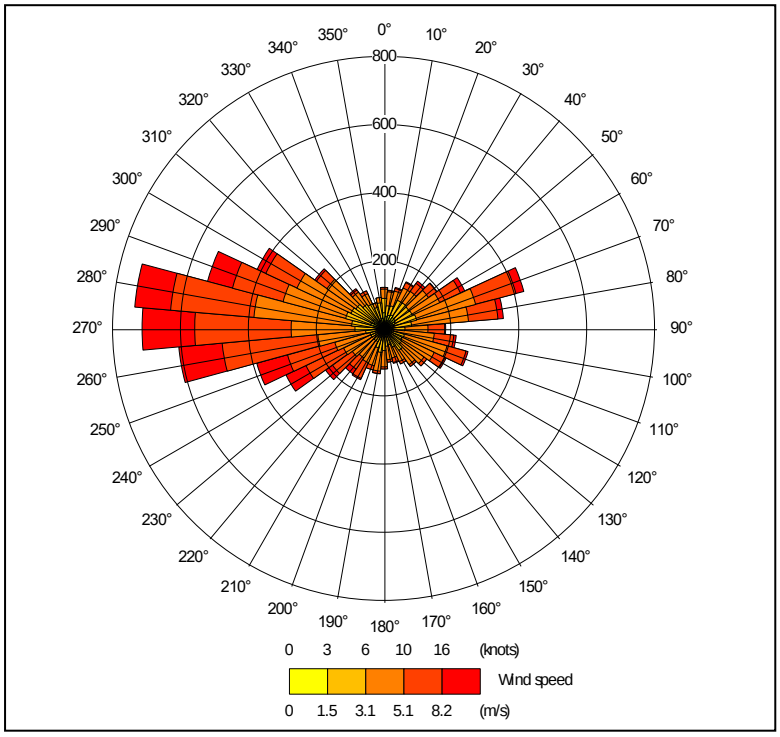
ADMS-Roads is a Gaussian dispersion model with inputs for local observations such as the surrounding terrain, meteorological data for example wind speed, wind direction and solar radiation to reflect the local dispersion environment. ADMS-Roads has been extensively validated and is commonly used for air quality assessments of road schemes in the UK.

3.4.2 Meteorological data

Annual meteorological data for 2019 was procured from the RAF St Athan weather station. The data capture is 100% for temperature, wind speed and wind direction, whereas cloud cover has a data capture of 91%. A wind rose of 2019 met data from RAF St Athan can be seen in Figure 13. This demonstrates that the prevailing wind direction is westerly, which is typical of coastal locations to the west of the UK.

[15] https://naei.beis.gov.uk/data/ef-transport
[16] https://lle.gov.wales/GridProducts#data=LidarCompositeDataset

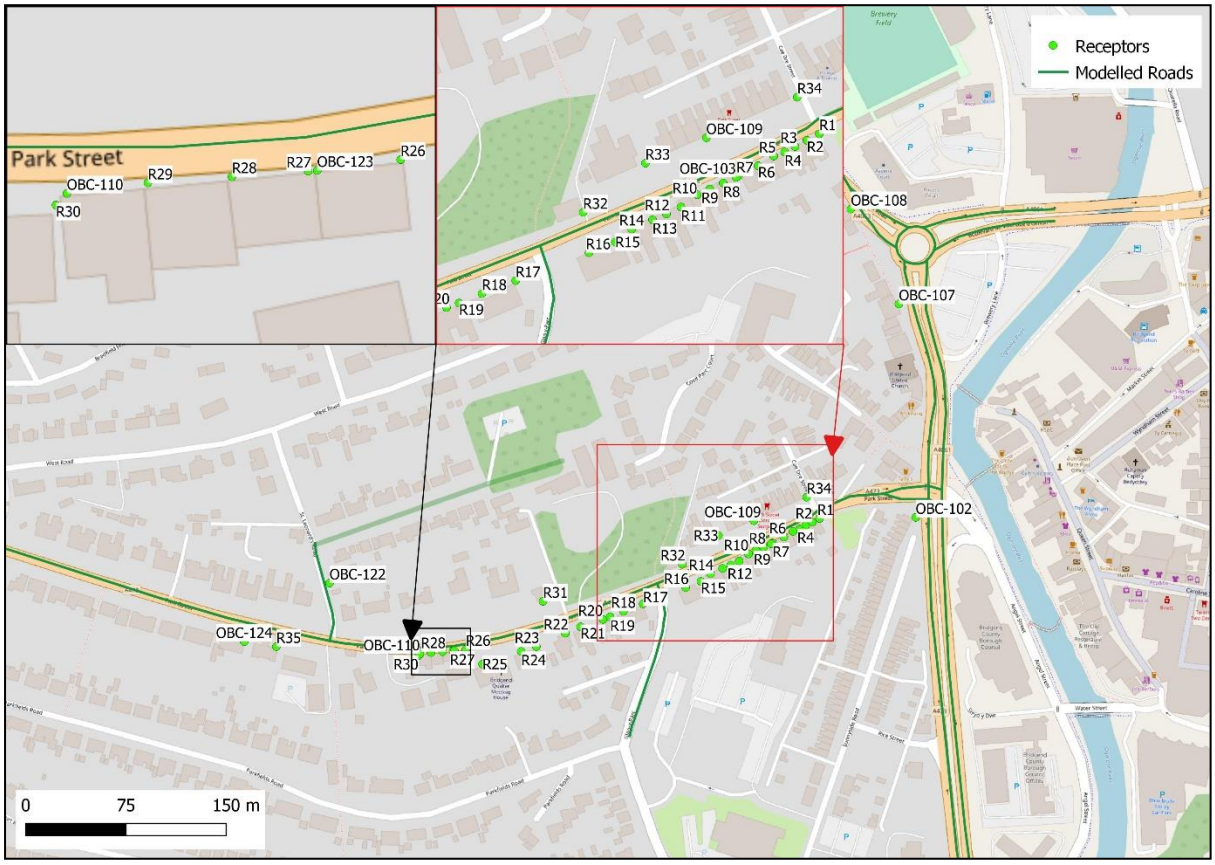
Figure 20 Wind rose for RAF St Athan 2019 meteorological data



3.4.3 Modelled receptors

There are two types of receptors, those that representative of sensitive receptors such as residential dwellings and monitoring locations. Sensitive receptors have a prefix of 'R' and monitoring locations have a prefix of 'OBC'. The Park Street AQMA has residential dwellings to the south and North of the Road, with residential dwellings to the north all being within close proximity of the road (<2 metres) and therefore at greater risk of exceeding the NO_2 annual mean AQO. To ensure the full extent of exceedances are captured in this project, all residential dwellings south of Park Street in the AQMA have been included. The dwellings north of Park Street are setback much further from the road, typically at 14 metres, there is one exception at approx. 4 metres. The closest residential dwelling to the north of each unique Park Street Road link has been included in the dispersion model as a receptor. Sensitive receptors were placed at building facades and at a height of 1.5 metres, whereas monitoring locations were placed at a combination of building facades and street furniture such as lampposts. Monitoring locations heights were taken from Bridgend's Annual Status Report, in this study area all monitoring location heights were 2 metres. Receptor locations have been presented in Figure 14.

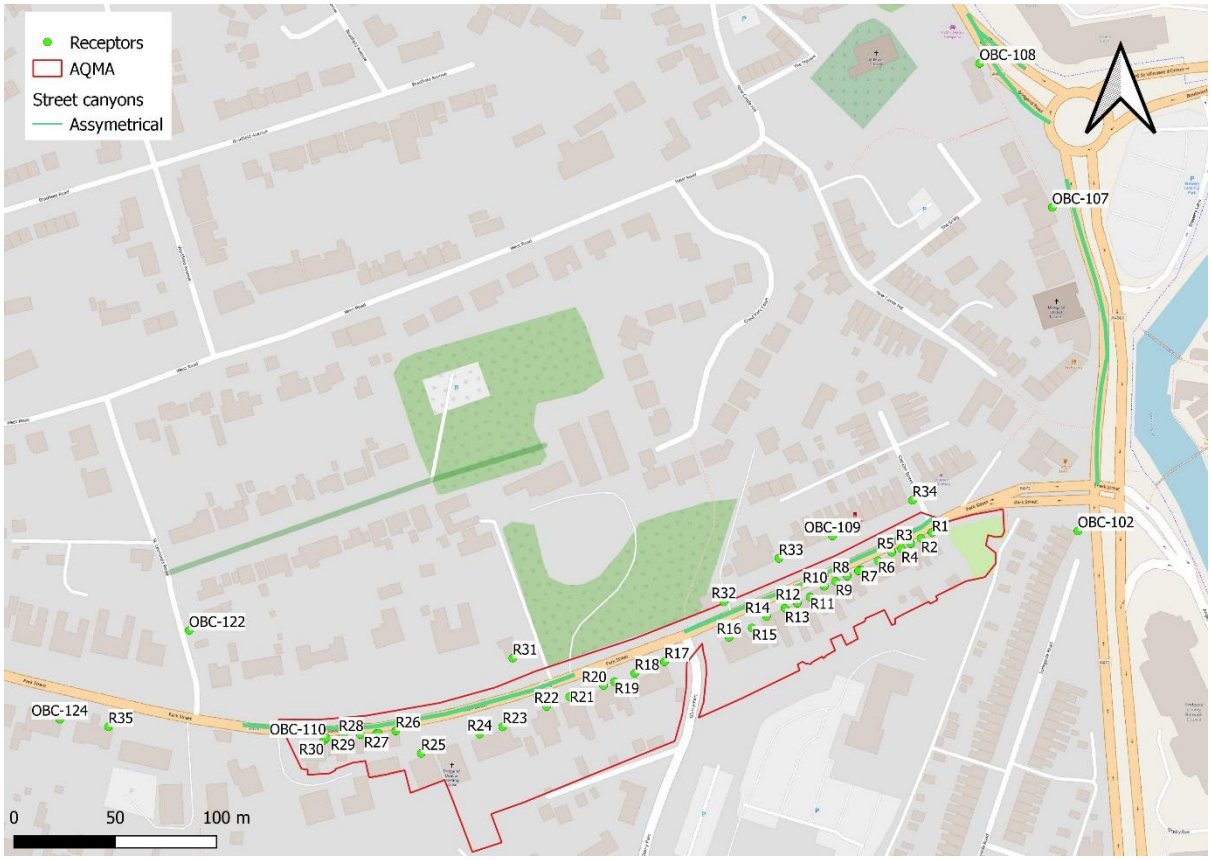
Figure 21 Bridgend Study Area and modelled Receptors



3.4.4 Street canyon

Bridgend has historic housing built nearby to roads, in some instances less than 1 metre, these tall buildings are built either side or on one side of the road. In both scenarios the presence of buildings close to the road will cause an impact on emission dispersion. Buildings on either side of the road with the same height are classed as a symmetrical street canyon. Whereas buildings on one side of the road, or where the height varies on either side are classed as asymmetrical street canyons. Symmetrical street canyons are identified when the height of buildings either side of the road is twice the road width. ADMS-Roads can be programmed to model these symmetrical canyons with the simple canyons module, however this would not reflect scenarios in Bridgend where there is only one side of the road with a tall building. As such, to reflect the varied impact of Bridgend's buildings street canyons on dispersion only asymmetrical canyons were included. The advanced street canyon module has been used in ADMS to estimate the impact on NO_2 concentrations from asymmetrical street canyons. Asymmetrical street canyons may affect dispersion by altering the channel of flow by the canyon walls and a recirculating flow region drive by the canopy flow perpendicular to the street. The area of recirculation by the building walls can lead to elevated pollutant concentrations. The location of asymmetrical canyons has been detailed in Figure 15.

Figure 22 Street canyons in Bridgend



3.4.5 Background concentrations

Background pollutant concentrations for a modelling study within an urban environment in England can be sourced from either a local monitoring location classified as an urban background site, or the background maps produced by Ricardo Energy & Environment for Defra. The background maps provide estimates of annual mean background concentrations of key pollutants at a resolution of 1 x 1km for England projected from a base year of 2018 and can be projected forward to future years up to 2030. These annual mean pollutant maps combine pollutant measurement data with the emissions information from the UK's National Atmospheric Emissions Inventory (NAEI) to provide estimated pollutant concentrations for the whole of England.

In this case, no nearby background pollutant measurements were available; therefore, Defra's background maps were used as the best available estimate of current and future background pollutant concentrations. For Bridgend's baseline year (2019) Defra's background maps were downloaded and the background concentrations for the appropriate grid squares extracted. The background concentrations for NO_2 are presented in Table 16. Background concentrations are significantly less than the respective AQOs assessed, 40 µg/m^3 for NO_2.

Table 20: Mapped Background NO_x Concentrations in Bridgend in 2019 and 2023

Easting	Northing	Background NOx 2019 ($\mu g.m^{-3}$)	Background NOx 2023 ($\mu g.m^{-3}$)
290500	179500	14.2	11.9
289500	179500	10.6	8.9
290500	180500	13.6	11.4

3.4.6 Model verification

The root mean square error (RMSE) is a measure of uncertainty in dispersion modelling, Defra's LAQM.TG(16) guidance highlights that the RMSE should ideally be within 10% of the objective being assessed, which is 4 $\mu g/m^3$ for the NO_2 annual mean of 40 $\mu g/m^3$. The RMSE for the Bridgend Detailed Assessment is 3.5 $\mu g/m^3$, which is within the ideal range specified by Defra. Further details on model verification can be found within Appendix 1 – Model Verification. The fractional bias is a measure of the model's tendency to over or under predict, with negative values representing the former and positive values the latter. The fractional bias is 0.015 which means the model has a tendency to slightly under-predict.

4 Results of air quality assessment

4.1 Baseline and initial scenario modelling

The impacts from the initial DS schemes; no vehicular access to St Leonard's way, ghost right hand at Heol-y-Nant and the 4-phase junction at Tondu Road/Park Street on NO_2 concentrations are discussed in this section. Estimated air quality concentrations at receptors are described in relation to air quality objectives. Consistent with the approach set out in Table 7.1 of Defra's LAQM.TG(16) guidance document, a receptor is identified as being at risk of exceeding the air quality objectives if the modelled concentration of pollutants is 90% or more of the AQOs. For example, for the NO_2 annual mean this would be a concentration above 36 $\mu g/m^3$. Only receptors which are classed as 'at risk of exceeding' or above (≥ 36 $\mu g/m^3$) in the DM or DS scenario and where the DS scheme has resulted in increased concentrations have been presented in Table 17. The remaining receptors included in this assessment are presented in Appendix 2 – All model results.

Table 21 Baseline 2019, and 2023 DM and DS Estimated NO_2 concentrations

Receptor ID	NO_2 ($\mu g/m^3$) Base 2019	NO_2 ($\mu g/m^3$) DM 2023	NO_2 ($\mu g/m^3$) DS 2023	NO_2 ($\mu g/m^3$) DS-DM
R26	56.8	44.6	39.3	-5.4
R27	60.2	47.3	41.6	-5.7
R28	60.5	47.5	41.8	-5.8
R29	57.4	44.9	39.3	-5.6

R30	49.0	38.3	33.6	-4.7
R35	22.0	16.1	16.4	0.3
OBC-124	19.9	14.6	14.9	0.4
OBC-108	29.5	23.7	24.8	1.1
OBC-110	50.7	39.6	34.7	-4.9
OBC-123	56.4	44.3	39.0	-5.3

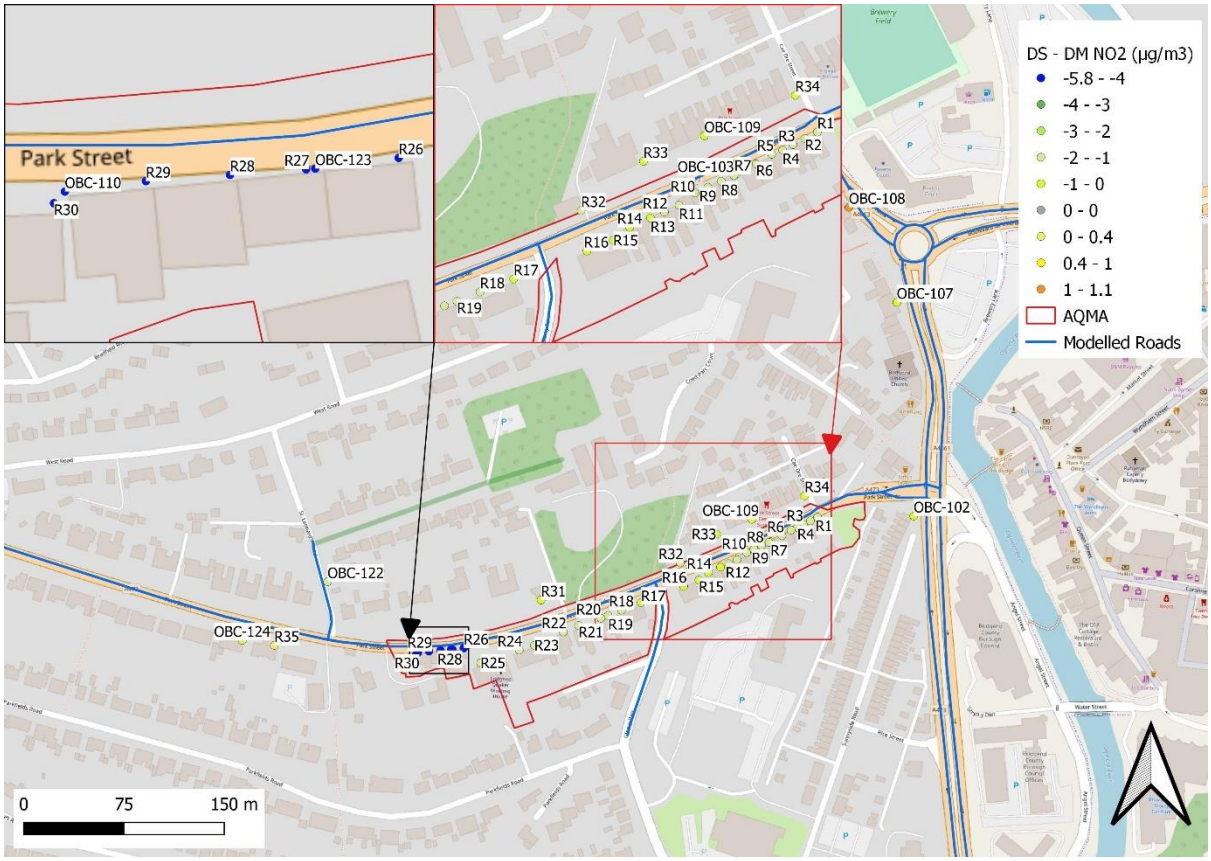
Two receptors (R26 and R29) are forecast to become compliant with the NO_2 annual mean after the DS schemes (St Leonard's, ghost right hand and 4-phase junction road) are introduced. Whilst receptors are no longer classed as exceeding the NO_2 annual mean, they are now classed as 'at risk of exceeding' the NO_2 annual mean. When model uncertainty is considered, in this case model uncertainty is 3.5 µg/m^3, there is a high likelihood that receptors R26 and R29 will remain in exceedance. However, the remaining receptors are estimated to experience NO_2 concentrations less than 36 µg/m^3, when model uncertainty is taken into account and are not considered to be at risk of exceeding the NO_2 annual mean after the DS schemes are introduced. R30 would be classed as 'at risk of exceeding' the NO_2 annual mean if the DS schemes are not introduced. There are two types of receptors, those that are representative of sensitive receptors such as residential dwellings and monitoring locations. Sensitive receptors have a prefix of 'R' and monitoring locations have a prefix of 'OBC'. The Park Street AQMA has residential dwellings to the south and North of the Road, with residential dwellings to the north all being within close proximity of the road (<2 metres) and therefore at greater risk of exceeding the NO2 annual mean AQO. To ensure the full extent of exceedances are captured in this project, all residential dwellings south of Park Street in the AQMA have been included. The dwellings north of Park Street are setback much further from the road, typically at 14 metres, there is one exception at approx. 4 metres. The closest residential dwelling to the north of each unique Park Street Road link has been included in the dispersion model as a receptor. Sensitive receptors were placed at building facades and at a height of 1.5 metres, whereas monitoring locations were placed at a combination of building facades and street furniture such as lampposts. Monitoring locations heights were taken from Bridgend's Annual Status Report, in this study area all monitoring location heights were 2 metres. Receptor locations have been presented in Figure 14.

Figure 14 shows all modelled receptors and an inset map towards the top left, which highlights the location where receptors are estimated to remain in exceedance of the NO_2 annual mean in the DS scenario. Receptors R26, R29 and R30 are estimated to experience lower NO_2 concentrations compared to R27 and R28 even though they are on the same row of housing. This is likely a result of distance of receptors to Park Street.

There are mostly decreases in NO_2 concentrations across Bridgend, with some exceptions occurring at receptor R35 and monitoring locations OBC-124 and OBC-108. OBC-124 and R35 are both west of St Leonard's Road, and as vehicles can no longer access St Leonards from Park Street, vehicles have been redistributed west of this junction. Monitoring location OBC-108 is anticipated to experience a more significant increase of 1.1 µg/m^3 due to an approx. 1,000 AADT increase on Tondu Road. The impact is not considered significant as

the absolute concentration is substantially below the NO_2 annual mean at this location (23.7 µg/m^3) in the DM scenario.

Figure 23 Change in NO_2 concentrations associated with the Do-Something scenario



4.2 Additional 2023 modelling

NO_2 results from the additional modelling scenarios are presented below and compared to the 2023 DS results.

The three scenarios, in addition to the measures implemented in the 2023 DS, were:

- Electric buses: buses in Bridgend are 100% electric
- HGV restriction: HGVs are restricted from driving on Park Street
- Combined: The combination of the two above additional measures related to electric buses and HGV restrictions

Table 22 presents modelled NO_2 concentrations at receptor locations where there were exceedances or an increase in concentrations in previous modelling scenarios. Results at all receptor locations are presented in Appendix 2.

In all three additional scenarios, there are still exceedances of the 40 µg/m^3 NO_2 objective at receptors R27 and R28. When model uncertainty is considered, in this case model uncertainty is 3.5 µg/m^3, there is a high likelihood that receptors R26 and R29 will remain in exceedance.

Table 22 Additional 2023 scenarios estimated NO_2 concentrations (µg/m^3)

Receptor ID	NO_2 (µg/m^3) DS 2023	NO_2 (µg/m^3) Electric buses	Electric buses – DS 2023	NO_2 (µg/m^3) HGV restriction	HGV restriction – DS 2023	NO_2 (µg/m^3) Combined	Combined – DS 2023
R26	39.3	38.6	-0.6	39.2	0.0	38.6	-0.6
R27	41.6	40.9	-0.7	41.6	0.0	40.9	-0.7
R28	41.8	41.1	-0.7	41.8	0.0	41.1	-0.7
R29	39.3	38.6	-0.7	39.3	0.0	38.6	-0.7
R30	33.6	33.0	-0.6	33.6	0.0	33.0	-0.6
R35	16.4	16.2	-0.3	16.3	-0.1	16.1	-0.4
OBC-124	14.9	14.7	-0.2	14.8	-0.1	14.6	-0.3
OBC-108	24.8	24.8	0.0	24.8	0.0	24.7	-0.1
OBC-110	34.7	34.1	-0.6	34.7	0.0	34.1	-0.6
OBC-123	39.0	38.3	-0.6	38.9	0.0	38.3	-0.6

Figure 24 - **Figure 26** show the reductions in NO_2 concentrations from each scenario compared to the DS 2023. There were small reductions in all scenarios (<1 µg/m^3), with the maximum reductions in the Combined scenario on the eastern side of the Park St AQMA (1 – 2 µg/m^3). The HGV restriction had no effect on the western side of the Park St AQMA as HGVs were not predicted to be present on these road links in the DS 2023.

Figure 24 Change in NO_2 concentrations associated with the Electric buses scenario

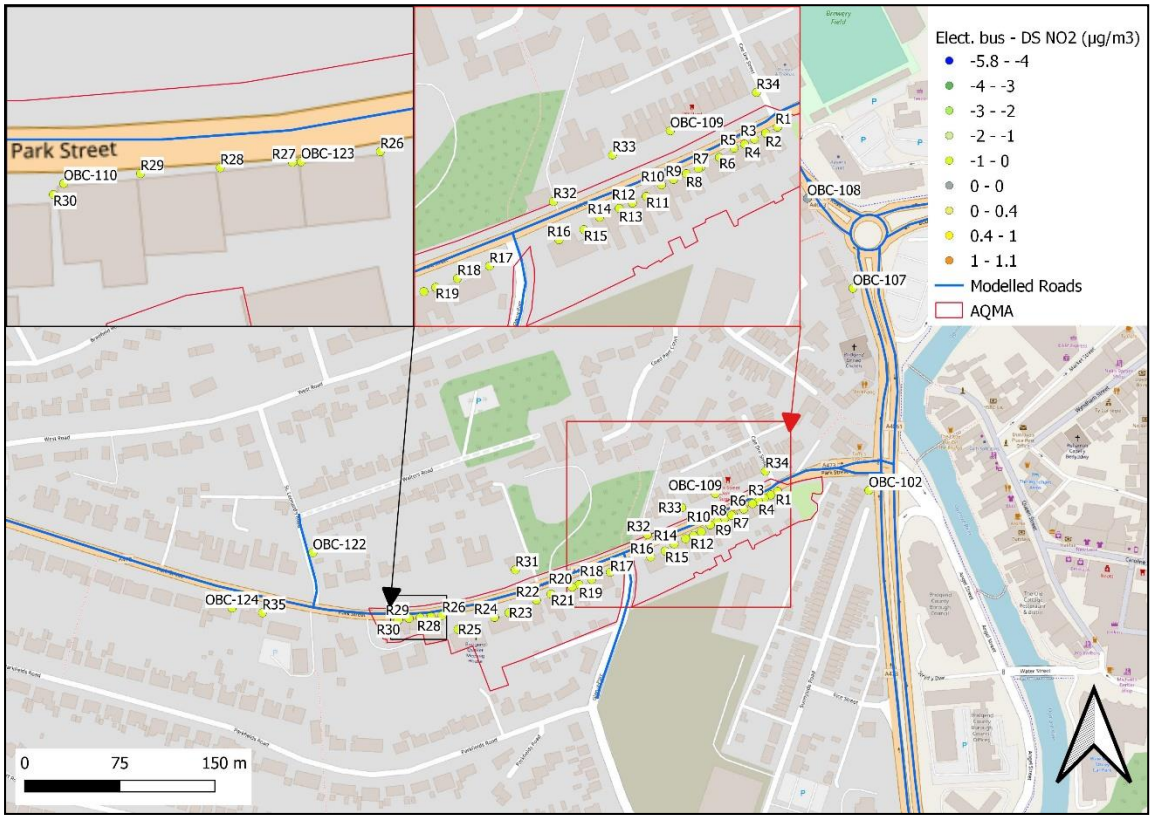


Figure 25 Change in NO_2 concentrations associated with the HGV restriction scenario

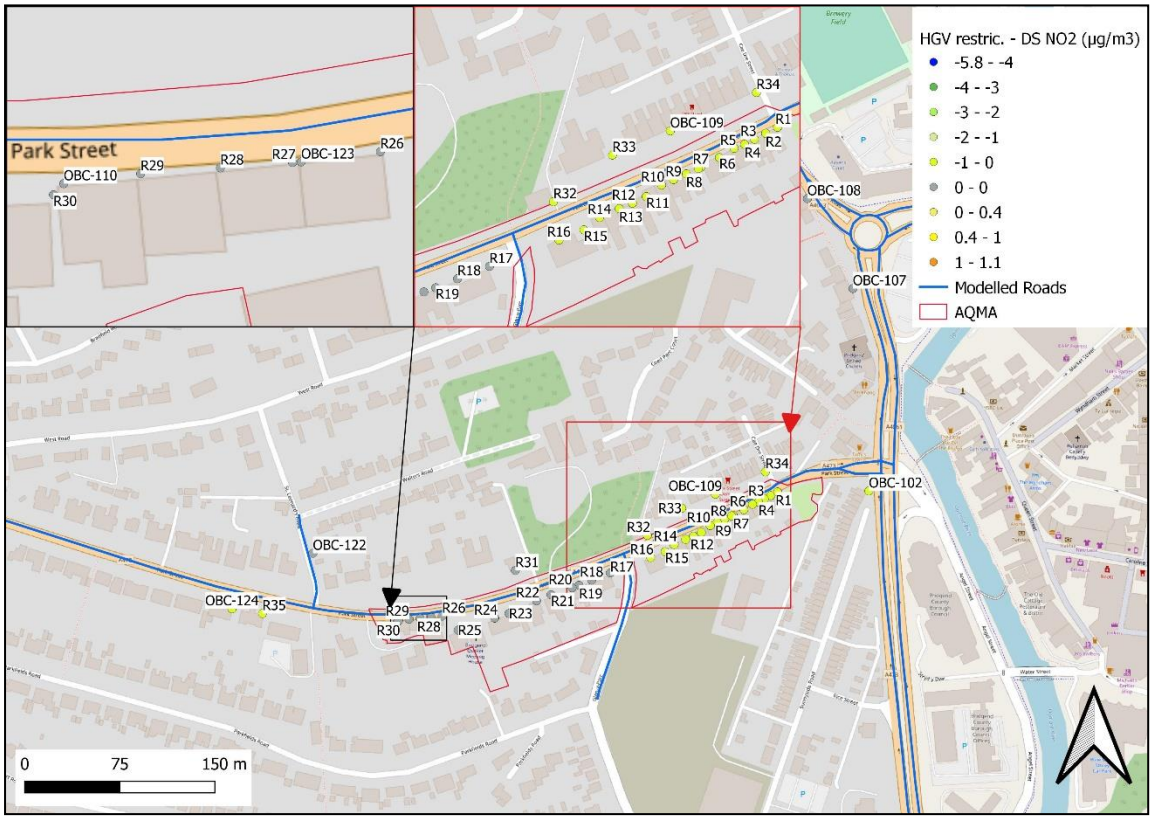
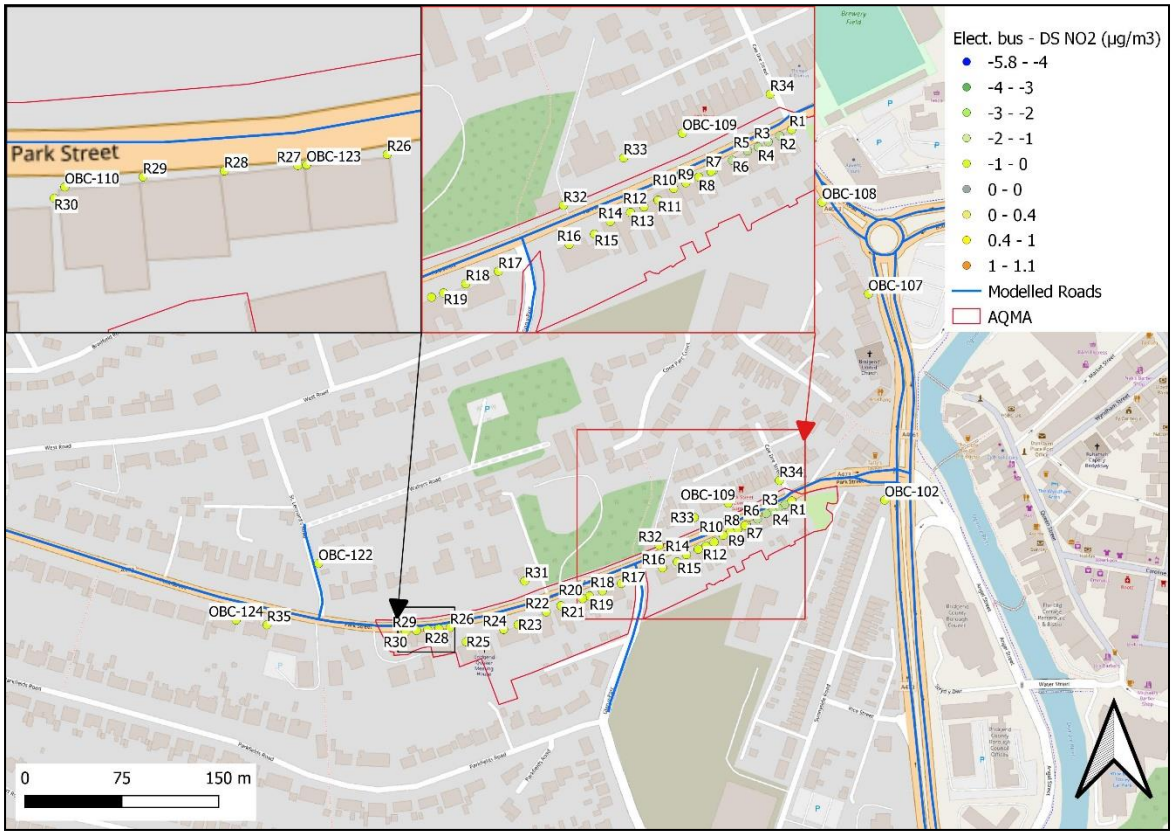


Figure 26 Change in NO_2 concentrations associated with the Combined scenario



5 Conclusions

The majority of receptors in Bridgend are classed as being compliant and two receptors remain in exceedance of the NO_2 annual mean after the DS schemes have been introduced. However, when model uncertainty is factored an additional two receptors in the Park Street AQMA are still likely to be in exceedance. The non-compliant and 'at risk' receptors all feature on one row of houses along Park Street, high concentrations are due to receptors being close to the road (<1 metre). Three additional measures (bus electrification, HGV restrictions on Park St, and a combination of the two) were modelled as additions to the DS 2023. These measures caused small (<1 µg/m^3) reductions in NO_2 concentrations at the receptor locations where exceedances were predicted; exceedances at these locations are still likely.

Further exploratory air quality modelling is recommended to establish the setback distance from Park Street to the affected receptors to enter discussions with the council regarding measures that could achieve this. Additional modelling could also explore what year the receptors are estimated to come into compliance with national fleet projections to assist discussions with the Welsh Government regarding solutions for the NO_2 annual mean compliance issues.

Appendix 1 – Model Verification

Verification of the model involves comparison of the modelled results with any local monitoring data at relevant locations; this helps to identify how the model is performing and if any adjustments should be applied. The verification process involves checking and refining the model input data to try and reduce uncertainties and produce model outputs that are in better agreement with the monitoring results. This can be followed by adjustment of the modelled results if required. The LAQM.TG(16) guidance recommends making the adjustment to the road contribution of the pollutant only and not the background concentration these are combined with.

The approach outlined in LAQM.TG(16) section 7.508 – 7.534 has been used in this case eleven diffusion tube NO_2 sites in Bridgend have been used for model verification. A single road NOx adjustment factor was derived and used to calculate:

- Modelling results at receptor points adjacent to relevant affected road links.

It is appropriate to verify the performance of the ADMS model in terms of primary pollutant emissions of nitrogen oxides (NOx = NO + NO_2). To verify the model, the predicted annual mean Road NOx concentrations were compared with concentrations measured at the various monitoring sites during 2019. The model output of Road NOx (the total NOx originating from road traffic) was compared with measured Road NOx, where the measured Road NOx contribution is calculated as the difference between the total NOx and the background NOx value. Total measured NOx for each diffusion tube was calculated from the measured NO_2 concentration using the current version of the Defra NOx/NO_2 calculator (v8.1).

The initial comparison of the modelled vs measured Road NOx identified that the model was under-predicting the Road NOx contribution at most locations. Refinements were subsequently made to the model inputs to improve model performance where possible.

The gradient of the best fit line for the modelled Road NOx contribution vs. measured Road NOx contribution was then determined using linear regression and used as a domain wide Road NOx adjustment factor. This factor was then applied to the modelled Road NOx concentration at each discretely modelled receptor point to provide adjusted modelled Road NOx concentrations. A linear regression plot comparing modelled and monitored Road NOx concentrations before and after adjustment is presented in **Figure 27**. The total annual mean NO_2 concentrations were then determined using the NOx/NO_2 calculator to combine background and adjusted road contribution concentrations.

Only monitoring location OBC-101 was excluded from model verification as the roads near this monitoring location were excluded from the traffic modelling study and is also considered to be more representative of an urban background location.

A primary NOx adjustment factor (PAdj) of 3.47 based on model verification using all of the 2019 NO_2 measurements was applied to all modelled Road NOx data prior to calculating an NO_2 annual mean.

A plot comparing modelled and monitored NO_2 concentrations before and after adjustment during 2019 is presented in Figure 18.

Figure 27: Comparison of modelled Road NO_x Vs Measured Road NO_x before and after adjustment

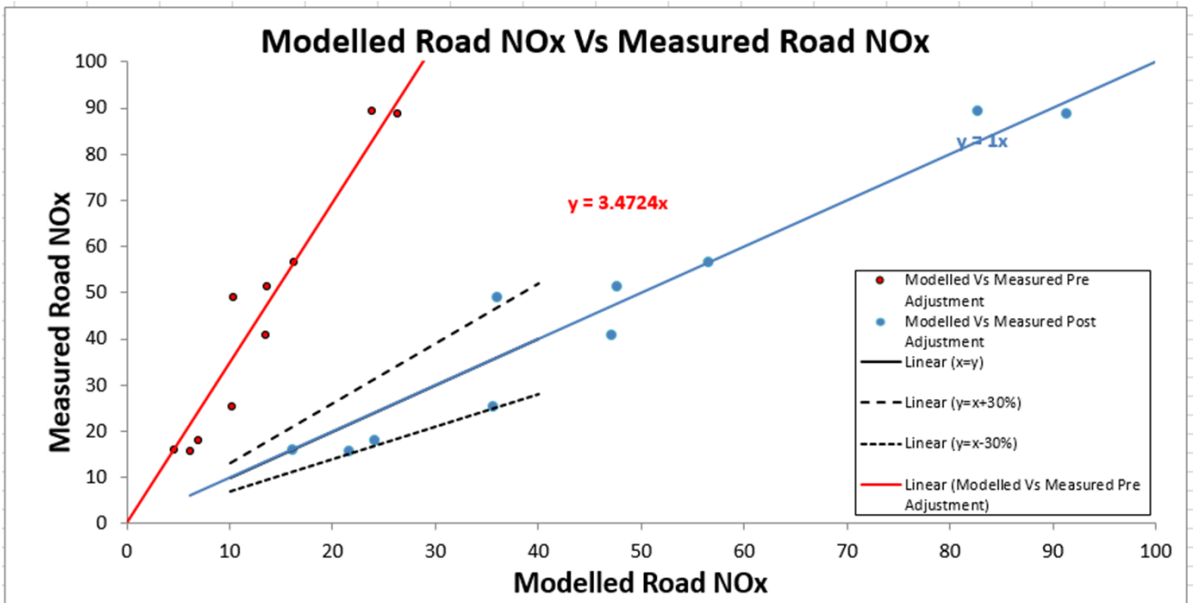
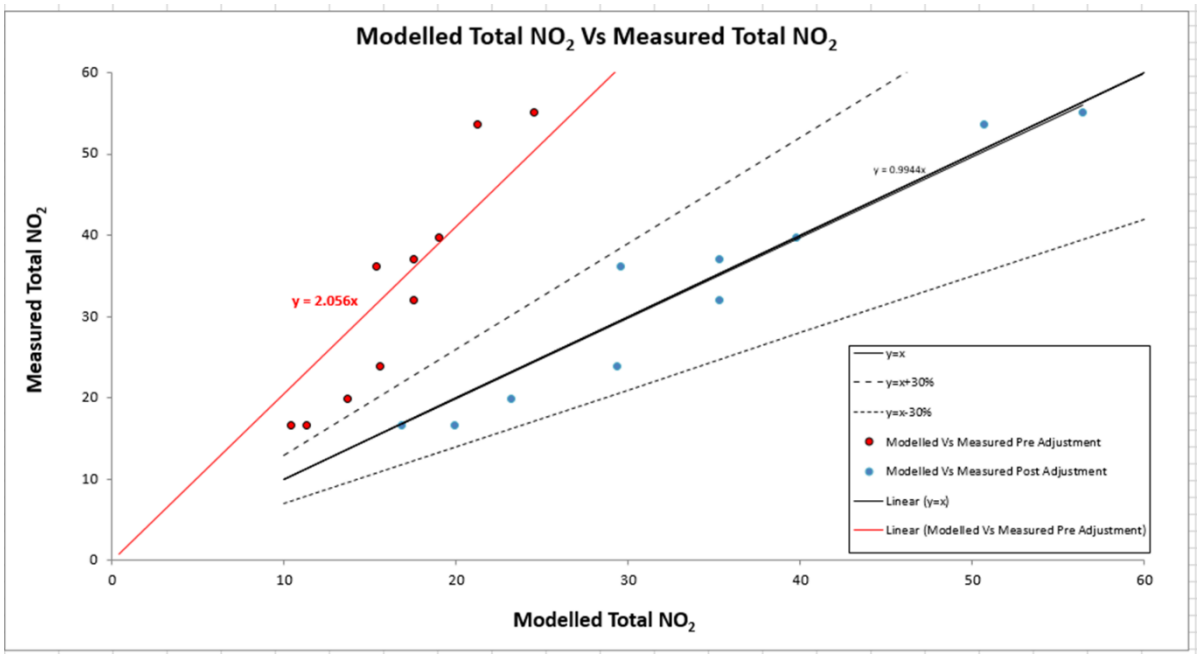


Figure 28 Modelled vs. measured NO_2 annual mean 2018 before and after adjustment



Model performance

To evaluate the model performance and uncertainty, the Root Mean Square Error (RMSE) for the observed vs predicted NO_2 annual mean concentrations was calculated, as detailed in Technical Guidance LAQM.TG(16). This guidance indicates that an RMSE of up to 4 $\mu g/m^3$ is ideal, and an RMSE of up to 10 $\mu g/m^3$ is acceptable. The calculated RMSE is presented in Table 18. In this case the RMSE was calculated at 3.5 $\mu g.m^{-3}$ which is within the ideal range suggested by the guidance.

Table 23 Comparison of measured and modelled concentrations at measurement locations in 2019, and the model root mean square error.

NO_2 monitoring location	Measured NO_2 annual mean concentration 2019 ($\mu g.m^{-3}$)	Modelled NO_2 annual mean concentration 2019 ($\mu g.m^{-3}$)
OBC-103	37.1	35.3
OBC-123	55.2	56.4
OBC-124	16.6	19.9
OBC-110	53.7	50.7
OBC-122	16.7	16.9
OBC-107	32.0	35.3
OBC-108	36.2	29.5
OBC-104	39.8	39.8
OBC-109	19.9	23.2
OBC-102	23.9	29.3
RMSE (all sites)		3.5 $\mu g/m^3$

Appendix 2 – All model results

ID	Base 2019	DM 2023	DS 2023	DS-DM 2023	Electric buses	Electric buses – DS 2023	HGV restric.	HGV restric. – DS 2023	Combined	Combined – DS 2023
R1	**41.6**	32.7	31.4	-1.3	30.9	-0.5	30.9	-0.5	30.4	-1.0
R2	**42.0**	33.1	31.7	-1.4	31.2	-0.5	31.2	-0.5	30.7	-1.0
R3	**41.1**	32.4	31.0	-1.4	30.5	-0.5	30.5	-0.5	30.0	-1.0
R4	39.9	31.4	30.0	-1.4	29.5	-0.5	29.5	-0.5	29.0	-1.0
R5	**41.5**	32.6	31.2	-1.5	30.6	-0.5	30.7	-0.5	30.1	-1.0
R6	39.0	30.6	29.3	-1.4	28.8	-0.5	28.8	-0.5	28.3	-1.0
R7	37.0	29.1	27.7	-1.4	27.2	-0.5	27.2	-0.5	26.7	-1.0
R8	36.2	28.4	27.1	-1.4	26.6	-0.4	26.6	-0.5	26.1	-0.9
R9	36.2	28.4	27.0	-1.4	26.6	-0.4	26.5	-0.5	26.1	-0.9
R10	36.2	28.4	27.0	-1.4	26.6	-0.4	26.5	-0.5	26.1	-0.9
R11	36.3	28.3	27.1	-1.2	26.6	-0.4	26.6	-0.5	26.1	-0.9
R12	35.2	27.5	26.3	-1.2	25.9	-0.4	25.8	-0.5	25.4	-0.9
R13	22.1	17.5	17.0	-0.6	16.7	-0.2	16.8	-0.2	16.5	-0.4
R14	21.6	17.2	16.6	-0.6	16.4	-0.2	16.5	-0.2	16.2	-0.4
R15	20.3	16.2	15.7	-0.5	15.5	-0.2	15.6	-0.1	15.4	-0.3
R16	21.4	17.0	16.5	-0.5	16.3	-0.2	16.4	-0.1	16.2	-0.3
R17	27.5	21.8	20.9	-0.9	20.6	-0.3	20.9	0.0	20.6	-0.3
R18	27.5	21.9	20.7	-1.1	20.5	-0.3	20.7	0.0	20.4	-0.3
R19	27.1	21.5	20.3	-1.2	20.0	-0.3	20.3	0.0	20.0	-0.3
R20	26.9	21.4	20.1	-1.3	19.9	-0.3	20.1	0.0	19.8	-0.3
R21	25.4	20.1	18.7	-1.4	18.5	-0.3	18.7	0.0	18.4	-0.3
R22	24.1	19.1	17.7	-1.4	17.5	-0.2	17.7	0.0	17.5	-0.2
R23	21.8	17.4	16.1	-1.3	15.9	-0.2	16.1	0.0	15.9	-0.2
R24	21.5	17.1	15.9	-1.2	15.7	-0.2	15.9	0.0	15.7	-0.2
R25	20.0	15.9	14.9	-1.1	14.7	-0.2	14.9	0.0	14.7	-0.2
R26	**56.8**	**44.6**	39.3	-5.4	38.6	-0.6	39.2	0.0	38.6	-0.6
R27	**60.2**	**47.3**	**41.6**	-5.7	**40.9**	-0.7	**41.6**	0.0	**40.9**	-0.7
R28	**60.5**	**47.5**	**41.8**	-5.8	**41.1**	-0.7	**41.8**	0.0	**41.1**	-0.7
R29	**57.4**	**44.9**	39.3	-5.6	38.6	-0.7	39.3	0.0	38.6	-0.7
R30	**49.0**	38.3	33.6	-4.7	33.0	-0.6	33.6	0.0	33.0	-0.6
R31	17.6	14.1	13.4	-0.7	13.3	-0.1	13.4	0.0	13.3	-0.1
R32	37.8	29.5	28.1	-1.4	27.6	-0.5	27.7	-0.5	27.2	-0.9
R33	19.6	15.6	15.2	-0.4	15.0	-0.2	15.0	-0.2	14.8	-0.3
R34	27.1	21.5	20.8	-0.7	20.5	-0.3	20.5	-0.3	20.2	-0.6
R35	22.0	16.1	16.4	0.3	16.2	-0.3	16.3	-0.1	16.1	-0.4

OBC-103	35.3	27.8	26.4	-1.3	26.0	-0.4	26.0	-0.5	25.5	-0.9
OBC-123	**56.4**	**44.3**	39.0	-5.3	38.3	-0.6	38.9	0.0	38.3	-0.6
OBC-124	19.9	14.6	14.9	0.4	14.7	-0.2	14.8	-0.1	14.6	-0.3
OBC-110	**50.7**	39.6	34.7	-4.9	34.1	-0.6	34.7	0.0	34.1	-0.6
OBC-122	16.9	13.1	11.3	-1.9	11.2	-0.1	11.2	0.0	11.2	-0.1
OBC-107	35.3	29.3	29.1	-0.1	28.8	-0.3	29.1	0.0	28.8	-0.3
OBC-108	29.5	23.7	24.8	1.1	24.8	0.0	24.8	0.0	24.7	-0.1
OBC-104	39.8	31.3	30.1	-1.3	29.6	-0.5	29.6	-0.4	29.1	-0.9
OBC-109	23.2	18.4	17.7	-0.7	17.5	-0.2	17.5	-0.2	17.3	-0.5
OBC-102	29.3	23.5	23.1	-0.4	22.9	-0.2	22.9	-0.2	22.7	-0.4

Appendix C: Reasons for Not Pursuing Action Plan Measures

Table 24 - Reasons For Not Pursuing Action Plan Measures

Action category	Action description	Reason action is not being pursued (including Stakeholder views)
Traffic Management	4-phase junction at Heol-y-Nant	Early transport modelling deemed this option unworkable due to space constraints and the potential to increase congestion on Park Street.

Appendix D – Consultation Report

Air Quality Action Plan
Park Street

Consultation Report

Date of issue: **December 2022**

Contents

1. Overview

A public consultation on the Air Quality Action Plan strategy for Park Street, Bridgend was undertaken over a twelve-week period from **5th September 2022** to **21st November 2022**.

In total, there were **86 responses** to the consultation. The online survey received a total **71 completions**, with a further **15 responses** from two engagement events held throughout the consultation period.

2. Introduction

The public survey was available to complete online through a link on the consultation page of the council's website. Paper copies of the consultation were also available, which could be

sent directly to residents upon request.

The consultation team also offered residents the opportunity to arrange a telephone consultation for those that could not complete the survey online, to ensure the survey was accessible to all residents.

Surveys were available in standard and large print formats: both were available in English and Welsh Language. The content of the page remains online.

Respondents could choose to answer all or some questions. All survey responses offered the option of anonymity. The council's standard set of equality monitoring questions were also included within the survey, in line with recommended good practice for all public-facing surveys carried out by the council.

3. Marketing and engagement methods

3.1. Marketing

This section details methods used to raise the profile of the consultation and encourage participation.

3.1.1. Social media

The council runs the following social media accounts: Twitter, Facebook, Instagram, LinkedIn, and YouTube.

The public consultation on the AQAP was posted bilingually to the council's corporate Twitter and Facebook channels throughout the consultation period, to raise awareness of the consultation and to encourage citizens to share their views on the strategy.

The council currently has over 18K Facebook followers and 14.6K followers on its English Twitter account, and 353 on its Welsh Twitter account. While content is most likely to be seen by these users, it is also displayed to users who are not connected to the accounts.

Facebook	**Likes**	**Comments**	**Shares**
5th September	5	2	9
28th September	1	0	4
20th October	3	2	2
8th November	0	0	0
18th November	0	1	0
Total:	**9**	**4**	**15**

Twitter	**Likes**	**Retweets**	**Comments**
5th September	0	2	0

29th September	0	0	1
1st October	0	1	0
4th October	0	1	0
13th October	0	0	0
28th October	0	0	0
1st November	0	0	0
9th November	0	0	0
9th November	0	0	0
16th November	0	0	0
19th November	1	1	0
Total:	**1**	**5**	**1**

Twitter polls were also posted during the consultation period to interact with residents and again encourage engagements with the consultation.

Twitter Polls	**Total Votes**
20th October: How concerned are you about the air quality within Park Street and Bridgend?	**12**
• Very concerned	41.7%
• Concerned	8.3%
• Not concerned	8.3%
• Not concerned at all	41.7%
28th October: Have you read our action plan?	**8**
• Yes	12.5%
• No	87.5%
3rd November: Have you filled in our online survey?	**10**
• Yes	10%
• No	90%
17th November: Do you travel through Park Street on your	**6**

daily commute?	
• Yes	0%
• No	100%

3.1.2. Gov Delivery

GovDelivery is a digital communications tool that was implemented by the local authority in June 2020, to send messages directly to residents' email inboxes in the language of their choice.

There are currently 35,766 English language subscribers and 249 Welsh language subscribers from Bridgend County Borough to the weekly update emails.

Details of the Park Street AQAP public consultation was included in Gov Delivery bulletins throughout the duration of the live period. The bulletin was delivered to 35,342 subscribers.

The table below shows when details were included in bulletin as well as the number of click through links in both English and Welsh language.

Date	**English Link Clicks**	**Welsh Link Clicks**
10/11/22	19	0

3.1.3. Media and Publicity

A press release was issued to coincide with the start of the consultation, to raise awareness and encourage participation. This was released on 5th September 2022.

- https://www.bridgend.gov.uk/news/council-launches-consultation-on-air-quality-action-plan-for-park-street-in-bridgend/

3.2. Engagement Events

Throughout the consultation period there were two drop-in sessions held at the Civic Offices, to encourage residents and members to share their views, concerns, and feedback regarding the Air quality Action Plan for Park Street. Both events were held by the Consultation Team and the Officers from the Shared Regulatory Services.

3.2.1. Engagement Drop in Events:

The first event was held on 5th October 2022 between 2pm and 4pm. This event attracted 9 residents of Park Street Bridgend. Comments and feedback from the event are included in Appendix 1 of this report.

The second engagement event was held at the Civic Offices on 15th November, at a later time of 4pm-6pm, to give residents a final opportunity to share any feedback face to face, before the consultation closes.
There were 6 attendees for this event: all responses and feedback from the event are included in Appendix 2.

3.2.2. Event Promotion:

Both events, were promoted on the council's social media as well as shared on the Shared Regulatory Services' website and social media channels. Leaflets were also sent out to local councillors for both events; as well as a leaflet drop through doors of Park Street Residents for the final engagement event.
Leaflets sent out are shown in Appendix 3. They were sent out bilingually, in both English and Welsh Language including information about the event as well as a QR code for residents to scan to take them directly to the online survey.

4. Response Rate

In total there were 86 responses, 71 responses were from the online survey, and 15 respondents were event attendees.

5. How effective was the consultation?

The data collection methods, which include the online survey and a paper survey were developed using plain English to maximise understanding. These response methods were designed to give a consistency to the survey across multiple platforms.

6. Consultation Survey

6.1. Language used to complete the survey

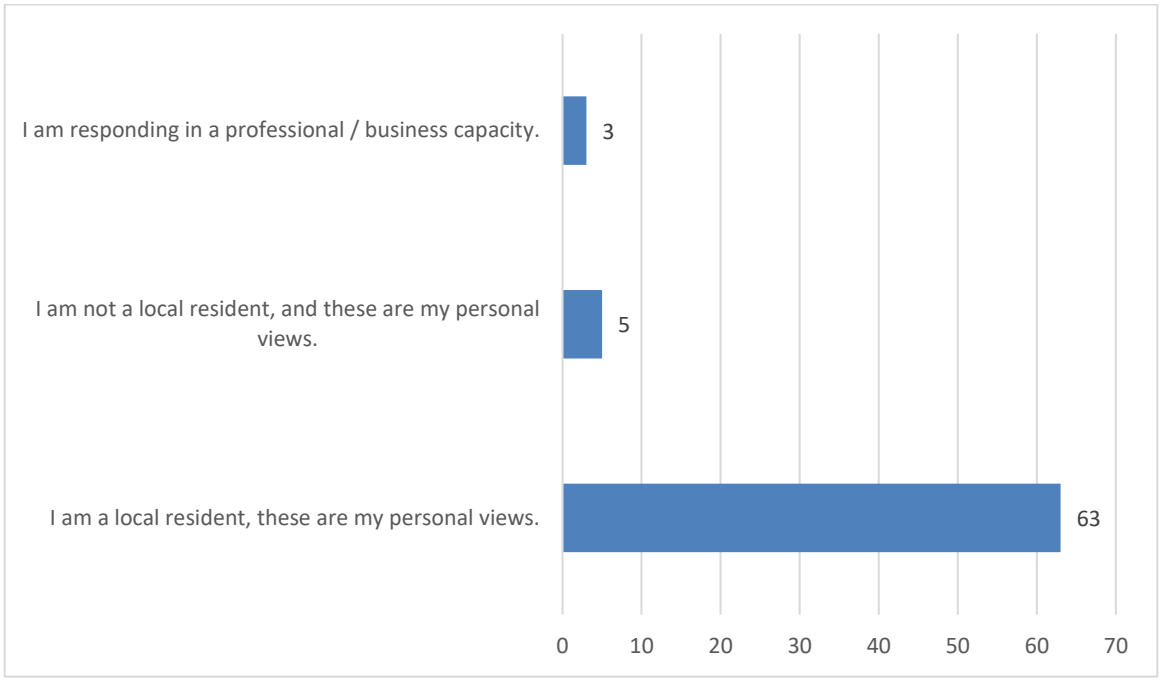
Respondents to the consultation survey were initially asked in which language they would like to complete the survey. Overall, 100% of respondents selected English with 0% selecting Welsh.

Language	#	%
English	**71**	**100%**
Welsh	0	0.%
Total	**71**	**100.0**

7. Survey Questions and Analysis:

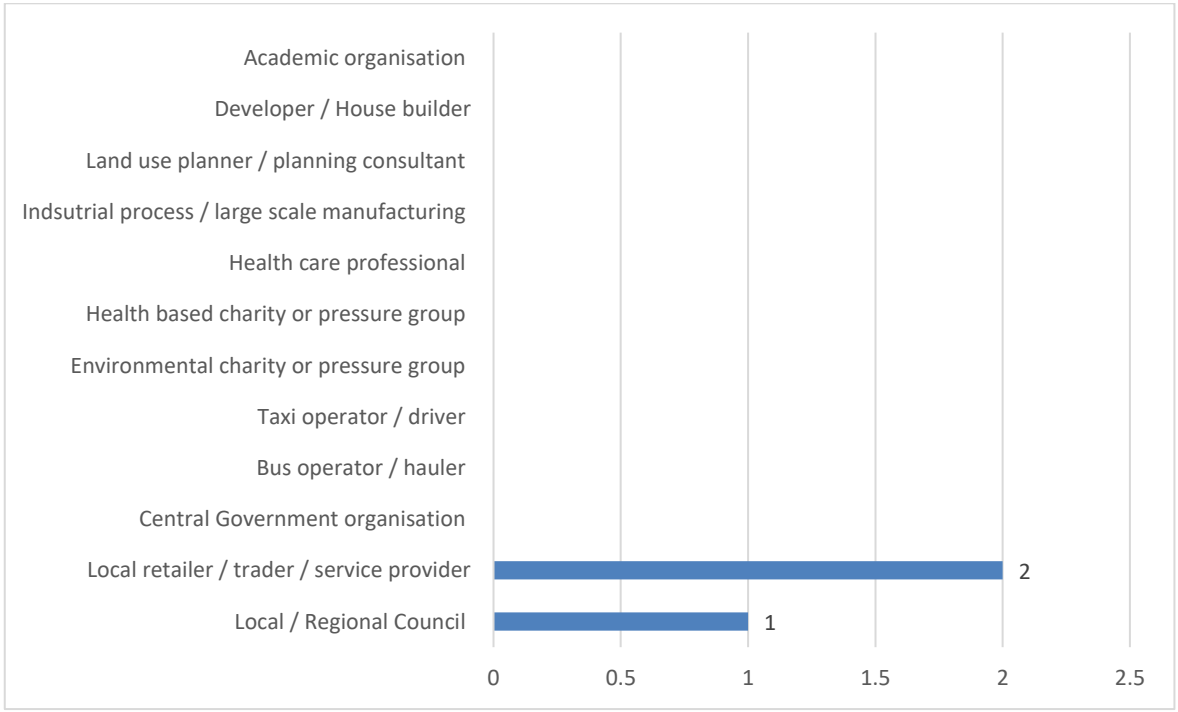
This section outlines and analyses all questions asked in the online survey.

To help us understand who we have consulted with, please indicate which of this best describes your view point in relation to this consultation.



As shown in the graph above, 63 respondents **(89%)** stated they were a local resident and were expressing their personal views. 5 respondents **(7%)** confirmed they were not a local resident, and comments were their personal views. 3 respondents **(4%)** also stated that they were responding in a professional / business capacity. In total, 70 respondents provided a response for this question.

If responding in a professional or business capacity, please state which type of organisation or industry you represent (please tick all that apply)



As shown in the previous graph, **3** respondents stated they were responding in a professional /

business capacity. Shown in the graph above, **2** of these respondents stated they were from a Local retailer / trader / service provider. **1** respondent confirmed they were from a Local / Regional Council.

What is your postcode? (Optional)
(If responding in a personal capacity provide postcode of home address)

Shown below is a list of personal postcodes provided by online survey respondents.

Post Code	**Number of respondents**
CF31	50
CF32	3
CF34	1
CF36	2

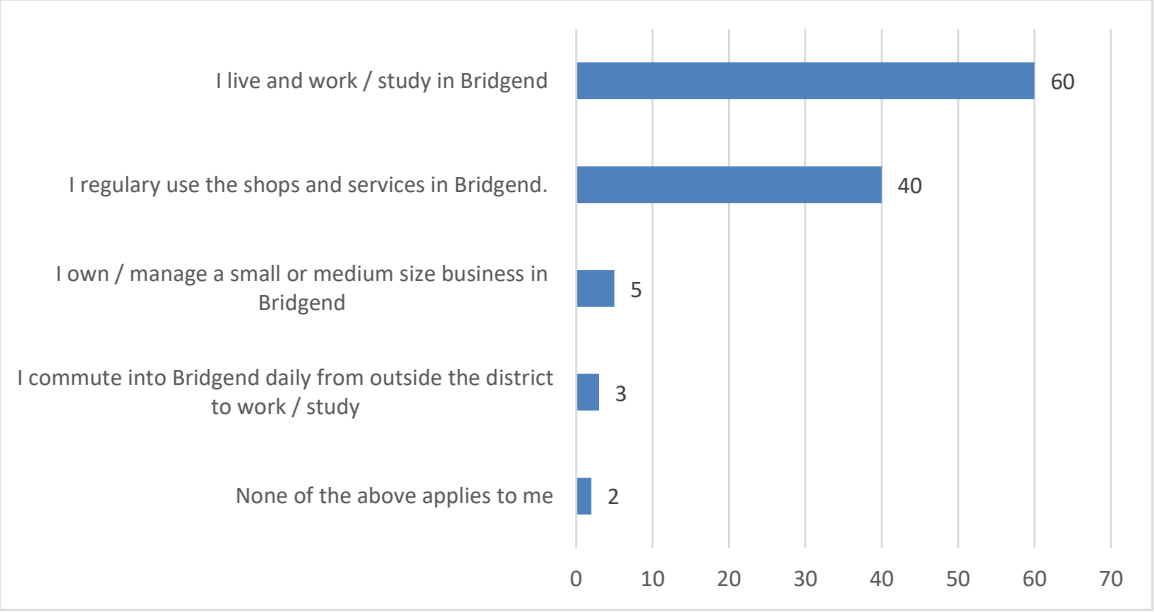
As shown in the table above, **56 respondents** provided a post code for this question. The most common post code area was CF31, where **50** respondents **(89%)** stated this was their personal post code area.

What is your postcode?
(If responding in a professional or business capacity provide postcode of your work address / business premises.

Two post codes were provided for those that responded to the survey in a professional or business capacity. Both codes were from the CF31 area.

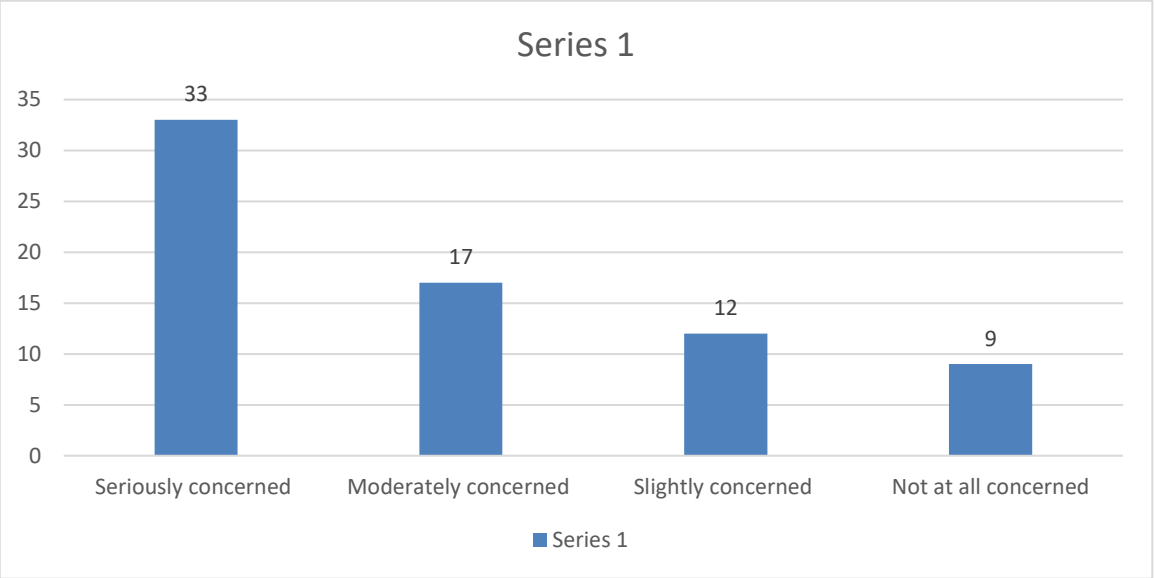
CF31	2

Which of these statements applies to you? (Tick all that apply).



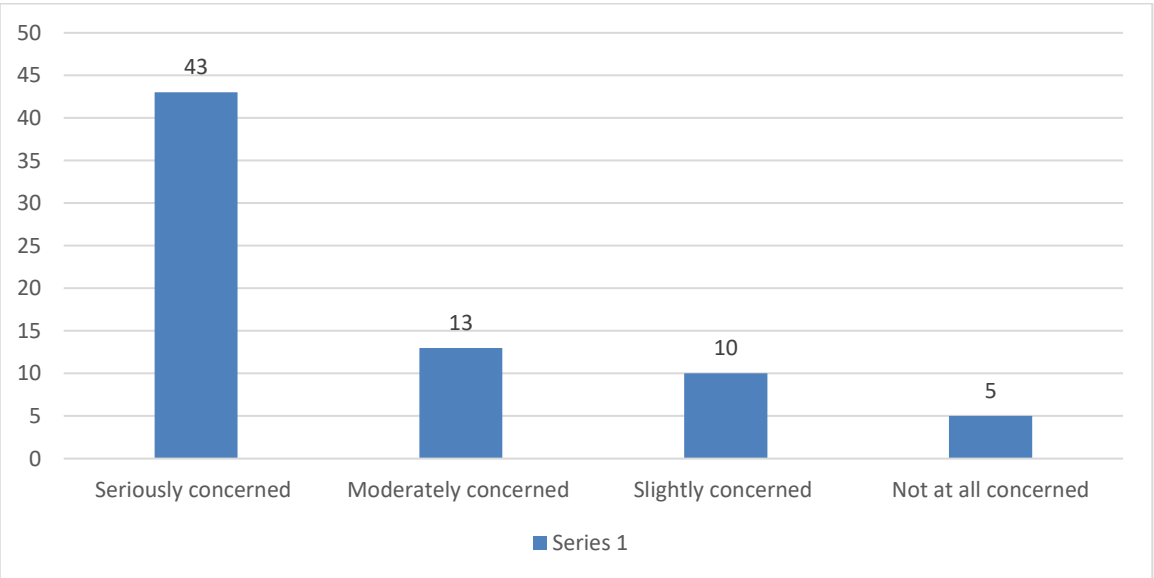
This question was format as a multi-choice question, allowing respondents to select all the option that are relevant to them. As shown in the graph above, **60 respondents (86%)** state they live and work / study in Bridgend. **40 respondents (57%)** selected they regularly use the shops and services in Bridgend. **5 respondents (7%)** confirm they own / manage a small or medium size business in Bridgend. **3 respondents (4%)** state they commute into Bridgend daily from outside the district to work / study. **2 respondents (3%)** selected that None of the above applies to them.

Before reading the draft air quality action plan, how concerned were you about air quality within Park Street and Bridgend?



71 respondents provided a response for this question. **33 respondents (47%)** confirmed that before reading the draft action plan, they were seriously concerned about air quality within Park Street and Bridgend. **17 respondents (24%)** selected Moderately concerned about the air quality, and a further **12 respondents (17%)** stated they were slightly concerned. Whereas **9 respondents (13%)** selected that they were Not concerned at all.

After reading the draft action plan, how concerned are you now about air quality within Park Street and Bridgend?

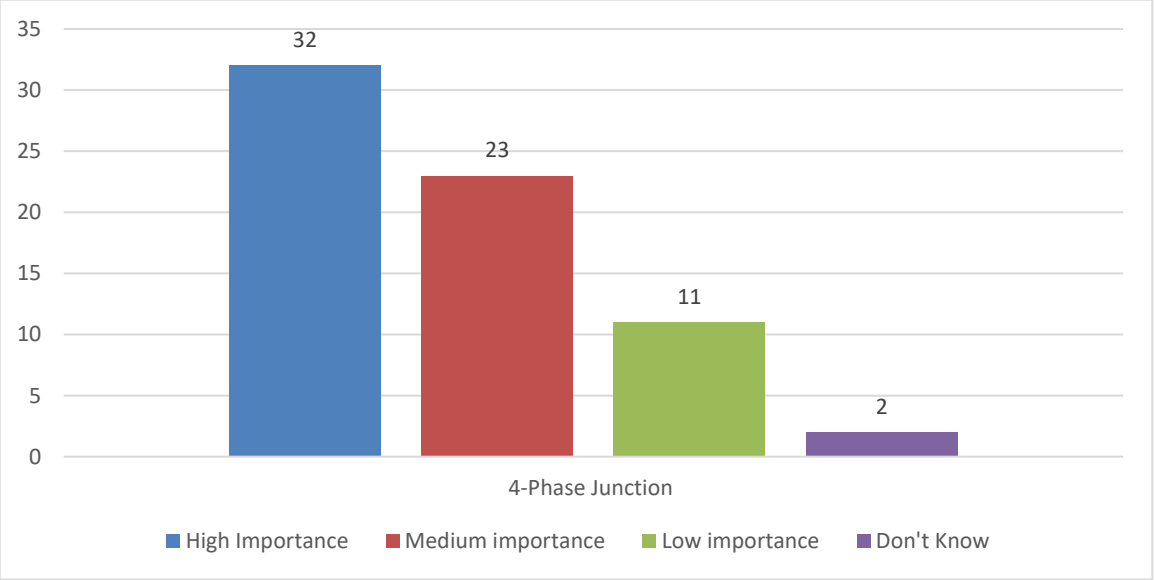


As shown in graph above, there were slight changes to the responses after reading the action plan. **43 respondents (61%)** confirmed they were seriously concerned about the air quality after reading the draft action plan. **13 respondents (18%)** stated they were Moderately concerned, and **10 respondents (14%)** selected Slightly concerned. **5 respondents (7%)** still felt they were Not at all Concerned about the air quality in Park Street and Bridgend after reading the draft action plan.

The draft Air Quality Action Plan sets out categories of measures that the council proposes should be the focus of attention to improve air quality within Park Street AQMA. These have been provisionally prioritised by the Council.

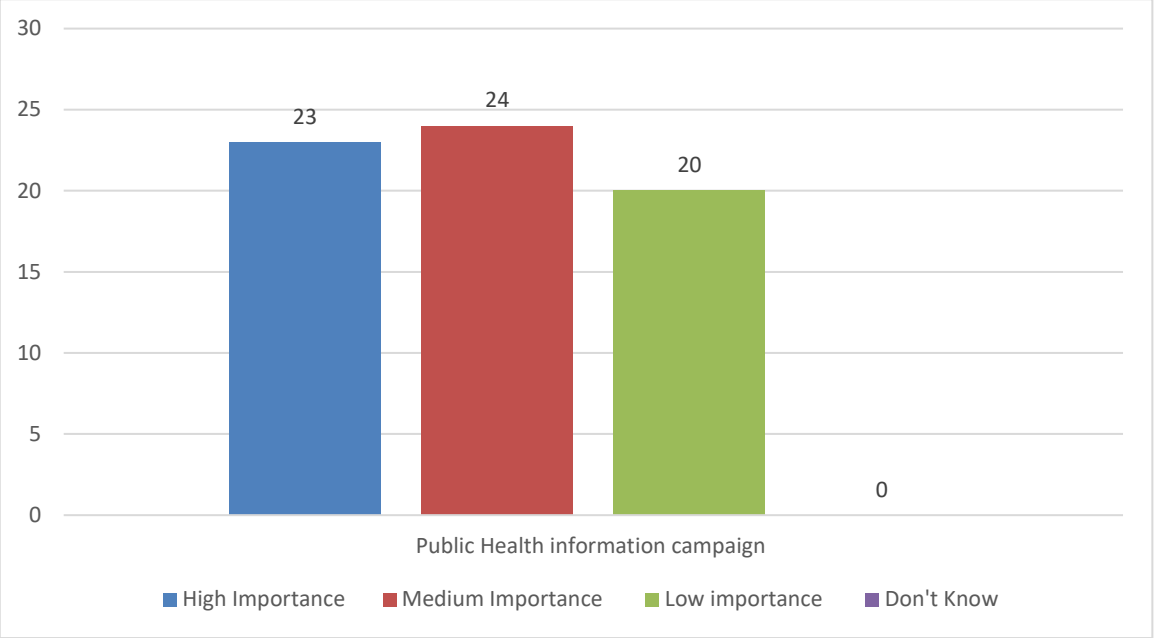
In your view, what importance should be given to these proposed measures?

1. **Implementation and optimization of 4-phase junction at the Park Street / Angel Street / Tondu Road Junction.**



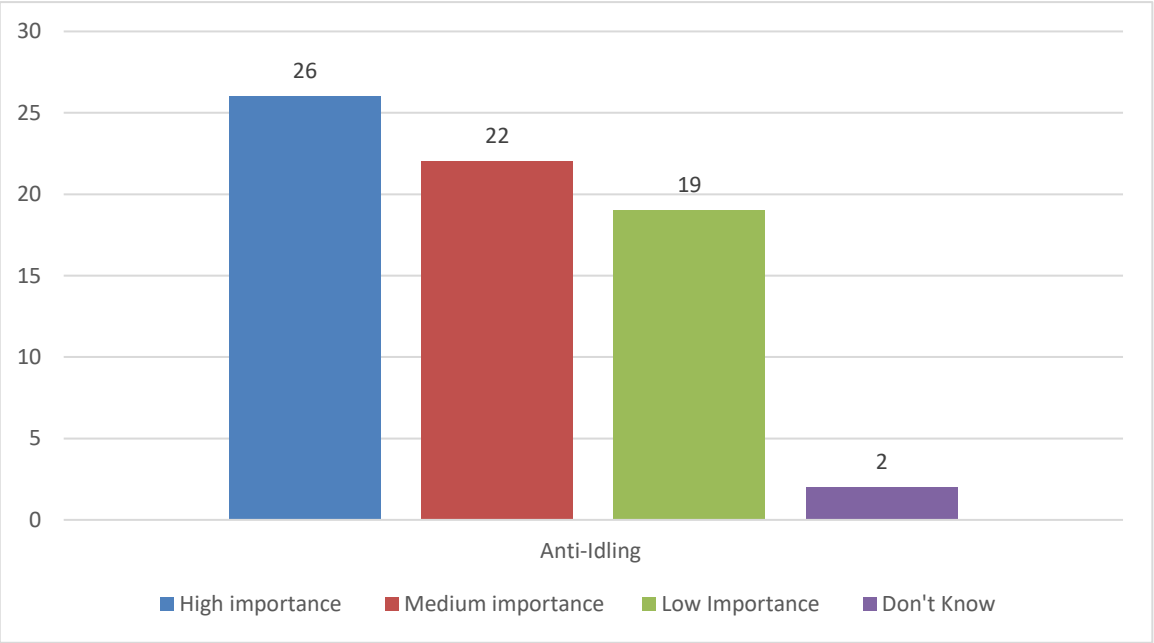
As shown above, this proposal was as ranked High importance by **32 respondents (47%). 23 respondents (34%)** felt that that this proposal was of medium importance, whereas **11 respondents (16%)** ranked this as Low importance. **2 respondents (3%)** selected Don't know what importance should be given.

2. **Public health information campaign.**



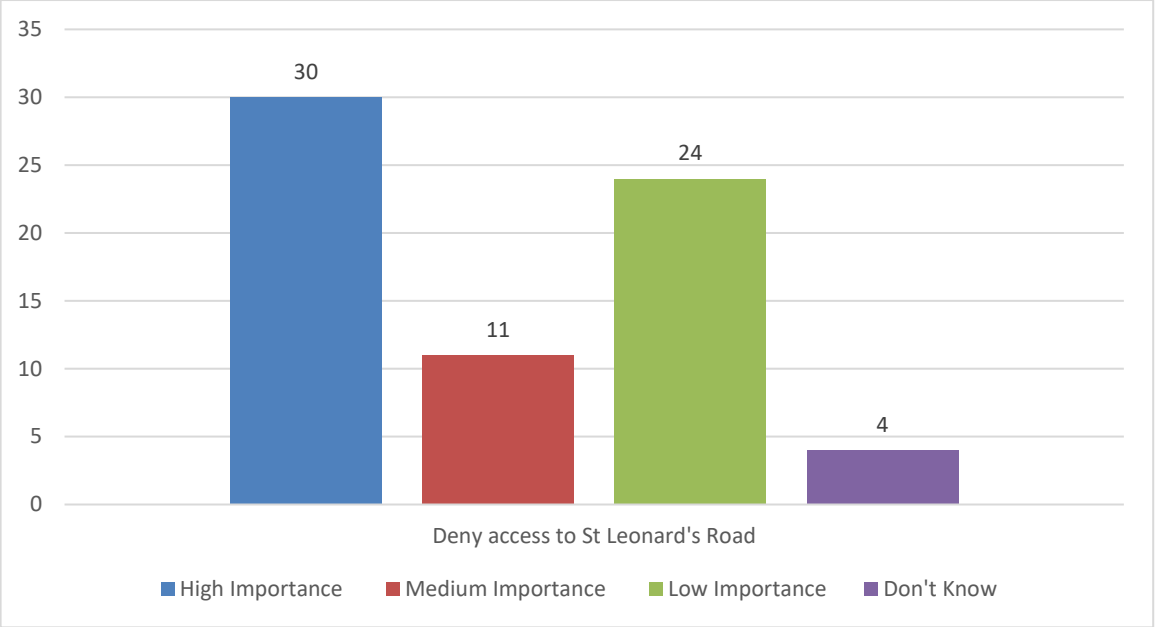
As shown above, this proposal was ranked as medium importance by **24 respondents (36%).** Closely followed by **23 respondents (34%)** that rated this proposal as High importance. **20 respondents (30%)** selected Low importance and 0 respondents selected Don't know.

3. **(Anti-idling implemented as TROs specific to sensitive areas such as outside schools, hospitals, care homes, as well as Park Street AQMA.**



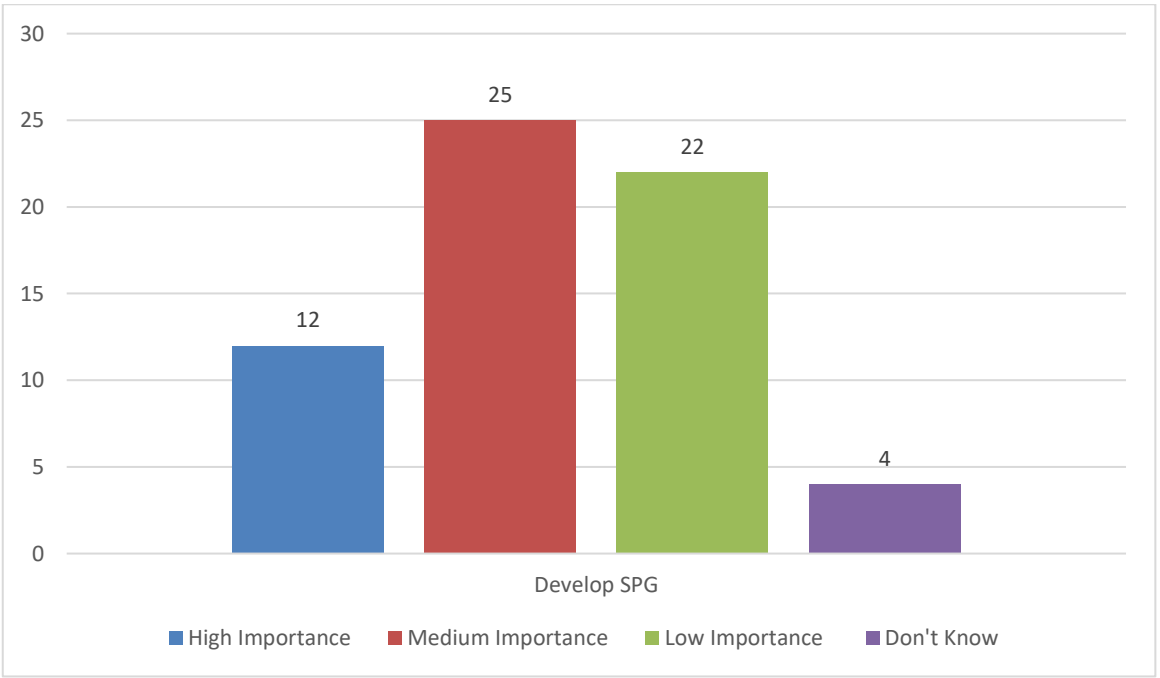
As shown above, **26 respondents (38%)** rated this proposal as High importance. **22 respondents (32%)** felt Anti-idling was of medium importance, whereas **19 respondents (28%)** rated the proposal as Low importance. **2 respondents (3%)** selected Don't Know.

4. **Deny all access onto St Leonard's Road for all traffic movements.**



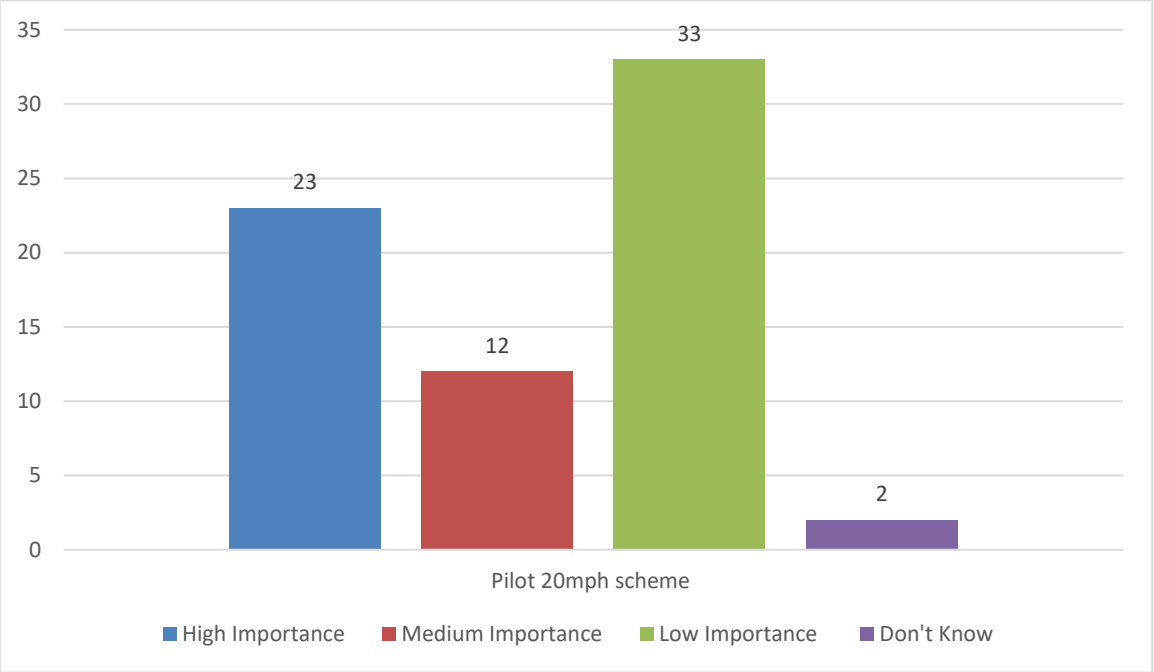
Considering the graph above, **30 respondents (44%)** rated this proposal as a High Importance. However, **24 respondents (35%)** feel denying access to St Leonard's Road is of Low importance. A further **11 respondents (16%)** rated the proposal as medium importance, and **4 respondents (6%)** selected Don't Know.

5. **Develop Supplementary Planning Guidance (SPG).**



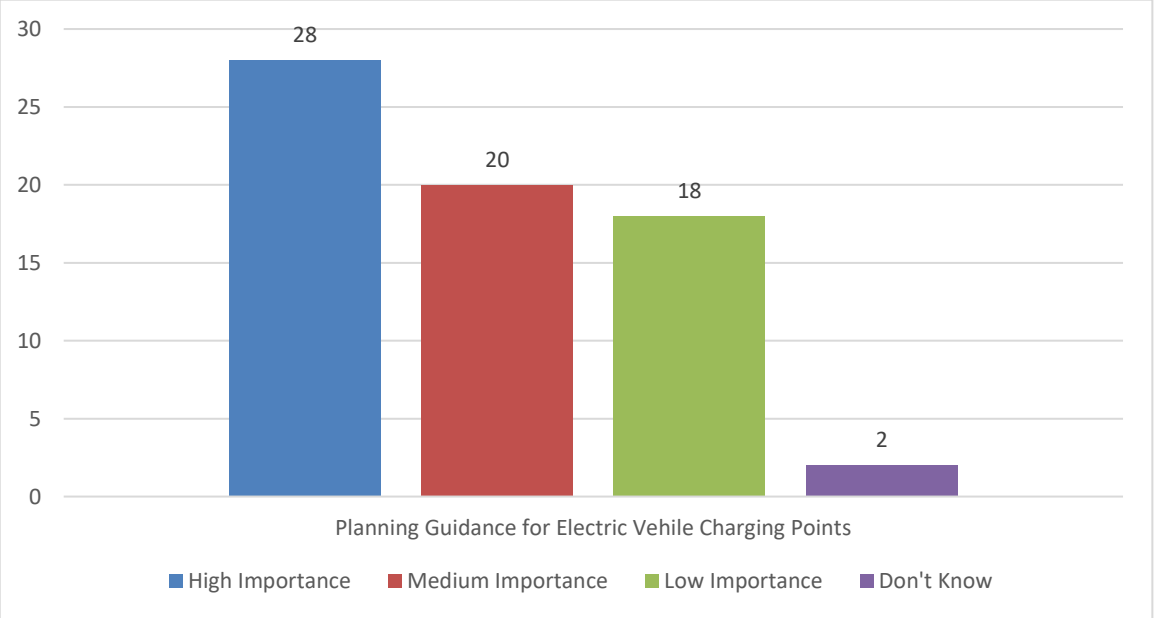
As shown in the graph above, the highest number of respondents (**25 respondents, 40%)** rated this proposal as medium importance. Another **22 respondents (35%)** felt this was of a low importance, and **12 respondents (19%)** selected High importance. There were also **4 respondents (6%)** which selected Don't Know.

6. **Introduce a pilot scheme "20mph speed limit" to Park Street.**



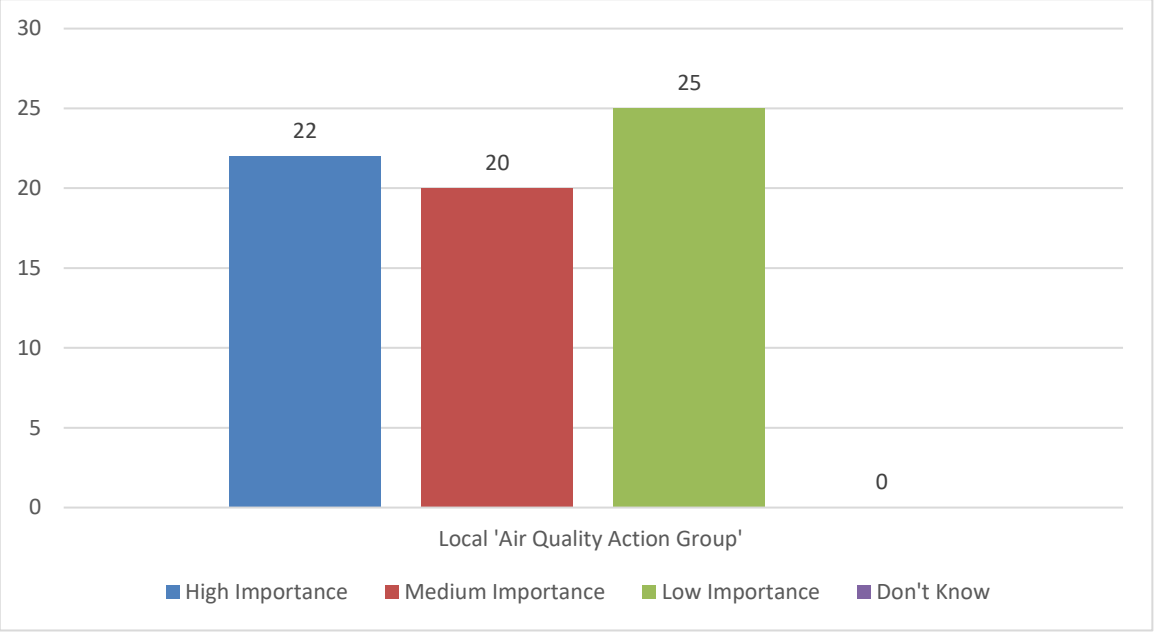
As shown above, **33 respondents (47%)** view this proposal as being a low importance. Whereas **23 respondents (33%)** feel that this should be of high importance. **12 respondents (17%)** rated the proposal as a medium importance, and **2 respondents (3%)** selected Don't Know.

7. Planning guidance for the provision of Electric Vehicle Charging Points.



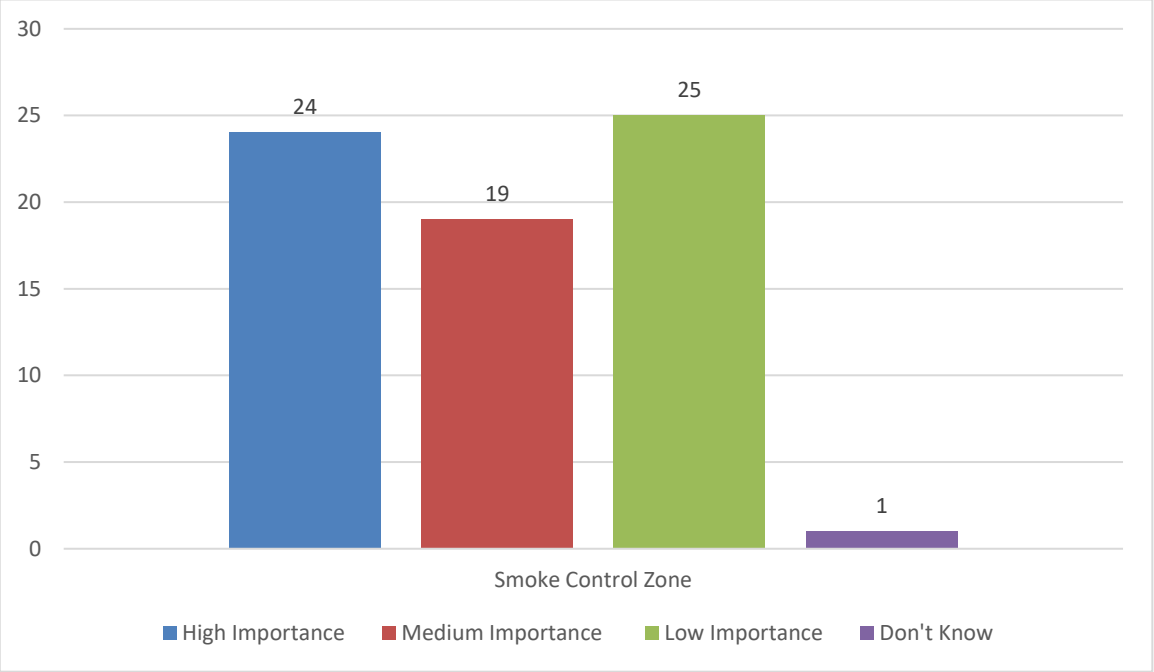
For this proposal, **28 respondents (41%)** feel a high importance should be given. **20 respondents (29%)** view this as a medium importance. **18 respondents (27%)** selected a low importance for this proposal, and **2 respondents (3%)** selected Don't Know.

8. Support creation of local Air Quality Action Group.



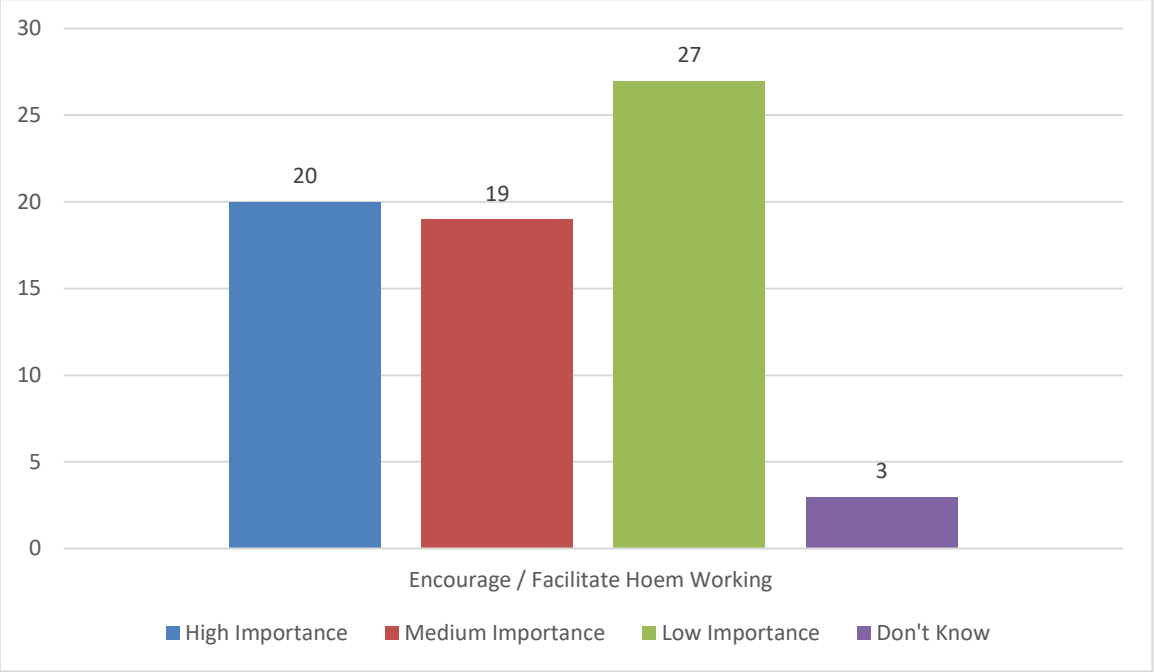
The graph above shows **25 respondents (37%)** believe this proposal should be given a low importance. Although, **22 respondents (33%)** selected High importance for the proposal. A further **20 respondents (30%)** rated this proposal as a medium importance.

9. Implement 'Smoke control zone' for Bridgend.



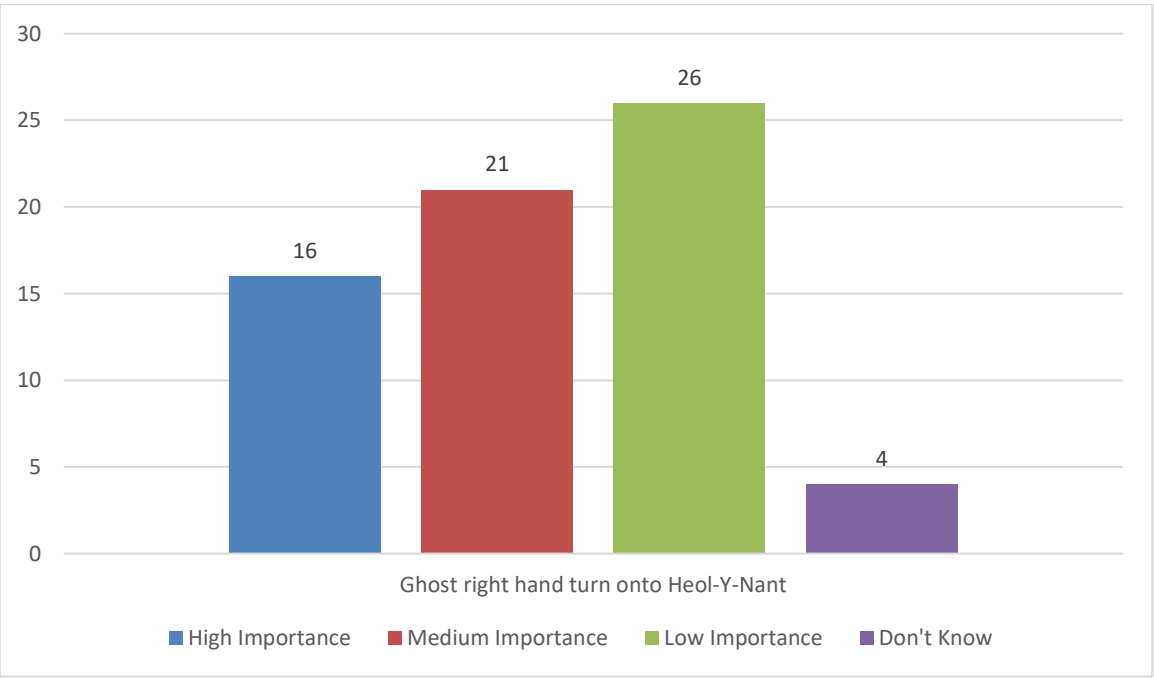
As shown above, **25 respondents (36%)** believe this proposal should be given a low importance, however **24 respondents (35%)** feel this is of a high importance. **19 respondents (28%)** rated a smoke control zone as medium importance, and **1 respondent (1%)** selected Don't Know.

10. Encourage / Facilitate home working.



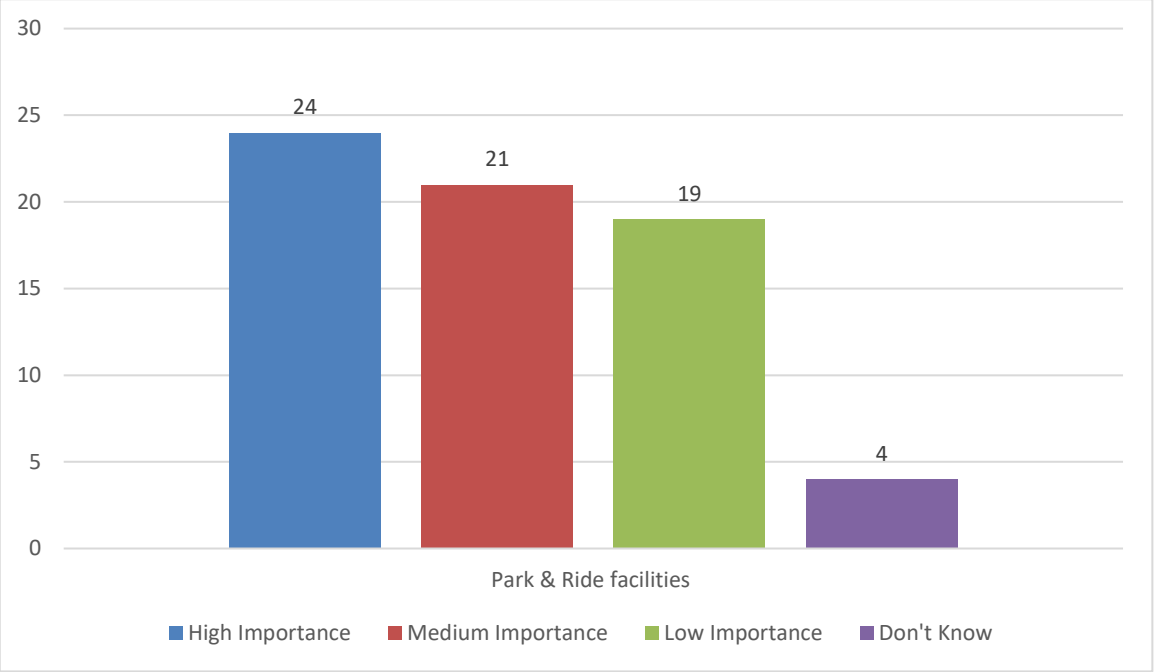
As shown above, the most responses for encouraging / facilitate home working were of a low importance. **27 respondents (39%)** selected Low importance. **20 respondents (29%)** believe this proposal should be of High importance, and **19 respondents (28%)** rated as a medium importance. There were also **3 respondents (4%)** which selected Don't Know.

11. Ghost right hand turn into Heol-Y-Nant.



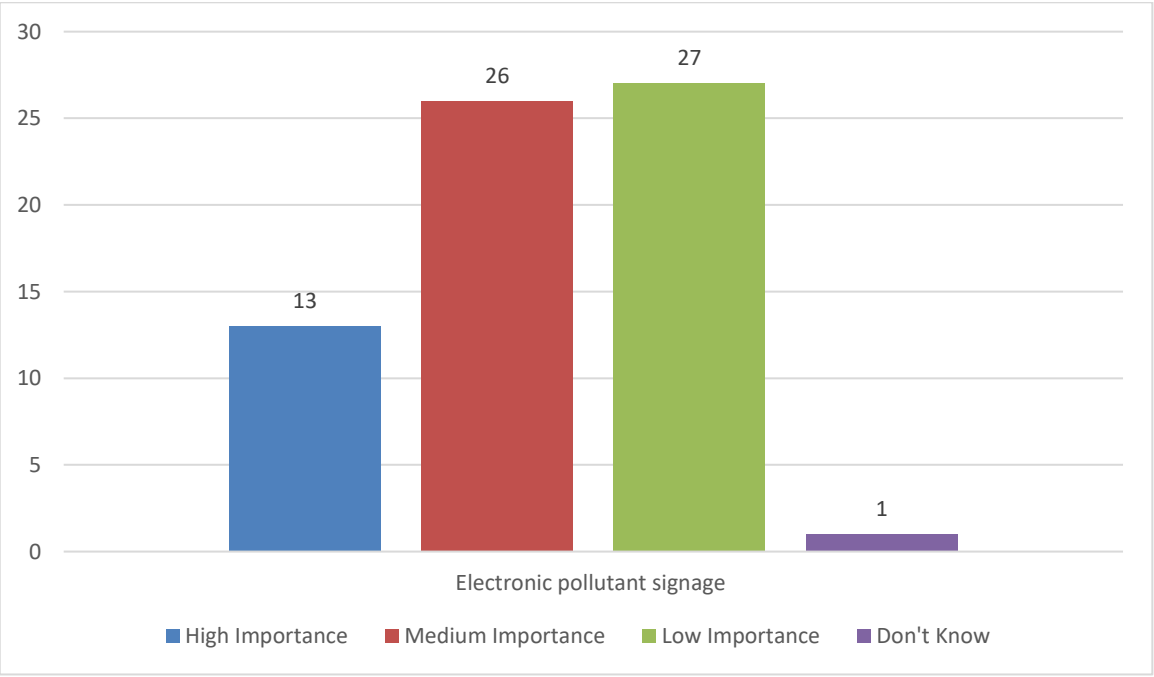
As shown above, the proposal for a ghost right hand turn onto Heol-Y-Nant was rated as a low importance by **26 respondents (39%). 21 respondents (31%)** believe this proposal is of medium importance, and **16 respondents (24%)** rated this as high importance. Another **4 respondents (6%)** selected Don't Know.

12. Park and ride facilities to be implemented at strategic sites.



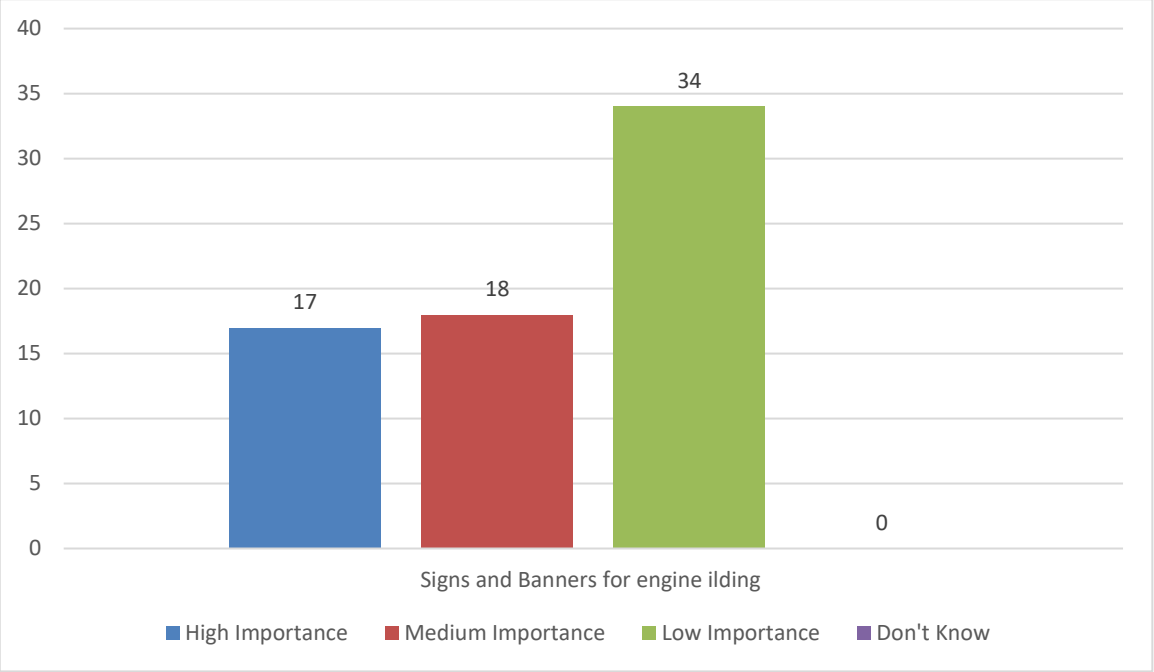
The graph above shows the proposal for Park and Ride facilities to be implemented at strategic sites was rated as a high importance by **24 respondents (35%).** Although **21 respondents (31%)** did also rate this as Low importance. There were **19 respondents (28%)** that believe this proposal is of medium importance, and **4 respondents (6%)** selected Don't Know.

13. Electronic "pollutant signage" within AQMA and local area.



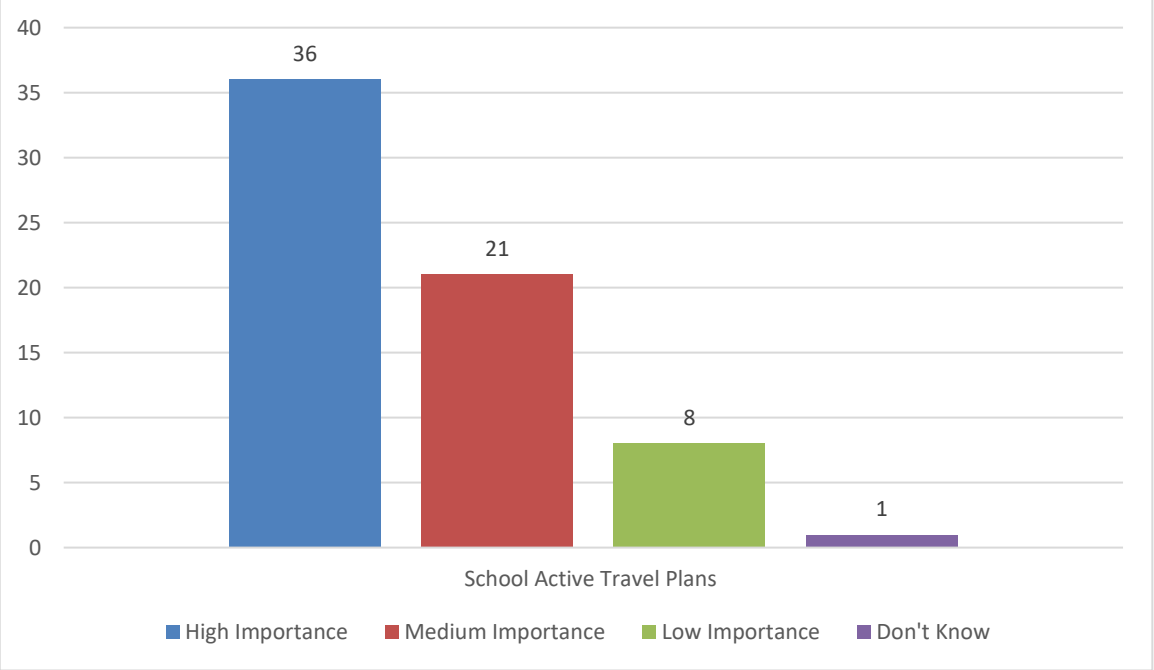
As shown above, **27 respondents (40%)** rated this proposal as a low importance, whereas another **26 respondents (39%)** felt this would be of a medium importance. **13 respondents (19%)** believe the proposal should be high importance, and **1 respondent (2%)** selected Don't Know.

14. Signs and banners for engine idling.



As shown, **34 respondents (49%)** saw this proposal as a low importance. **18 respondents (26%)** rated the proposal as medium importance, whereas another **17 respondents (25%)** felt this was a high importance.

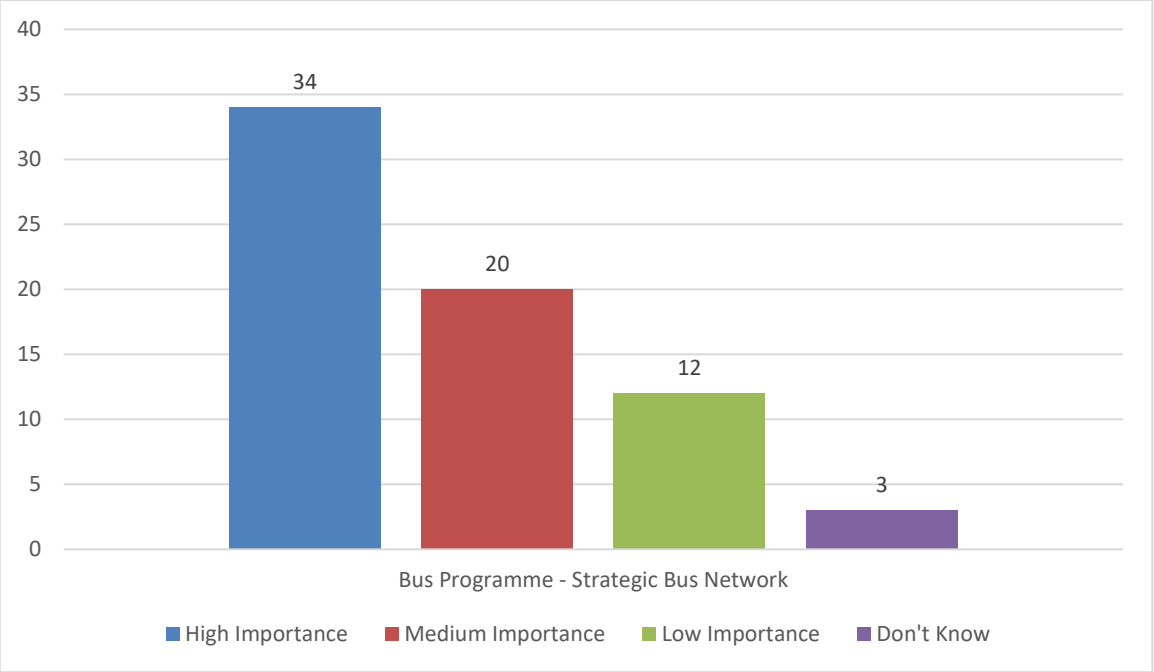
15. School Active Travel Plans



The graph above shows School Active Travel Plans were viewed as a high importance by **36 respondents (55%).** Another **21 respondents (32%)** felt this proposal was of medium importance, however there were **8 respondents (12%)** that rated this as a low importance. **1**

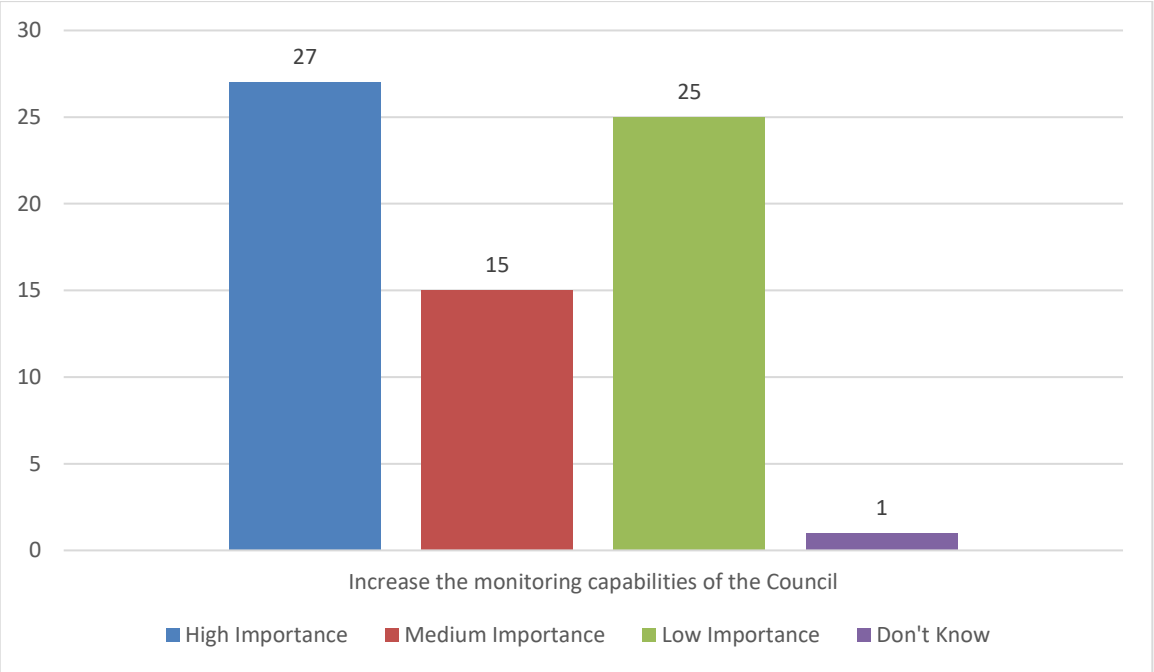
respondent (2%) selected Don't Know.

16. Bus Programme – Strategic Bus Network.



As displayed above, **34 respondents (49%)** chose to rate this proposal as of high importance. **20 respondents (29%)** believed this is a medium importance and **12 respondents** viewed this as a low importance. **3 respondents (4%)** selected Don't Know.

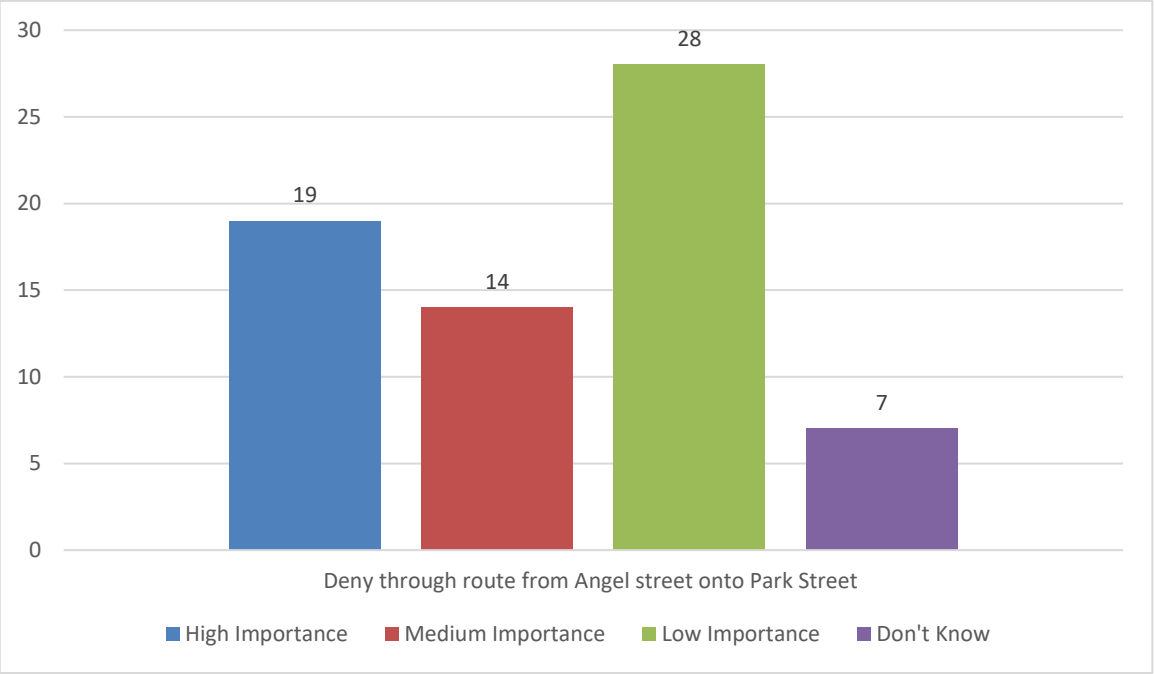
17. Increase the monitoring capabilities of the Council.



As shown above, **27 respondents (40%)** view this proposal as being a high importance. Although, **25 respondents (37%)** rated the proposal a low importance. **15 respondents (22%)**

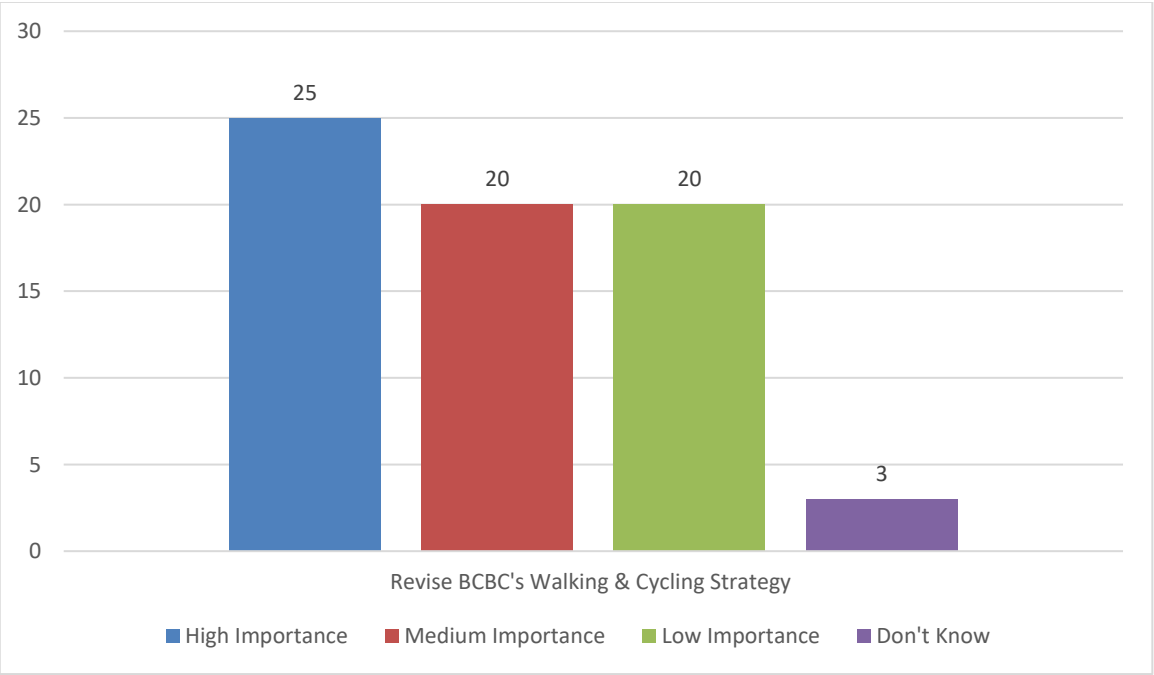
believe the proposal should be of a medium importance. **1 respondent (2%)** selected Don't Know.

18. Deny a through route movement from Angel Street onto Park Street.



As displayed above, the proposal to deny a through route movement from Angel Street to onto Park Street, was rated as a low importance by **28 respondents (41%). 19 respondents (28%)** viewed the proposal as high importance, and **14 respondents (21%)** feel this would be of medium importance. There were **7 respondents (10%)** which selected Don't Know.

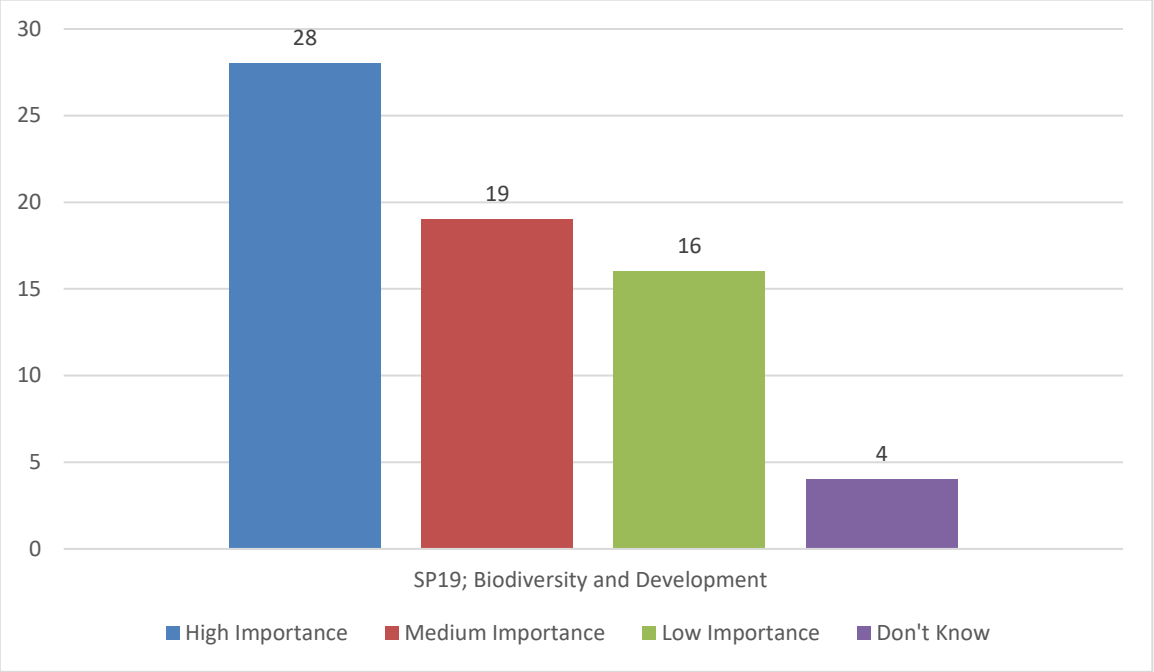
19. Revise BCBC's Walking and Cycling Strategy.



As displayed above, **25 respondents (37%)** view this proposal as being a high importance. **20**

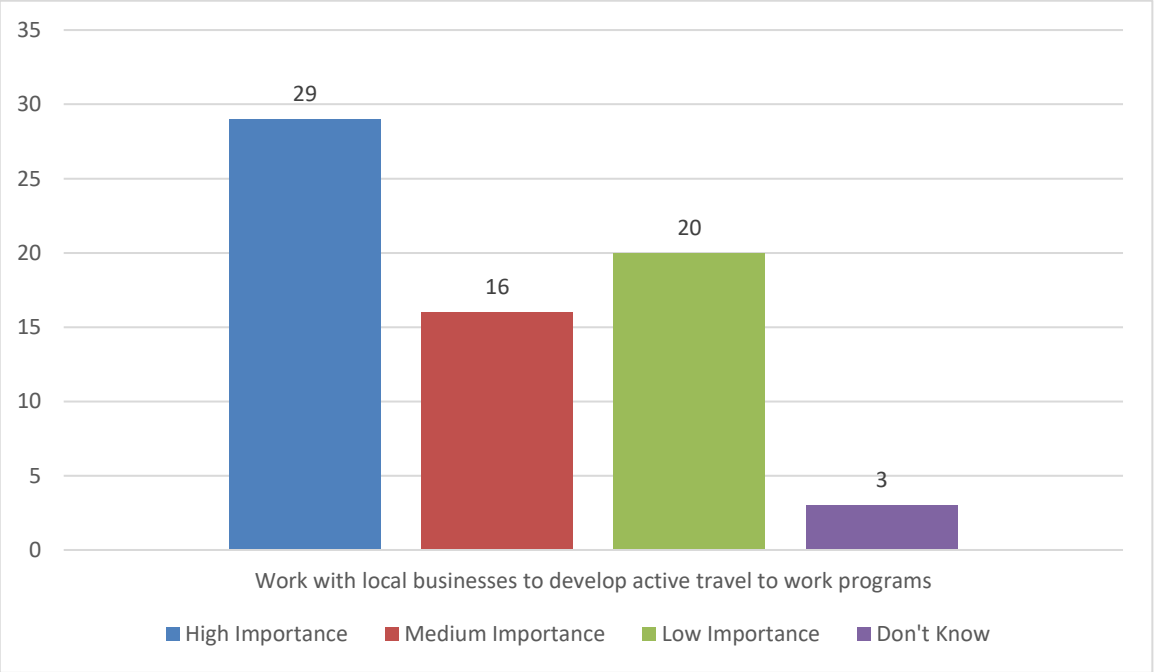
respondents (29%) rated this as a medium importance. An additional **20 respondents (29%)** felt this would be a low importance. **3 respondents (4%)** selected Don't Know.

20. Endorse SP19; Biodiversity and Development. Further influence the use of green infrastructure for new developments.



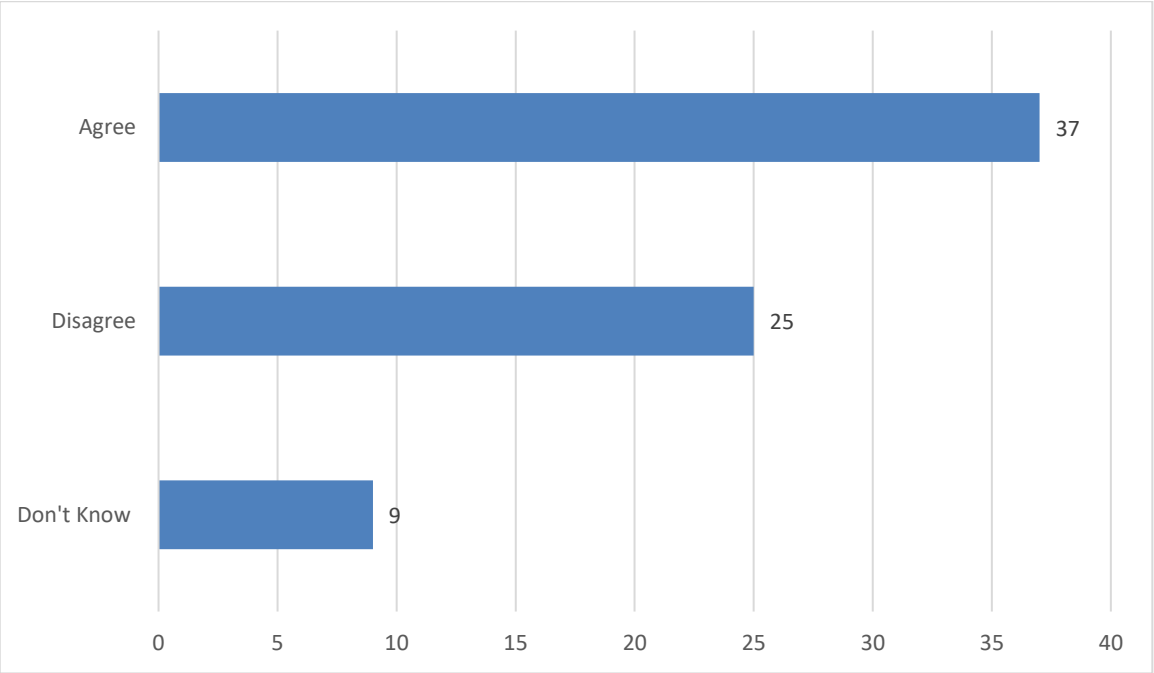
As displayed in the graph above, **28 respondents (42%)** rated this proposal as a high importance. **19 respondents (28%)** viewed this as a medium importance. **16 respondents (24%)** felt the proposal is of a low importance. **4 respondents (6%)** selected Don't Know.

21. Work with local businesses to develop active travel to work programs.



The graph above shows the proposal to work with local businesses to develop active travel to work programs was viewed as a high importance by **29 respondents (42%).** Although, **20 respondents (30%)** also rated this as a low importance. **16 respondents (24%)** chose to rate the proposal as a medium importance. **3 respondents (5%)** selected they Don't Know the level of importance for the proposal.

Do you agree with these proposals?



As shown above, **37 respondents (52%)** state they Agree with the proposal options. **25 respondents (35%)** selected they disagree with the options, and **9 respondents (13%)** selected they don't know if they agree or disagree.

Please describe why you disagree with these options being implemented.

Those respondents that selected they disagree with the proposals were asked to leave further comments to why they disagree. Comments made from respondents are themed into the table below.

Comment	**Number of responses**
Closing St Leonard's Road will result in congestion else where	4
Closing St Leonard's Road will result in residents having to drive further, meaning increased pollution.	2
Traffic waiting to turn into St Leonard's Road is only a small contributor, traffic is heading towards the town centre	2

LDP has not been considered – proposed housing will have further negative impact.	1
Idling vehicles cannot be policed	1
St Leonard's Road is a bus route, will affect those using the route	1
These changes will not affect the underlying issue	1
Plant Trees	1
Monitoring receptors are not located in the correct areas, only capture at the junction	1
Traffic comes from A48, not from local residents	1
Unsure of difference closing St Leonard's Road would make, still access Park Street	1
One way system may be better for access to St Leonard's Road.	1
Measure 18 does not make sense	1
Measures will make congestion worse	1
Traffic flow is broken (in direction of Laleston) when vehicles wait to turn into St Leonard's Road – gives residents a chance to cross the road	1
Total waste of time, electric vehicles do not produce pollution.	1
More needs to be done, restrict on-street parking	1

As shown in the table above, **22 comments** were made for this question. The top four comments are as followed. **4 comments** from respondents mentioned their concern that closing St Leonard's Road will result in congestion elsewhere around the area. **2 comments** were relating to the closing of St Leonard's Road will mean residents have to drive further, resulting in increased pollution. Another **2 comments** revealed that traffic waiting to turn into St Leonard's Road is only a small contributor, traffic is heading towards the town centre.

Are there any other measures you feel the council should be taking to improve the air quality which are currently not in the draft air quality action plan?

Comments made from respondents are themed into the table below.

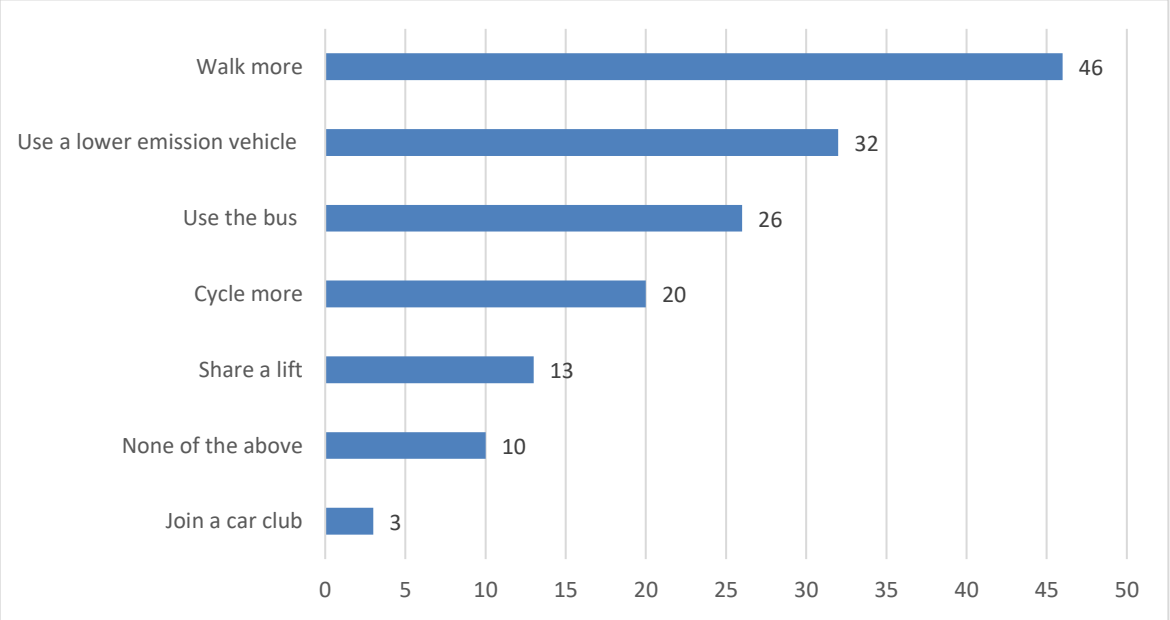
Comment	Number of responses
Stop developments and planning proposals in locations where pollution is already high. Improve infrastructure first.	9
Effective active travel facilities into and along Park Street e.g., Cycle lanes, foot paths,	7
Ban / provide alternative routes for high polluting vehicles, e.g., Lorries, Buses, and Trucks	3
Plant Trees / Urban tree planting	3
Filter lane left turn out of park street onto A4063, without traffic lights / on green for longer.	2
Incentive Taxi companies move to hybrid vehicles.	2
Stop cutting down mature trees / penalties for contractors that cut down protected trees.	2
Children to go to schools within their catchment area, reduce congestion.	2
Deny access right hand turn access to Glan-Y-Parc from traffic coming down Park Street.	2
New regulations on wood burners.	2
Yellow lines along the whole of Park Street, to stop vehicles stopping on road.	2
Compulsory purchase of impact houses to widen road.	1
Additional pedestrian crossing and lights at St Leonard's Road Junction.	1
Noise cameras to identify anti-social drivers. E.g., those with modified exhaust systems.	1
Use land for electric car charging stations rather than housing developments	1
Stop traffic turning right from Park Street into Angel Street.	1
Create bypasses around the town centre.	1
Development of 15-minute communities, making active travel an easier option.	1
Adjust left hand filter light from Park Street to sync with right hand turn from the roundabout.	1

Consider new road systems and layouts in and around Bridgend e.g., one-way systems to improve flow of traffic	1
Restriction of Park Steet / St Leonards Road junction – including compulsory purchase of part of properties on the south east corner of junction to install mini roundabout at the junction. Remove queuing and congestion.	1
Incentives for active travel and electric cars	1
Implement 20 mph speed limit on Park Street.	1
Park and ride option for Park Street	1
Consideration for alternative routes when undertaking road works.	1
20mph would be pointless due to traffic.	1
Greener infrastructure	1
Parking charges to discourage diesel vehicles	1
Ghost lane into Heol-Y-Nant is dangerous and led to near accidents	1
Access to St Leonard's Road should be residents' access only.	1
No through traffic on Park Street.	1
Alternative school buses route.	1
Local traffic only, enforced with owner registration and ANPR.	1
Total waste of time, movement to non-polluting vehicles in 3 years.	1
Plan is good	1
Improved charging points for electric vehicles	1
More efficient and cost-effective public transport	1
Put box junction with yellow hatched markings at the junction of Cae Dre Street and Park Street.	1
Make the forward/right turn lane at the traffic lights at the bottom of Park St longer by using more of the available space (moving the road markings over.	1
Pedestrian bridges with ramps over traffic light-controlled junction.	1

Parking for resident parking permit only. Stop vehicles stopping on the road.	1
Model the time dependent data properly, taking the east bound and west bound traffic in Park Street separately.	1
Always green left-hand filter at bottom of Newcastle Hill.	1
Long-term replacement for lower Park Street – diverting eastbound traffic along Heol-Y-Parc.	1
More publicity and awareness for motorists.	1

As shown in the table above, the top four themes identified are as followed: **9 comments** mentioned the Council should stop developments and planning proposals in locations where pollution is already high and improve infrastructure first. **7 comments** were relating to putting in place effective active travel facilities into and along Park Street e.g., Cycle lanes, foot paths. **3 comments** referred to banning / provide alternative routes for high polluting vehicles, e.g., Lorries, Buses, and Trucks. An additional **3 comments** mentioned planting trees / Urban tree planting.

Which of these measures would you personally consider taking to improve air quality within the Park Street AQMA? Please tick all that apply.



This question was format as a multi-choice, allowing respondents to choose all options that apply to them. As shown in the graph above, **46 respondents (68%)** selected they would consider walking more, to help improve the air quality within Park Street. **32 respondents (47%)** said they would consider the use of a lower emission vehicle. **26 respondents (38%)** selected they use the bus and **20 respondents (29%)** disclosed they would consider cycling more. **13 respondents (19%)** selected they would share a lift and **3 respondents (4%)**

selected to Join a car club. Whereas **10 respondents (15%)** selected they could consider doing none of the above to help improve the air quality in Park Street.

There was an option for respondents to select other and specify the measure they would consider. Those comments are shown in the table below:

Comment	**Number of responses**
Stop high polluting vehicles, e.g., Buses, Trucks and Lorries.	1
Use an Electric Vehicle and Walk / Cycle	2
Cycling on Park Street is dangerous	1
Active travel in this area poses a health risk	1
Public transport	1
Left as residents' expense, unless council subsidise for those whose health is damaged.	1

Do you have any further comments to make in regard to the Air Quality Action Plan?

33 comments were made for this question. All responses are themed into the table below.

Comment	**Number of responses**
Action plan does not corollate with LDP's and Planning.	4
Active travel needs to be safe before it can be encouraged.	3
More electric charging points in and around Bridgend	2
No data from 2021 / 2022 is included in the report. Data from Covid 19 is irrelevant and misleading.	2
Further research and consultation are needed. Survey is biased.	2
Visibility and speed of cars are a concern	2
Owe it to future generations to improve.	2
Don't introduce tolling. Use signage for awareness.	1
Something needs to be done to stop anti-social drivers.	1
Do not support 20mph zones.	1
Action needs to be implemented.	1
Provide alternative routes for use.	1
Safe pedestrian crossing is needed in lower park street.	1
Free flowing filter lane from Park Street onto Tondu road would help traffic flow.	1
Work with planning departments	1
Pollution in the area is caused by people commuting through the area.	1
Encourage taxis to move to Electric vehicles / increase license cost for diesel.	1
Anti-idling will cause increase in noise and pollution from restarting engines.	1
Council could make a difference: Solar panels on building and Tree planting.	1
Children to attend school's closest to their home to reduce	1

commute.	
School traffic focus: Parking limits	1
Information campaigns are not effective and waste of resources	1
Regular updates on options and progress for residents.	1
Residents should be regular informed when pollution levels are high.	1
Health screening for residents for pollution effects on residents.	1
Ensure all residents of Newcastle ward are notified of the consultation in time to participate.	1
Zebra crossing around St Leonard's Road for safety.	1
Waste of public money.	1
Right hand turners up St Leonard's Road are not a significant factor	1

As shown in the table above, the top three comments are as followed: **4 comments** mentioned the Action plan does not corollate with LDP's and Planning proposals for the area. **3 comments** referred to the safety of active travel plans within the area before they can be encouraged. **2 comments** suggested the need for more electric charging points in and around Bridgend.

8. Conclusion

Bridgend County Borough Council's 2018 Annual Progress Report (APR) documented and made the recommendation to implement and raise an Order for an Air Quality Management Area (AQMA), designated to Park Street, Bridgend. On 18th September 2018 BCBC's Cabinet approved the 2018 LAQM APR for Bridgend County Borough. The report examined datasets captured during 2017 and noted that Park Street, Bridgend was an area of particular concern and subsequently an Air Quality Management Area (AQMA) was required. It was reported that two nitrogen dioxide (NO_2) non-automated monitoring locations situated at residential facades on Park Street, recorded elevated levels and exceeded annual averages when compared to the annual mean NO_2 Air Quality Objective of 40 µg/m^3.

The report provides a summary of the findings, a wide range of comments were received regarding the proposed mitigation measures for Park Street AQMA. All feedback will be circulated to the responsible officers so that as much feedback as possible can be considered for the process.

8.1. Equality Impact Assessment

The full equality impact assessment will be completed for the Park Street Bridgend, Air Quality Action Plan.

8.2. Summary

Information from this consultation will be used to inform the Air Quality Action Plan for Park Street Bridgend. Information will also be shared with cabinet on (INSERT DATE)

9. Appendices

13.1 Appendix 1: Comments made drop in event 1:

Number of attendees: 9 in total including Cllr Wood & Cllr Easterbrook

Survey /Consultation process feedback:

- Suggestion to consult with residents: Letter / leaflet drop to raise awareness and encourage residents to get involved.
- Feedback on survey: Have shorter survey questions.

Air Quality comments:

- Re-open left Filter Lane at the bottom of Newcastle Hill to reduce congestion.
- Make St Leonard's Road one way access.
- Traffic lights signals timing need to be relooked at.
- Objection for developments and planning proposals for the area will cause a further negative impact to congestion and air quality.
- Congestion is worse at School hours.

13.2 Appendix 2: Comments raised drop in event 2:

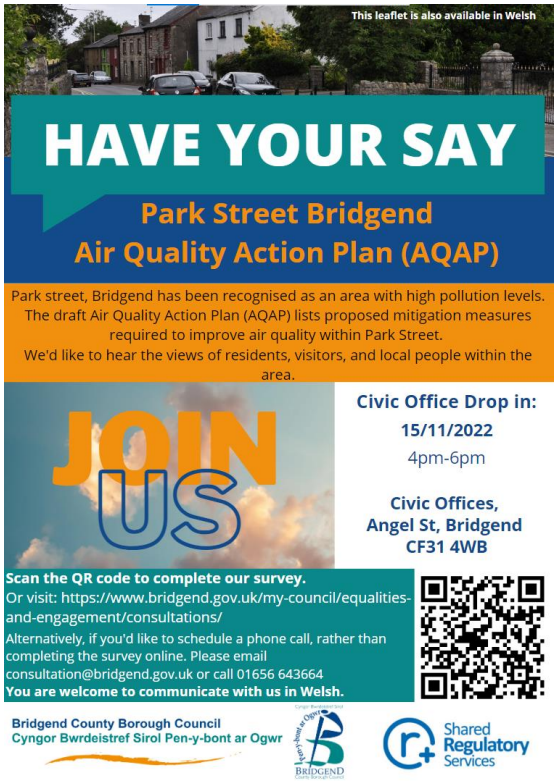
Number of attendees: 7 including Cllr Bletsoe and Cllr Wood.

1. Closing roads will result in people's journey's increasing, resulting in further pollution.
2. Proposals do not go far enough.
3. Against the LDPs
4. Planning and development proposals for Coed Park and Sunnyside will have a further negative impact with more cars passing through Park Street.
5. Need infrastructure in and around park Street that supports the housing
6. Traffic management at bottom of Park Street - heavy traffic at off peak times
7. Suggestion of micro-Roundabout by St Leonards Road.

8. Traffic coming west and down park street is a major contributor
9. Bottom of park street needs to be free flowing. Traffic management at bottom of Park Street - heavy traffic at off peak times
10. Increased traffic from proposed doctors' surgery.
11. Needs to be taken further / more research.
12. No infrastructure to support less cars being on the roads. Buses are cut. Green infrastructure is needed. E.g., Park and ride facilities
13. Crossing Park street - cars turning right help pedestrians to cross.
14. Questions of time limits of implementation
15. Feedback on light timings - tailbacks are longer. Continuous line up. (Worked against the flow of traffic).
16. Green infrastructure is needed.
17. Traffic lights coming west from park street.
18. Wood burners and smoke control.
19. Clean air area around Park Street.
20. Safety of pedestrians needs to be considered.

13.3 Appendix 3: Leaflets for Drop in events.

Leaflets were posted in both English and Welsh Language.



13.4 Appendix 4: Email responses from residents.

Comments on the AQAP

Reason for rejecting mitigation Measure (18)

Measure no (18) would simply move the air pollution elsewhere, with vehicles accessing everything to the north of St Leonard's Road by passing further along Park Street, turning up Heol Nant, and coming back along West Road. The air pollution might not be so concentrated at nos 90-99 Park Street without the queues, but more pollution would be emitted due to the longer journeys.

Further suggestions

1) Complete reconstruction of the Park Street/St Leonard's Road junction. The options here would require compulsory purchase of part of the curtilage of the properties on the southeast corner of this junction: -
   a) Install mini-roundabout at the junction. This would remove any possibility of queuing as vehicles turning right up St Leonard's road would have right of way over any eastbound traffic crossing the junction. This would also have the added advantage of slowing down traffic approaching the junction (without stopping it), this would make the junction safer due to its deficient vision splay when exiting St Leonard's Road.
   b) Install a ghost junction with a right hand turning dedicated lane. This would require more property area to be acquired, and would only reduce the possibility of queueing, rather than eliminate it.
2) Rather more radically, implement new route alternative to the Park Street hill - give residents of the Newcastle area new access by opening up Newcastle Hill. This could be done by creating a right turn ghost junction at the bottom of Park Street into the area

behind the defunct Wicked Lady pub, followed by a left hand turn up the now opened up Newcastle Hill, which would be a one-way Street going up. This would have the advantage of removing the need for Newcastle residents to turn right into St Leonard's Road and would advantage the Newcastle Hill residents as they would have quicker, more direct, access to their properties. While the gradient of Newcastle Hill is steep (1:8), it's no worse than the gradient of Coed Parc Court (1:7), and vehicles would be travelling upwards against gravity by the same elevation as by the St Leonard's Road route, so no extra energy expenditure producing emissions would be involved.

3) If no (18) was implemented a pedestrian crossing would need to be installed to cross Park Street immediately to the west of the St Leonard's Road junction. This is because the visibility of oncoming traffic coming up Park Street to a pedestrian crossing the road (north to south following the path down to Newbridge fields) is limited, and the only safe way to avoid an accident with a fast vehicle is to wait for a vehicle turning right up St Leonard's Road, giving a safe opportunity to cross when there is no nearby eastward travelling traffic. This would of itself cause queuing of traffic, but it would be of shorter duration and less frequent than the queuing now.
4) Referring to the list of mitigation measures, no (19) would be pointless. Since Park Street is the main road ging west out of Bridgend centre, Vehicles would turn right exiting Angel Street, go round the Embassy roundabout and come back at Park street to turn right into it. Alternatively, they would seek to exit Angel Street in the opposite direction and joining Park Street via Glan-y-Parc.

Traffic light idea, and main polluting traffic stream?

AN

alistair nelson <alistairnel@outlook.com>
To Spear, Adam(SRS)
Cc Cllr Steven Bletsoe; Cllr Timothy Wood

Reply | Reply All | Forward

Wed 16/11/2022 10:38

You replied to this message on 16/11/2022 13:32.

bridgend-park-street data Nov 2022.pdf
22 KB

Hi Adam,

Following up on my suggestion late yesterday afternoon. I wonder if consideration has been given to putting traffic light control on Park Street approaching the St Leonards junction from the west, but not from the east coming up the hill. If that was for some of the time (50% ?) on red then that would reduce the length of the queue going down Park Street. This queue is frequently all the way up the hill from the bottom to past St Leonards. Joining the queue from Walters Road if there is a queue it usually takes two light changes to get past the traffic lights at the bottom junction. A Red light on the section west of St Leonards would mean two light changes for traffic coming from that direction, one before St Leonards and one at the bottom of Park Street (the downward queue having been reduced). So the delay for that traffic would be minimal. But it would reduce the length of queuing on the downward slope of Park Street, displacing it to the flat section west of St Leonards – there would hopefully be less downward queuing in the Terraced house/canyon section (which I think may be significant – see below).

The effect would also avoid right hand turns causing an upward queue when the light was Red – road signs and markings would have to make it obvious to that traffic that they were free to turn. If the lights were red 50% of the time then that could reduce upward queuing significantly and bring down the annual average below 40. Obviously this would need detailed modelling, which I guess has not been done.

Looking at the actual data for the past two weeks (see attached graph), it's obvious that there is a distinct double peak structure in the daily data, one around 9am and another (often smaller) around 5pm. There are exceptions, like peaks on Friday around 7pm and Saturday and Sunday around midday. This could be used to specify the operation times of the Traffic light west of St Leonards.

The early morning peaks and the Friday, Saturday and Sunday ones I would ascribe to downward queuing due to traffic heading into Bridgend. The weekday evening ones could be right hand turner queues due to traffic coming out of Bridgend. If that were the case then the right hand turners are not the worst offenders, it's the downward queue going into Bridgend! From personal experience I know that I spend more time, perhaps up to 5 minutes in the downward queue, compared to less than a minute normally queuing to turn right into St Leonards. Has any consideration been given in the modelling to the varied usage of Park Street through a 'normal' day, or any attempt to identify which traffic stream is the main culprit? The time resolved data gives a clue!

Cheers, Alistair