Cumberland Council (Carlisle Area) Air Quality Action Plan

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

January 2021 (Updated October 2023)

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Executive Summary

This Air Quality Action Plan (AQAP) has been produced as part of our statutory duties required by the Local Air Quality Management framework. It outlines the action we will take to improve air quality in Cumberland Council (Carlisle Area) between now and the next five years.

This action plan replaces the previous action plan which ran from 2012 until 2020. Projects delivered through the past action plan include:

- Completion of the Carlisle Northern Development Route.
- Improvements in traffic management, including Smart Signalling at Hardwicke Circus.
- Improvements in bus service.
- Improved cycling and walking routes.

Air pollution is associated with a number of adverse health impacts. It is recognised as a contributing factor in the onset of heart disease and cancer. Additionally, air pollution particularly affects the most vulnerable in society: children and older people, and those with heart and lung conditions. There is also often a strong correlation with equalities issues, because areas with poor air quality are also often the less affluent areas[1,2].

The annual health cost to society of the impacts of particulate matter alone in the UK is estimated to be around £16 billion[3]. Cumberland Council is committed to reducing the exposure of people in Carlisle and the surrounding areas to poor air quality in order to improve health.

We have developed actions that can be considered under nine broad topics:

- Alternatives to private vehicle use
- Freight and delivery management
- Policy guidance and development control
- Promoting low emission transport
- Promoting travel alternatives
- Public information

[1] Environmental equity, air quality, socioeconomic status and respiratory health, 2010
[2] Air quality and social deprivation in the UK: an environmental inequalities analysis, 2006
[3] Defra. Abatement cost guidance for valuing changes in air quality, May 2013

- Transport planning and infrastructure
- Traffic management
- Vehicle fleet efficiency

Our priorities are:

- Undertake signal improvements at the Bridge Street junction to improve traffic flow and reduce the number of vehicles stopping at the pedestrian crossing.
- Continue to make progress on the 'southern bypass' project.
- Continue to work with the planning department to ensure air quality implications are considered within the planning process.
- Improve cycle/pedestrian links.

In this AQAP we outline how we plan to effectively tackle air quality issues within our control. However, we recognise that there are a large number of air quality policy areas that are outside of our influence (such as vehicle emissions standards agreed in Europe), but for which we may have useful evidence, and so we will continue to work with regional and central government on policies and issues beyond Cumberland Council's direct influence.

Responsibilities and Commitment

This AQAP was prepared by the Environmental Health Department of Cumberland Council with the support and agreement of the following officers and departments:

- Cumberland Council, Highways Manager.
- Cumberland Council, Highways and Transport department.
- Ricardo Energy and Environment, Air Quality Consultants.

On 28th January 2021, this Action Plan was presented to the Executive Committee, as part of the approval and consultation process with key stakeholders. The Plan was approved, no major changes were requested.

This AQAP will be subject to an annual review. Appraisal of progress each year will be reported in the Annual Status Reports (ASRs) produced by Cumberland Council, as part of our statutory Local Air Quality Management duties.

Each year the ASR is taken for consideration to the Health and Wellbeing Overview and Scrutiny Committee for an update on the Action Plan measures.

Following an appraisal by Defra in December 2022 a number of minor amendments were made to this AQAP to take into account the comments made. Changes were also made to the wording and branding following a merge between Carlisle City Council, Allerdale Council, Copeland Council and Cumbria County Council to become Cumberland Council. The AQAP was updated in October 2023 to reflect these changes.

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1 Introduction

This report relates only to the Carlisle Area of Cumberland Council, previously known as ‘Carlisle City Council’. On 1st April 2023 Cumberland Council replaced Cumbria County Council and the three local authorities: Carlisle City Council, Allerdale Borough Council and Copeland Borough Council.

This report outlines the actions that Cumberland Council will deliver in order to reduce concentrations of air pollutants, particularly in locations where there is public exposure to air pollution; thereby positively impacting on the health and quality of life of residents and visitors.

It has been developed in recognition of the legal requirement on the local authority to work towards Air Quality Strategy (AQS) objectives under Part IV of the Environment Act 1995 and relevant regulations made under that part and to meet the requirements of the Local Air Quality Management (LAQM) statutory process.

This Plan will be reviewed every five years at the latest and progress on measures set out within this Plan will be reported on annually within Cumberland Council’s air quality Annual Status Report (ASR).

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2 Summary of Current Air Quality in Carlisle

Air pollutant concentrations remain below air quality standards at all locations apart from nitrogen dioxide (NO_2) measured on Bridge Street, which lies within an Air Quality Management Area (AQMA 4). A summary of air quality monitoring since 2006 throughout the council area is presented in the latest ASR report[4]. Nitrogen dioxide, PM_{10} and $PM_{2.5}$ are measured using automatic analysers at Paddy's Market[5] Car Park near Bridge Street. In addition, NO_2 is measured at twenty-eight locations including Bridge Street, using passive diffusion tube samplers.

Monitoring data from the automatic analyser shows that PM_{10} and $PM_{2.5}$ concentrations have decreased since monitoring started in 2006 and 2009, respectively (Figure 2-1). Similarly, a decline for nitrogen dioxide over the monitoring period is shown in Figure 2-2 . Although the concentrations of NO_2 measured using the automatic analyser are somewhat below the air quality standard the diffusion tube sampler just across the road and within AQMA 4 at Site E8 (opposite Milbourne Street) on Bridge Street shows levels just above the standard. The large differences in concentration could be explained as follows: the diffusion tube at Site E8 was located on a building façade at a height of 2.2 m, was four metres from the road and downwind of the road whereas at Paddy's Market, the samplers are at a height of three metres, are in a more open location, are further from Bridge Street (nine metres) and upwind of the road.

Also, AQMA 4 is located on an incline with sometimes slow moving or queuing traffic, under these conditions oxides of nitrogen emissions from heavy goods vehicles are expected to be greater compared to travelling on the horizontal.

When the building is occupied the façade, within AQMA 4, would be representative of a location relevant for exposure.

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[4] https://www.carlisle.gov.uk/Portals/0/ASR_CCC_2020_FINAL.pdf?ver=hGKF1VQIteNPjpW-yZGdmw%3d%3d%20Quality%20Annual%20Status%20Report.pdf

[5] Paddy's Market is also known as Carlisle Roadside. Further information about the site can found from Defra's website: https://uk-air.defra.gov.uk/networks/site-info?uka_id=UKA00526

Figure 2-1 Annual mean concentrations for PM_{10} and $PM_{2.5}$ measured at Paddy's Market.

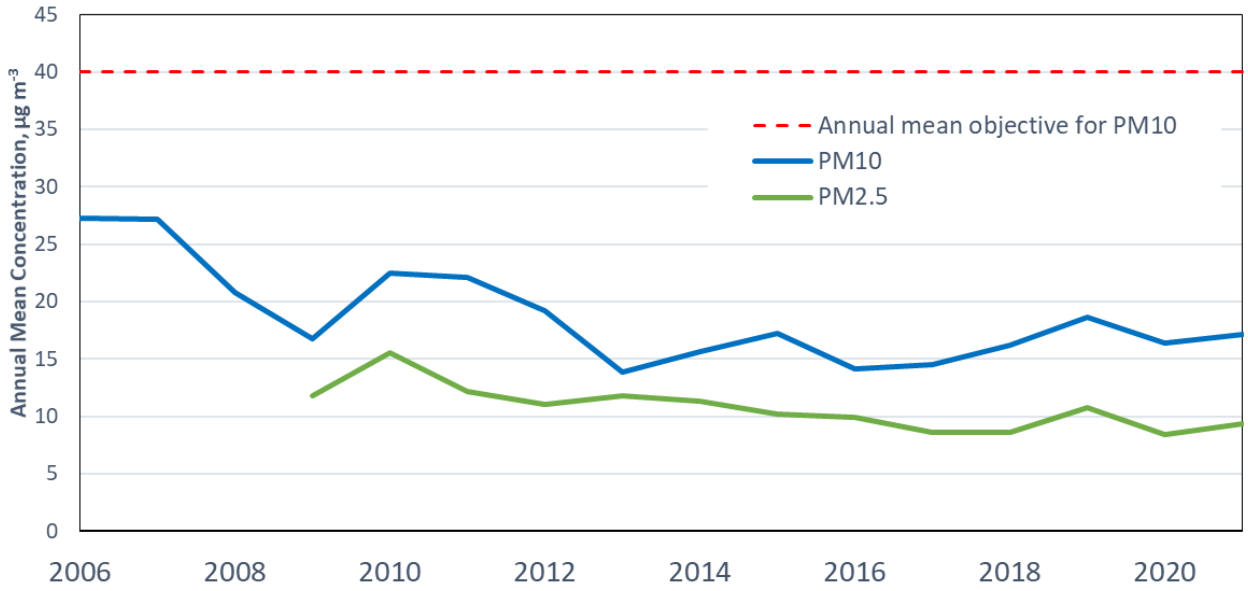
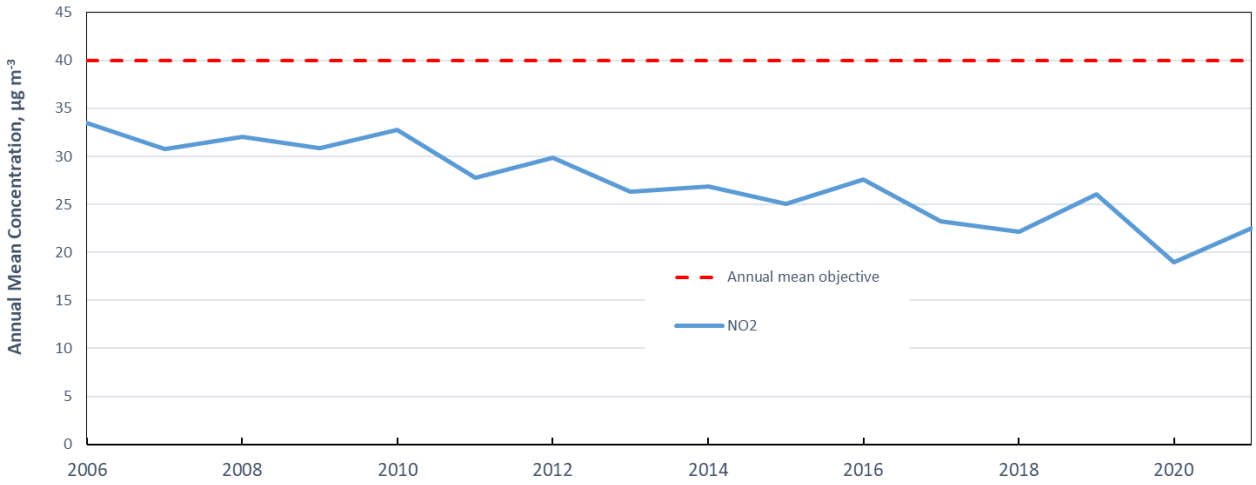


Figure 2-2 Nitrogen dioxide concentrations measure at Paddy's Market



AQMA 3 (Wigton Road) and AQMA 6 (London Road) were revoked in 2019 and AQMA 1 (A7) was substantially reduced in size. The location of the existing AQMA and a number of nearby diffusion tubes are shown in Figure 2-3. Concentrations measured at these sites are presented in Figure 2-4 and Figure 2-5. Nitrogen dioxide concentrations are seen to decrease steadily at most locations – with only Bridge Street (located in AQMA 4) showing an exceedance.

Figure 2-3 AQMAs and nearby diffusion tubes in Cumberland Council (Carlisle Area)

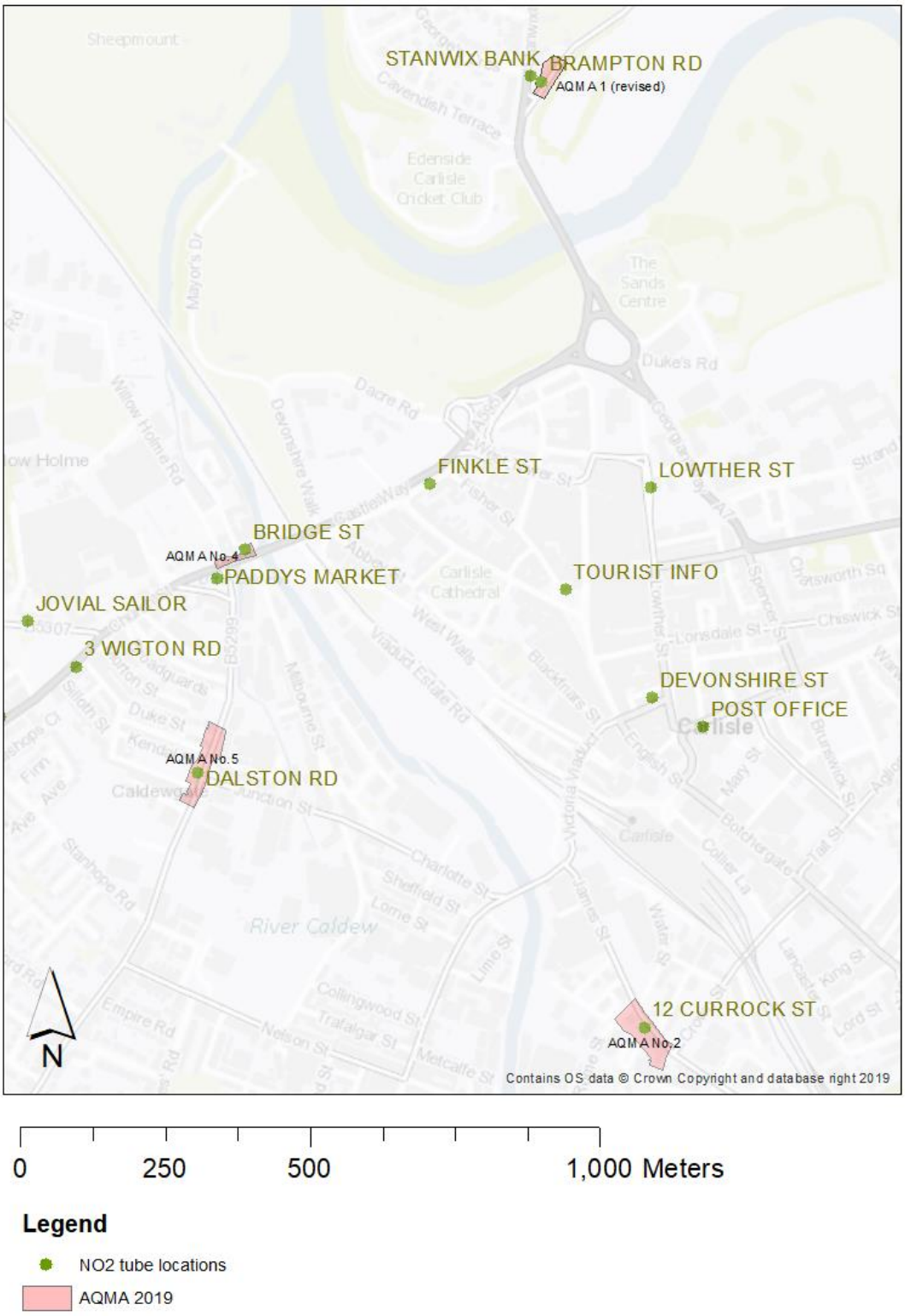


Figure 2-4: Nitrogen dioxide concentrations measured

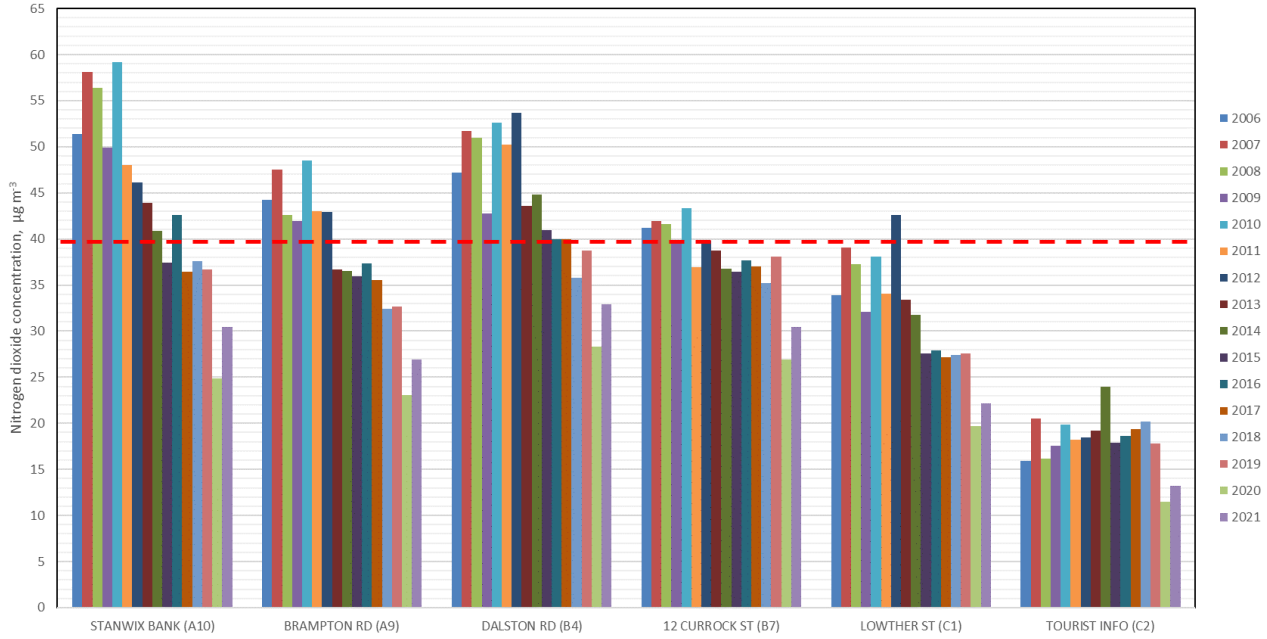
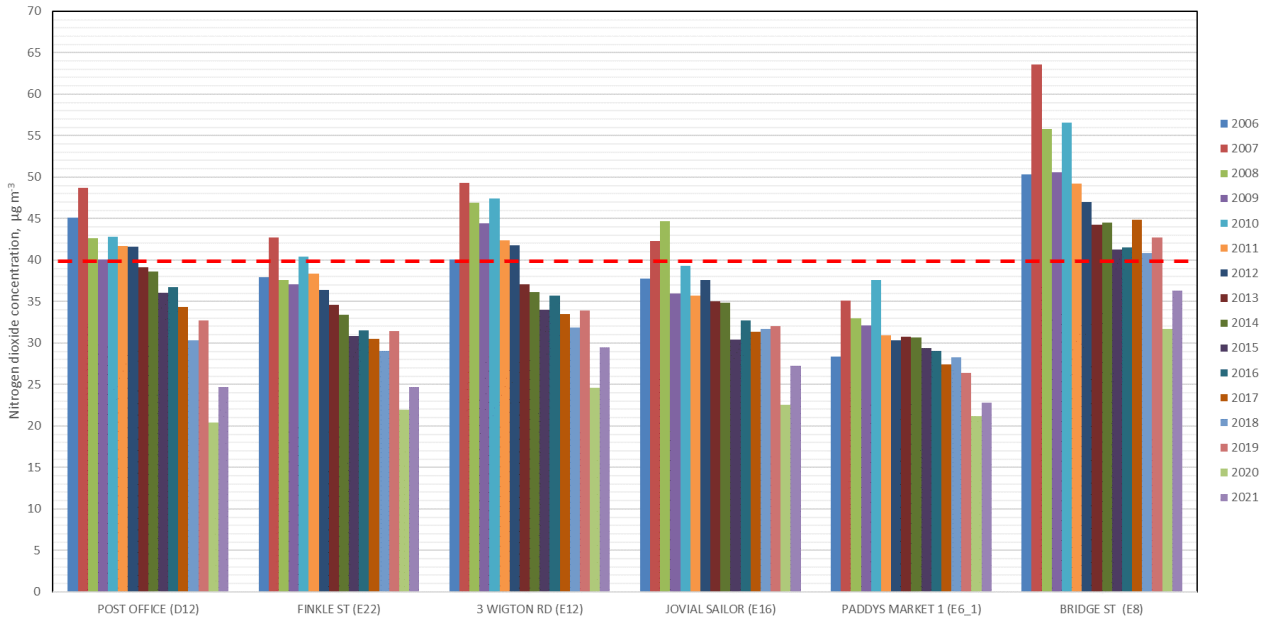


Figure 2-5: Nitrogen dioxide concentrations measured



The reduction in in nitrogen dioxide concentration is likely to be due to lower emissions of NOx from road transport due to the increase in new cleaner Euro 6 vehicles in the fleet.

3 Cumberland Council's Air Quality Priorities

3.1 Public Health Context

Although monitoring data for $PM_{2.5}$ in Carlisle shows compliance with the air quality standard, local authorities are expected to work towards reducing emissions and concentrations of $PM_{2.5}$ (particulate matter with an aerodynamic diameter of 2.5µm or less), as detailed in Policy Guidance LAQM.PG16 (Chapter 7). There is clear evidence that $PM_{2.5}$ has a significant impact on human health, including premature mortality, allergic reactions, and cardiovascular diseases.

Work carried out by Public Health England as part of the Public Health Outcomes Framework (PHOF) shows that the mortality associated with particulate air pollution within Cumberland Council (Carlisle Area) is 3.4%. This information is available from the following web link:

http://www.phoutcomes.info/search/air#page/1/gid/1/pat/6/par/E12000008/ati/101/are/E07000113/iid/30101/age/230/sex/4

and displayed in Figure 3-1 against the values calculated for north west England (4.3%) and England (5.2%).

Figure 3-1 Fraction of mortality attributed to particulate air pollution in Cumberland Council

Indicator	Period	Carlisle			Region	England	England		
		Recent Trend	Count	Value	Value	Value	Worst/ Lowest	Range	Best/ Highest
D01 - Fraction of mortality attributable to particulate air pollution New data	2018	–	-	3.4%	4.3%	5.2%	7.3%		2.9%

The measures undertaken by Cumberland Council to address $PM_{2.5}$ were summarised in the latest ASR report[6]. They include working with the Highways Department, the Highways Agency and the Council Planning department to ensure that developments do not unduly impact air quality. Also, the council will continue to provide comprehensive control over Part A2 and Part B processes and ensure that the Smoke Control Areas are enforced.

These measures along with national measures have resulted in the Paddy's Market sampling meeting the WHO guideline concentration of 10 µg m^{-3} since 2015. Meeting

[6] https://www.carlisle.gov.uk/Portals/0/ASR_CCC_2020_FINAL.pdf?ver=hGKF1VQIteNPjpW-yZGdmw%3d%3d 20Annual%20Status%20Report.pdf

this guideline concentration and reducing exposure to $PM_{2.5}$ forms an important part of the Clean Air Strategy[7].

3.2 Planning and Policy Context

As with the 2012 AQAP[8], the current AQAP is intrinsically linked to other important national and local policy and plans including:

- National Planning Policy Framework[9];
- Local Plan (2015-2030);
- Local Transport Plan;
- Local Development Plan;
- Carlisle City Centre Development Framework;
- Clean Air Strategy 2019[10];
- UK Plan for Tackling Roadside Nitrogen Dioxide Concentrations[11].

Supplementary planning guidance for developers is provided in Appendix C.

3.2.1 Carlisle District Local Plan 2015-2030

The Carlisle District Local Plan 2015-2030[12] sets out a long-term spatial vision and strategic objectives to support the development of a thriving District through the identification of land to accommodate new development, and policies to achieve this growth in a positive, managed and sympathetic way, whilst ensuring the timely delivery of the infrastructure necessary to support growth is written with the aim of contributing to sustainable development.

The Council's plan sets out a number of planning policies that are used when making decisions on planning applications for development. The policies relate to the

[7] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/770715/clean-air-strategy-2019.pdf
[8] https://www.carlisle.gov.uk/LinkClick.aspx?fileticket=r3R76WJIhuI%3d&tabid=729&portalid=0&mid=2838
[9] https://www.gov.uk/guidance/national-planning-policy-framework
[10] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/770715/clean-air-strategy-2019.pdf
[11] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/633270/air-quality-plan-detail.pdf
[12] https://www.carlisle.gov.uk/Portals/24/Documents/Local_Plan/Carlisle%20District%20Local%20Plan%202015-2030/Carlisle%20District%20Local%20Plan%202015-2030.pdf?timestamp=1586016997843

location of development, traffic generation, accessibility to public transport and other sustainable modes of transport, which will contribute to protecting air quality.

Examples of some of these policies are shown below:

Policy SP 1 - Sustainable Development

When considering development proposals Cumberland Council will take a positive approach that reflects the presumption in favour of sustainable development contained in the National Planning Policy Framework (NPPF). It will always work proactively with applicants, and communities, jointly to find solutions which mean that proposals can be approved wherever possible, and to secure development that improves the economic, social and environmental conditions.

The Carlisle District Local Plan is the first reference point for those involved in the determination of planning applications. The NPPF makes it clear that local planning documents should reflect the presumption in favour of sustainable development and Policy SP 1 responds to this requirement.

The key paragraphs within the NPPF related to air quality are presented in Appendix C.

Policy SP 2 - Strategic Growth and Distribution

All new development will be assessed against its impact upon the transport network. Development that will cause severe issues that cannot be mitigated against will be resisted. Development likely to generate significant levels of transport within isolated and poorly accessible areas will be resisted unless a clear environmental, social or economic need can be demonstrated. Sufficient land will be identified to accommodate 9,606 net new homes between 2013 and 2030.

Policy SP 9 - Healthy and Thriving Communities

The impact of our environment on the health and wellbeing of the population is being increasingly recognised in health plans, strategies and policy statements and in national planning policies. Good public transport, in combination with cycling and walking, can reduce air pollution, noise and greenhouse gas emissions, energy consumption and congestion.

Policy IP 2 - Transport and Development

All new development will be assessed against its impact upon the transport network. Development that will cause severe issues that cannot be mitigated against will be resisted. Development likely to generate significant levels of transport within isolated

and poorly accessible areas will be resisted unless a clear environmental, social or economic need can be demonstrated.

Policy IP 3 - Parking Provision

Where appropriate, proposals for new development will be expected to provide a minimum number of parking spaces per new dwelling/m^2 of floor space depending on the type and location, in consultation with the Local Highway Authority and in accordance with any local standards in operation. In all areas the need to encourage the use of alternative means of travel, other than the private car, shall be an important consideration when applying parking standards.

Policy CM 5 - Environmental and Amenity Protection

Development will not be permitted where:

1. it would generate or result in exposure to, either during construction or on completion, unacceptable levels of pollution (from contaminated substances, odour, noise, dust, vibration, light and insects) which cannot be satisfactorily mitigated within the development proposal or by means of compliance with planning conditions.

2. it would cause demonstrable harm to the quality, quantity and associated ecological features of groundwater and surface waters or impact on human health.

3. it is on contaminated or unstable land which would pose an unacceptable risk to human health or the environment, unless suitable mitigation and/or remediation is or can be carried out to ensure safe development.

4. it would be subject to unacceptable risk from existing hazardous installations; and/or

5. proposals for new hazardous installations (e.g. certain gases, liquids and explosive chemicals) pose an unacceptable risk to the health or safety of users of the site, neighbouring land and/or the environment.

Proposals may be required to submit detailed assessments in relation to any of the above criteria to the Council for approval.

Where development is permitted which may have an impact on such considerations, the Council will consider the use of conditions or planning obligations to ensure any appropriate mitigation measures are secured.

Policy GI 3 - Biodiversity & Geodiversity

When considering planning applications and the need to conserve and enhance biodiversity, the following principles apply:

1. permission for development will be refused if significant harm resulting from development cannot be avoided, adequately mitigated or, as a last resort, compensated for.
2. proposals where the primary objective is to conserve or enhance biodiversity will be approved.
3. the incorporation and integration of wildlife corridors and other habitats in and around development sites will be required, wherever the opportunity arises.
4. species appropriate provision will be sought on development sites to encourage an increase in biodiversity and.
5. development which would result in the loss or deterioration of irreplaceable habitats, including ancient woodland and the loss of aged or veteran trees found outside ancient woodland will be refused unless the need for, and the benefits of, the development in that location clearly outweigh the loss.

3.2.2 Local Transport Plan 3 (2011 -2026)[13]

The Local Transport Plan (LTP) is the statutory planning document that sets out the council's vision, strategy and policies for transport. It also describes the approaches and measures that will be taken to implement these policies in each Cumbrian Authority. The plan provides the framework to co-ordinate the local delivery of integrated transport and seeks improvements to our transport systems.

The LTP 3 was referenced in the 2012 AQAP and many of the issues raised, such as poor parking, have been considered further in the Carlisle District Local Plan

Within LTP 3 there is a priority to improve resident's ability to access jobs, services and healthcare in rural areas.

[13] https://www.cumbria.gov.uk/eLibrary/Content/Internet/544/942/41075102846.pdf

3.2.3 Carlisle City Centre Development Framework (2015)[14];

The Carlisle City Centre Development Framework provided part of the evidence base to identify site specific allocations for commercial development. Proposals included developments at Rickergate and Lowther Street area, Citadel and Caldew Riverside

3.2.4 Carlisle Plan (2015-2018) [15]

The Carlisle Plan has a vision to improve the health, wellbeing and prosperity of the people of Carlisle.

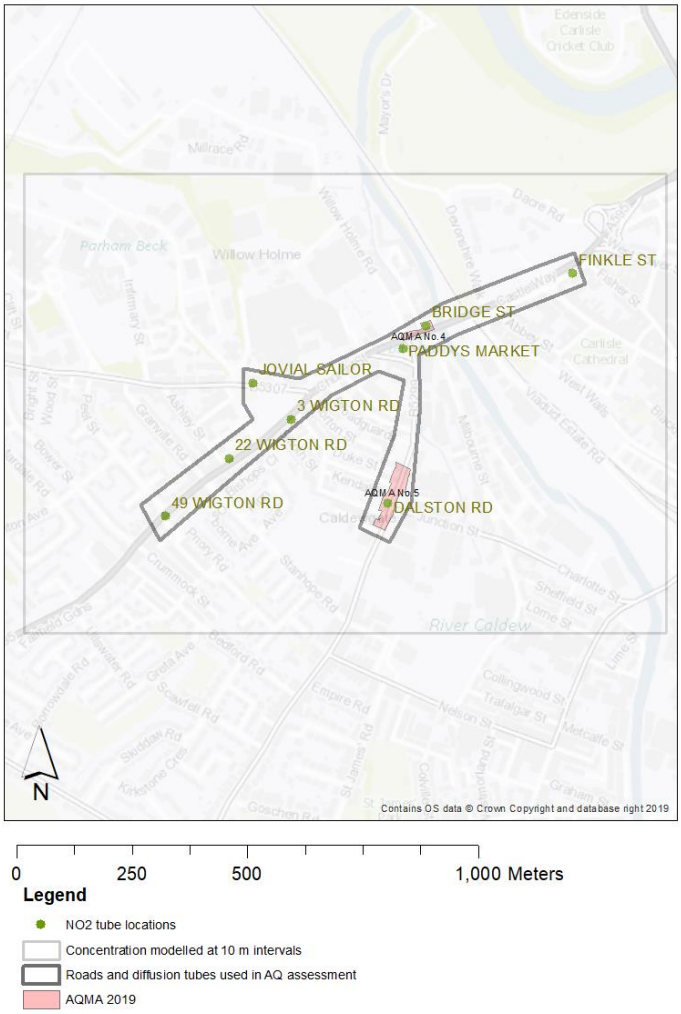
3.3 Source Apportionment

To better understand the sources of emission in Bridge Street and the surrounding roads an analysis, known as source apportionment, has been undertaken. In addition, the modelling of nitrogen dioxide levels to predict the impact of measures to achieve compliance with the air quality standard was extended to include a number of monitoring stations that would be needed for model verification and the Dalston Road AQMA (AQMA 5). The modelling domain is shown in Figure 3-2.

[14] https://www.carlisle.gov.uk/LinkClick.aspx?fileticket=PLdhlv1pa3E%3d&portalid=24&timestamp=1586089930364

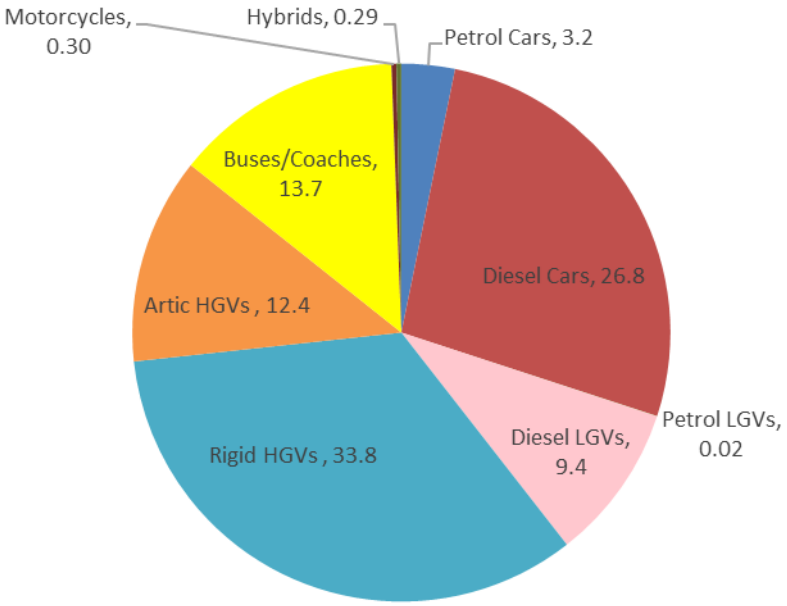
[15] https://www.carlisle.gov.uk/Portals/0/Documents/Council/Council_and_Democracy/Carlisle%20Plan%202015-18%20-%20screen.pdf

Figure 3-2 Modelling domain.



Oxides of nitrogen emissions were calculated using the Emission Factor Tool (EFT2019_v9.0.xlsb). ADMS Roads 4.1 was used to calculate the oxides of nitrogen concentration along each road link. Traffic data were provided by the Highways department. A description of the traffic data and road speeds are presented in Appendix D. The relative amounts of oxidise of nitrogen released from Bridge Street are shown in Figure 3-3.

Figure 3-3 The percentage source contributions with Bridge Street



Vehicle Type	Percentage, %
Rigid HGVs	33.8
Diesel Cars	26.8
Buses/Coaches	13.7
Artic HGVs	12.4
Diesel LGVs	9.4
Petrol Cars	3.2
Motorcycles	0.30
Hybrids	0.29
Petrol LGVs	0.02
Sum:	100

The largest emission source is from rigid heavy goods vehicles (33.8 %), followed by diesel cars (26.8 %), buses (13.7 %), articulated heavy goods vehicles 12.4 %, diesel light goods vehicles (9.4 %) and petrol cars (3.2 %).

3.4 Required Reduction in Emissions

3.4.1 Required NOx emission

A reduction of oxides of nitrogen emissions of 1.8 µg m^{-3}, or 2.7 % is required on Bridge Street to meet the annual objective of 40 µg.m^{-3} for nitrogen dioxide. This was calculated in accordance with Section 7.86 (and Box 7.6) of the Technical Guidance LAQM (TG16). Table 3-1 shows the background NOx concentrations, current roadside NOx implied from the measured NO_2 concentration and NOx concentration that would allow compliance to take place. Details of this methodology are provided in Appendix D.

Table 3-1 Nitrogen dioxide measured within the Bridge Street AQMA and the required NOx emission reduction required to achieve compliance

NO_2 measured at sampling site, µg m^{-3}	NOx background, µg m^{-3}	Roadside NOx from NO_2 calculator, µg m^{-3}	Road NOx to achieve compliance, µg m^{-3}	Road NOx reduction required, µg m^{-3}	Percentage road NOx reduction, µg m^{-3}
40.8	16.3	64.2	62.45	1.8	2.7%

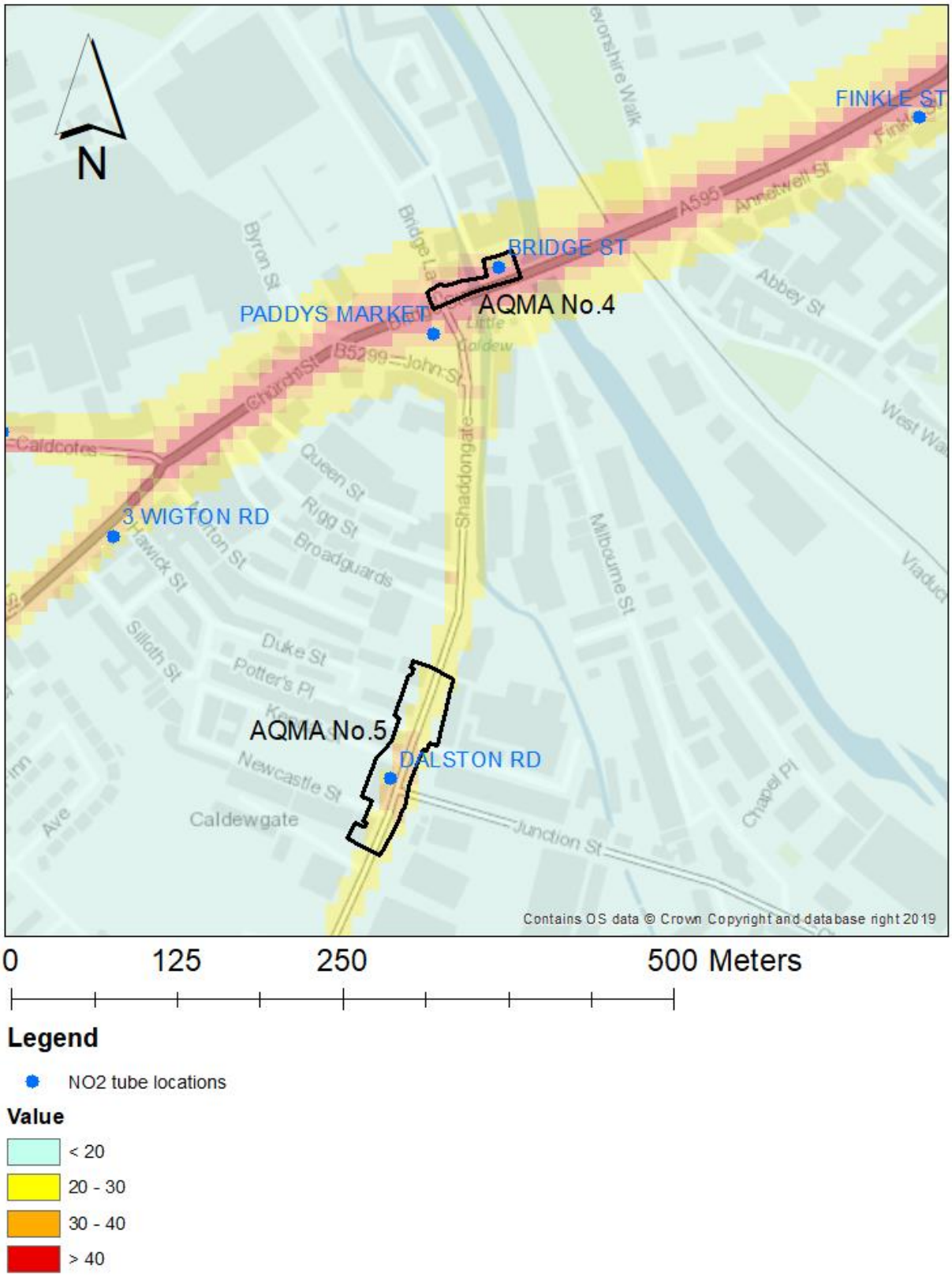
3.4.2 Nitrogen dioxide concentrations within AQMA 4 on Bridge Street

The oxide of nitrogen emissions within Bridge Street and the surrounding roads were modelled using the dispersion model ADMS Roads. The modelling methodology is described in Appendix D. A map of nitrogen dioxide concentrations in the model domain is shown in Figure 3-4. Concentrations exceeding 40 µg m^{-3} are seen to occur along Bridge Street and Church Street but fall rapidly away from the road.

The highest NO_2 concentrations measured on Bridge Street occurred close to the E8 sampling site. Moving away from this location, both towards Church Street and towards the city centre, resulted in a decrease in concentration as traffic speed increased.

There is no exceedance within the Dalston Road AQMA.

Figure 3-4 Nitrogen dioxide concentrations predicted along Bridge Street in 2018



3.5 Key Priorities

The priorities for Cumberland Council are:

1. to reduce emissions so that concentrations of nitrogen dioxide are below the National Air Quality Objective throughout the Council's area,
2. to ensure that concentrations of nitrogen dioxide remain at levels below the National Air Quality Objectives.
3. to improve public health by taking action to keep air pollution levels as low as they can possibly be.

Priority 1 – Reduce emissions within AQMA 4

The source apportionment shows that traffic emissions from heavy goods vehicles are the main source of air pollution. Only a small reduction in emissions is required to meet the National Air Quality Objectives. Improved traffic management is expected to ensure that these Objectives are met.

Priority 2 – Reduce emissions across Carlisle

The planned growth in population and economic activity in Carlisle could hinder the success of the Air Quality Action Plan. The evolving work currently being carried out to tackle congestion in Carlisle will be key to the success of the Air Quality Action Plan.

Priority 3 – Keep emissions low in the future

Keeping emissions low and reducing them further in the future will require ongoing involvement with relevant transport and planning policies, strategies and plans.

4 Development and Implementation of Cumberland Council AQAP

4.1 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. Schedule 11 of the Environment Act 1995 requires local authorities to consult the bodies listed in Table 4-1. In addition, we have undertaken the following stakeholder engagement:

- Presented the report on the council website
- Promoted the AQAP through social media

The response to our consultation stakeholder engagement is given in Appendix A.

Table 4-1 – Consultation Undertaken

Yes/No	Consultee
Yes	the Secretary of State
Yes	the Environment Agency
Yes	the highways authority
Yes	all neighbouring local authorities
Yes	other public authorities as appropriate, such as Public Health officials
Yes	bodies representing local business interests and other organisations as appropriate

4.2 Steering Group

This AQAP was prepared by the Environmental Health Department of Cumberland Council (Carlisle Area) in partnership with Ricardo. Ricardo are specialist air quality consultants that provide expert advice to Local Authorities on environmental matters. The Highways department were engaged in the development process and provided the traffic count data used in the modelling. The Planning department were also engaged in the development process. As part of the consultation process all the key stakeholders and council departments were invited to make comments and have an input into the development of this final version of this Action Plan.

5 AQAP Measures

Table 5-1 shows the Cumberland Council's AQAP measures for Carlisle. It contains:

- a list of the actions that form part of the plan
- the responsible individual and departments/organisations who will deliver this action
- estimated cost of implementing each action (overall cost and cost to the local authority)
- expected benefit in terms of pollutant emission and/or concentration reduction
- the timescale for implementation
- how progress will be monitored

NB: Please see future ASRs for regular annual updates on implementation of these measures

Table 5-1 – Air Quality Action Plan Measures

Measure No.	Measure	Category	Classification	Year Measure Introduced in AQAP	Estimated / Actual Completion Date	Organisations Involved	Funding Source	Defra AQ Grant Funding	Funding Status	Estimated Cost of Measure	Measure Status	Reduction in Pollutant / Emission from Measure	Key Performance Indicator	Progress to Date	Comments
1	Construction of the new Carlisle Southern Link Road (CSLR). This will extend the existing Carlisle Northern Development Route (CNDR). Monitor the air quality impacts of the CSLR and CNDR.	Traffic Management	Other	<2021	2025	Cumberland Council	Cumberland Council and Ministry of Housing, Communities and Local Government	No	Funding is in place	£150 million	Building work is underway	Potential for significant improvement in NO2 levels across the city centre.	Reduced NO2 levels at monitoring locations and within AQMA's.	The CNDR is operational. Monitoring at receptors on new road revealed consistently low NO2 levels. There is evidence of NO2 improvements and traffic reduction in the city centre. Several new cycle links from arterial roads are in place. Construction of the Carlisle Southern Link Road is underway. Environmental Health assisted in the consultation process. Delays were incurred due to rising costs and supply issues caused by global events. Expected to be open to the public in 2025.	The new Carlisle Southern Link Road is part of the wider Garden Village housing project, which is expected to deliver 10'000 new homes by 2030. The road would extend the existing CNDR. This would provide a complete bypass around the City Centre with both ends of the route connected to the M6 Motorway.
2	Effective traffic management measures will be implemented to improve traffic flow on the existing road network and in new developments.	Traffic Management	UTC, Congestion management, traffic reduction	2012	Ongoing.	Cumberland Council	Cumberland Council	No. 2022 funding bid failed	Ongoing.	Unknown	Ongoing	Modelling undertaken at AQMA 4 indicates that a 2.7% reduction in NOx would achieve compliance.	Reduced NO2 levels and standing traffic within AQMA's.	Traffic modelling has shown that emissions from diesel vehicles dominate emissions. Emissions factor toolkit has been used to show increased traffic speeds would reduce oxide of nitrogen emissions within Bridge Street AQMA. Work has been carried out to the traffic light sequence in this area to reduce standing start traffic. Early data indicates a significant improvement in NO2 levels within the AQMA.	Improvements to the signalling on Castle Way and Bridge Street was implemented in August 2022. Early monitoring data shows significant improvement. A funding bid to make wider improvements to traffic management around Bridge St AQMA including automatic NOx measurements was rejected by Defra.
3	Environmental Health will work alongside the Planning Department to minimise the air quality impacts of new developments.	Policy Guidance and Development Control	Air Quality Planning and Policy Guidance	2012	Ongoing	Cumberland Council	Cumberland Council	No	Ongoing.	Unknown	Ongoing.	Not calculated	Effective links between EH and Planning. AQIA's submitted where necessary. Early consultation with applicants.	Environmental Health is consulted on all proposed developments which may impact on air quality. Responses are aimed at minimising AQ impacts, particularly within or close to our AQMA's. This includes large residential developments. Recommendations made for car charging points for all new residential properties.	Environmental Health comment on all potentially polluting developments. The outcome depends on Planning Department and current policy
4	Improvements to passenger transport infrastructure. Sustainable transport will be integrated into major new developments	Transport Planning and Infrastructure	Bus route improvements	2012	Ongoing	Cumberland Council and local public transport providers	Cumberland Council and local public transport providers	No	Ongoing.	Unknown	Ongoing.	Not calculated	Improved bus service. Increased use of transport provided. Reduced NO2 along main routes	Ongoing improvements to bus services with new shelters and raised kerbs. Plans for large new housing developments include public transport provision and/or sustainable transport options.	Success is dependent on public uptake of sustainable transport options. The council has no real control over the improvement of vehicle fleet.
5	Cycling and walking will be encouraged. Implement new and improved pedestrian and cycle links	Transport Planning and Infrastructure	Cycle network	2012	Ongoing	Cumberland Council	Cumberland Council with various funding bids.	No	Ongoing.	Unknown	Ongoing.	Not calculated	Completion of proposed works and ongoing improvement of the cycle and pedestrian route network.	The pedestrian crossing on Castle Way is complete. Pedestrian/cycle bridge connecting Currock and Denton Holme, over the railway line are complete. Ongoing applications for government funding for schemes that aim to improve the existing cycleways, creating new sections of cycle track and installing vehicle charging points. Extensive plans to increase the cycle path network are now in place.	Ongoing plans associated with improved pedestrian and cycle connections to the CNDR. Funding required to accelerate major improvements.
6	Travel plans will be required for all new developments that meet the criteria. Existing businesses will be encouraged to implement, monitor and review travel plans.	Promoting Travel Alternatives	Workplace Travel Planning	2012	Ongoing	Cumberland Council	Cumberland Council	No	Ongoing.	Unknown	Ongoing.	Not calculated	Increased number of participant businesses and more widespread use of alternative transport.	All schools within the city now have travel plans. New developments likely to result in increased highway usage must submit a travel plan for approval when making an application.	Difficult to quantify the impact of Travel Plans.
7	The council will continue to provide comprehensive environmental control over emissions from all Part A2 and B Processes located within the local authority area.	Environmental Permits	Other measure through permit systems and economic instruments	2012	Ongoing	Cumberland Council	Cumberland Council	No	Ongoing.	Unknown	Ongoing.	Not calculated	Risk based inspections showing that emission limits are being met and efforts are being made to improve on national objectives.	All processes which fall under part B & A2 processes are permitted by Cumberland Council. No recent enforcement action required in relation to emissions.	Any new applications are considered by Environmental Health as part of the planning consultation process and the environmental permitting procedures.

Measure No.	Measure	Category	Classification	Year Measure Introduced in AQAP	Estimated / Actual Completion Date	Organisations Involved	Funding Source	Defra AQ Grant Funding	Funding Status	Estimated Cost of Measure	Measure Status	Reduction in Pollutant / Emission from Measure	Key Performance Indicator	Progress to Date	Comments
8	The council will continue to investigate complaints of black smoke and smoke nuisance as well as managing smokeless zones. Enforcement action will be taken as necessary.	Public Information	Other	2012	Ongoing	Cumberland Council	Cumberland Council	No	Ongoing.	Unknown	Ongoing.	Not calculated	Reduction in the number of complaints from members of the public. Reduction in repeat offences.	There is information on website. Environmental Health provide advice and enforcement as required. Smoke complaints are responded to involving domestic fires, bonfires, trade waste, industrial and dark smoke. Advice leaflet sent out for all cases of domestic burning. Advice given to minimise potential for smoke issues and ensure compliance with smokeless zones.	The Air Quality Strategy set out a goal to cut public exposure to particulate matter pollution. The aim is to reduce by half the number of people in the United Kingdom exposed to the WHO guideline concentration of 10 µg m^{-3} by 2025. The measures set out here will contribute to this target.
9	Provision of home improvement grants and energy saving advice to the public.	Public Information	Other	2012	Ongoing	Cumberland Council	Cumberland Council with various funding bids.	No	Ongoing.	Unknown	Ongoing.	Not calculated	Number of properties taking up schemes, resulting in Improved energy efficiency of housing stock.	Cumberland Council (Carlisle Area) Home Improvement Agency is currently delivering Health through Warmth Scheme, supported by the Energy Companies Obligation. This includes boiler upgrades and home insulation. Safe and warm grants are provided by the council to deliver up to £7,500 to enable low-income homes to carry out minor repairs and energy efficiency measures to their homes. Work has begun on enforcing the Minimum Energy Efficiency Standards, specifically aimed at private rented sector properties. New energy efficiency grants are now available up to £3000 through council grant scheme. Available schemes are regularly changing and evolving.	Cumberland Council (Carlisle Area) have now revised Housing Renewal Assistance Policy under the Regulatory Reform Order 2002. This covers all grants involving housing and energy efficiency measures.
10	Environmental Health will work alongside the Neighbourhoods and Green Spaces team to implement the effective use of trees and green areas to offset traffic derived emissions.	Public Information	Other	2012	Ongoing	Cumberland Council	Cumberland Council	No	Ongoing.	Unknown	Ongoing.	Not calculated	Increase in trees and vegetation in visible locations. Increased public interest.	Cumberland Council continues to manage and maintain trees in parks and green spaces, including some additional planting, of mainly mixed broadleaf species, where necessary. Planting of green areas is an essential part of many new developments, including residential.	Limitations to planting options in busy urban areas. Parks and open spaces do not have significant air quality issues. Green Spaces continue to have a positive public impact.
11	Air Quality considerations to be included in all relevant council policies and strategies.	Policy Guidance and Development Control	Air Quality Planning and Policy Guidance	2012	Ongoing	Cumberland Council	Cumberland Council	No	Ongoing.	Unknown	Ongoing.	Not calculated	Increased awareness of air quality issues and consideration given by more council departments.	Included air quality links within most major relevant policies including Local Transport Plan (LTP 3) (2011-26) and The Carlisle District Local Plan (2015-30). New schemes being developed to deliver improved cycling routes and vehicle charging infrastructure.	Air Quality considerations are put forward during discussion and consultation stages of policy development.
12	Promotion of air quality and sustainable transport issues. Air quality information and monitoring data will be provided to the public.	Public Information	via the Internet	2012	Ongoing	Cumberland Council	Cumberland Council	No	Ongoing.	Unknown	Ongoing.	Not calculated	Increased public awareness and participation in improving air quality.	Air quality info and real time monitoring data is available on the website. Monitoring data shows continued improvement in most areas. Cumberland Council is actively supporting and promoting Clean Air Day, utilising social media and our website, as part of the Global Action Plan. Cumberland Council has ongoing projects to cut carbon emissions. These aim to raise ambition to tackle climate change and sharing learning and resources. The public can influence and drive climate action through citizens' juries and other projects, with community groups steering the programme.	Difficult to quantify improvements as a direct result of promotional work or providing monitoring data.
13	Installation of charging points and development of charging network	Promoting Low Emission Transport	Procuring alternative Refuelling infrastructure to promote Low Emission Vehicles, EV recharging, Gas fuel recharging	2023	Ongoing	Cumberland Council	Cumberland Council with various funding bids.	No	Ongoing.	Unknown	Ongoing.	Not calculated	More charging points available	In 2023, Cumberland Council received notification that it had been successful with funding to install up to 900 charging points and develop its strategy[16].	Difficult to quantify improvements as a direct result of providing charging points. The aim is to assist with the transition to Electric Vehicles.

[16] https://www.yourcumbria.org/News/2021/partnershipsuccessfulbidtodriveforwardevpoints.aspx

Appendix A: Response to Consultation

Table A.1 – Summary of Responses to Consultation and Stakeholder Engagement on the AQAP

Consultee	Category	Response
Local Councillor	Councillor	- Request to provide maximum measured pollutant levels when reporting monitoring data. Not just daily and annual means. - Request to expand the monitoring network including the use of backpack PM2.5 monitors. - Comment that the height of the continuous analyser inlet and the diffusion tubes are too high to represent adult and children exposure to pollutants.
Public Comment	Public	- Request for additional tree planting and green landscaping, including along the A595 / Bridge Street / Church Street / Willowholme and on riverbanks.
Public Comment	Public	- Comment to provide alternatives to private vehicle use including carshare schemes, park and ride and congestion charges. - Comment that the Southern Link Road does not address air quality issues and there is no economic or social or environmental benefit. Expressed concerns that it will generate more pollution, cause habitat destruction, increase traffic, air pollution and noise pollution. - Expressed views against the provision of additional parking spaces in the city centre and badly timed traffic signals causing engine idling. - Expressed support for the relocation of the bus station to the Citadel area of the city centre. Also suggested a total rethink of the cycling infrastructure and giving priority to cyclists.
Public Comment	Public	- Comment that the Southern Link Road will increase traffic levels and therefore air pollution and particulates. - Expressed views against the provision of additional parking spaces in the city centre and railway station. - Expressed views against the council providing free parking in the city centre.
Public Comment	Public	- Comment to welcome any steps which seek to reduce air pollution - Comment relating to light pollution from lighting towers in the Kingmoor area. - Comment relating to industrial processes which create invisible gasses that can cause pollution and a

		request that the council set standards for all pollutants, which are monitored and enforced. - Request to close down major industrial plant if is found to be damaging the environment, including council approved facilities and motorways. - Comment that the council is there to serve the interests of the community not the interests of polluters.
Public Comment	Public	- Comment to welcome the goal to "improve public health by taking action to keep air pollution levels as low as they can possibly be. - Request to improve air quality considerations within the planning process. - Expressed concerns relating to a proposed energy from waste facility. - Request to lower the current pollutant objective levels. - Request to expand the monitoring network including, more diffusion tubes, more particulate monitoring, more monitoring around existing and proposed industrial sites. - Request to resume the reporting of Benzene levels in the Annual Status Reports. - Request to monitor additional pollutants including PM 0.1, dioxins, PCB's and heavy metals. - Request to explore funding opportunities through S106 agreements, universities and research institutes. - Concerns raised relating to the impact of air pollution on biodiversity. Suggestion to refuse planning applications that will result in increased pollution in excess of critical loads and levels. - Suggestions to improve and strengthen existing planning policies to aim for lower air pollution levels and protect biodiversity. - Suggested amendments to planning policies to encourage the use of a risk-based consideration of air pollution increases even when air pollution limits are not exceeded.
Statutory Consultees		No comments were received from statutory consultees.

Appendix E presents a response to the commentary provided by Defra's appraisal of the AQAP.

Appendix B: Reasons for Not Pursuing Action Plan Measures

Table B.1 – Action Plan Measures Not Pursued and the Reasons for that Decision

Action category	Action description	Reason action is not being pursued (including Stakeholder views)
Traffic Management	Joint Parking Policy	Action not pursued because the initiative was abandoned. The AQAP measure was dropped from AQAP 2021.

Appendix C: Supplementary Planning Guidance

It is intended that this section will be used as a separate, standalone guidance document. The purpose is to inform Planning officers and developers of which air quality considerations are required for any particular development. This will improve the understating between Planning Officers, Environmental Health Officers and developers when deciding on what is required from a given development proposal. It will also add greater clarity and consistency in the decision-making process.

The previous Air Quality and Land Use Planning guidance note[17] encouraged applications that adhered to sustainable development principles that minimised environment impact and allowed mitigation where possible. LAQM Policy Guidance (PG16) requires that the planning and air quality functions of local authorities should be carried out in close cooperation. As such this updated guidance note supersedes that previously published and considers the following documents:

- LAQM PG (16)[18],
- National Planning Policy Framework
- Planning Guidance and AQ guidance from the Institute of Air Quality Management (IAQM)[19]

National Planning Policy Framework

The National Planning Policy Framework (NPPF) provides a framework which local councils can produce neighbourhood plans that reflect the needs of their local communities. Key paragraphs related to air quality include:

Paragraph 110
Within this context, applications for development should:

a) give priority first to pedestrian and cycle movements, both within the scheme and with neighbouring areas; and second - so far as possible - to facilitating access to high quality public transport, with layouts that maximise the catchment area for bus or other public transport services, and appropriate facilities that encourage public transport use;
b) address the needs of people with disabilities and reduced mobility in relation to all modes of transport;
c) create places that are safe, secure and attractive - which minimise the scope for conflicts between pedestrians, cyclists and vehicles, avoid unnecessary street clutter, and respond to local character and design standards;
d) allow for the efficient delivery of goods, and access by service and emergency vehicles; and
e) be designed to enable charging of plug-in and other ultra-low emission vehicles in safe, accessible and convenient locations.

Paragraph 180
Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

[17] https://www.carlisle.gov.uk/Portals/0/Documents/Residents/Environment/Air_Quality_Land_Use_Guidance.pdf
[18] https://laqm.defra.gov.uk/documents/LAQM-PG16-April-16-v1.pdf
[19] https://iaqm.co.uk/text/guidance/air-quality-planning-guidance.pdf

a) mitigate and reduce to a minimum potential adverse impact resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;
b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason; and
c) limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation.

Paragraph 181
Planning policies and decisions should sustain and contribute towards compliance with relevant limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and Clean Air Zones, and the cumulative impacts from individual sites in local areas. Opportunities to improve air quality or mitigate impacts should be identified, such as through traffic and travel management, and green infrastructure provision and enhancement. So far as possible these opportunities should be considered at the plan-making stage, to ensure a strategic approach and limit the need for issues to be reconsidered when determining individual applications. Planning decisions should ensure that any new development in Air Quality Management Areas and Clean Air Zones is consistent with the local air quality action plan.

Paragraphs 102 -111 relating to sustainable transport are also relevant.

Air Quality Guidance

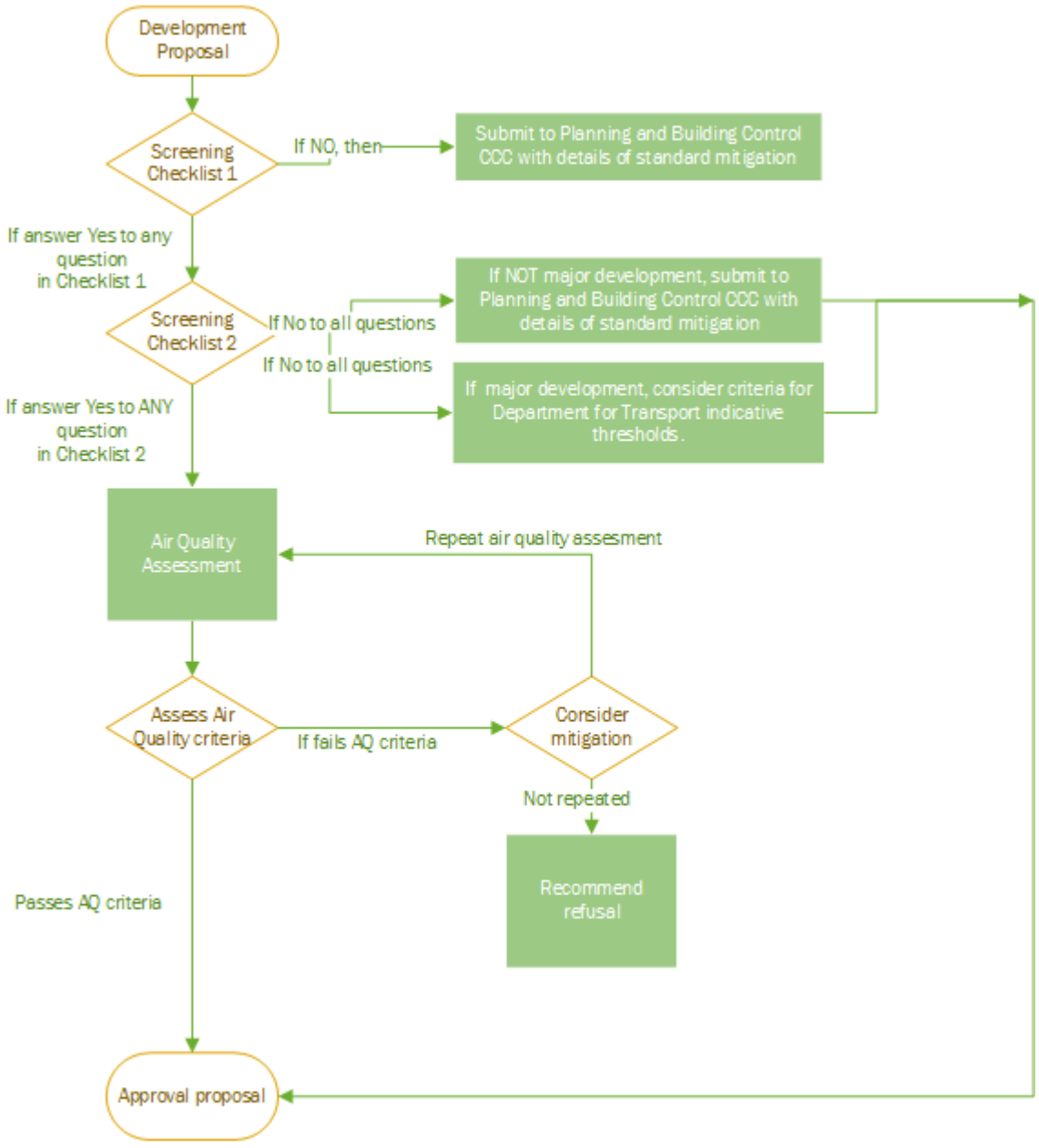
Local planning guidance on air quality tends to follow the IAQM guidance which aims to define the appropriate assessment of air quality in planning applications. A review of existing supplementary or local planning guidance documents[20,21] shows that flow diagrams and screening checklists are very useful tools to help visualise the overall process and how steps within the process inter-relate. The approach followed by Kent&Medway Air Quality Partnership[22] was considered an excellent exemplar and was used as the basis of the approach followed by Cumberland Council. This document has hence been developed to:

- Introduce a method for assessing the air quality impacts of a development which includes the quantification of impacts, calculation of damage costs and the identification of mitigation measures to be implemented to negate the impact of development on air quality.
- Tackle cumulative impacts.
- Provide clarity and consistency of the process for developers, the local planning authority (LPA) and local communities.

A flow chart summarising the air quality assessment process is summarised in Figure C-1 and the associated screening checklists are described below. Checklist 1 screens out developments which are not likely to have a significant effect on air quality. Checklist 2 determines whether an air quality assessment or mitigation assessment are required.

[20] http://kentair.org.uk/documents/K&MAQP_Air_Quality_Planning_Guidance_Mitigation_Option_A.pdf
[21] http://www.sussex-air.net/Consultation/Sussex_AQ_Guidance_2019.pdf
[22] http://kentair.org.uk/documents/k%26magp_air_quality_planning_guidance_mitigation_option_a.pdf

Figure C-1 Flowchart summarising the processes to assess the impact of a development on air quality



Screening Checklist 1: Questions to be answered by the Developer

Screening checklist	Yes	No	Recommendation
Q1. Is the proposed development categorised as a major development			If Yes, go to Checklist 2 If No, go to Question 2
Q2. Is the proposed development within, or close to an Air Quality Management Area (AQMA)			If Yes, go to Checklist 2 If No, submit to planning department with standard mitigation for all developments

Screening Checklist 2: Questions to be answered by the Developer

Screening checklist	Yes	No	Recommendation
Q3. Does the development require an Environmental Impact Assessment (EIA)?			If any question is answered = YES, then consider applying the standard mitigations specified below for **all developments** and contact the Air Quality Officer to confirm whether an air quality (AQ) assessment and / or emission mitigation assessment is also required. OR If all questions are answered = NO, and the development is a **major development** then consider mitigation for all developments and undertake an emissions mitigation assessment. OR If all questions are answered = NO, and the development is a **NOT a** major development **OR** the air quality officer determines there is no need for an AQ and/or emissions mitigation assessment then consider just the standard mitigation for all developments
Q4. Will development type likely become large scale major development[23]? (either on its' own or as part of several separate cumulative planned developments.)			
Q5. Is there vehicle parking in the development: >100 (outside AQMA) or >50 (within or adjacent to AQMA)?			
Q6. For existing roads with >10,000 Annual Average Daily Traffic (AADT) does the development: Introduce extra vehicle movements (>5%), is it likely to cause congestion or introduce > 15 extra heavy- duty vehicle movements per day?			
Q7. Will the development introduce new sensitive receptors into an AQMA?			
Q8. Are there any other proposed developments in the vicinity of this development which could have a cumulative effect on air quality?			
Q9. Is the development introducing biomass energy/heating plant into an urban environment?			
Q10. Is the development likely to impact in sensitive environments (ie. Sites of Special Scientific Interest etc.)			

[23] The definition 'major development' is described in Town and Country Planning (Development Management Procedure) Order (England) 2015 definitions http://www.legislation.gov.uk/uksi/2015/595/made.

It is reproduced here:
'major development' means development involving any one or more of the following
(a) the winning and working of minerals or the use of land for mineral-working deposits;
(b) waste development;
(c) the provision of dwellinghouses where-
(i) the number of dwellinghouses to be provided is 10 or more; or
(ii) the development is to be carried out on a site having an area of 0.5 hectares or more and it is not known whether the development falls within sub-paragraph (c)(i);
(d) the provision of a building or buildings where the floor space to be created by the development is 1,000 square metres or more; or
(e) development carried out on a site having an area of 1 hectare or more;

Air Quality Assessment

The purpose of an air quality assessment is to determine whether emissions or activity from a new development will impact on air quality and/or local environment.
The air quality assessment (AQA) will only be required for major developments (as defined in footnote on previous page). The format of the AQA is specified in the IAQM (Section 6.18 to 6.23). LAQM TG(16), Chapter 7, provides the tools and supporting information to help local authorities and developers carry out assessments of air quality. Before proceeding with an air quality assessment, the applicant should discuss its scope with Environmental Health Department.

Any development which includes a biomass boiler or incinerator is required to complete the Biomass Boiler Information Request form which can be found on the council website, using the following link. This must be completed at the start of the process and presented with the initial application documentation. This will be used to determine if a further detailed AQ assessment is required:
https://www.carlisle.gov.uk/Portals/0/Documents/Residents/Environment/Biomass%20Boiler%20Information%20Request%20Form.pdf

Mitigation

Mitigation is the reduction of the severity of air quality impact related to the development.

Standard mitigation

In line with many Local Planning Guidance Documents a minimum series of mitigation measures will be set for all developments, these are listed in Table C-1.

Table C-1 Standard mitigation to be applied to all developments

Category	Mitigation measure
Residential	All gas-fired boilers to meet a minimum standard of < 40 mg NOx/kWh
	Electric Vehicle charging point per dwelling with dedicated parking or 1 charging point per 10 spaces (unallocated parking)
Commercial /Industrial	10% of parking spaces to be provided with Electric Vehicle charge points which may be phased with 5% initial provision and the remainder at an agreed trigger level
Demolition/ Construction	Mitigation in accordance with the Institute of Air Quality Management (IAQM) Guidance on the Assessment of Dust from Demolition and Construction[24]

Emissions mitigation assessment

The purpose of an emissions mitigation assessment is to assess the local emissions from a development and to determine the appropriate level of mitigation required to help reduce the potential effect on health and/or the local environment. In addition, the developer will be required to minimise dust emissions during the construction phase in accordance with the IAQM Guidance on the Assessment of Dust from Demolition and Construction.

Where mitigation is not integrated into a scheme, the local planning authority (LPA) will require this through a planning condition(s). If on-site mitigation is not possible then the LPA may seek contribution to wider air quality mitigation measures through a Section 106 agreement.

[24] https://iaqm.co.uk/text/guidance/guidance_monitoring_dust_2018.pdf

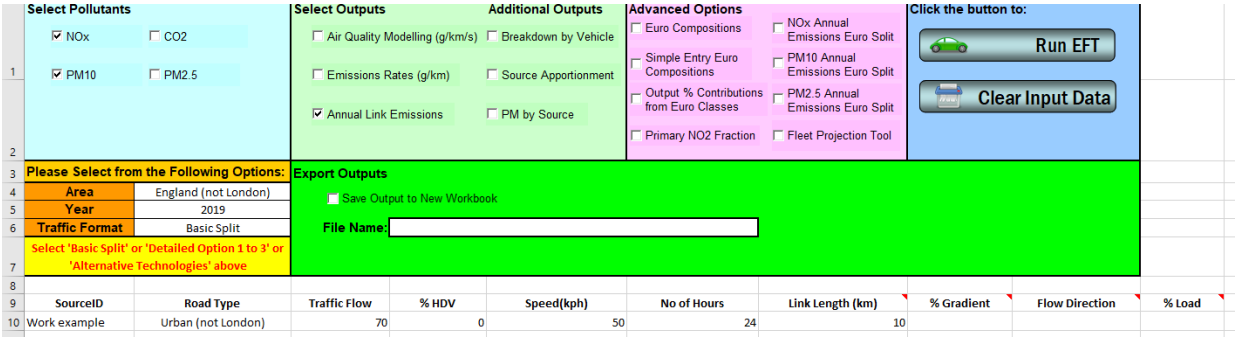
Each emissions mitigation assessment should include a brief emissions mitigation statement, which should include:

- Development traffic input data for emissions mitigation calculation
- Emissions calculation and totals
- Mitigation proposed to be equivalent to the value of emissions calculation (appropriate to the type and size of development and local policy requirements)
- Statement of provision required to minimise dust emissions in accordance with the IAQM Guidance on the Assessment of Dust from Demolition and Construction.

An emissions mitigation calculation inputs the additional number of trips generated by the development into the latest DEFRA Emissions Factor Toolkit (EFT)[25]. A worked example to calculate the extra NOx and PM_{10} emissions for a development of 10 houses is provided here. The inputs are as follows:

Input year:	2019
Trips per day:	70
Traffic type:	Cars only (HGV set to 0%)
Average speed:	50 kph
Length of road link:	10 km

The inputs are provided as follows



The emission calculator is run by pressing the "*Run EFT"* button. Annual emissions of NOx and PM_{10} are provided below:

Pollutant Name	Annual Emission (tonnes/yr)	AQ damage cost, £/tonne	AQ damage cost, £ for 1 year	AQ damage cost, £ for 5 years
NOx	0.0805	6199	499	2495
PM_{10}	0.00838	67947	569	2847
			Total	5342

The emission is then multiplied by the damage costs factor[26]. The cost is calculated as a five-year total and is the value used for costing the required emissions mitigation for the development.

Additional requirements for mitigation measures

The mitigation options selected for a development should be relevant and appropriate to:

- Any local policies including Air Quality Action Plans, which may determine the mitigation priorities that the local authority may wish to be incorporated within a particular scheme.
- Any local air quality concerns; to assist in the mitigation of potential cumulative air pollution impacts of the development on the local community.

[25] https://laqm.defra.gov.uk/review-and-assessment/tools/emissions-factors-toolkit.html

[26] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/770576/air-quality-damage-cost-guidance.pdf (see Table 3)

- The type, size and activity of the development.

Scheme mitigation should be provided within the design of the development where possible. Table C-2 lists the mitigation measures to be considered.

Table C-2 Potential mitigation measures[27]

Category	Mitigation measure
Residential	Travel plan (where required) including mechanisms for discouraging high emission vehicle use and encouraging the uptake of low emission fuels and technologies
	A Welcome Pack available to all new residents online and as a booklet, containing information and incentives to encourage the use of sustainable transport modes from new occupiers
	Eco-driver training and provision of eco-driver aid to all residents
	EV recharging infrastructure within the development (wall mounted or free standing in-garage or off-street points)
	Car club provision within development or support given to local car club/eV car clubs
	Designation of parking spaces for low emission vehicles
	Improved cycle paths to link cycle network
	Adequate provision of secure cycle storage
	Using green infrastructure[28], in particular trees to absorb dust and other pollutants
Commercial /Industrial	Differential parking charges depending on vehicle emissions
	Public transport subsidy for employees
	All commercial vehicles should comply with either current or previous European Emission Standard
	Fleet operations should provide a strategy for considering reduced emissions, low emission fuels and technologies
	Use of ultra-low emission service vehicles
	Support local walking and cycling initiatives
	Contributing funding to measures, including those identified in air quality action plans and low emission strategies, designed to offset the impact on air quality arising from new development
Additional mitigation	Contribution to low emission vehicle refuelling infrastructure
	Low emission bus service provision or waste collection services
	Bike/e-bike hire schemes
	Contribution to renewable fuel and energy generation projects
	Incentives for the take-up of low emission technologies and fuels

[27] http://kentair.org.uk/documents/K&MAQP_Air_Quality_Planning_Guidance_Mitigation_Option_A.pdf
[28] Green Infrastructure" is repeatedly included in many of the LPGs reviewed. Since these were published further evidence from the Air Quality Expert Group (AQEG) on the effectiveness of GI has been reviewed[28] which concluded that care needs to be taken when considering this as a measure to mitigate air pollution. It is also noteworthy that Defra are not funding GI as part of LA air quality grant applications funding in 2019[28]

Appendix D: Air Quality Modelling information

Calculation of required NOx reduction

The following provides the method to calculate the reduction in road NOx emission required to meet the 40 µg m^{-3} annual mean objective for NO_2. Any required percentage reductions of local emissions should be expressed in terms of NOx due to the local road traffic. This is because the primary emission is NOx and there is a non-linear relationship between NOx concentrations and NO_2 concentrations.

It is assumed that the worst-case relevant exposure location is that at the Bridge Street sampling location and calculating the emission reduction there will ensure that there is no exceedance throughout council's area.

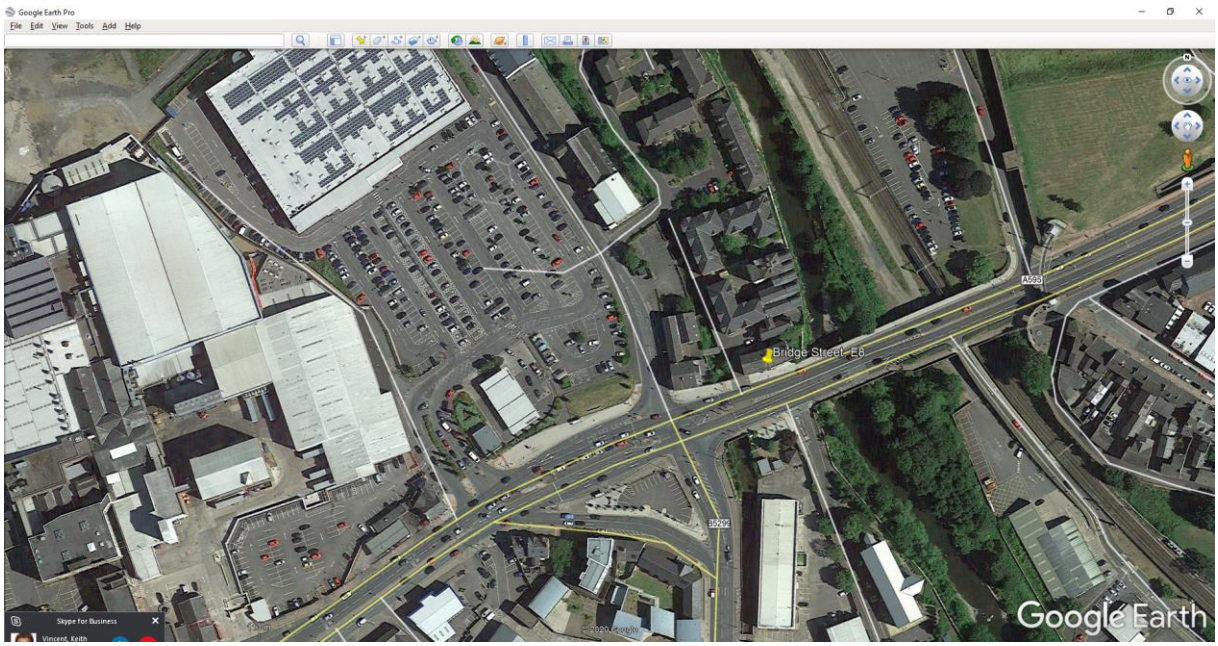
Step 1: Use the NOx to NO_2 calculator (see para 7.86 of Technical Guidance LAQM.TG16) to obtain the NOx concentration that equates to the 40.8 µg m^{-3} NO2, which in this example is 64.2 µg m^{-3}.
Step 2: Obtain the local background concentrations of NOx (16.3 µg m^{-3}) for 2018. from the background maps (see para 7.68 Technical Guidance LAQM.TG16). See derivation of background NOx below.
Step 3: Calculate the road NOx concentration required to give a total NO_2 concentration of 40 µg m^{-3}. This is done in an iterative way using the NOx to NO_2 calculator. A road NOx concentration of 62.45 µg m^{-3} along with the local background NOx (16.3 µg m^{-3}) would result in the annual objective concentration being achieved.
Step 4: Calculate the road NOx reduction to go from the "road NOx-current" to the "road NOx-required". In this example the road NOx reduction is calculated to be 1.8 µg m^{-3} (64.2 µg m^{-3} minus 62.45 µg m^{-3}), which represents a 2.7 % reduction in road NOx (1.8 µg m^{-3}/ 64.2 µg m^{-3}) as a percentage).
The concentrations derived from these steps are summarised in Table D-1.**Error! Reference source not found.**

Table D-1 Concentrations used to derive the required reduction of NOx emission

NO_2 measured at sampling site, µg m^{-3}	NOx background, µg m^{-3}	Roadside NOx from NO_2 calculator, µg m^{-3}	Road NOx to achieve compliance, µg m^{-3}	Road NOx reduction required, µg m^{-3}	Percentage road NOx reduction, µg m^{-3}
40.8	16.3	64.2	62.45	1.8	2.7%

During the model verification (see below) the background concentration for the 1 km x 1 km square was seen to be relatively small (10.5 µg m^{-3}) and unrealistic of the actual area- there is a retail park and an associated large car park some 100 m to the west of the sampling site on Bridge Street (Figure D-1).

Figure D-1 Areal view of Bridge Street and nearby car parks.



The National Atmospheric Emission Inventory doesn't consider carparks, so these have not been included in the background concentration maps. So instead, we have used the concentration value in the square just south of the 1 km x 1 km square where the Bridge Street sampling site is located. The concentrations of both background squares are shown in Table D-2.

Table D-2 Oxides of nitrogen concentrations measured at the two 1 km x 1 km where the Bridge Street sampling site is located

Location	Easting	Northing	NOx background, µg m^{-3}
Bridge Street, E8	339516	556024	
1 km x 1 km square containing site	339500	556500	10.5
1 km x 1 km square immediately to the south of square containing Bridge Street	339500	555500	16.3

Model input data

Traffic Data

Traffic data flows within the modelling domain were based on the 2017 Carlisle Transport Model and were scaled to annual average daily traffic flows obtained from three different count point locations. These included a count point on Wigton Road obtained from the DfT website and two locations where manual counts had taken place- one on Bridge Street with the manual counts recorded in the summer of 2017 and the other on Shaddongate with the manual counts recorded in the Spring of 2017. The locations of the count points are shown in Figure D-2. The annual average daily traffic is presented in Table D-3 and the traffic assigned to each turning are presented in Table D-4.

Figure D-2 Location of traffic count points used in the AQ model

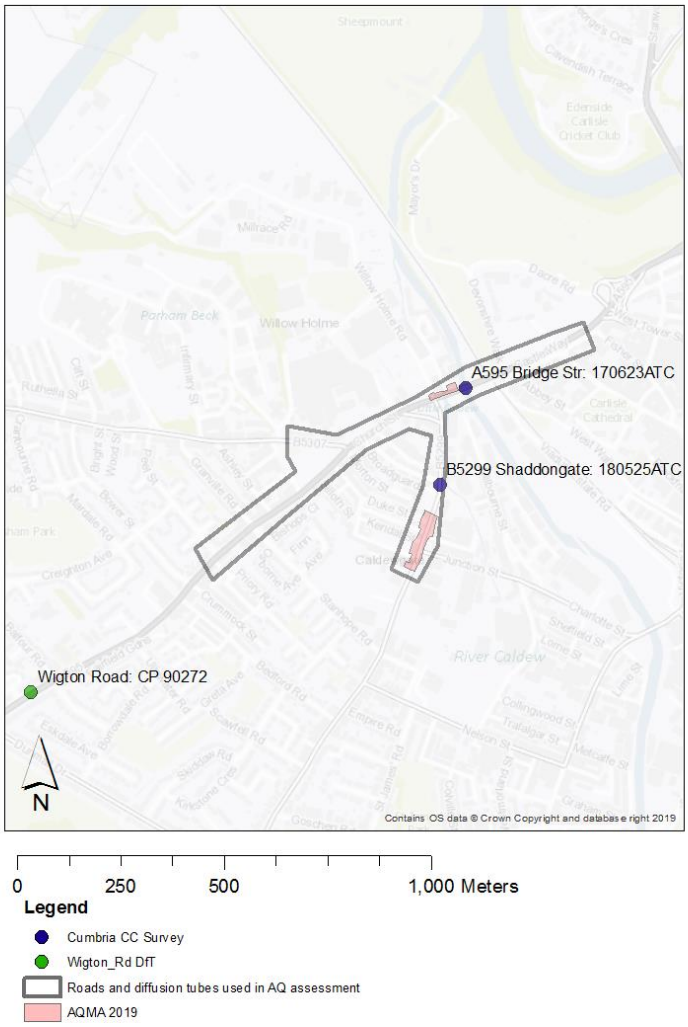


Table D-3 Annual average daily traffic flows used within the modelling domain

Count point location	To	From
Bridge Street (170623ATC)	East	West
	16811	16508
Shaddongate (180525ATC)	South	North
	8142	10205
Wigtown Road[29], CP 90272	East	West
	7717	7080

The annual average daily traffic flow at each junction is shown in Table D-4 and the percentage vehicle type and traffic speeds within each road link are presented in Table D-5.

[29] DfT https://data.gov.uk/dataset/208c0e7b-353f-4e2d-8b7a-1a7118467acc/gb-road-traffic-counts

Table D-4 Annual average daily flows assigned to each of the junctions nearby the Bridge Street AQMA.

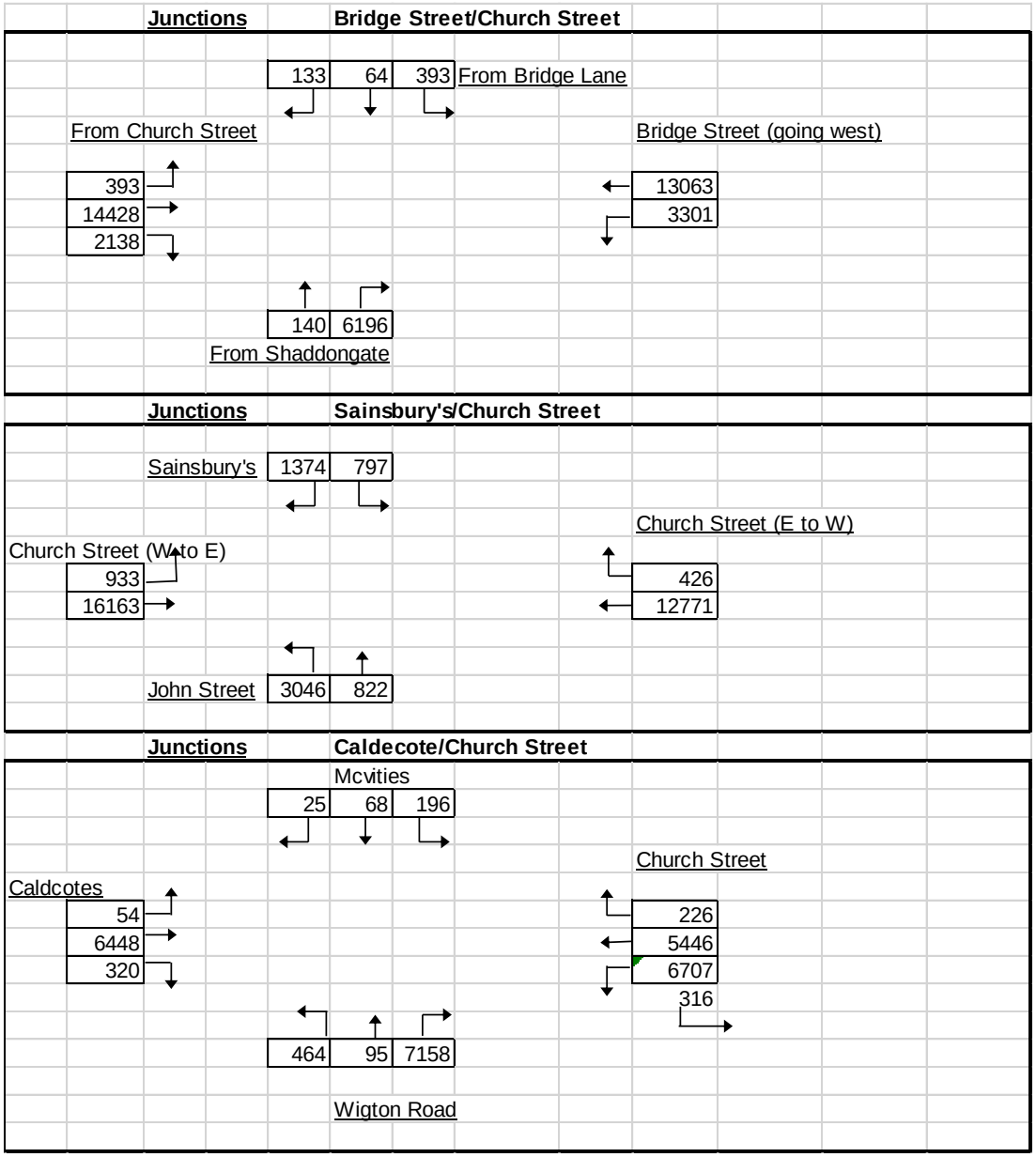


Table D-5 Annual average traffic flows, percentage vehicle types and speeds assigned to vehicles

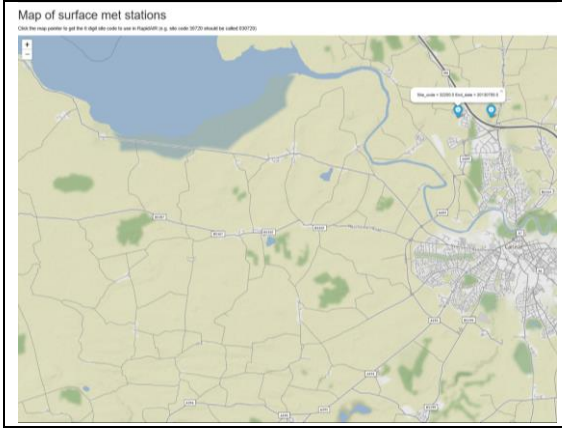
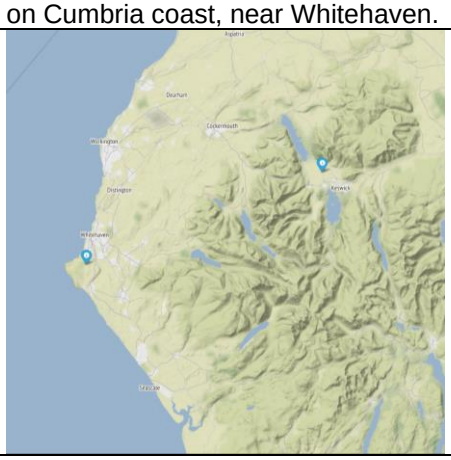
Road name from traffic model	Source ID	Traffic Flow	% Car	% LGV	%HGV	%Bus	%Motorbike	Speed (kph)	Link Length (km)
Caldcotes_combined	2193	12413	75.9	8.4	10.8	1.9	3.0	15	0.154
Bridge Ln_left to_Bridge St	2207	266	75.9	8.4	10.8	1.9	3.0	10	0.028
Sainsburys_left to_Church St (E)	2368	797	75.9	8.4	10.8	1.9	3.0	10	0.036
Church St (W)_left to_Sainsburys	2369	933	75.9	8.4	10.8	1.9	3.0	10	0.026
Shaddongate_combined_lower _road	1453	13506	80.9	9.0	7.5	0.6	2.0	10	0.022
Wigton_Road_combined	1493	14424	80.1	14.3	3.1	1.6	0.9	10	0.111
Shaddongate_combined_lower _road	1517	13506	80.9	9.0	7.5	0.6	2.0	20	0.046
Shaddongate_combined_lower _road	1522	13506	80.9	9.0	7.5	0.6	2.0	20	0.007
Shaddongate_combined_lower _road	1541	13506	80.9	9.0	7.5	0.6	2.0	20	0.067
Bridge_St_to_east_all	1745	16959	75.9	8.4	10.8	1.9	3.0	15	0.011
Bridge_St_to_east_all	1765	16959	75.9	8.4	10.8	1.9	3.0	15	0.086
Bridge_St_to_west_all	1838	16364	78.1	8.7	9.4	1.9	1.9	10	0.135
Bridge_St_to_east_all	1841	16959	75.9	8.4	10.8	1.9	3.0	15	0.141
Shaddongate_combined_lower _road	2295	13506	80.9	9.0	7.5	0.6	2.0	20	0.032
Wigton_Road_combined	2296	14424	80.1	14.3	3.1	1.6	0.9	10	0.083
Wigton_Road_combined	2297	14424	80.1	14.3	3.1	1.6	0.9	10	0.056
Church St (E)_ahead to_Church St (W)	2298	12771	78.1	8.7	9.4	1.9	1.9	10	0.043
Bridge_St_to_west_all	2299	16364	78.1	8.7	9.4	1.9	1.9	10	0.055
Wigton_to_east_combined	2300	7717	80.7	13.8	3.1	1.5	0.9	10	0.040
Roundabout_section_south	2301	5446	80.1	14.3	3.1	1.6	0.9	10	0.012
Shaddongate_combined_lower _road	2303	13506	80.9	9.0	7.5	0.6	2.0	20	0.142
Bridge Ln_ahead to_Shaddongate	2304	64	80.9	9.0	7.5	0.6	2.0	10	0.016
Church St (E)_ahead to_Church St (W)	2316	12771	78.1	8.7	9.4	1.9	1.9	10	0.011
Church St_ahead to_Bridge St	2340	14428	75.9	8.4	10.8	1.9	3.0	10	0.046
Bridge St_left to_Shaddongate	2346	3301	78.1	8.7	9.4	1.9	1.9	10	0.023
Church St_ahead to_Bridge St	2360	14428	75.9	8.4	10.8	1.9	3.0	10	0.021
Bridge_St_to_east_all	2365	16959	75.9	8.4	10.8	1.9	3.0	10	0.037
Bridge_St_to_east_all	4683	16959	75.9	8.4	10.8	1.9	3.0	15	0.159
Bridge_St_to_west_all	4692	16364	78.1	8.7	9.4	1.9	1.9	10	0.089
Wigton_Road_combined	4698	14424	80.1	14.3	3.1	1.6	0.9	10	0.015
Bridge_St_to_east_all	4753	16959	75.9	8.4	10.8	1.9	3.0	15	0.144
Wigton_Road_combined	4754	14424	80.1	14.3	3.1	1.6	0.9	10	0.059
Wigton_Road_combined	4755	14424	80.1	14.3	3.1	1.6	0.9	10	0.049
Church St (E)_ahead to_Church St (W)	4756	12771	78.1	8.7	9.4	1.9	1.9	10	0.072
Church St_left to_Wigton Rd	4757	6707	78.1	8.7	9.4	1.9	1.9	10	0.043
Church St (E)_ahead to_Church St (W)	4758	12771	78.1	8.7	9.4	1.9	1.9	10	0.005
Church St (E)_ahead to_Church St (W)	4759	12771	78.1	8.7	9.4	1.9	1.9	10	0.008
Roundabout_section_east	4760	12695	80.1	14.3	3.1	1.6	0.9	10	0.020

Road name from traffic model	Source ID	Traffic Flow	% Car	% LGV	%HGV	%Bus	%Motorbike	Speed (kph)	Link Length (km)
Roundabout_section_east	4761	12695	80.1	14.3	3.1	1.6	0.9	10	0.013
Shaddongate_combined_lower_road	4762	13506	80.9	9.0	7.5	0.6	2.0	20	0.066
John St_left to_Church St (W)	4763	3046	80.6	9.0	8.1	0.4	2.0	10	0.068
Shaddongate_combined_lower_road	4764	13506	80.9	9.0	7.5	0.6	2.0	10	0.016
Shaddongate_combined_upper_road	4765	9702	80.9	9.0	7.5	0.6	2.0	20	0.035
Shaddongate_combined_lower_road	4766	13506	80.9	9.0	7.5	0.6	2.0	10	0.020
Bridge_St_to_west_all	4816	16364	78.1	8.7	9.4	1.9	1.9	10	0.041
John St_left to_Church St (W)	4822	3046	80.6	9.0	8.1	0.4	2.0	10	0.034
Shaddongate_combined_lower_road	4826	13506	80.9	9.0	7.5	0.6	2.0	20	0.012
Church St_ahead to_Bridge St	4828	14428	75.9	8.4	10.8	1.9	3.0	10	0.010
Church St_ahead to_Bridge St	4829	14428	75.9	8.4	10.8	1.9	3.0	10	0.026
Church St (E)_ahead to_Church St (W)	4847	12771	78.1	8.7	9.4	1.9	1.9	10	0.090
Bridge St_left to_Shaddongate	4851	3301	78.1	8.7	9.4	1.9	1.9	10	0.024
Church St (E)_ahead to_Church St (W)	4856	12771	78.1	8.7	9.4	1.9	1.9	10	0.021
Bridge_St_to_west_all	4862	16364	78.1	8.7	9.4	1.9	1.9	10	0.082
Bridge_St_to_west_all	4864	16364	78.1	8.7	9.4	1.9	1.9	10	0.051
Wigton_Road_combined	4870	14424	80.1	14.3	3.1	1.6	0.9	10	0.081
Church St_ahead to_Bridge St	4874	14428	75.9	8.4	10.8	1.9	3.0	10	0.134
Shaddongate_combined_lower_road	4875	13506	80.9	9.0	7.5	0.6	2.0	20	0.030
Bridge_St_to_west_all	5733	16364	78.1	8.7	9.4	1.9	1.9	15	0.129
Bridge_St_to_west_all	5739	16364	78.1	8.7	9.4	1.9	1.9	15	0.033
Shaddongate_combined_lower_road	5876	13506	80.9	9.0	7.5	0.6	2.0	20	0.130
Shaddongate_combined_lower_road	5947	13506	80.9	9.0	7.5	0.6	2.0	20	0.004

Meteorological data

The meteorological data is based on surface site 032200- supplemented with data from surface stations -032220 and 032100. The locations of the meteorological stations are shown in Figure D-3

Figure D-3 Location of meteorological stations used in the dispersion model

Locations of meteorological stations 032200 and 032220 just north of Carlisle	Location of third meteorological station (032100) on Cumbria coast, near Whitehaven.
	

The wind rose is shown below in Figure D-4. Table D-6 is a statistical summary of the meteorological data.

Figure D-4 2018 Carlisle/Cumbria wind rose

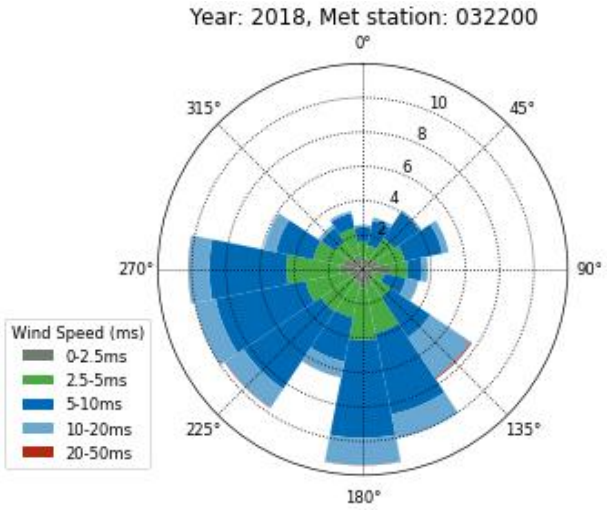


Table D-6 Descriptive statistics for AERMET data file

Parameter	ws	Wd	tempk	cc
Count	8597	8592	8598	8172
Mean	6.07	195.82	283.11	6.51
Std Dev	3.54	85.69	5.88	3.15
Min	0.5	10.0	266.1	1.0
25%ile	3.4	140.0	278.8	4.0
50%ile	5.7	200.0	283.1	8.0
75%ile	8.2	260.0	287.4	9.0
Maximum	23.1	360.0	303.1	10.0

Note: "cc" is cloud cover in tenths, "tempk" is degrees Kelvin, "ws" is wind speed in metres/second, "wd" is wind direction in degrees

Data capture for main meteorological parameters (%)

Wind speed data capture %: 98.14
Wind direction data capture %: 98.08
Cloud cover data capture %: 93.29
Temperature data capture %: 98.15

Emission factors

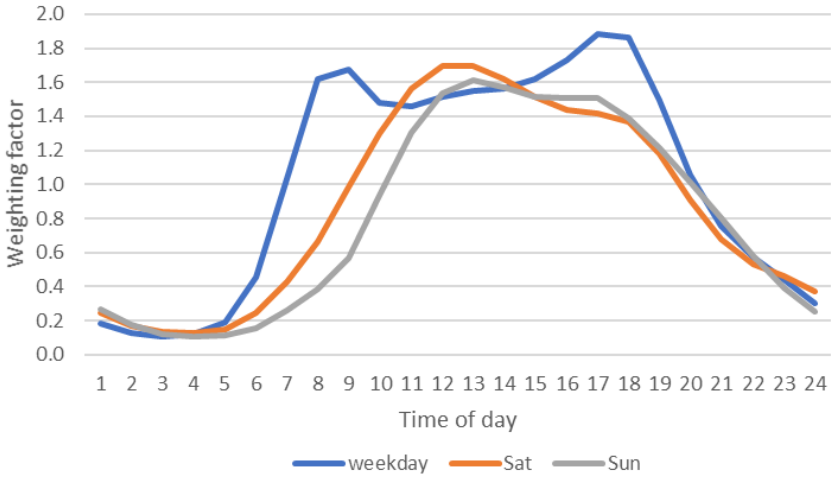
Emissions were calculated using the Emission Factor Tool (EFT2019_v9.0.xlsb) using the information on traffic flows shown in Table D-4.

Time varying emissions

Motor vehicle traffic distribution by time of day and day of the week was obtained from national statistics[30]. The diurnal variation for workdays, Saturday and Sunday are shown in Figure D-5.

[30] www.gov.uk/government/organisations/department-for-transport/series/road-traffic-statistics Table TRA0307

Figure D-5 Diurnal traffic movements used in the dispersion model study



Other modelling parameters

ADMS-Roads 4.1 (model version 4.1.1.0) was used. The modelling parameters were set as follows:

Parameter	Value
Minimum-Monin Obukov height	30 m
Surface roughness at dispersion site	0.5 m
Surface roughness at meteorological met station	0.1 m
Latitude	45° N
Receptors within model domain	Every 10 m

Model verification

Verification of the model involves comparison of the modelled results with local monitoring data at relevant locations. This helps to identify how the model is performing at the various monitoring locations. 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.

The modelling domain was extended slightly from an initial evaluation to include eight monitoring stations. The location of the monitoring stations in the modelling domain was presented previously in Figure 3-2. The approach outlined in Box 7.15 of LAQM.TG(16) has been used in this case.

The verification is carried out using the NOx concentration derived from the dispersion modelled against the 'measured NOx' (derived using the NOx to NO_2 calculator[31] SHEET *Diffusion tubes*). It is appropriate to verify the ADMS Roads model in terms of primary pollutant emissions of nitrogen oxides. The model has been run to predict annual mean road NOx concentrations during the 2018 calendar year at the diffusion tube sites. The measured and modelled NOx are compared in Columns 4 and 5 of Table D-7. The adjustment factor (1.7875) is derived using linear regression by plotting the modelled Road NOx contribution vs. measured Road NOx contribution (see Figure D-6).

This factor was then applied to the modelled Road NOx concentration for each modelled point to provide adjusted modelled Road NOx concentrations (see Column 6).
A modelled NO_2 is then derived from the total NOx (background + road NOx) derived using the NOx to NO_2 calculator SHEET *NOx to NO_2*

[31] https://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html#NOxNO2calc Version NOx_to_NO2_Calculator_v7.1.xlsm

A plot comparing modelled and monitored NO_2 concentrations after adjustment is presented in Figure D-7 . The data for this plot are presented in
The largest variation between modelled and measured concentrations occurred at Site B4 (Dalston Road) for which the model underpredicted the NOx concentration by 18.1 µg m^{-3} (34.5 %). While more detailed information about the nature of the traffic at this location could have improved the model prediction, the RMSE for the NO_2 prediction within the model domain is 4 µg m^{-3} and hence within the 10 % of the air quality objective recommended by TG22 (Paragraph 7.585).
Table D-8. Model uncertainty can be estimated by calculating the root mean square error (RMSE). In this case the calculated RMSE was 4 µg m^{-3} after adjustment which is within the suggested value (10% of the objective being assessed) in LAQM.TG(16). The model has therefore performed sufficiently well for use within this assessment.

Table D-7 Measured, modelled NOx and adjusted NOx

	Site code	Location	Measured Road NOx, µg m^{-3}	Modelled Road NOx (before adjustment), µg m^{-3}	Modelled Road NOx (after adjustment), µg m^{-3}	Difference (measure-modelled) / measured, %
1	B4	DALSTON RD	52.5	19.2	34.4	34.5
2	E22	FINKLE ST	37.48	19.9	35.6	-4.9
3	E12	3 WIGTON RD	43.63	20.2	36.1	-17.2
4	E15	22 WIGTON RD	35.96	20.2	36.1	0.5
5	E16	JOVIAL SAILOR	43.19	32.3	57.7	33.7
6	E19	49 WIGTON RD	40.75	18.0	32.1	-21.2
7	E6	PADDYS MARKET	35.75	22.0	39.3	9.8
8	E8	BRIDGE ST	64.38	38.1	68.1	5.8

The largest variation between modelled and measured concentrations occurred at Site B4 (Dalston Road) for which the model underpredicted the NOx concentration by 18.1 µg m^{-3} (34.5 %). While more detailed information about the nature of the traffic at this location could have improved the model prediction, the RMSE for the NO_2 prediction within the model domain is 4 µg m^{-3} and hence within the 10 % of the air quality objective recommended by TG22 (Paragraph 7.585).

Table D-8 Measured and modelled NO_2

	Site code	Location	Measured Road NO_2, µg m^{-3}	Modelled NO_2 (after adjustment), µg m^{-3}	Difference measured-modelled, µg m^{-3}	Product of difference, (µg m^{-3})^2
1	B4	DALSTON RD	35.8	27.7	8.14	66.3
2	E22	FINKLE ST	29.1	28.2	0.86	0.7
3	E12	3 WIGTON RD	31.9	28.5	3.43	11.8
4	E15	22 WIGTON RD	28.4	28.5	-0.08	0.0
5	E16	JOVIAL SAILOR	31.7	38.0	-6.34	40.2
6	E19	49 WIGTON RD	30.6	26.6	4	16.0
7	E6	PADDYS MARKET	28.3	29.9	-1.62	2.6
8	E8	BRIDGE ST	40.8	42.3	-1.52	2.3
					∑	139.90
					RMSE (rounded to integer)	4 µg m^{-3}

Figure D-6 Modelled road NOx vs measured road NOx

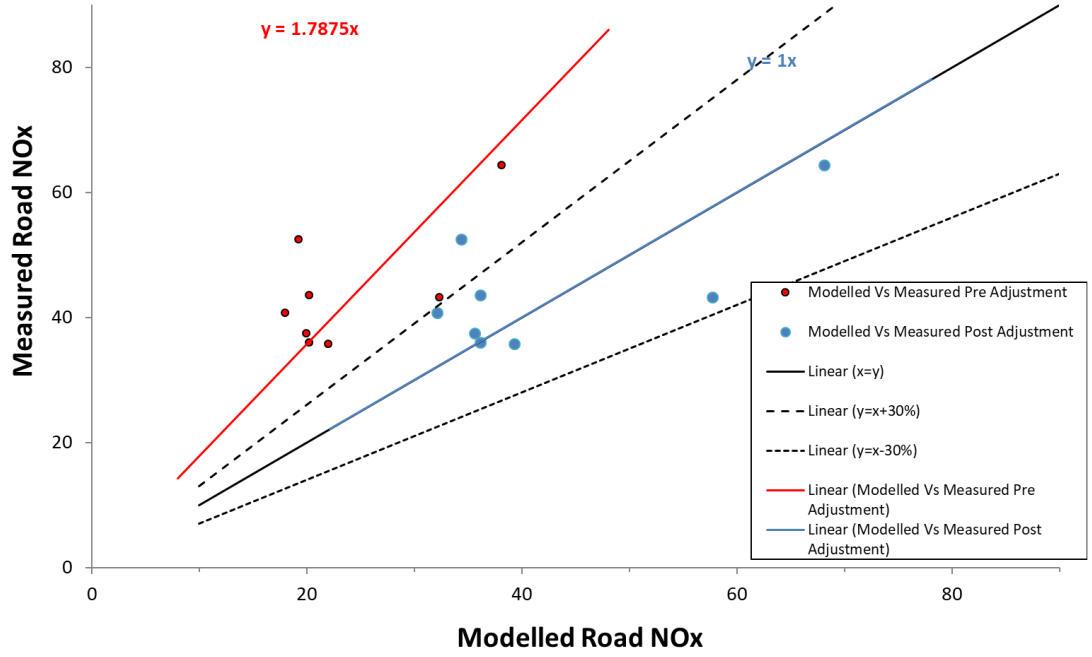
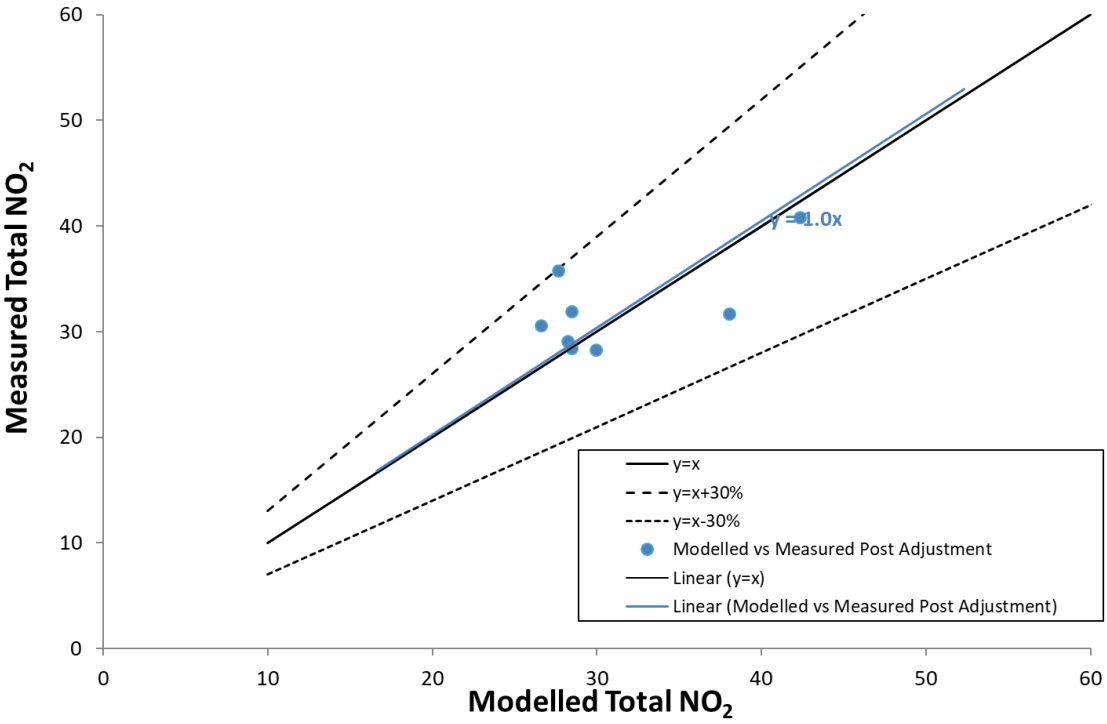


Figure D-7 Modelled total NO_2 vs measured total NO_2



Note on bias adjustment factor

The nitrogen dioxide concentrations used in verification process were obtained from the 2019 Annual Status Report. These had been bias adjusted using a value of 0.93 obtained from national spreadsheet. This was justified on the basis that the factor incorporated variation from many types of monitoring sites. Also, since 2006 the annual datasets have tended to be bias adjusted using the national adjustment factor this has allowed for a consistent methodology over the years.

Appendix E: Defra's appraisal of AQAP

Defra approved the AQAP on 21st December 2022. However, as a consultee, a number of recommendations were made for incorporation into the AQAP. The table below presents the recommendations and summarises how they were actioned.

Recommendation	Action
There is an Error! Reference source not found. cross referencing issue on page 42 of the document, which should be rectified.	This has been rectified
The measures table could be updated to the format of the most recently templated version (released March 2022)	Table 5.1 has been updated to table of measures as provided in the March 2022 AQAP template
The PHOE fraction of mortality indicator can be updated	The data was accurate at the time the report was drafted and is not now materially different. The 2023 ASR will have the updated data
National Scale policy documents, such as the Clean Air Strategy 2019 and the UK Plan for Tackling Roadside Nitrogen Dioxide Concentrations could be more directly considered within the AQAP.	Reference to the Clean Air Strategy and UK Plan for Tackling Roadside NO_2 have been added as bullet points into Section 3.2
Some form of consideration, whether that be through dispersion modelling or otherwise, of the likely impacts of the scale of development proposed within the Local Plan would be beneficial, to ensure the compliance currently achieved within the AQMAs will continue into the future. There is also no projection of future concentrations within Appendix D, which could be added using roadside projection factors, or additional modelling scenarios	We don't think dispersion modelling is proportionate to assess the impacts of developments set out in the Local Plan, and there is no available activity data to enable that in any case. Ambient monitoring will continue and will be used to assess air quality in the future. As is already included in the AQAP planned development will be assessed on a case-by-case basis using the Supplementary Guidance and mitigation measures will be considered accordingly
As per Box 7.5 of LAQM.TG(22), source apportionment for NO2 should be included. This should also include the local and regional background component. This will allow for a clearer understanding of the make-up of total ambient concentrations, and the sources that the local authority may have direct control over	Source apportionment for NOx is included in the AQAP. We believe this sets out clearly that traffic is a key contributor to the exceedance in Bridge Street
It would also be informative to understand whether the source apportionment is the same for all AQMAs, or whether this fleet / emissions profile is unique to Bridge Street AQMA. This may have important ramifications for the effectiveness of more generalised measures across the district.	It is likely the source apportionment will differ to some extent in each AQMAs. Detailed traffic data was only provided for roads impacting Bridge Street – we do not have detailed traffic data for locations other than Bridge Street
Source apportionment should also be more explicitly referenced in the measures themselves, to ensure that the most significant sources are being effectively targeted. For example, HGVs are the largest roads source but are not directly referenced in any of the measures	This information is currently not available but is being sought.

Recommendation	Action
The calculated required reduction in emissions should be updated to consider concentrations monitored in 2019, as a more conservative estimate of the reductions required. However, it is noted that monitored concentrations have reduced markedly since, so the 2018 calculation is still likely to be conservative	For consistency, we have not made this update. This can be done for the next AQAP update in 2025.
The AQAP determines qualitatively that the actions are likely to be effective, but doesn't accurately quantify any of the specific measures' impacts, which would help the reader to understand the relative merits of particular interventions. As per paragraph 2.85 of LAQM.TG(22), an AQAP should contain quantification of the impacts of measures as a minimum. This could be aided by updated dispersion modelling, which has already been produced in support of the AQMA/AQAP.	The AQAP was completed prior to the updated guidance. In any case many of the measures do not have accurate activity data to inform a dispersion model e.g., the impact of cycling/walking and travel plans cannot readily be quantified.
More specificity could be added to the list of measures, which are generally strategic in nature, with the exception of Measure 1. Hyper local sources, or impacts on dispersal of emissions, could also be targeted to improve areas of elevated concentrations along Bridge Street	Work to improve the signalling on Castle Way and Bridge Street was implemented in summer 2022. Early data indicates a significant improvement in NO2 levels at Bridge St AQMA. This will be detailed in ASR 2023.
The measures would also benefit from a detailed cost/benefit analysis, as it is currently unclear to the lay person which of the measures will be most cost effective, and which will achieve the greater pollutant reductions	All of the measures in Table 5-1 are being implemented and therefore their cost-effectiveness is not directly relevant
Expected costs of the measures are often vague or not listed. Details of funding sources could also be more clearly determined, as at present this throws some doubt on the likelihood of the implementation of the measures. For example, Measure 2 is listed, but states that 'such projects require significant investment' – which indicates delivery will be at best, a challenge.	Work to improve the signalling on Castle Way and Bridge Street was implemented in summer 2022. Early data indicates a significant improvement in NO2 levels at Bridge St AQMA. This will be detailed in ASR 2023. Expected costs are difficult to quantify when measures are ongoing and implemented internally by the council.
Please advise if the Council is happy to add funding sources to the table and preferred wording.	Funding sources have been added where possible
It is assumed that the table in Appendix A will be expanded to include responses from the statutory consultees in the Final AQAP. This should also include responses to the consultation feedback received from the Council themselves, which signpost within the document where the consultation comments have been enacted, or otherwise, with supporting justification.	No comments have been received from statutory consultees. This information has been added to the table.
Appendix B should also be populated, highlighting measures not taken forward to the Final AQAP, and the reasons behind these decisions	The abandoned joint parking policy has been added to the table. Reasoning has also been added.
It is noteworthy that many of the mitigation measures recommended within Appendix C for developers (e.g EV charging, variable parking charges, etc) are not included within the list of measures taken forward by the Council in the AQAP. This may represent a missed opportunity for the Council to lead by example on such measures and/or policies.	A reference to the EV infrastructure pilot has been added to the table of measures (added as Measure 13).

Recommendation	Action
The composition and actions of the Steering Group has been discussed in only limited detail. Please ensure the Steering Group will be maintained through implementation, to ensure the AQAP remains relevant and is enacted, as there is currently no stated intention to do so. Details of the outcomes of future meetings could also therefore be provided within future updates.	We will ensure that the Steering Group will oversee the AQAP implementation.
If in the interim period compliance with the AQS objective has been achieved, as is indicated by 2021 concentrations, the Council could consider retaining an updated version of this Plan to form the basis of a local air quality strategy for the AQMAs (or for the wider district) as per paragraph 4.12 of LAQM.PG(22).	No comment
Additional locations along the A595 / Church Street, according to Figure 3.4, look to be at risk of exceedance, which is not discussed. Further consideration should be given to these locations.	Additional text has been added into Section 3.4.2 to say that concentration decreased along Bridge Street and Church Street as the traffic speeds increased.
Little description or justification of the model's underperformance at Site B4 is provided. Given this is the second highest road NOx it is considered that the model's performance should have been improved within this area, to ensure additional modelled exceedances have not been artificially suppressed through model performance	The overall performance of the AQ model, as defined by the RMSE, within the modelling domain, which included Site B4, was 10 %. This is considered satisfactory for LAQM AQ model assessments.
The dispersion modelling is now somewhat outdated, using superseded tools. An update to this could be considered	The modelling relied on current methods at the time the report was drafted. An update can be considered for the next AQAP update in 2025
It appears Table D-7 and D-8's columns are mis-labelled – the Road NOx/2 is specific component of total NO2 (Total NOx/2 = Road + Background NOx/2). These columns actually represent total NOx/2 and so should be corrected. The percentage differences in monitored vs modelled would also be a good addition, as these should be within 25%, and ideally 10%, and demonstrates quickly which sites are performing well and which are not.	The labels in Table D.7 were correct. Within Table D.8, Column 5, the label was changed from *Modelled Road NO_2* to *Modelled NO_2.* The differences between modelled and measured concentrations were also added.

Glossary of Terms

Abbreviation	Description
AQAP	Air Quality Action Plan - A detailed description of measures, outcomes, achievement dates and implementation methods, showing how the local authority intends to achieve air quality limit values'
AQMA	Air Quality Management Area – An area where air pollutant concentrations exceed / are likely to exceed the relevant air quality objectives. AQMAs are declared for specific pollutants and objectives
AQS	Air Quality Strategy
ASR	Air quality Annual Status Report
Defra	Department for Environment, Food and Rural Affairs
EU	European Union
LAQM	Local Air Quality Management
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides
PM_{10}	Airborne particulate matter with an aerodynamic diameter of 10µm (micrometres or microns) or less
$PM_{2.5}$	Airborne particulate matter with an aerodynamic diameter of 2.5µm or less
…	…