Air Quality Action Plan

Lichfield District Council

2019

Bureau Veritas UK Limited
66 Prescot Street
London
E1 8HG

Telephone: +44 (0) 207 661 0700
Fax:: +44 (0) 027 661 0741
Registered in England 1758622
www.bureauveritas.co.uk

Registered Office
Suite 308 Fort Dunlop
Fort Parkway
Birmingham
B24 9FD

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Signature	
Approved by	Dr Antony Wiatr (Principal Consultant)
Signature	
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Bureau Veritas UK Limited
66 Prescot Street
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Lichfield District Council
Air Quality Action Plan

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

August 2019

Local Authority Officer	Craig Morris
Department	Environmental Protection
Address	District Council House, Frog Lane, Lichfield, Staffordshire WS13 6YY
Telephone	01543 308213
E-mail	craig.morris@lichfielddc.gov.uk
Report Reference number	LDC_AQAP_2019
Date	August 2019

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 Lichfield District Council (LDC - the Council), and specifically the two declared Air Quality Management Areas (AQMAs) for nitrogen dioxide (NO_2), between 2018 and 2022. These are Muckley Corner, and the second a section of the A38 between Streethay and Alrewas.

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]. The Council is committed to reducing the exposure of people in the District of Lichfield to poor air quality in order to improve health.

We have developed actions to improve air quality in the district, and specifically the AQMAs, that can be considered against the following five broad topic areas:

- Transport measures – provision of additional transport infrastructure; changes to road layout or operation; formulation of traffic plans; with the aim being to encourage the use of greener modes of transport, and/or reduce congestion and associated vehicle emissions;
- Leading by example measures – measures that LDC will implement to encourage wider behavioural changes in the local population with respect to their travel choices;
- Education, community and partnership measures – provision of information to increase community awareness of the challenges faced on air quality within the local area, to facilitate behavioural change;

[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

- Statutory measures – use of legislation and targeted enforcement to control air pollution; and
- Air quality monitoring – ensure satisfactory air quality monitoring data is available to track outcomes of the implementation of our action plan measures and allow effective management of air quality.

Our priorities are focussed on the reduction of emissions from road traffic throughout the District. Regulation of emissions from industry have shown to be sufficient such that these sources of emissions are not the significant contributor to the problems identified by the Council in respect of the AQMAs.

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 roads managed by Highways England and 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 the Council's direct influence.

Responsibilities and Commitment

This AQAP was prepared by Bureau Veritas on behalf of LDC with the support and agreement of the Environmental Protection and Housing Manager.

The recommendations of this AQAP will now be taken forward for consultation with the Action Planning Steering Group and the other identified statutory and non-statutory consultees, prior to implementation.

This AQAP will be subject to an annual review, appraisal of progress and reporting to the Action Planning Steering Group. Progress each year will be reported in the Annual Status Reports (ASRs) produced by the Council as part of our statutory Local Air Quality Management (LAQM) duties.

If you have any comments on this AQAP please send them to Craig Morris at:

District Council House, Frog Lane, Lichfield, Staffordshire WS13 6ZE

T: 01543 308213

E: craig.morris@lichfielddc.gov.uk

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1 Introduction

This 2nd draft Air Quality Action Plan (AQAP), provided for consultation purposes, outlines the actions that Lichfield District Council (LDC - the Council) proposes to deliver between 2018 and 2022, in order to reduce concentrations of air pollutants and exposure to air pollution; thereby positively impacting on the health and quality of life of residents and visitors to the District.

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. The Act does not prescribe any timescale for preparing an AQAP. However, the Government expect them to be completed within 12 months following the designation of any AQMAs. The prime responsibility for preparing and submitting the AQAP rests with LDC; however, there is a requirement on other relevant stakeholders to collaborate with LDC to identify proposals in pursuit of the AQS objectives within their respective responsibilities and functions.

A dispersion modelling exercise usually provides the technical backup for the appraisal of measures targeting emissions reduction to be included within the AQAP. The AQAP should refer to the findings of this assessment in terms of source apportionment (i.e. where emissions are coming from) so that action plan measures may be targeted appropriately.

An AQAP must include the following elements:

- Quantification of the source contributions to the predicted exceedences of the relevant objectives; this will allow the AQAP measures to be effectively targeted;
- Evidence that all available options have been considered;
- How the local authority will use its powers and also work in conjunction with other organisations in pursuit of the air quality objectives;
- Clear timescales in which the authority and other organisations and agencies propose to implement the measures within its plan;

- Where possible, quantification of the expected impacts of the proposed measures and an indication as to whether the measures will be sufficient to meet the air quality objectives. Where feasible, data on emissions could be included as well as data on concentrations where possible; and
- How the local authority intends to monitor and evaluate the effectiveness of the plan.

2 Summary of Current Air Quality in Lichfield

LDC is situated in the north of the West Midlands, close to some highly industrialised parts of the UK. To the south west lie Walsall and Birmingham. LDC is only moderately industrialised, but there are a number of major roads in the region, including the M6 Toll, A38 and A5. Consequently, road traffic is the main source of air pollution in the area. Burntwood and Lichfield are the two largest urban areas in the District[4].

This draft AQAP has been prepared following the declaration of two Air Quality Management Areas (AQMAs) for nitrogen dioxide (NO_2), to be delivered. The first AQMA is in the Muckley Corner area, the second along the A38 between Streethay and Alrewas.

2.1 A5 Muckley Corner AQMA

In 2008 LDC declared an AQMA[5] for the area encompassing the Muckley Corner Roundabout on the A5 along with a number of surrounding buildings.

Detailed dispersion modelling of the Muckley Corner Junction was undertaken prior to declaration. The junction was previously identified as showing exceedences of the NO_2 annual mean AQS objective and subsequently declared an Air Quality Management Area in 2008. Modelling was carried out for the base year 2009 and the assessment year 2010 (which includes the committed junction redesign). Source apportionment was undertaken showing the contribution of specific vehicle classes (cars, LGV, OGV1, OGV2 and PSV) and background levels of pollution make towards overall NO_x concentrations. The necessary NO_x reductions required to meet the UK annual mean NO_2 objective of 40µg/m^3 were calculated for 2010 as it represented the current year at the time.

An Action Planning appraisal assessment, based on the findings of the [then] Further Assessment was also undertaken. Within this work the direct impact of the junction redesign was assessed by comparing with and without scheme scenarios for the same model year (2010). Despite this work, which is predicted to reduce local road

[4] 2013 Air Quality Progress Report: Lichfield District Council
[5] Local Air Quality Management 2010 Nitrogen Dioxide Further Assessment and Air Quality Action Plan for Muckley Corner

traffic emissions and improve air quality, it is expected that the more significant improvements could be achieved through increased use of the M6 Toll Road.

The Council considers that should the operator of the M6 Toll Road, (Midland Express Ltd) change their pricing policy, a considerable positive impact could be achieved through reducing congestion and HGV traffic on the A5. Unfortunately, enquiries with Midland Expressway Ltd. suggest that there is currently no intention for the pricing policy to be changed. Work is taking place with Midlands Connect (a collaboration of local authorities including Staffordshire CC, Local Enterprise Partnerships and other key partners from across the Midlands), however, to identify long term solutions as well as short term plans to reduce congestion, including measures to make best use of the M6 Toll, which still has room for growth when a significant number of vehicles are travelling through the Midlands using more congested routes.

The Midlands Connect Long Term Motorway Hub Strategy (June 2018) (https://www.midlandsconnect.uk/media/1175/midlands-motorway-hub-summary-report-final-06062018.pdf) recommends improving the quality of information on signage on the M6, providing smarter information to the travelling public, which could help divert traffic onto the M6 Toll at peak times or during incidents. This element of the Hub strategy could be delivered within the next two years and if completed, has the potential to also draw traffic away from the A5 during peak times or incidents on the M6 where traffic might have previously moved to the A5.

The Study states: "Additional signage, smart information and strengthened governance arrangements to encourage greater use of the M6 Toll at any time, but particularly during incidents on the M6. This will reduce the volume of traffic re-routing through urban areas with associated air quality, noise and safety impacts. Our data collection suggests that there is still a market for some people to shift from using the M6 to the M6 Toll if the benefit of doing so is better understood".

The base modelling and source apportionment work has subsequently been updated as part of the preparation of this draft AQAP, with source apportionment being undertaken for a more detailed breakdown of vehicles.

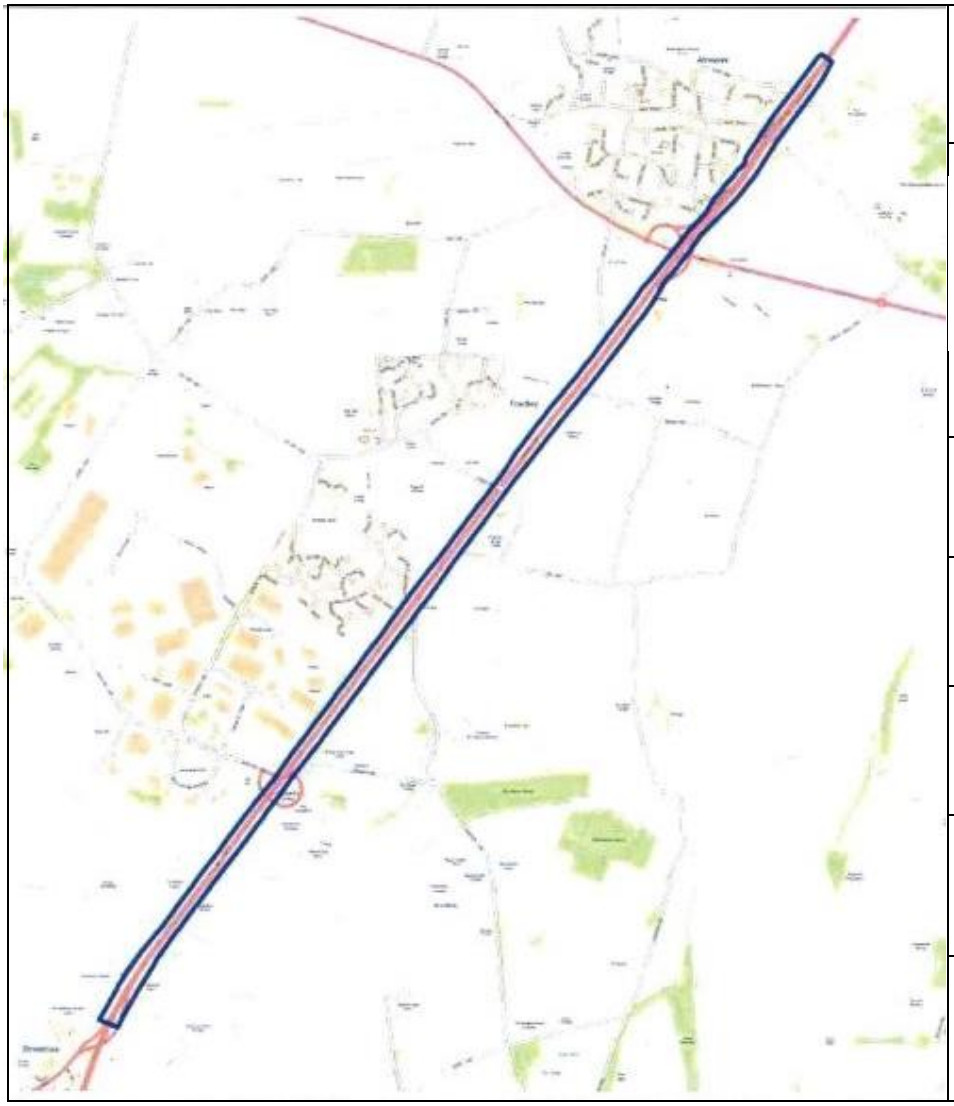
Figure 2.1 - Muckley Corner AQMA

Contains Ordnance Survey Data Crown Copyright and Database Right [2017]	
BUREAU VERITAS	**Air Quality Bureau Veritas 5th Floor 66 Prescot Street London, E1 8HG**
Location Muckley Corner	
Title Muckley Corner Air Quality Management Area	
By MN	**Approved** AW
Scale Not To Scale	**Job Ref** 6332839
Date January 2017	**Figure No.** 2.1

2.2 A38 AQMA

The conclusions of the 2015 Detailed Assessment of the A38, specifically the region in the vicinity of the Rykneld St junction, were that annual mean NO_2 concentrations were found to be exceeding the 40µg/m^3 annual mean AQS objective at six locations of relevant exposure. The gridded output of the model demonstrated that the geographical extent of the exceedence covers the area along the A38 from the junction with the A5127 Burton Road to the District north boundary. The Council declared an AQMA in this area in 2016, the extent of which is shown below in Figure 2.2. Source apportionment was conducted for this area as part of the preparation of this draft AQAP, building on the inputs of the 2015 Detailed Assessment.

Figure 2.2 - A38 AQMA



Contains Ordnance Survey Data Crown Copyright and Database Right [2017]

Air Quality Bureau Veritas 5th Floor 66 Prescot Street London, E1 8HG	
Location A38, between Streethay and Alrewas	
Title AQMA Boundary	
By MN	**Approved** AW
Scale Not To Scale	**Job Ref** 6332839
Date June 2018	**Figure No.** 2.2

Since declaration of the Muckley Corner AQMA, the Council has taken forward a number of measures in pursuit of improving local air quality, as summarised below. More details on the measures can be found in the Local Plan (2008-2029) and Integrated Transport Strategy (2015-2029). Key completed measures are:

- Public transport services have been maintained and improved through 2014/15 with more bus services linking to Burntwood and Tamworth, and more frequent services to Burton on Trent; and
- The A5/A5148 Wall Island improvement scheme was required due to traffic congestion and queuing problems during peak periods. Works were delivered in 2014 as part of the Highways Agency's Pinch Point Programme. Traffic signals were introduced on two junction approaches with gap closures and

carriageway widening works. This has helped to alleviate daily traffic congestion and reduce journey times as well as improving road safety at the junction.

The Council expects the measures outlined in this draft AQAP, which is considered applicable to both areas given the predominant emissions source in both AQMAs is road traffic, to form the next steps in improving local Air Quality. As a minimum, this Plan will be reviewed every five years, with progress on measures set out within this Plan reported annually within the Council's ASR.

2.3 Recent Monitoring

During 2016, there were a total of thirteen sites where the annual mean NO2 objective was exceeded. Sites A38-2A/B, MUC-1A/B/C and MUC-1 exceeded the annual mean objective with reported concentrations of 45.1µg/m3, 49.4µg/m3 and 47.2µg/m3 respectively. All three monitoring sites were at locations representing relevant exposure and therefore distance correction was not required.

The annual mean concentrations at the exceeding sites, A38-1, A38-4A/B, A38-5A/B, A5-1A, A5-2B, MUC-6, MUC-2, MUC-3, MUC-4 and MUC-5 were all distance corrected to estimate the concentration at relevant exposure. Of the sites that were distance corrected; only MUC-3 and MUC-4 were still found to be exceeding the annual mean NO2 objective at the receptor façade, with reported concentrations of 46.0µg/m3 and 44.1µg/m3 respectively.

Further details are available in the Council's latest statutory LAQM report on Air Quality in the District[6].

[6] https://www.lichfielddc.gov.uk/Residents/Environment/Environmental-health/Pollution/Air-quality-monitoring.aspx

3 Lichfield District Council's Air Quality Priorities

3.1 Public Health Context

The Air Quality Indicator in the Public Health Outcomes Framework (England) provides further impetus to join up action between the various local authority departments which impact on the delivery of air quality improvements.

To help facilitate this, Defra commissioned research to develop a toolkit to help local authorities and public health professionals tackle air pollution in their area[7]. The toolkit provides a one-stop guide to the latest evidence on air pollution, guiding local authorities to use existing tools to appraise the scale of the air pollution issue in its area. It also advises local authorities how to appropriately prioritise air quality alongside other public health priorities to ensure it is on the local agenda.

Integral to a successful process is the development of communication methods for localised air quality and health impact information. Communication guides were developed through a series of workshops and interviews. Participants included Directors of Public Health, public health professionals, local authority air quality managers and members of the public.

The toolkit comprises the following key guides:

- Getting to grips with air pollution – the latest evidence and techniques;
- Understanding air pollution in your area;
- Engaging local decision-makers about air pollution;
- Communicating with the public on air pollution; and
- Air Pollution: an emerging public health issue: Briefing for elected members.

For LDC, the fraction of mortality attributable to air pollution[8] is 5%, which is similar to the national average of 5.1%. When combined with age standardised mortality rates per 100,000 in Lichfield given by the office of national statistics[9], an estimate of approximately 47.3 deaths per 100,000 per year is attributable to air pollution. This is

[7] http://randd.defra.gov.uk/Default.aspx?Menu=Menu&Module=More&Location=None&Completed=0&ProjectID=18580
[8] Specifically anthropogenic $pm_{2.5}$
[9] https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/deaths/bulletins/deathsregistrationsummarytables/2015, 2014 used as was the year of PHOF indicator

comparable to the number of deaths from cancers considered preventable in persons under the age of 75, at 65.8. Thus, air pollution is a considerable public health issue in the District. It should be noted that this figure only accounts for one pollutant ($PM_{2.5}$) for which stronger scientific evidence on links with mortality exist, and not NO_2, for which the AQMAs are declared, so the true figure is possibly even higher.

3.2 Planning and Policy Context

There are a number of related policies and strategies at the local and regional level that can be tied in directly with the aims of the AQAP. A majority of these policies and strategies are focused on transportation issues and, therefore are likely to help contribute to overall improvements in air quality across the LDC area. The review of these strategies and policies also assists in not duplicating the work within this AQAP, but instead focus on measures outside those considered within these strategies and policies, but that still contribute toward their overall aims.

3.2.1 Local Transport Plan 2011-2026

Staffordshire County Council (SCC) is responsible for producing a statutory Local Transport Plan (LTP) which sets out the Council's strategy for transport. The LTP covers all aspects of transport such as walking, cycling, public transport as well as proposed road building and improvements to existing roads and bridges.

A third LTP (LTP3), covering the period from 2011 to 2026, was submitted to the Department for Transport in March 2011. The Plan is split into the following two documents:

The Strategy Plan[10]

The strategy Plan sets out the County Council's proposals and polices for transport provision within the County, including walking, cycling, public transport, car based travel and freight, together with the management and maintenance of local roads and footways.

The County Council's Transport vision in the county is:

A transport system that supports Staffordshire's economy, and safely and conveniently connects people and services within Staffordshire and beyond; it

[10] Reference has been made to the Staffordshire LTP 2011 –Strategy Plan in writing Section 3.1 http://www.staffordshire.gov.uk/transport/transportplanning/localtransportplan/staffordshirelocaltransportplan2011-strategyplan.pdf

provides opportunities for services and jobs to be accessed in a sustainable way, and makes sure that any adverse effect of transport on Staffordshire's rich environment and on residents' quality of life is minimised.

The Implementation Plan[11]

The Implementation Plan for Staffordshire's third LTP is split into two parts; the first part sets out how available funding will be used in order to deliver the LTP objectives over the period (2011/12 to 2014/15). The second part describes the arrangements that have been put in place for overseeing LTP delivery and ensuring that it remains on track to meet its objectives.

- **Existing Road Network and Future Transport Pressures**[12]

Within LDC there are a number of major link roads, including the M6 Toll, A38 and A5. Consequently, road traffic is the predominant source of air pollution in the area.

Considering the wider region, Staffordshire is a diverse county situated near the geographical centre of England and has the greatest population of all the shire counties in the West Midlands. It shares borders with 11 other strategic authorities and influences traffic into the East Midlands and the North West. To the south of the county the economies of the Black Country and Birmingham strongly influence work travel patterns, as do the economies of Stoke-on-Trent, Cheshire and Derbyshire in the north and east of the county. Conversely, Staffordshire influences travel to work patterns in these areas, with 16% of the county's workforce living outside of the county.

The current and future challenges and constraints on regional traffic and transport are set out in the following sections:

- **Local Transport Plan Objectives**
  - *Supporting Growth and Regeneration**
    - Stimulating areas of generation and deprivation.
    - Supporting rural communities.
    - Facilitating tourist activity.

[11] Reference has been made to the Staffordshire LTP 2011 - **Implementation Plan in** writing Section 3.1
http://www.staffordshire.gov.uk/transport/transportplanning/localtransportplan/implementationplan.pdf

[12] Local Air Quality Management 2010 Nitrogen Dioxide Further Assessment and Air Quality Action Plan for Muckley Corner.

- Maximizing the impact of events on traffic movement.
- Managing network capacity.
- Keeping the highway in good state of repair.
- Improving the efficiency of freight distribution.

- *Maintaining the Highway Network**
  - Ensuring the maximum benefit from the highway.
  - Delivering better street lightening
  - Designing for maintenance.
  - Delivering winter services.
  - Delivering sustainable highway maintenance.
  - Improving communication.
  - Ensuring better co-ordination of activities and joint working.

- *Making Transport Easier to Use and Places Easier to Get to**
  - Improving integration between transport and land-use planning
  - Improving bus services
  - Supporting residents with mobility impairments and those without access to private motor vehicle
  - Improving and integration 'other' transport services.

- *Improving Safety and Security*
  - Delivering engineering measures
  - Delivering road safety education, training and publicity
  - Supporting road safety enforcement.
  - Reducing crime fear of crime and anti-social behavior.
  - Planning for and responding to damage caused to transport infrastructure.

- *Reducing Road Transport Emissions and Their Effects on the Highway Network*
  - Promoting alternatives to private motor vehicles
  - Promoting the use of low-emitting vehicles and vehicle efficiency
  - Leading by example

- Improving the resilience of the transport network to climate change.

- *Improving Health and Quality of Life*
  - Getting more people walking and cycling.
  - Supporting access to services.
  - Enabling community cohesion.
  - Reducing the number and severity of road traffic collisions.
  - Reducing the impact of traffic noise.
  - Reducing emissions from road transport.
  - Reducing the impact of artificial light.

- *Respecting the Environment.*
  - Reducing road transport emissions.
  - Reducing the negative impact of artificial light.
  - Minimising flooding, soil erosion and pollutants entering watercourses.
  - Minimising the risk of soil contamination.
  - Improving townscapes and heritage assets on the highway.
  - Enhancing the quality of rural landscapes and the associated biodiversity.
  - Protecting the network of internationally significant nature conservation sites.

Considering the above in the context of regional air quality improvement, the LTP3 sets out the following policies:

Policy 5.1: Promote alternatives to private motor vehicles

This will be achieved by:

- Investing in measures to improve conditions for pedestrians and cyclist particularly in urban areas.
- Encouraging major employers to develop travel plans as a way of managing travel to and from work in a sustainable way.
- Encouraging local planning authorities to secure development patterns and mixes that reduce the need to travel and enable the use of smarter travel modes.

- Supporting new development that includes or is located in areas with good public transport links.
- Working with local planning authorities and developers to mitigate impacts of development in less sustainable locations but which is essential to support regeneration and economic growth.
- Promoting the financial and environmental benefits to businesses of adopting flexible working practices.
- Ensuring transport and access is considered at an early stage in service design and delivery.
- Raising awareness of the financial, environmental and social benefits of taking services to communities/people.
- Sharing information about improving local air quality through the Staffordshire Air Quality Forum (SAQF).
- Promoting the financial, environmental and health benefits of smarter travel modes to Individuals.
- Promoting (and running) schemes that encourage the take up of smarter travel modes.
- Encouraging local planning authorities to keep their car parking strategies under review.
- Introducing Traffic Regulation Orders (such as clear zones, low-emission zones and no stopping/parking zones), subject to there being suitable alternative routes, especially in urban areas, AQMAs, and areas given specific environmental designation such as Special Areas of Conservation (SAC) and Areas of Outstanding Natural Beauty (AONB).

Policy 5.2: Promote the use of low-emitting vehicles and vehicle efficiency

This will be achieved by:

- Investigating measures that will encourage the adoption of low-emitting vehicles such as the installation of electric vehicle charging points in pilot areas.
- Encouraging individuals to purchase low-emitting vehicles and undertake eco-driver training.
- Investigating the posibility of giving low-emiting vehicles greater road priority.

- Encouraging businesses with a company car fleet that when replacing vehicles they consider purchasing lower emitting vehicles, put their drivers through eco-driver training and minimise their business mileage.
- Encouraging public transport operators that when replacing vehicles they consider purchasinglower emitting vehicles and put their drivers through eco-driver training.
- Lobbying Government, Network Rail and train operating companies to electrify more of thecounty's rail lines.
- Creating Freight Quality Partnerships where partners are willing and benefits are identifiable.

Policy 5.3: Leading by example to reduce Staffordshire Road Transport Emissions

This will be achieved by:

- Replacing the County Council vehicles (when required) with ones that are less polluting and more fuel efficient, wherever possible.
- Assessing the County Council essential car user criteria to ensure that it is fit for purpose.
- Reviewing the County Council staff car parking facilities
- Continuing to develop initiatives, such as flexible working, that reduce the need for employees to use their cars to get to work.
- Investigating the introduction of eco-driver training for some essential car users.
- Ensuring all main council offices have access to a pool bicycle and/or car.
- Using recycled and locally sourced materials whenever possible in County Council highway construction and maintenance schemes.
- Delivering other priorities contained within the County Council's Travel Plan (available on request)

Policy 5.4: Improve the resilience of the transport network to changing climatic conditions

This will be achieved by:

- Delivering the priorities contained within the Council's Climate Change Adaptation Strategies (www.staffordshire.gov.uk).

- Assessing, managing and minimising risks posed by climate change to people and property where it relates to the transport network.
- Managing disruption and ensuring rapid recovery of the transport network from the impact of a climate change related event.
- Encouraging all owners of the transport network to manage, maintain and develop it with climate change in mind.
- Supporting new development that has been designed with climate change in mind by, for example, including green space, tree planting and artificial shade.

3.2.2 Lichfield Climate Change Strategy

There are a number of policy's and strategies at regional and local level that support or require the reduction and impacts of climate change to be addresses in the development of planning policies.

At county level, Staffordshire County Council has published a corporate climate change strategy "Green Shoots" 3rd edition in 2013. This sets the ambitious target of 80% reduction in CO_2 emissions by 2050 from 1990 levels[13].

The key projects in the action plan of the this climate change strategy that will be undertaken by the county council over the next five years, in order to fulfil the carbon reduction targets are:

- Renewable Energy:
  - Installation of solar Photo Voltaic (PV) across school estate.
  - Installation of biomass heating systems on schools estate
  - Installation of solar PV across corporate estate.
  - Renewable energy delivery plan.
- Energy Efficiency
  - Ensure insulation is 270mm in corporate buildings.
- Travel
  - A reduction in business mileage by 10%.
  - Revision of Sustainable Travel Plan.
  - Changes to the specification of leased vehicles.

[13]Staffordshire County Council _Corporate Climate Change Strategy "Green Shoots" 3rd Edition _2013
http://www.staffordshire.gov.uk/environment/climatechange/Green-Shoots-Final-Version2.pdf

- Road Lighting
  - Reduced hours / levels of street lighting
- Energy Efficiency
  - White light technology
  - Carbon Trust Collaborative Low Carbon Schools Service
- Information and Communications Technology (ICT)
  - Replacement of desktop personal computers to thin clients.
- Waste and Recycling
  - Improved Recycling Rates and Joint Municipal Waste Management Strategy Refresh
- Procurement
  - Revision of sustainable procurement policy
- Communications
  - NUS Green Impact Programme
  - Science for Sustainability
- Partnership Working
  - Staffordshire Climate Change Partnership and Student Placements
- Energy Efficiency
  - Community Energy Audits
- Supporting Local Businesses
  - Support local businesses to reduce their energy bills and make them more resilient to climate change

3.2.3 Lichfield Local Plan Strategy February 2015

The Lichfield District Local Plan: Strategy was submitted for examination in March 2013. In 3 September 2013, following hearings in June-July 2013, main modifications were recommended. The Lichfield Local Plan Strategy was adopted, after modification, in February 2015.

This document provides the broad policy framework and establishes a long-term strategy to manage development, provide services, deliver infrastructure and create sustainable communities. The Strategic priorities related to air quality in the LDC's Local Plan Strategy is as follows:

Strategic Priority 3: Climate Change

To create a District where development meets the needs of our communities whilst minimising its impact on the environment and helps the District to mitigate and adapt to the adverse effects of climate change.

Strategic Priority 5: Sustainable Transport

To reduce the need for people to travel by directing most growth towards existing sustainable urban and rural settlements and by increasing the opportunities for travel using sustainable forms of transport by securing improvements to public transport, walking and cycling infrastructure.

The following core policies will have a direct impact on local air quality and are to be delivered in the context of the above strategic goals.

Core Policy 3: Delivering Sustainable Development

The Council will require development to contribute to the creation and maintenance of sustainable communities, mitigate and adapt to the adverse effects of climate change, make prudent use of natural resources, reduce carbon emissions, enable opportunities for renewable energy and help minimise any environmental impacts. Within this, also directly relevant is:

Policy SC2: Renewable Energy - Biomass Energy Development

- minimise pollution from noise, emissions and odours;
- minimise emissions and waste products, including airborne emissions, emissions to watercourses and ash

Core Policy 5: Sustainable Transport

The Council will continue to work with partners to improve accessibility, by enhancing sustainable transport opportunities and encouraging development that reduces the need to travel and changes to travel behaviour through a balance of transport measures. Future development within the District will be focused on the most accessible settlements and locations to reduce the need to travel.

Development proposals will, either individually or collectively, have to make appropriate provisions for:

- Reducing the need to travel;
- Widening travel choices and making travel by sustainable means of transport more attractive than the private car;
- Improving road safety; and
- Improving air quality and reducing the impact of travel upon the environment, in particular reducing carbon emissions that contribute to climate change.

Core Policy 10: Healthy & Safe Lifestyles

The District Council will ensure that the current high standard of air quality in the District is monitored and maintained and, where possible, improved with no decline in standards being deemed acceptable as a result of new development.

3.3 Source Apportionment

The AQAP measures presented in this report are intended to be targeted towards the predominant sources of emissions within the Council's area, with specific focus on those emissions sources which contribute to the exceedances of the annual mean AQS objective for NO_2 within the AQMAs.

To better understand the contribution of various emissions sources to the total annual mean NO_2 concentrations, a source apportionment exercise was undertaken, for both NO_x and NO_2.

The methodology to achieve this involves dispersion modelling of road traffic emissions. Emissions are attained using traffic data obtained from the Department for Transport (DfT)[14], input into version 6.0.2 of the Emissions Factor Toolkit[15], set up under 'Detailed Option 2'. To enable source apportionment of Road-NO_x emissions, the 'breakdown by vehicle' and 'source apportionment' additional outputs were utilised.

Road-NO_x contributions for each source type at receptor locations are then modelled using the ADMS-Roads (Version 4.0) atmospheric dispersion model developed by Cambridge Environmental Research Consultants (CERC), utilising various other inputs including meteorological data.

[14] Department for Transport – Traffic Counts (2014) http://www.dft.gov.uk/traffic-counts/
[15] EFT_v6.0.2 available at - http://laqm.defra.gov.uk/review-and-assessment/tools/emissions-factors-toolkit.html

Background pollutant concentrations, as derived for the area from UK-Air, have been added to the ADMS-Roads modelled road source output to calculate predicted total annual mean concentrations of NO_x and NO_2. Both pollutants can then be apportioned appropriately. NO_x is converted to NO_2 concentrations, following the methodology in Defra's Local Air Quality Management Technical Guidance, LAQM.TG(16)[16]; and using the NO_x to NO_2 conversion tool (version 4.1[17]) published by Defra for consistency with previous model outputs for the A38 AQMA. For further details consult Appendix D.

Local sources contributions have then been defined by modelling local traffic emissions. The vehicle splits are as follows:

- Cars;
- Buses/Coaches;
- LGVs;
- HGVs; and
- Motorcycles.

LAQM.TG(16)[16] also recommends the separation of regional background (over which local authorities do not have control), local background contribution (over which authorities should have some influence) and local sources (the principal sources for the local authority to control).

For each location the total NO_x from all vehicle classes as well as the percentage attributable to background sources has been therefore been predicted.

Separate exercises have been conducted for each of the two AQMAs.

A source apportionment study for the Muckley Corner AQMA was initially carried out as part of the Further Assessment completed following declaration, as then required by the LAQM regime. This has been updated with more recent data as part of this AQAP, requiring a base model set up and a new verification exercise (the details of which are presented in Appendix D).

[16] Department for Environment, Food and Rural Affairs (Defra) Local Air Quality Management Technical Guidance (TG16), April 2016, available at http://laqm.defra.gov.uk. Used under Open Government Licence v.3. © Crown copyright 2016
[17] http://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html#NOxNO2calc

A source apportionment study has also been undertaken for the A38 AQMA, subsequent to the Detailed Assessment that led to its declaration, building on the base model used in that assessment. For the full verification and methodology of that modelled domain, consult the Detailed Assessment[6].

Source apportionment results for modelled NO_x concentrations are presented in the following sections, separated for NO_x and NO_2, as follows:

- An illustration of the high level source apportionment of NO_x concentrations averaged across all modelled locations, providing information regarding:
    - The regional background, which the Council is unable to influence;
    - The local background, which the Council may have some influence over; and
    - Other local sources (explicitly modelled), which the Council may have full control over.
- A more detailed source apportionment of the local source contributions to NO_x concentrations, based on:
    - The average across all modelled locations. This provides useful information when considering possible action measures to test and adopt. It will however understate road NO_x concentrations in problem areas;
    - The average across all locations with NO_2 concentration greater than 40µg/m^3. This provides an indication of source apportionment in areas known to be a problem (i.e. only where the AQS objective is exceeded). As such, this information should be considered with more scrutiny when testing and adopting action measures; and
    - The location where the maximum road NO_x concentration has been predicted. This is likely to be in the area of most concern and so a good place to test and adopt action measures. Any gains predicted by action measures are however likely to be greatest at this location and so would not represent gains across the whole modelled area.
- The source apportionment results for NO_2 concentrations use the same approach as was undertaken for NO_x, as follows:

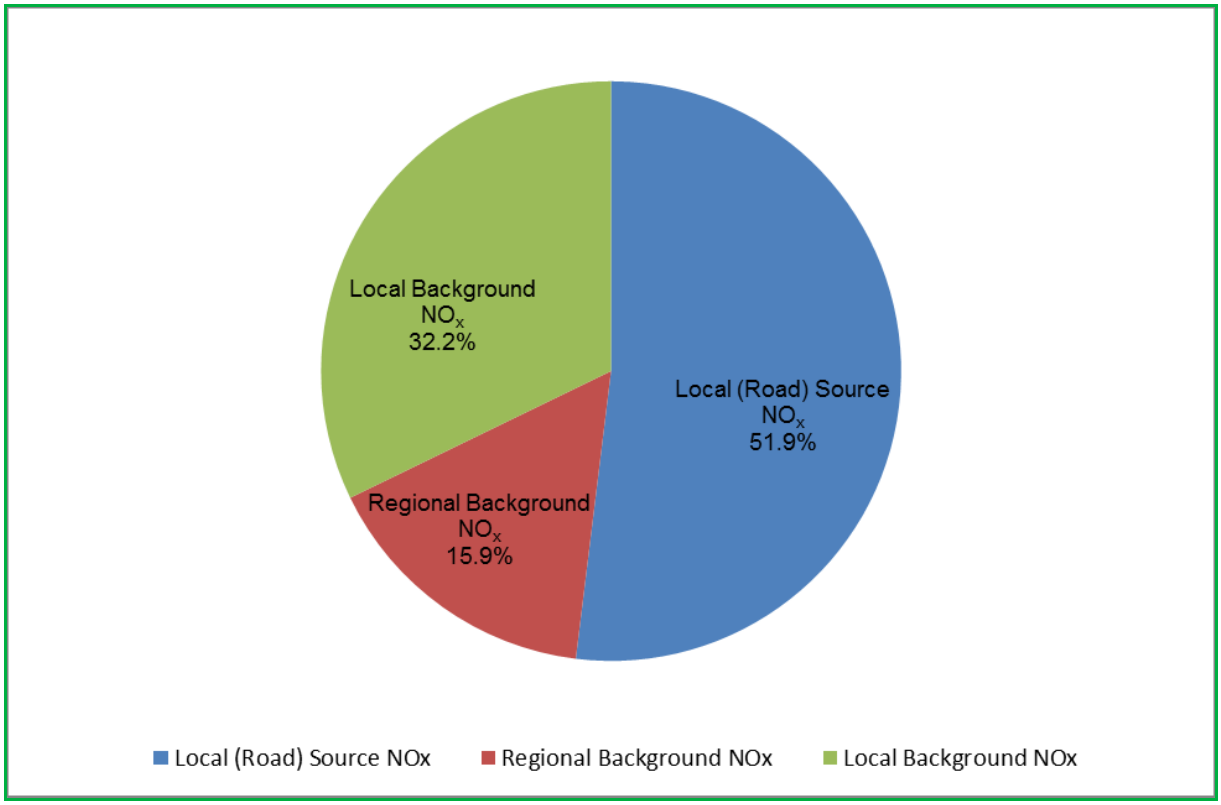
- High level source apportionment of NO_2 concentrations averaged across all modelled locations; and
- More detailed source apportionment of the local sources contribution to NO_2 concentrations, based on the average across all modelled locations; the average at all locations with NO_2 concentration greater than 40µg/m^3; and at the location where the maximum road NO_2 concentration has been predicted.

3.3.1 Muckley Corner

The following section describes the source apportionment results in the Muckley Corner area, presented first for NO_x and then for NO_2.

For NO_x, Figure 3.1 demonstrates the contributors to NO_x concentrations at a high level.

Figure 3.1 - High Level Source Apportionment of NO_x Concentrations Averaged Across All Modelled Locations at Muckley Corner



Local road sources have the largest contribution at 51.9%, followed by local background at 32.2%, then regional background at 15.9%. This means the Council may be able to either directly and indirectly influence 84.1% of total NO_x

concentrations with targeted intervention measures and policies (i.e. the sum of the local road sources and the local background) within the Muckley Corner area.

As demonstrated in Table 3.3, when considering the average NO_x concentration across all modelled locations, road traffic accounts for 46.4µg/m^3 (66.9%) of total NO_x (54.2µg/m^3). Of this total average NO_x, HGVs account for the greatest contribution (25.3%) of any of the vehicle types on average, followed by Cars (15.3%).

When considering the average NO_x concentration at locations with an NO_2 concentration greater than 40µg/m^3, the road traffic contribution is much higher, accounting for 61.3µg/m^3 (70.1%) of total NO_x (87.5µg/m^3). Of this 87.5µg/m^3, HGVs account for the greatest contribution (38.9%) of any of the vehicle types, followed by Cars (17.8%).

At the location with the maximum road NO_x concentration (77.9µg/m^3 out of a total NO_x of 104.1µg/m^3, predicted at 'DT7'), road traffic accounts for 74.9% of the overall NO_x. Of this 104.1µg/m^3, HGVs account for the greatest contribution (44.9%) of any of the vehicle types, followed by Cars (17.3%).

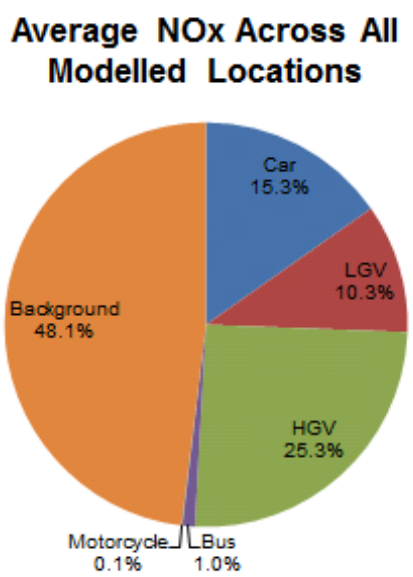
Table 3.1 - Detailed Source Apportionment of NO_x Concentrations – Muckley Corner

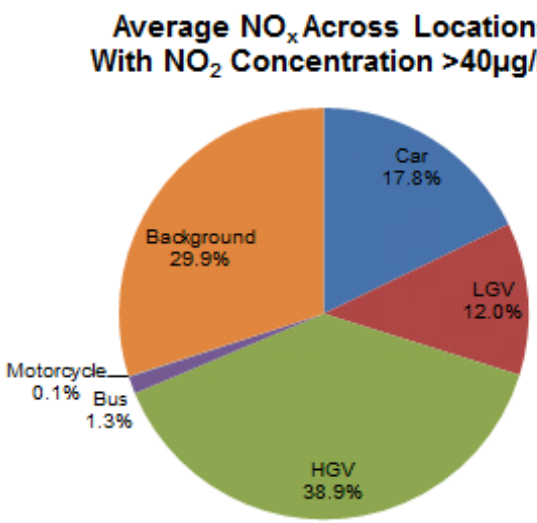
Metric	All Vehicles	Car	LGV	HGV	Bus	Motorcycle	Background
Average Across All Modelled Locations							
NO_x Concentration (µg/m^3)	28.2	8.3	5.6	13.7	0.5	0.0	26.1
Percentage of Total NO_x	51.9%	15.3%	10.3%	25.3%	1.0%	0.1%	48.1%
Percentage Contribution to Road NO_x	100.0%	29.4%	19.9%	48.7%	1.9%	0.1%	-
Average Across All Locations With NO_2 Concentration Greater Than 40µg/m^3							
NO_x Concentration (µg/m^3)	61.3	15.6	10.5	34.0	1.2	0.0	26.2
Percentage of Total NO_x	70.1%	17.8%	12.0%	38.9%	1.3%	0.1%	29.9%
Percentage Contribution to Road NO_x	100.0%	25.5%	17.1%	55.5%	1.9%	0.1%	-
At Location With Maximum Road NO_x Concentration (DT7)							

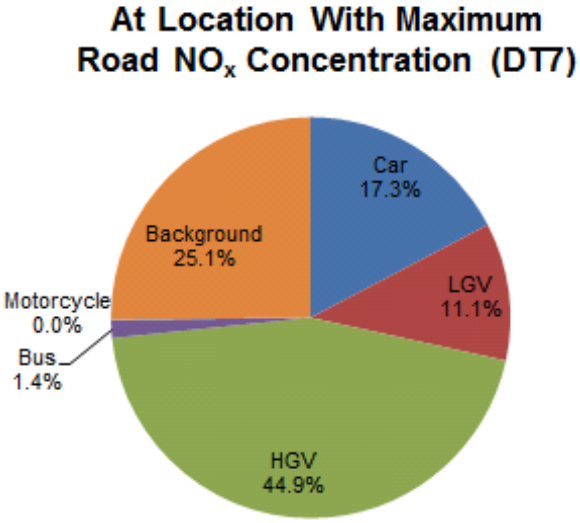
NO_x Concentration ($\mu g/m^3$)	77.9	18.0	11.6	46.8	1.5	0.0	26.2
Percentage of Total NO_x	74.9%	17.3%	11.1%	44.9%	1.4%	0.0%	25.1%
Percentage Contribution to Road NO_x	100.0%	23.2%	14.8%	60.0%	1.9%	0.0%	-

Figure 3.2 illustrates the detailed source apportionment of NO_x concentrations in pie chart format.

Figure 3.2 - Detailed Source Apportionment of NO_x Concentrations in Muckley Corner

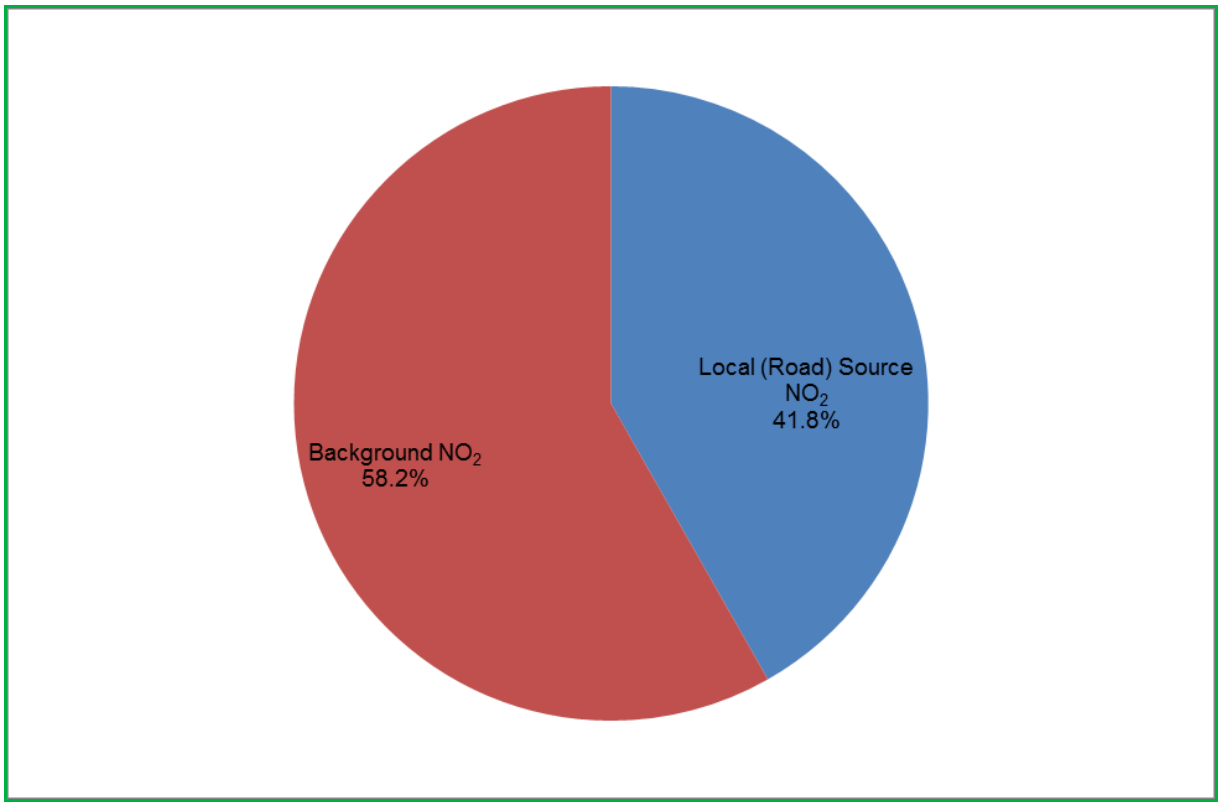






For NO_2, Figure 3.3 demonstrates the contributors to NO_2 concentrations at a high level.

Figure 3.3 - High Level Source Apportionment of NO_2 Concentrations Averaged Across All Modelled Locations at Muckley Corner



At a high level, the background component has the greater contribution to total NO_2 concentrations at 58.2%, whilst local road sources contribute the remaining 41.8%. It should be noted that it is not possible to separate out the regional and local components of the overall NO_2 background contribution. This means that Council actions could potentially have a direct impact on 41.8% of the total NO_2 concentrations within the Muckley Corner area.

As demonstrated in Table 3.2, when considering the average NO_2 concentration across all modelled locations, road traffic accounts for 13.2µg/m^3 (41.8%) of total NO_2 (31.6µg/m^3). Of this total average NO_2, HGVs account for the greatest contribution (20.2%) of any of the vehicle types on average, followed by Cars (12.4%).

When considering the average NO_2 concentration at locations with an NO_2 concentration greater than 40µg/m^3, the road traffic contribution is much higher, accounting for 27.1µg/m^3 (59.5%) of total NO_2 (45.6µg/m^3). Of this 45.6µg/m^3, HGVs

account for the greatest contribution (33%) of any of the vehicle types, followed by Cars (15.1%).

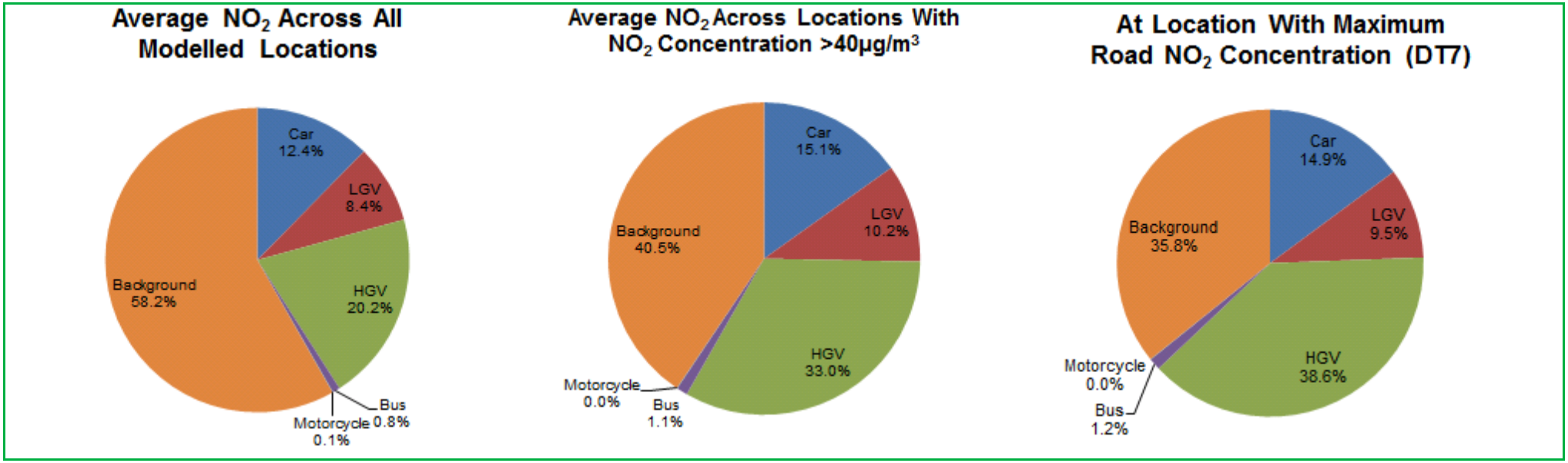
At the location with the maximum road NO_2 concentration (33.2µg/m^3 out of a total NO_2 of 51.7µg/m^3, predicted at 'DT7'), road traffic accounts for 64.2% of the overall NO_2. Of this 51.7µg/m^3, HGVs account for the greatest contribution (38.6%) of any of the vehicle types, followed by Cars (14.9%).

Table 3.2 - Detailed Source Apportionment of NO_2 Concentrations – Muckley Corner

Metric	All Vehicles	Car	LGV	HGV	Bus	Motorcycle	Background
Average Across All Modelled Locations							
NO_2 Concentration (µg/m^3)	13.2	3.9	2.6	6.4	0.3	<0.1	18.4
Percentage of Total NO_2	41.8%	12.4%	8.4%	20.2%	0.8%	0.1%	58.2%
Percentage Contribution to Road NO_2	100.0%	29.6%	20.0%	48.4%	1.9%	0.1%	-
Average Across All Locations With NO_2 Concentration Greater Than 40µg/m^3							
NO_2 Concentration (µg/m^3)	27.1	6.9	4.6	15.0	0.5	<0.1	18.5
Percentage of Total NO_2	59.5%	15.1%	10.2%	33.0%	1.1%	<0.1%	40.5%
Percentage Contribution to Road NO_2	100.0%	25.5%	17.1%	55.4%	1.9%	0.1%	-
At Location With Maximum Road NO_2 Concentration (DT7)							
NO_2 Concentration (µg/m^3)	33.2	7.7	4.9	19.9	0.6	<0.1	18.5
Percentage of Total NO_2	64.2%	14.9%	9.5%	38.6%	1.2%	<0.1%	35.8%
Percentage Contribution to Road NO_2	100.0%	23.2%	14.8%	60.0%	1.9%	<0.1%	-

Figure 3.4 illustrates the detailed source apportionment of NO_2 concentrations in pie chart format.

Figure 3.4 - Detailed Source Apportionment of NO_2 Concentrations in Muckley Corner

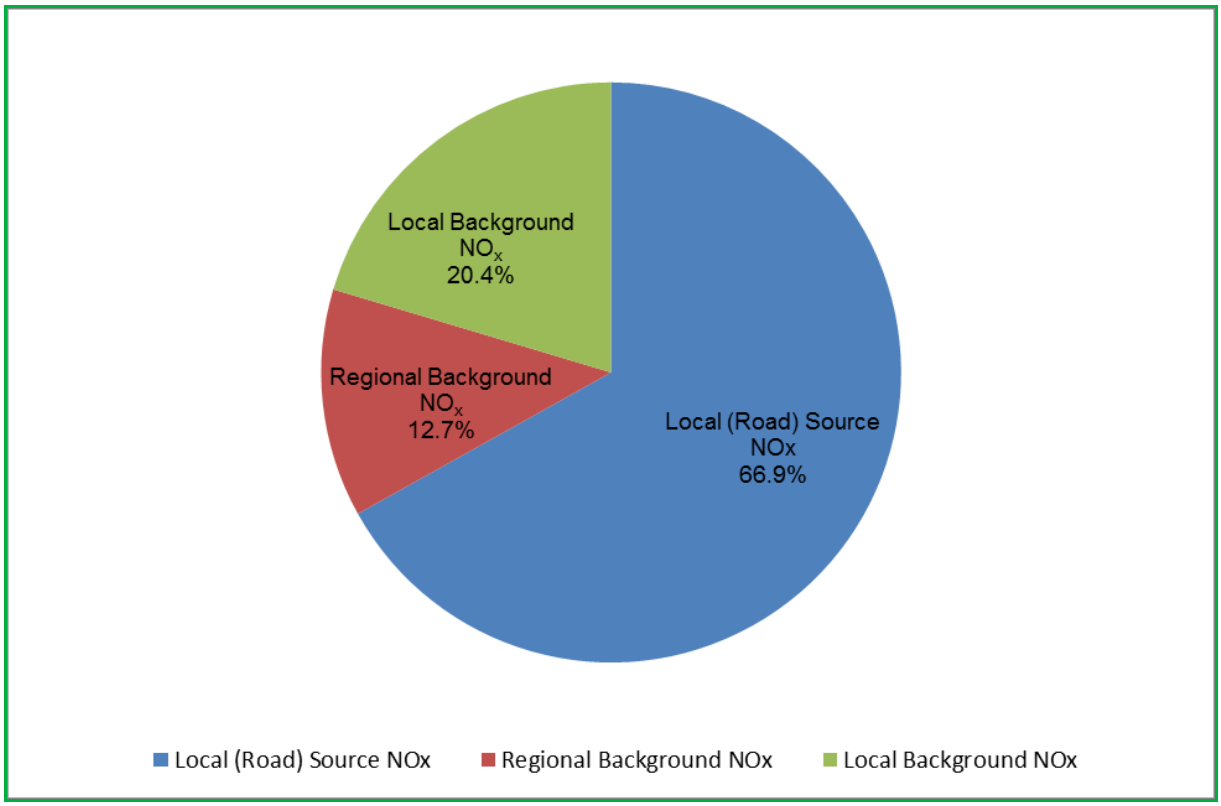


3.3.2 A38 AQMA

The following section describes the Source Apportionment results in the A38 AQMA area, presented first for NO_x and then for NO_2.

For NO_x, Figure 3.5 demonstrates the contributors to NO_x concentrations at a high level.

Figure 3.5 - High Level Source Apportionment of NO_x Concentrations Averaged Across All Modelled Locations at the A38



Local road sources have the largest contribution the at 66.9%, followed by local background at 20.4%, then regional background at 12.7%. This means the Council may be able to either directly and indirectly influence 87.3% of total NO_x concentrations with targeted intervention measures and policies (i.e. the sum of the local road sources and the local background) within the A38 AQMA.

As demonstrated in Table 3.3, when considering the average NO_x concentration across all modelled locations, road traffic accounts for 46.4µg/m^3 (66.9%) of total NO_x (69.4µg/m^3). Of this total average NO_x, Cars account for the greatest

contribution (28.9%) of any of the vehicle types on average, followed by HGVs (24.3%).

When considering the average NO_x concentration at locations with an NO_2 concentration greater than 40µg/m^3, the road traffic contribution is much higher, accounting for 58.2µg/m^3 (71.3%) of total NO_x (81.6µg/m^3). Of this 81.6µg/m^3, Cars account for the greatest contribution (29.8%) of any of the vehicle types, closely followed by HGVs (27.3%).

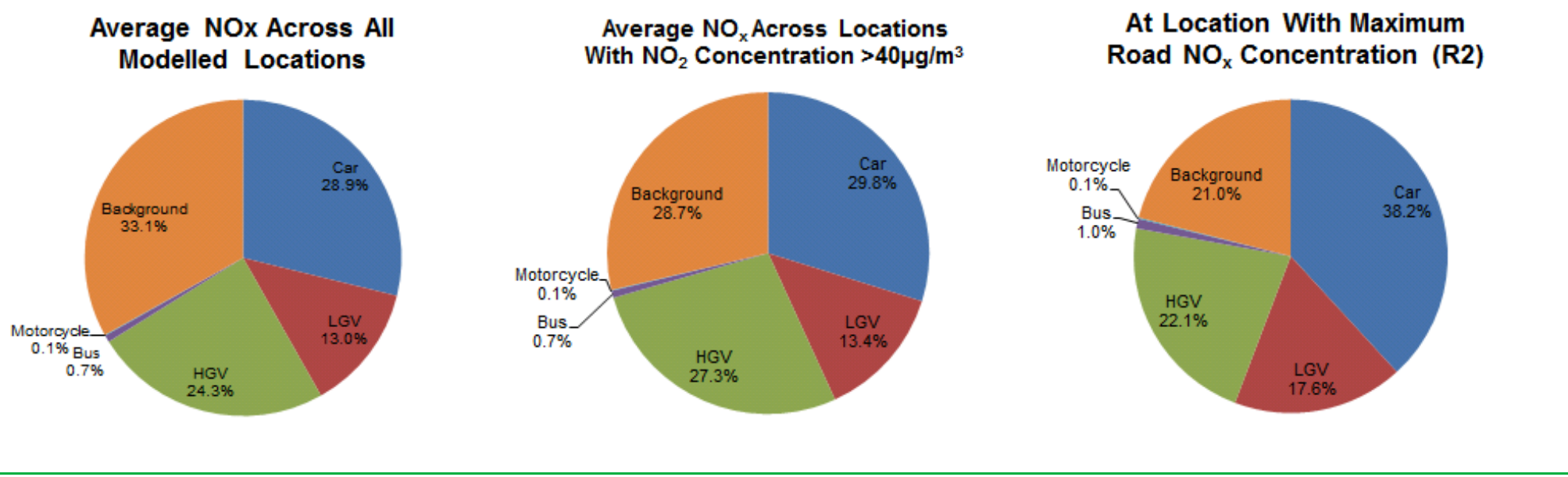
At the receptor with the maximum road NO_x concentration (85.7µg/m^3 oout of a total of 108.5µg/m^3, predicted at 'R2'), road traffic accounts for 79% of the overall NO_x. Of this 108.5µg/m^3, Cars account for the greatest contribution (38.2%) of any of the vehicle types, followed by HGVs (22.1%).

Table 3.3 - Detailed Source Apportionment of NO_x Concentrations – A38 AQMA

Metric	All Vehicles	Car	LGV	HGV	Bus	Motorcycle	Background
Average Across All Modelled Locations							
NO_x Concentration (µg/m^3)	46.4	20.0	9.0	16.9	0.5	0.1	23.0
Percentage of Total NO_x	66.9%	28.9%	13.0%	24.3%	0.7%	0.1%	33.1%
Percentage Contribution to Road NO_x	100.0%	43.1%	19.4%	36.3%	1.1%	0.1%	-
Average Across All Locations With NO_2 Concentration Greater Than 40µg/m^3							
NO_x Concentration (µg/m^3)	58.2	24.3	10.9	22.3	0.6	0.1	23.4
Percentage of Total NO_x	71.3%	29.8%	13.4%	27.3%	0.7%	0.1%	28.7%
Percentage Contribution to Road NO_x	100.0%	41.8%	18.7%	38.3%	1.0%	0.1%	-
At Location With Maximum Road NO_x Concentration (R2)							
NO_x Concentration (µg/m^3)	85.7	41.4	19.1	23.9	1.1	0.1	22.8
Percentage of Total NO_x	79.0%	38.2%	17.6%	22.1%	1.0%	0.1%	21.0%
Percentage Contribution to Road NO_x	100.0%	48.4%	22.3%	27.9%	1.3%	0.2%	-

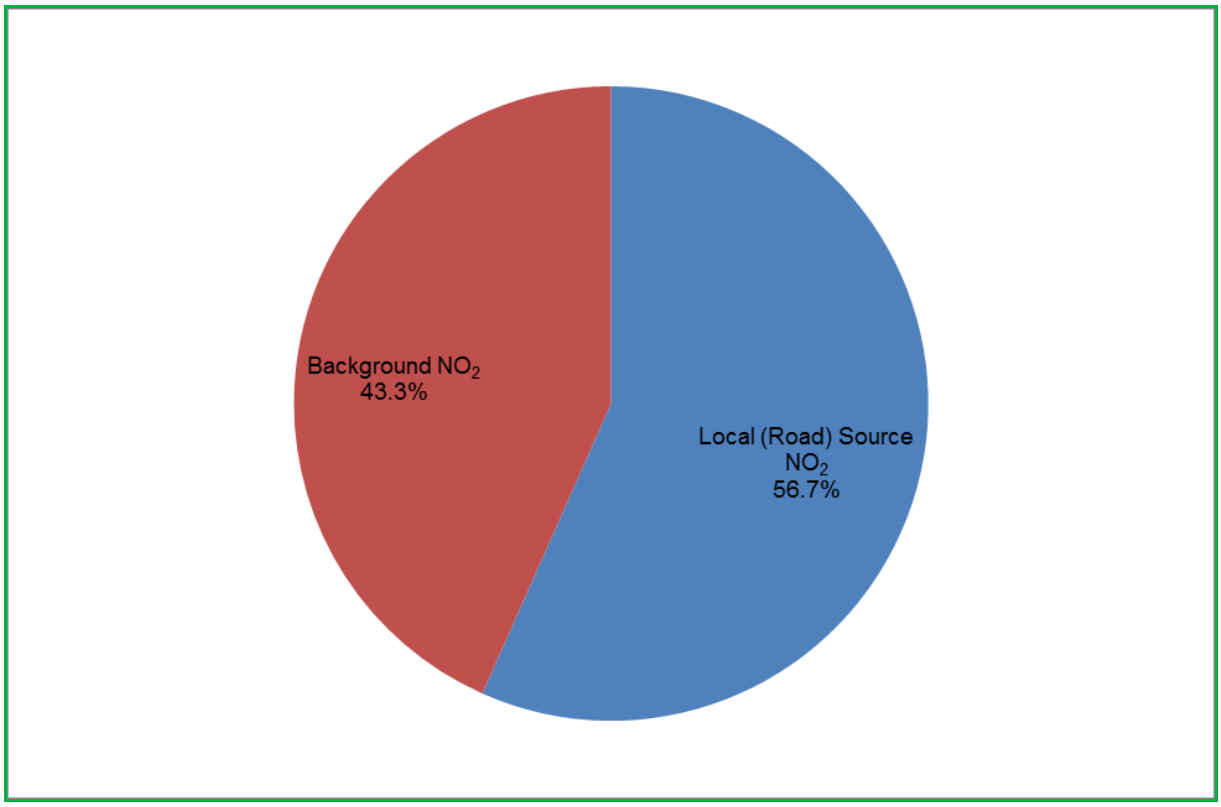
Figure 3.6 illustrates the detailed source apportionment of NO_x concentrations in pie chart format.

Figure 3.6 - Detailed Source Apportionment of NO_x Concentrations in A38 AQMA



For NO_2, Figure 3.7 demonstrates the contributors to NO_2 concentrations at a high level.

Figure 3.7 - High Level Source Apportionment of NO_2 Concentrations Averaged Across All Modelled Locations at A38 AQMA



At a high level, the local road component has the greater contribution to total NO_2 concentrations at 55.7%, whilst the background contributes the remaining 43.3%. It should be noted that it is not possible to separate out the regional and local components of the overall NO_2 background contribution. This means that Council actions could potentially have a direct impact on 56.7% of the total NO_2 concentrations within the A38 AQMA area.

As demonstrated in Table 3.4Table 3.2, when considering the average NO_2 concentration across all modelled locations, road traffic accounts for 21.4µg/m^3 (56.7%) of total NO_2 (37.8µg/m^3). Of this total average NO_2, Cars account for the greatest contribution (24.4%) of any of the vehicle types on average, followed by HGVs (20.6%).

When considering the average NO_2 concentration at locations with an NO_2 concentration greater than 40µg/m^3, the road traffic contribution is much higher, accounting for 26.3µg/m^3 (61.2%) of total NO_2 (42.9µg/m^3). Of this 42.9µg/m^3, Cars

account for the greatest contribution (25.5%) of any of the vehicle types, closely followed by HGVs (23.5%).

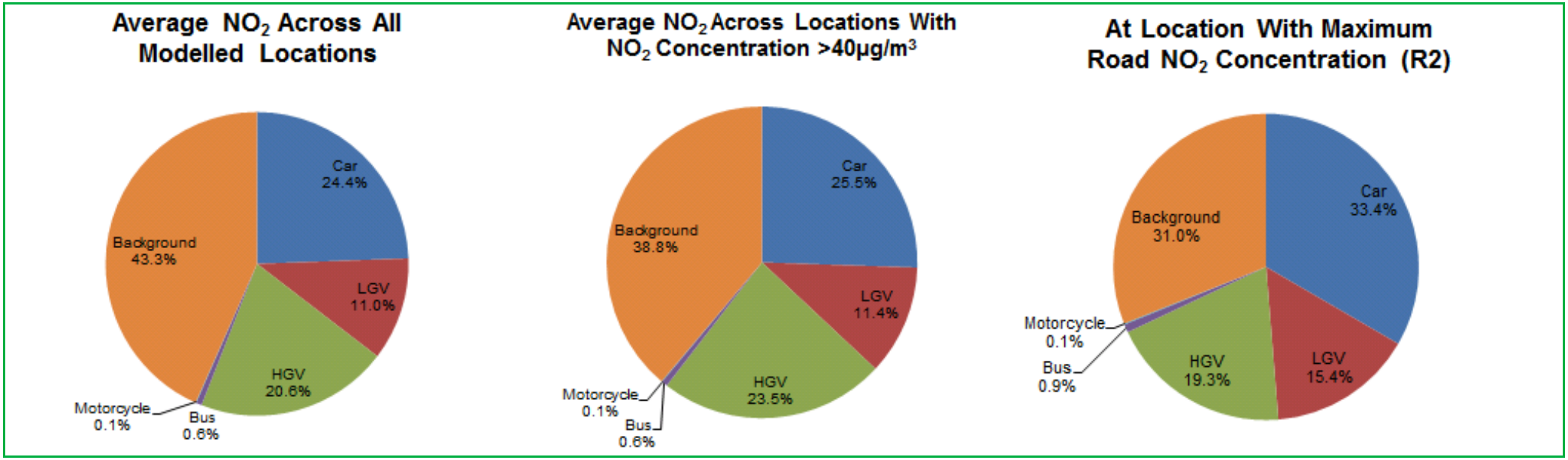
At the location with the maximum road NO_2 concentration (36.2µg/m^3 out of a total NO_2 of 52.5µg/m^3, predicted at 'R2'), road traffic accounts for 61.2% of the overall NO_2. Of this 52.5µg/m^3, Cars account for the greatest contribution (33.4%) of any of the vehicle types, followed by HGVs (19.3%).

Table 3.4 - Detailed Source Apportionment of NO_2 Concentrations – A38 AQMA

Metric	All Vehicles	Car	LGV	HGV	Bus	Motorcycle	Background
Average Across All Modelled Locations							
NO_2 Concentration (µg/m^3)	21.4	9.2	4.2	7.8	0.2	<0.1	16.4
Percentage of Total NO_2	56.7%	24.4%	11.0%	20.6%	0.6%	0.1%	43.3%
Percentage Contribution to Road NO_2	100.0%	43.1%	19.4%	36.3%	1.1%	0.1%	-
Average Across All Locations With NO_2 Concentration Greater Than 40µg/m^3							
NO_2 Concentration (µg/m^3)	26.3	11.0	4.9	10.1	0.3	0.0	16.7
Percentage of Total NO_2	61.2%	25.5%	11.4%	23.5%	0.6%	0.1%	38.8%
Percentage Contribution to Road NO_2	100.0%	41.7%	18.7%	38.5%	1.0%	0.1%	-
At Location With Maximum Road NO_2 Concentration (R2)							
NO_2 Concentration (µg/m^3)	36.2	17.5	8.1	10.1	0.5	0.1	16.3
Percentage of Total NO_2	69.0%	33.4%	15.4%	19.3%	0.9%	0.1%	31.0%
Percentage Contribution to Road NO_2	100.0%	48.4%	22.3%	27.9%	1.3%	0.2%	-

Figure 3.4 illustrates the detailed source apportionment of NO_2 concentrations in pie chart format.

Figure 3.8 - Detailed Source Apportionment of NO_2 Concentrations in A38 AQMA



3.4 Required Reduction in Emissions

In line with the methodology presented in Box 7.6 of LAQM.TG(16)[16], the necessary reduction in Road NO_x emissions required to bring each AQMA into compliance is calculated below. This is done at each worst-case exposure location.

3.4.1 Muckley Corner

Metric	Value (Concentrations as µg/m^3)
Worst-Case Relevant Exposure NO_2 Concentration	51.1
Equivalent NO_x Concentration	102.4
Background NO_x	26.2
Background NO_2	18.5
Road NO_x - Current	76.3
Road NO_x - Required (to achieve NO_2 concentration of 39.9µg/m^3)	57.2
Required Road NO_x Reduction	19.1
Required % Reduction	25.0%

3.4.2 A38

Metric	Value (Concentration as µg/m^3)
Worst-Case Relevant Exposure NO_2 Concentration	52.5
Equivalent NO_x Concentration	108.5
Background NO_x	22.8
Background NO_2	16.3
Road NO_x - Current	85.7
Road NO_x – Required (to achieve NO_2 concentration of 39.9µg/m^3)	51.1
Required Road NO_x Reduction	34.5
Required % Reduction	40.3%

3.5 Key Priorities

Based on the above information, the proposed AQAP measures should be divided into five targeted categories, although there is often considerable overlap between some of the categories:

- Transport measures – provision of additional transport infrastructure, changes to road layout or operation, formulation of traffic plans, with the aim being to encourage the use of greener modes of transport and/or reduce congestion and associated vehicle emissions;
- Leading by example measures – measures that LDC will implement to encourage wider behavioural changes;
- Education, community and partnership measures – provision of information to increase community awareness to facilitate behavioural change;
- Statutory measures – use of legislation and targeted enforcement to control air pollution; and
- Air quality monitoring – ensure satisfactory air quality monitoring data and evidence base is available to allow effective management of air quality.

Through consultation with the steering group and the Council's EHO, and based on the source apportionment information, three Transport measures have been identified as a strong priority, and for each of these a direct appraisal of the quantitative impact of these intervention scenarios will be undertaken[18]. As both the A38 and A5 are Highways England managed roads[19], there is little the Council itself can affect by way of intervention measures. However, these are initiatives that Highways England and the Council can jointly support. Whilst a number of assumptions are made under the appraisal of each scenario, this enables the impact of each policy to be quantified to demonstrate its relative effectiveness in advance of implementation. The three priority measures and scenarios that will be assessed in this way are;

- Implementation of the EcoStars Project;
- Alteration to traffic flows based on increased use of the M6 Toll Road; and
- Upgrade of A-Roads to Expressway status

The above scenarios will account for quantifying the individual effects associated with each of the intervention measures in isolation. A detailed description of these priority measures is given in Section 5. The modelling of any additive, cumulative or

[18] Completed post-consultation and confirmation of engagement with measures
[19] https://www.gov.uk/government/publications/roads-managed-by-the-highways-agency

synergistic air quality impacts associated with the various combinations and permutations of multiple AQAP measures are not accounted for.

4 Development and Implementation of Lichfield DC's AQAP

4.1 Consultation and Stakeholder Engagement

Local authorities are required to consult on their AQAP. To facilitate this process, an Action Planning Steering Group was formed to provide an appropriate forum for developing the AQAP. The composition of the Steering Group was carefully considered to ensure the efficacy of the AQAP.

It is also important for the success of the AQAP to seek involvement from all local stakeholders including local residents, community groups and local businesses in the drawing up of the AQAP, in addition to their active participation in achieving the AQAP measures.

The following is a list of statutory and non-statutory consultees to which the final draft Plan is to be sent:

- Department for Environment, Food and Rural Affairs;
- Highways England;
- Staffordshire County Council;
- Clinical Commissioning Groups;
- Neighbouring local authorities;
- Local residents within AQMAs;
- Other relevant local stakeholders.

All comments from both statutory and non-statutory consultees received on the draft AQAP will be considered and incorporated where appropriate into the final AQAP. It is recommended that the consultation period be no less than 6 weeks in duration to enable consultees the opportunity to contribute to the process. If there are further changes the Plan will be presented to LDC for endorsement and in any case will subsequently be placed on the Council's website[20].

Following consultation and the formal adoption of the AQAP, the Council is also required to submit annual AQAP progress reports (in the form of summary table

[20] https://www.lichfielddc.gov.uk/

within the regular ASR), and also revise the AQAP appropriately when circumstances influence the content and progress of the plan.

4.2 Steering Group

The draft AQAP has been led principally by the EHOs at LDC, with support from the appointed consultants. Other parties have been drawn upon as necessary, including the managers of the EcoStars project[21] and regional representatives from Highways England. This core group has formed the basis of the project direction.

This will be opened up to wider statutory consultees in due course prior to final publication.

4.3 Keeping the AQAP up to date

The success of this AQAP is dependent upon the on-going assessment and reporting of progress in the implementation of measures, as well as the evidence acquired from on-going evaluation of the impacts of measures. The use of monitoring to show the decline in pollutant concentrations attributed to the implementation of measures is an obvious basis of evidence. However, for some measures, such as the EcoStars project, alternative indicators, such as the number of vehicles and companies registered, should also be used.

The Council will ensure an AQAP Steering Group continues to have regular contact after the adoption and implementation of measures contained within their AQAP in order that a review of the AQAP and its progress is undertaken. This progress will be reported within the Council's statutory ASR report, which forms the basis of the LAQM reporting requirements since 2016.

Where, in undertaking review, evidence shows that unforeseen barriers to progress have arisen, or measures are no longer suitable, the AQAP should be updated to reflect the local authority's position. The AQAP will be maintained as a "live" strategy. Where necessary, updates to source apportionment will be considered.

[21] Specialist Transport Consultants TRL, http://www.stoke.gov.uk/ccm/content/environment/environmental-health/pollution/air-quality/eco-stars-project.en

5 AQAP Measures

Table 5.1 shows Lichfield's AQAP measures. 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; and
- how progress will be monitored.

A full summary of each measure is provided below the table, organised by the category of the measure. Please see future ASRs for regular annual updates on implementation of these measures.

Table 5.1 - Air Quality Action Plan Measures

Measure No.	Measure	EU Category	EU Classification	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
1	Ecostars	Vehicle Fleet Efficiency	Fleet efficiency and recognition schemes	Lichfield DC and supporting Third Party	N/a	On-going	Reduction in fuel consumption & emissions	<tbc after quantitative appraisal>	On-going	On-going	http://www.ecostars-uk.com/
2	Increase the volume of through traffic using M6 Toll	Traffic Management	UTC, Congestion management, traffic reduction	Midlands Connect Partnership	Planning	Not yet commenced	Reduction in HGV % in AQMAs	<tbc after quantitative appraisal>	Report outlining proposals by Midlands Connect has been produced	2020	Subject to work undertaken by Midlands Connect Partnership
3	Upgrading Trunk A-Roads to Expressways	Traffic Management	UTC, Congestion management, traffic reduction	Highways England	Stalled	Not yet commenced	Reduction in traffic congestion	<tbc after quantitative appraisal>	Some discussion with Highways England	Unknown	Subject to Highways England engagement – this measure may never happen but it included as Lichfield DC needs to maintain pressure for it to happen
4	Pollution abatement equipment for HGVs	Vehicle Fleet Efficiency	Vehicle Retrofitting programmes	Lichfield DC/OLEV	2018/19	2019-2022	# vehicles retrofitted	Reducing emissions contribution from HGVs	Planning Phase	2022	Consider OLEV or AQ grant application funding
5	Replacing older vehicles	Promoting Low Emission Transport	Company Vehicle Procurement - Prioritising uptake of low emission vehicles	Lichfield DC/OLEV	2018/19	2019-2022	# vehicles replaced (in addition to normal fleet turnover)	Reducing emissions from all council owned vehicles	Planning Phase	On-going	Consider OLEV or AQ grant application funding
6	Travel planning amongst LDC employees	Promoting Travel Alternatives	Workplace Travel Planning	Lichfield DC	2019	2019-2022	Implementing travel plan by end 2018	Reducing emissions from LDC employees	Planning Phase	2019	Requires employee education and engagement

Measure No.	Measure	EU Category	EU Classification	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
7	Education Initiatives inc. website information updates	Public Information	Other	Lichfield DC	2018/19	2019-2022	New website information by end 2019	Through public awareness	Planning Phase	2019	
8	Staffordshire Air Quality Forum	Policy Guidance and Development Control	Regional Groups Co-ordinating programmes to develop Area wide Strategies to reduce emissions and improve air quality	County-wide	Complete	On-going	Full LA engagement across the group + Regular Meetings	N/a	On-going	On-going	Partnership to continue indefinitely
9	Use the planning regime to minimise impact of new developments on AQMAs	Policy Guidance and Development Control	Air Quality Planning and Policy Guidance	Lichfield DC / Staffordshire AQ Forum	Ongoing	Ongoing	Supplementary Planning Guidance implemented	Reducing emissions contribution and restricting impact on AQMAs	On-going, discussions around partnership joint guidance to follow	End of 2019	Staffordshire-wide Planning Guidance under development
10	Inspect under the Environmental Permit regime and enforce legislation to reduce combustion processes	Environmental Permits	Introduction/ increase of environment charges through permit systems and economic instruments	Lichfield DC	Complete	On-going	Installations adhering to permits and enforcement/penalties for breaches	By restricting emissions from industrial processes	On-going	Continual	This is standard LDC work in Environmental Protection
11	Air quality monitoring	Public Information	Other	Lichfield DC/Defra	On-going	On-going	# monitoring locations and On-time submittal of ASRs	Through EHO/public awareness	On-going annually	Annual	Possibly liaise with Defra regarding need for additional monitoring and/or AURN funding. Consider continuous monitoring and AQ grant application

5.1 Transport Measures

As discussed in Section 3.3, in the Muckley Corner AQMA 41.8% of NO_2 concentrations are contributed by road traffic, and in the A38 AQMA the figures are even higher at 56.7%. Therefore, pollution concentrations in both the AQMAs can be tackled by reducing traffic volumes, smoothing the flow of traffic (to reduce the stop-start acceleration cycle), removing the most polluting vehicles and modal shift towards vehicles with cleaner technologies. The following measures have therefore been considered for inclusion in the finalised AQAP:

5.1.1 EcoStars Project

ECO Stars (Efficient and Cleaner Operations) Fleet Recognition Scheme encourages and helps operators of HGVs, buses, coaches, vans and taxis to run fleets in the most efficient and sustainable way.

The scheme provides recognition for best operational practices, and guidance for making improvements. The ultimate aim is to reduce fuel consumption which naturally leads to fewer vehicle emissions and has the added benefit of saving money.

Members are awarded an ECO Star rating when they first join - ranging from 1 Star to 5 Stars - based on an assessment of their current operational and environmental performance. One of the ECO Stars team (all industry experts with years of transport experience) rates each individual vehicle and how the fleet is run as a whole.

The ECO Stars assessment is based on six key pillars which make up fleet operational efficiency:

- Fleet composition;
- Fuel management;
- Driver skills development;
- Vehicle specification and preventative maintenance;
- IT support systems; and
- Performance, monitoring and management.

Lichfield joined the scheme in 2015 as part of the eight Boroughs of Staffordshire and Stoke working in partnership with fleets to improve air quality in the Staffordshire

area and uptake has been excellent, with 32 entities becoming members[22]. A majority of these achieved a 4 star rating, so whilst standards are already high in the District there is significant scope for improvement.

The impacts of the project on air quality are to be quantified using uptake data from the scheme, and applying some modifications to the default fleet assumptions within the calculations of vehicle emissions along the route. Whilst there are some assumptions inherent in the estimates, which will be detailed in Appendix C, it is considered that the impacts of upgrading the members of the scheme will be demonstrably positive.

This measure is in direct support of LTP3 Policy 5.1: promoting alternatives to private motor vehicles and Policy 5.2: Promote the use of low-emitting vehicles and vehicle efficiency, as well as Core Policy 5: Sustainable Transport, of the Lichfield Local Plan Strategy.

5.1.2 Alteration to traffic flows based on increased use of M6 Toll;

The source apportionment exercise highlights a disproportionate contribution from HGVs (20.2% of overall NO_2 across all modelled locations in the Muckley Corner area) across both locations, although particularly in the Muckley Corner AQMA. It is considered that a contributory factor to this has been the cost of using the M6 Toll road, with freight operators sending their vehicles on alternative routes, such as the A5, rather than the new motorway due to high fees. With the M6 Toll operators not currently considering a change in pricing, however, it is the proposals from the Midlands Connect Partnership which are considered a more likely route to increasing traffic levels moving to the M6 Toll.

The possible benefits are to be demonstrated by reducing the percentage of HGVs operating in both the Muckley Corner and A38 areas, the details of which will be specified in Appendix C.

This measure is in direct support of LTP3 Policy 5.1: promoting alternatives to private motor vehicles and Policy 5.2: Promote the use of low-emitting vehicles and vehicle efficiency, as well as Core Policy 5: Sustainable Transport, of the Lichfield Local Plan Strategy.

[22] Figures as of February 2016

5.1.3 Upgrade of A-Roads to Expressway status

There had previously been plans for Highways England to upgrade key A-roads into "Expressways" – a new classification between an A-road and a Motorway.

The fundamental principal is to get traffic flowing more freely. To do this, junctions are modernised, with roundabouts and traffic lights removed and emergency refuge and maintenance areas provided. In addition, advanced technology can be used to detect and help clear incidents more quickly and get traffic moving.

On inception, 18 major routes were initially set to become Expressways, with a further seven projects being considered. Although elements of the Expressways are inspired by work which is already completed (e.g. the technology provision which has been rolled out on the motorway network), fitting these into the existing trunk road network is laborious and complex. There are many aspects of the concept which need to be progressed with funding before Expressways will be brought forward.

That said, whilst neither of the sections of the A38 nor the A5 relevant to the Council's AQMAs are currently targeted for this upgrade (to the Council's current knowledge), it is considered that this would be of major benefit to the AQMA areas, especially Muckley Corner where congestion is consistently formed around the roundabout. The Council will engage with Highways England to try to ensure these routes are targeted for upgrade in the future. Whilst the decision to upgrade roads to Expressways is outside of the Council's control, it is considered important that pressure is maintained via discussions with Highways England and Midland Connects.

As such, the potential impacts of an upgrade to Expressway status will be modelled in both areas, by making improvements to the dimension of junctions and the speed at which they are approached within the models. This has the effect of reducing overall emissions, despite the absolute vehicle numbers remaining constant.

This is in direct support of LTP3 Policy 5.1: promoting alternatives to private motor vehicles and Policy 5.2: Promote the use of low-emitting vehicles and vehicle efficiency, as well as Core Policy 5: Sustainable Transport, of the Lichfield Local Plan Strategy.

5.2 Leading by Example Measures

To minimise and control air pollution from the fleet, LDC gives a commitment to the following, in line with LTP3 Policy 5.3: Leading by example to reduce Staffordshire Road Transport Emissions:

5.2.1 Fit pollution abatement equipment if necessary to older Heavy-Goods Vehicles and Buses to help minimise pollution

Retrofitting of old Council owned HGVs and Buses with pollution abatement equipment will be considered by the Council where technically and financially feasible.

5.2.2 Establish and implement a rolling programme for replacing older more polluting vehicles with newer cleaner vehicles

Where this is not possible, the Council will look to replacing old vehicles within the fleet with more modern cleaner vehicles, which comply with the prevailing EURO standard. This will be extended to all Council owned vehicles.

5.2.3 Investigate options for better travel planning amongst Lichfield District Council employees

This measure would aim at reducing vehicle pollution from staff travelling to and from work. Additional benefits involve cost savings and a healthier workforce, although it is acknowledged that this can be challenging due to factors such as reluctance to give up car, the lack of cycling facilities and safety concerns, which need to be overcome.

Proposed options include the following:

- Develop a workplace travel plan for LDC;
- Undertake staff travel surveys to establish current travel patterns to and from Council premises;
- Establish car-sharing practices by implementing a car-sharing database;
- Encourage use of public transport among staff;
- Encourage walking and cycling among staff (such as by providing improved cycle security storage as completed in June 2018);
- Video conferencing; and

- Flexible working practices such as remote working enabled by remote IT access.

This plan would be of greatest benefit if targeting employees who use routes going through the AQMAs to get to work or as part of their duties, so it may be prudent to undertake a survey prior to implementation to avoid unnecessary effort.

5.3 Education, Community and Partnership Measures

To ensure that members of the public have access to information about air pollution and can make informed choices, LDC gives a commitment to:

5.3.1 Implement initiatives to educate communities on air pollution issues and ways to minimise impacts on air quality

LDC will consider the development of our website as a resource for air quality documents and as a means of making Air Quality a more accessible and relevant issue to local residents.

This will also involve uploading the Council's statutory reports to the website as soon as they are approved by Defra, so that the latest information is always available.

Other educational materials will also be considered for their efficacy.

5.3.2 Staffordshire Air Quality Forum

The Council is part of the regional group formed of the 8 local authorities, co-ordinating programmes to develop area wide strategies to reduce emissions and improve air quality. This has the benefit of building complementary strategies and measures that have external as well as local benefits. Under the partnership, such projects as Ecostars have become viable. We commit to continuing this partnership and maintaining an active engagement with the Forum.

5.4 Statutory Measures

To ensure that air pollution is controlled by legislation and targeted enforcement, LDC will continue to:

5.4.1 Use the planning regime to minimise impact of new developments on AQMAs

The Council will ensure the effective use of planning conditions and obligations to help mitigate the transport and air quality impacts of development. Section 106 agreements and Community Infrastructure Levy (CIL) charges can be used to improve air quality and make other environmental improvements, or offset the air quality impacts of a proposed development, and have been effective elsewhere in aiding with the implementation of AQAP measures and providing investment for air quality monitoring activities.

As part of any new schemes that are likely to influence traffic flows through either AQMA, conditions of planning permission should include provision for workplace, residential and personalised travel plans. All new residents should be made aware of the travel plan through the property information pack received with new properties. Public transport (e.g. bus) travel vouchers can be offered as part of these packs, if viable.

The Council, through the Staffordshire AQ Forum, will put together Supplementary Guidance for consultants and planners preparing air quality assessments for applications in the area, so as to be consistent in the methodology and the appraisal of such reports. This should serve to benefit the quality of information coming in as part of the application, and therefore enable Officers to make better and more informed decisions relating to air quality impacts.

5.4.2 Inspect industrial premises under the Environmental Permit regulatory regime and enforce relevant legislation to reduce burning of commercial and domestic waste

The Council continues to use its powers to control industrial premises and ensure they comply with the relevant regulations. It also enforces relevant legislation to reduce burning of commercial and domestic waste. This should be particularly pertinent in areas within, or close to, the two AQMAs, with the most stringent measures possible employed in areas that Officers deem to have an impact on the AQMAs.

5.5 Air Quality Monitoring

To ensure that there is adequate air pollution monitoring data with which to manage air quality within the AQMA, LDC reinforces its obligation to provide:

5.5.1 Accurate, precise and extensive air quality monitoring

The Council will continue monitoring pollutants relevant to LAQM, with particular reference to NO_2. This will enable future decision making to be made against the best possible evidence base. This should be targeted and focussed around the AQMAs, but that should not be to the detriment of other areas (e.g. town centres) so as to ensure other hot-spot areas are not overlooked.

The Council will consider installing continuous monitoring, within both AQMAs if possible. All funding sources should be explored, but Air Quality Grant application should be considered.

Monitoring data are to be compliant with best practice guidance on Quality Assurance / Quality Control (QA/QC), available in LAQM.TG(16)[16]. Comprehensive information in relation to QA/QC is provided every year in statutory air quality reports.

We will make the monitoring information freely available to the public in an easily understood form, through the annual statutory report.

5.6 Measures not pursued

A range of other measures are available and have been employed in other areas to combat against pollution within AQMAs, but which are not considered viable for implementation to our two AQMAs. These are summarised in Appendix B and include, but are not limited to, the following:

5.6.1 Bus Park and Ride

This measure was deemed most effective for AQMAs within town centres/visitors to a location, which is not necessarily the case with either of Lichfield's AQMAs. User uptake would be minimal, and thus not worth the investment.

5.6.2 Introduction of Low Speed Restrictions

Imposing a 20mph speed limit on the roads within and surrounding the AQMAs would have a dual effect; it would likely lead to increases in pollutant concentrations in areas where traffic is currently free flowing at speeds averaging greater than 20mph, but would likely decrease concentrations in areas where there is currently congestion and average speeds are lower than 20mph. This is due to the lower speed limits

'smoothing' traffic flows and thereby reducing the degree of acceleration, which is when emissions are highest. However, this would not be feasible in either AQMA as they are A-Roads, and would only serve to increase congestion and thus emissions.

5.6.3 Parking Strategies

Parking is not the principal issue in either AQMA as they are major through roads with limited parking and no multi-storey complexes. Managing a parking strategy for the areas would therefore have little effect.

5.6.4 Carry out regular emissions testing of vehicle fleet to ensure that all vehicles comply with the law

This is considered to be too costly relative to its actual impact on air quality, which would be minimal at best.

5.6.5 Compulsory Purchase

Compulsory purchase of properties located within the AQMAs is not considered to be feasible from both cost and practicality perspectives, and in any case would not address the underlying air pollution problem.

5.6.6 Road Closures

No practicable road closures that would benefit air quality are currently identified. All AQMA roads carry significant volumes of traffic and no practicable alternative roads are identified that would benefit air quality. Closure of these routes would only move the problem elsewhere.

5.6.7 Low Emission Zone/Clean Air Zone

The Council is aware of the Government's policy in dealing with non-compliant areas of poor air quality, which is the imposition of Clean Air Zones[23] (similar to Low Emission Zones). Such statutory measures are to be imposed with central government assistance and are considered impracticable and not proportional to the air quality issues within LDC. The enforcement of these zones would require the installation of costly Automatic Number Plate Recognition (ANPR) cameras which in themselves would do nothing to reduce air pollution. The Council considers therefore

[23] https://www.gov.uk/government/collections/air-quality-plan-for-nitrogen-dioxide-no2-in-uk-2015

that its limited resources are better appropriated to other projects which will have direct impacts on vehicular emissions.

5.6.8 Provide public with 'real time' travel and air quality information

Real time passenger information (RTPI) systems can assist by making greener alternative modes of transport as attractive as possible and increase rates of uptake. Bus stops, new developments in public spaces and new residential schemes are areas where such schemes can be targeted. Coupled with 'real-time' information on local air quality, this will enable commuters to make informed choices about their transport options. This would require infrastructure investment, so engagement from County Council would also be required.

It is considered that such systems will do nothing to address air quality in both AQMAs, given that they are through routes and not city centre locations.

Appendix A: Response to Consultation

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

Consultee	Category	Response
e.g. Chamber of Commerce	Business	E.g. Disagree with plan to remove parking on High Street in favour of buses and cycles; consider it will harm business of members.

<To be completed post-consultation>

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)
Bus Park and Ride	Installing parking areas outside of AQMAs and transporting people through AQMAs using public service vehicles	As per section 5.6.1.
Introduction of Low Speed Restrictions	Imposing a speed limit of 10, 20 or 30mph	As per section 5.6.2
Parking Strategies	Reviewing parking in AQMAs	As per section 5.6.3
Carry out regular emissions testing of vehicle fleet to ensure that all vehicles comply with the law	Bespoke emissions testing for Council vehicles	As per section 5.6.4
Compulsory Purchase	Purchase by the Council of properties in AQMAs	As per section 5.6.5
Road Closures	Closing afflicted roads	As per section 5.6.6
Low Emission Zone/Clean Air Zone	Implementing zones or corridors where certain vehicles cannot enter based on their emissions rating	As per section 5.6.7

Appendix C: Quantitative Appraisal of Measures

<This section will include details of the quantitative appraisal of the 3 key measures once agreed with the Council and applied>

Appendix D: ADMS and Model Verification

The ADMS-Roads dispersion model has been widely validated for this type of assessment, and as such is regularly used for LAQM purposes by a large number of local authorities.

Dispersion modelling requires a number of inputs including traffic and meteorological data. For the Muckley Corner source apportionment, it was necessary to set up a new base model, the inputs to which are summarised below.

The ADMS-Roads assessment incorporates numbers of road traffic vehicles as AADT (Annual Average Daily Traffic flows), vehicle speeds on the local roads and the composition of the traffic fleet. The traffic data for this assessment has been collated from Department for Transports (DfT), Traffic Counts web resource[14] and is outlined in Figure D.1. Traffic speed data has been derived from the speed limit on free flowing links. Where appropriate, the speeds have been reduced to simulate queues at junctions and traffic lights.

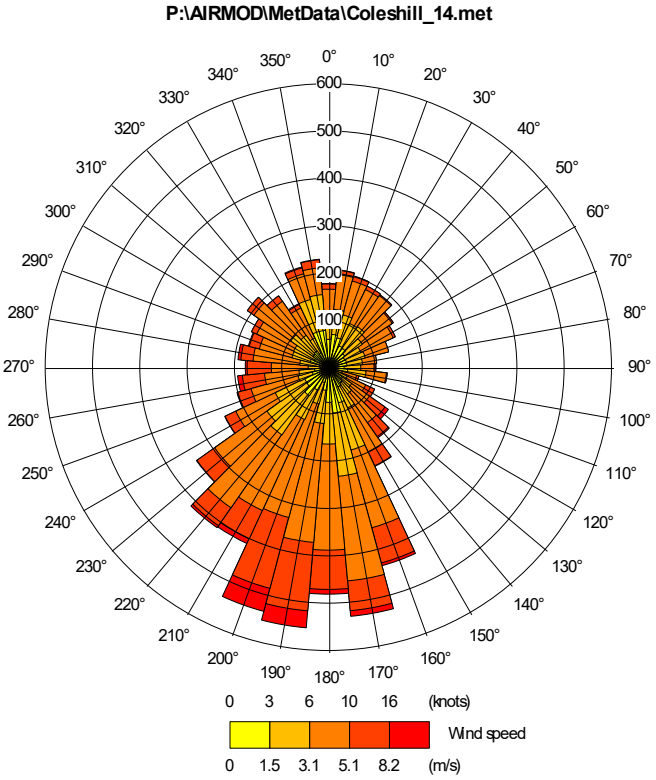
Figure D.1 - Traffic Data used in Source Apportionment of Muckley Corner

Link ID	AADT	% Car	% LGV	% Rigid HGV	% Artic HGV	% Bus and Coach	% Motorcycle	Speed (kph)
A5_East_EB	16789	68.0	17.5	5.3	8.5	0.3	0.4	90
A5_East_EB_J1	16789	68.0	17.5	5.3	8.5	0.3	0.4	20
A5_East_EB_J2	16789	68.0	17.5	5.3	8.5	0.3	0.4	50
A5_East_WB	16789	68.0	17.5	5.3	8.5	0.3	0.4	90
A5_East_WB_J1	16789	68.0	17.5	5.3	8.5	0.3	0.4	20
A5_East_WB_J2	16789	68.0	17.5	5.3	8.5	0.3	0.4	50
A5_West_1	27312	68.4	19.2	4.3	7.0	0.4	0.7	90
A5_West_2	27312	68.4	19.2	4.3	7.0	0.4	0.7	90
A5_West_EB	13656	68.4	19.2	4.3	7.0	0.4	0.7	90
A5_West_EB_J1	13656	68.4	19.2	4.3	7.0	0.4	0.7	20
A5_West_J2	27312	68.4	19.2	4.3	7.0	0.4	0.7	50
A5_West_WB	13656	68.4	19.2	4.3	7.0	0.4	0.7	90
A5_West_WB_J1	13656	68.4	19.2	4.3	7.0	0.4	0.7	20
Lichfield_Rd_NB	7895	71.8	17.8	5.3	4.1	0.4	0.5	90
Lichfield_Rd_NB_J1	7895	71.8	17.8	5.3	4.1	0.4	0.5	20
Lichfield_Rd_NB_J2	7895	71.8	17.8	5.3	4.1	0.4	0.5	50
Lichfield_Rd_SB	7895	71.8	17.8	5.3	4.1	0.4	0.5	90
Lichfield_Rd_SB_J1	7895	71.8	17.8	5.3	4.1	0.4	0.5	20
Lichfield_Rd_SB_J2	7895	71.8	17.8	5.3	4.1	0.4	0.5	50
R1	24684	68.0	17.5	5.3	8.5	0.3	0.4	20
R2	21551	68.4	19.2	4.3	7.0	0.4	0.7	20

R3	21625	68.4	19.2	4.3	7.0	0.4	0.7	20
R4	24758	68.0	17.5	5.3	8.5	0.3	0.4	20
Wallsall_Rd	7969	81.4	13.9	2.2	1.2	0.6	0.7	80
Wallsall_Rd_J1	7969	81.4	13.9	2.2	1.2	0.6	0.7	20
Wallsall_Rd_J2	7969	81.4	13.9	2.2	1.2	0.6	0.7	50

Meteorological data from a representative station is required by the dispersion model. 2014 meteorological data from Coleshill weather station has been used in this assessment. A wind rose for this site is shown in Figure D.2. LAQM.TG(16)[16] recommends that meteorological data should only be used if the percentage of usable hours is greater than 75%, and preferably 90%. 2014 meteorological data from Coleshill includes 8,665 lines of usable hourly data out of the total 8,760 for the year, i.e. 98.9% usable data. This is therefore suitable for the dispersion modelling exercise.

Figure D.2 - Coleshill Met Data 2014 Wind Rose



Defra maintains a nationwide model of existing and future background air pollutant concentrations at a 1km grid square resolution. The data sets utilised for this AQAP include annual average concentration estimates for NO_x and NO_2, using a base year of 2011. The model used is semi-empirical in nature; it uses the National Atmospheric Emissions Inventory (NAEI) emissions to model concentrations of

pollutants at the centroid of each 1km grid square, then calibrates these concentrations with actual monitoring data from the AURN (UK Automatic Urban and Rural Network). These have been used for consistency with the conclusions of the Detailed Assessment[6] of the A38 AQMA.

Annual mean background concentrations have been obtained from the Defra published background maps[24], based on the 1km grid squares which cover the modelled area and the affected road network.

The background concentrations applied to the Muckley Corner AQMA Source Apportionment are as follows:

Figure D.3 - Background Concentrations applied to Muckley Corner AQMA Source Apportionment

Grid Square (E,N)	2014 Unadjusted Annual Mean Concentration (µg/m^3)	
	NO_x	NO_2
408500, 306500	26.2	18.5
409500, 306500	26.5	18.7
408500, 307500	21.3	15.3
407500, 306500	26.0	18.3
AQS objective	-	*40*

For equivalent information pertaining to the A38 modelled domain, please consult the Detailed Assessment, the data for which is employed in the Source Apportionment exercise in this AQAP.

Verification of Modelling

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

[24] Defra Background Maps (2016). http://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html

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

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

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

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

- Traffic data;
- Distance between sources and monitoring as represented in the model;
- Speed estimates on roads;
- Background concentrations; and
- Local air quality monitoring data.

Verification was required only for the Muckley Corner area, as this was a new model domain. For verification of the A38 area, see the associated Detailed Assessment[6].

LDC undertakes passive diffusion tube monitoring at 10 locations located along roads within the Muckley Corner modelled area, which have therefore been considered for the purpose of model verification.

The full details of these monitoring sites are presented in the Council's ASRs.

Verification Calculations

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

For the verification and adjustment of NO_x/NO_2, the LAQM diffusion tube monitoring data was used as in the 2015 USA. Data capture for 2014 was good, and was above

90% for all sites. Table D.1 below shows an initial comparison of the monitored and unverified modelled NO_2 results for the year 2014, in order to determine if an adjustment was required.

Table D.1 - Comparison of Unverified Modelled and Monitored NO_2 Concentrations

Site ID	Background NO_2 ($\mu g/m^3$)	Monitored total NO_2 ($\mu g/m^3$)	Unverified Modelled total NO_2 ($\mu g/m^3$)	% Difference (modelled vs. monitored)
DT1 A5 1	18.3	34.3	29.3	-14.7
DT2 A5 1A	18.3	37.2	36.0	-3.2
DT3 A5 2A	18.5	32.1	29.4	-8.3
DT4 A5 2B	18.5	38.5	31.8	-17.5
DT5 MUC 1	18.5	**41.5**	**41.6**	0.1
DT6 MUC 2	18.5	37.6	36.8	-2.1
DT7 MUC 3	18.5	**54.6**	**46.4**	-15.1
DT8 MUC 4	18.5	**42.1**	**41.5**	-1.4
DT9 MUC 5	18.5	**47.2**	39.2	-17.1
DT10 MUC 6	18.5	38.0	31.7	-16.7
DT11 MUC 1ABC	18.5	**46.8**	31.0	-33.7

In **bold**, exceedence of the NO_2 annual mean AQS objective of $40\mu g/m^3$

The model was under predicting in most cases, and no further improvement of the modelled results could be obtained on this occasion. At one of the sites, the difference between modelled and monitored concentrations was greater than or close to 25%, and for five of the sites it was outside the desirable range of ±10%, meaning adjustment of the results was necessary, as per LAQM.TG(16)[16] guidance. The relevant data was then gathered to allow the adjustment factor to be calculated.

Model adjustment needs to be undertaken based on NO_x and not NO_2. For the diffusion tube monitoring results used in the calculation of the model adjustment, NO_x was derived from NO_2; using NO_x/NO_2 calculator tool[17].

Table D.2 provides the relevant data required to calculate a model adjustment factor, based on regression of the modelled and monitored road source contribution to NO_x.

Table D.2 - Data Required for Adjustment Factor Calculation

Site ID	Monitored total NO_2 ($\mu g/m^3$)	Monitored total NO_x ($\mu g/m^3$)	Background NO_2 ($\mu g/m^3$)	Background NO_x ($\mu g/m^3$)	Monitored road contribution NO_2 (total background) ($\mu g/m^3$)	Monitored road contribution NO_x (total background) ($\mu g/m^3$)	Modelled road contribution NO_x (excludes background) ($\mu g/m^3$)
DT1 A5 1	34.3	59.6	18.3	26.0	16.0	33.6	22.3
DT2 A5 1A	37.2	66.4	18.3	26.0	18.9	40.4	37.6
DT3 A5 2A	32.1	54.4	18.5	26.2	13.6	28.3	22.4

Site ID	Monitored total NO_2 ($\mu g/m^3$)	Monitored total NO_x ($\mu g/m^3$)	Background NO_2 ($\mu g/m^3$)	Background NO_x ($\mu g/m^3$)	Monitored road contribution NO_2 (total background) ($\mu g/m^3$)	Monitored road contribution NO_x (total background) ($\mu g/m^3$)	Modelled road contribution NO_x (excludes background) ($\mu g/m^3$)
DT4 A5 2B	38.5	69.3	18.5	26.2	20.0	43.2	27.6
DT5 MUC 1	41.5	76.8	18.5	26.2	23.0	50.6	50.7
DT6 MUC 2	37.6	67.2	18.5	26.2	19.1	41.0	39.1
DT7 MUC 3	54.6	112.6	18.5	26.2	36.1	86.5	63.2
DT8 MUC 4	42.1	78.3	18.5	26.2	23.6	52.1	50.6
DT9 MUC 5	47.2	91.6	18.5	26.2	28.7	65.5	44.7
DT10 MUC 6	38.0	68.1	18.5	26.2	19.5	42.0	27.2
DT11 MUC 1ABC	46.8	90.6	18.5	26.2	28.3	64.4	25.9

Figure D.4 provides a comparison of the Modelled Road Contribution NO_x versus Monitored Road Contribution NO_x, and the equation of the trend line based on linear regression through zero. The equation of the trend lines presented in Figure D.4 gives an adjustment factor for the modelled results of 1.28.

Figure D.4 - Comparison of the Modelled Road Contribution NOx versus Monitored Road Contribution NO_x

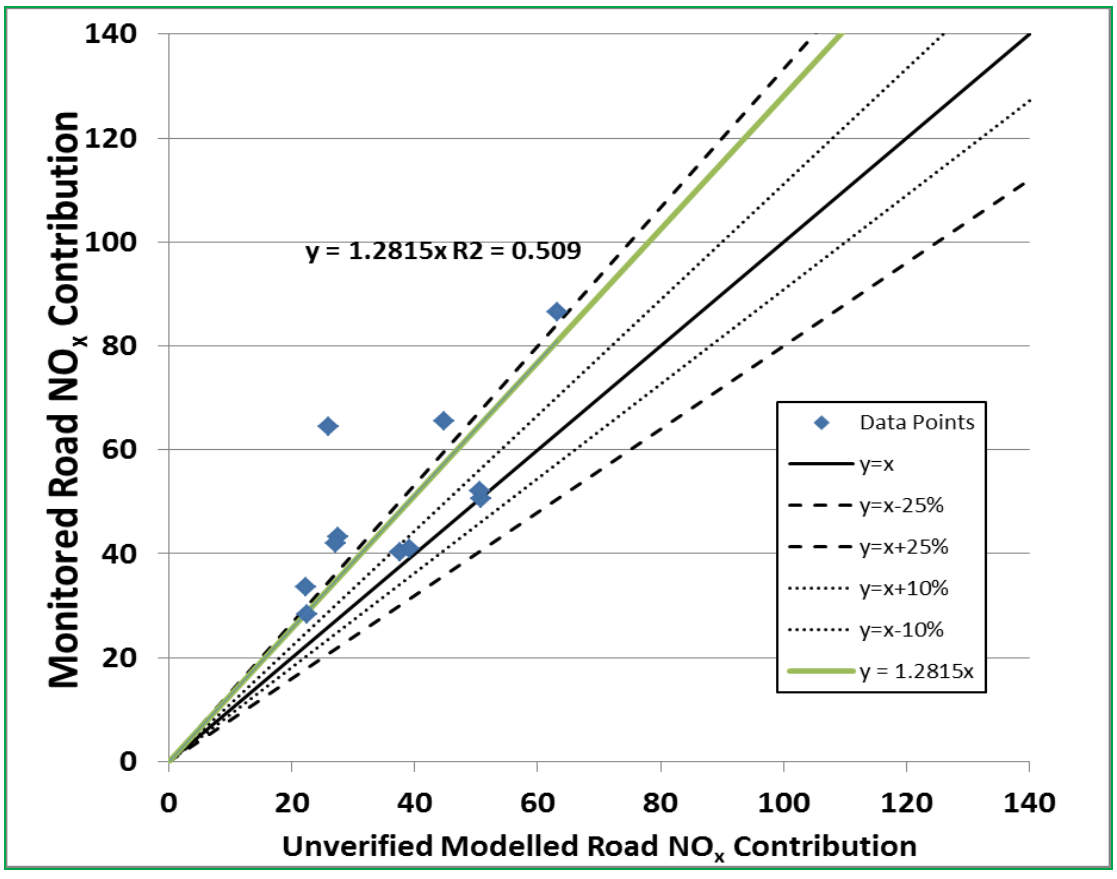


Table D.3 shows the ratios between monitored and modelled NO_2 for each monitoring location based on the above adjustment factor. There is some variation demonstrated, and using a factor of 1.28 to adjust all modelled results would lead to an under prediction of concentrations at one of these monitoring locations by up 26.8%. In order to provide more confidence in the model predictions, the majority of results should be within 25%, ideally within 10%, of the monitored, and consequently 1.28 is not a suitable verification factor.

Table D.3 - Adjustment Factor and Comparison of Verified Results against Monitoring Results

Site ID	Ratio of monitored road contribution NO_x / modelled road contribution NO_x	Adjustment factor for modelled road contribution NO_x	Adjusted modelled road contribution NO_x ($\mu g/m^3$)	Adjusted modelled total NO_x (including background NO_x) ($\mu g/m^3$)	Modelled total NO_2 (based upon empirical NO_x / NO_2 relationship) ($\mu g/m^3$)	Monitored total NO_2 ($\mu g/m^3$)	% Difference (adjusted modelled NO_2 vs. monitored NO_2)
DT1 A5 1	1.51	1.281	28.6	54.6	32.1	34.3	-6.4
DT2 A5 1A	1.07		48.1	74.1	40.4	37.2	8.6
DT3 A5 2A	1.26		28.7	54.9	32.3	32.1	0.6
DT4 A5 2B	1.57		35.3	61.5	35.2	38.5	-8.6
DT5 MUC 1	1.00		65.0	91.2	47.0	41.5	13.3
DT6 MUC 2	1.05		50.2	76.3	41.3	37.6	9.9
DT7 MUC 3	1.37		81.0	107.1	52.7	54.6	-3.4
DT8 MUC 4	1.03		64.8	91.0	47.0	42.1	11.6
DT9 MUC 5	1.46		57.3	83.5	44.1	47.2	-6.5
DT10 MUC 6	1.54		34.9	61.1	35.0	38.0	-7.8
DT11 MUC 1ABC	2.49		33.2	59.4	34.3	46.8	-26.8

DT11 MUC - 1ABC was taken out of the verification process due to the fact it is located at the same X,Y location as DT5 MUC – 1, at an increased height, but at higher concentration. This is inverse to the relationship expected, and therefore raises concern about the monitored concentration. Comparison with the other verification locations identified this site as the outlier. Removing this results in a decrease of the model verification factor and increased alignment between monitored and modelled values as shown in Table D.4 and Figure D. 6. The equation of this

new trend line presented gives an increased adjustment factor for the modelled results of 1.23, as shown in Figure D. 5.

Table D.4 - Adjustment Factor and Comparison of Verified Results against Monitoring Results after Removal of Verification Point

Site ID	Ratio of monitored road contribution NO_x / modelled road contribution NO_x	Adjustment factor for modelled road contribution NO_x	Adjusted modelled road contribution NO_x ($\mu g/m^3$)	Adjusted modelled total NO_x (including background NO_x) ($\mu g/m^3$)	Modelled total NO_2 (based upon empirical NO_x / NO_2 relationship) ($\mu g/m^3$)	Monitored total NO_2 ($\mu g/m^3$)	% Difference (adjusted modelled NO_2 vs. monitored NO_2)
DT1 A5 1	1.5	1.233	27.5	53.5	31.6	34.3	-7.8
DT2 A5 1A	1.1		46.3	72.3	39.7	37.2	6.6
DT3 A5 2A	1.3		27.6	53.8	31.8	32.1	-0.9
DT4 A5 2B	1.6		34.0	60.1	34.6	38.5	-10.1
DT5 MUC 1	1.0		62.5	88.7	46.1	41.5	11.1
DT6 MUC 2	1.0		48.3	74.4	40.6	37.6	7.9
DT7 MUC 3	1.4		77.9	104.1	51.7	54.6	-5.4
DT8 MUC 4	1.0		62.4	88.6	46.1	42.1	9.4
DT9 MUC 5	1.5		55.2	81.3	43.3	47.2	-8.3
DT10 MUC 6	1.5		33.6	59.8	34.5	38.0	-9.3

Figure D. 5 - Second Comparison of the Modelled Road Contribution NO_x versus Monitored Road Contribution NO_x

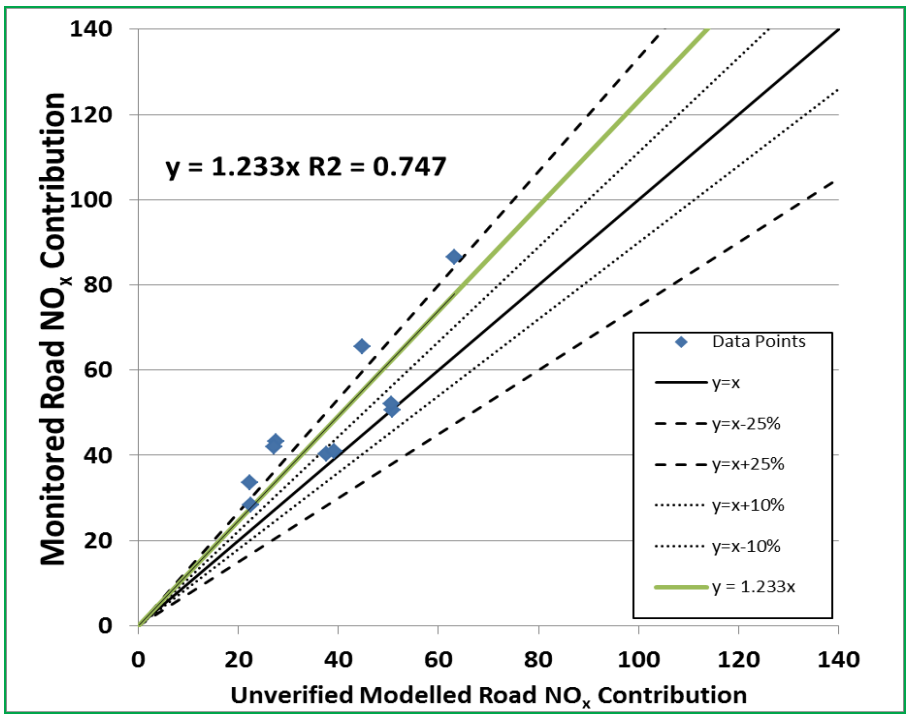
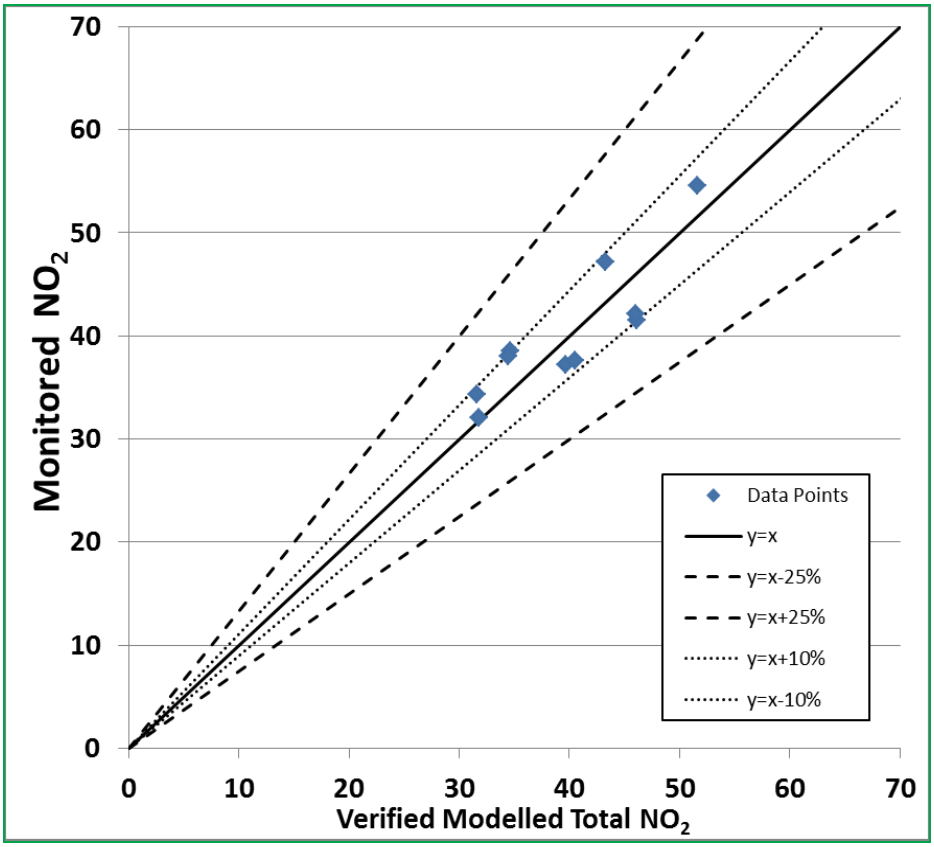


Figure D. 6 - Final Comparison of the Modelled NO_2 versus Monitored NO_2



The adjustment factor of 1.23 was applied to the road-NO_x concentrations predicted by the model in the Muckley Corner area before using the NOx/NO_2 calculator tool to

estimate total NO_2 concentrations. All sites show an acceptable agreement between the monitored and modelled NO_2, with modelled concentrations mostly within ±10% of the measured concentrations, with only two locations marginally outside. A factor of 1.23 also reduces the Root Mean Square Error (RMSE) from a value of 5.0 to 3.3.

All NO_x and NO_2 results presented and discussed herein for the Muckley Corner area are those calculated following the process of model verification using an adjustment factor of 1.23.

All NO_x and NO_2 results presented and discussed herein for the A38 area are those calculated following the same process of model verification using an adjustment factor of 1.40. For full details, consult the associated Detailed Assessment[6].

Glossary of Terms

Abbreviation	Description

AADT	AADT Annual Average Daily Traffic flows
ADMS	Atmospheric Dispersion Modelling System
AONB	Areas of Outstanding Natural Beauty
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
AURN	Automatic Urban and Rural Network
CERC	Cambridge Environmental Research Consultants
Defra	Department for Environment, Food and Rural Affairs
DfT	Department for Transport
EU	European Union
FCC	Freight Consolidation Centre
FQP	Freight Quality Partnership
HGV	Heavy Goods Vehicle
ITS	Intelligent Transport Systems
LAQM	Local Air Quality Management
LDC	Lichfield District Council
LGV	Light Goods Vehicle
LTP	Local Transport Plan
NAEI	National Atmospheric Emissions Inventory
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides
$PM_{2.5}$	Airborne particulate matter with an aerodynamic diameter of 2.5µm (micrometres or microns) or less
PM_{10}	Airborne particulate matter with an aerodynamic diameter of 10µm (micrometres or microns) or less
PTP	Personalised Travel Planning

QBP	Quality Bus Partnership
RMSE	Root Mean Square Error
RTPI	Real Time Passenger Information
SAC	Special Areas of Conservation
SAQF	Staffordshire Air Quality Forum
SCC	Staffordshire County Council
UTMC	Urban Traffic Management and Control
$\mu g/m^3$	Micrograms per cubic metre

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