2016 Air Quality Annual Status Report (ASR)

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

November 2016

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Endorsement from the Director of Health and Care, Staffordshire County Council

Staffordshire County Council is committed to working with partners to ensure that Staffordshire will be a place where improved health and wellbeing is experienced by all.

Poor air quality has a negative impact on public health, with potentially serious consequences for individuals, families and communities. Identifying problem areas and ensuring that actions are taken to improve air quality forms an important element in protecting the health and wellbeing of Staffordshire residents. Improving air quality is often a complex issue, presenting a multi-agency challenge – so it is essential that all agencies work together effectively to deliver improvements where they are needed.

As Director of Health and Care across Staffordshire I endorse this Annual Status Report which sets out the position in Newcastle-under-Lyme Borough Council and which will support an ongoing work program to address air quality issues.

Dr Richard Harling
Director of Health and Care Staffordshire County Council
November 2016

Executive Summary: Air Quality in Our Area

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].

Air Quality in Newcastle-under-Lyme

Air quality has been monitored in the borough of Newcastle-under-Lyme over the last 17 years, by using Nitrogen dioxide diffusion tubes and an automatic monitoring station, which monitors real time concentrations of particulate matter (PM_{10}) and Nitrogen dioxide (NO_2) in the air. These substances are monitored because they are found in vehicle exhaust fumes, which is the main source of pollution within the Borough.

Nitrogen Dioxide (NO_2)

Nitrogen dioxide is a gas which poses a risk to health as it can irritate the lungs and lower resistance to respiratory infections such as influenza. Particulate matter also affects the respiratory system, as it is made up of fine small solid particles or liquid droplets which are suspended in the air. The smaller the particles, the deeper they can penetrate into the respiratory system and the more harmful they can be.

Through monitoring Nitrogen dioxide (NO_2) over the last 17 years, we have been able to identify that NO_2 emissions from road traffic, exceed the limits set down in law, in

four areas of the Borough. These areas were declared as Air Quality Management Areas (AQMA's) in 2014, and are as follows;

1. Newcastle-under-Lyme Town Centre
2. Maybank- Wolstanton- Porthill
3. Liverpool Road, Kidsgrove
4. Single property at Madeley

[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

Declaring these areas as AQMA's, means that the Council must put in to place an action plan of how the air quality can be improved and brought back within legal limits. Development of the action plan is ongoing, and has involved input from a number of different sectors including Highways England, Planning Departments, and Public Health England. The aim of the Action Plan is to look at the different ways in which levels of pollution can be reduced by managing traffic more efficiently, and encouraging walking, cycling and the use of public transport. Since declaring the AQMA's no new major sources of emissions have been identified. Further information about the AQMAs and Action Plan can be found at:

https://www.newcastle-staffs.gov.uk/all-services/environment/environmental-protection/air-quality-newcastle-under-lyme, and at http://uk-air.defra.gov.uk/aqma/list

Monitoring of NO_2 concentration in the AQMAs and at a variety of locations across the Borough during 2015 shows, that there has been a general decrease in NO_2, with the majority of areas now being under the annual mean objective.

Town Centre AQMA

NO_2 concentrations have generally decreased each year from 2012 onwards within the Town Centre. Site 11 (34 London Road) shows a large spike in NO_2 concentration between 2012 and 2014 (increase of 25.7%), followed by a dramatic decrease in 2015 (decrease of 30.2%). Both Site 11 and Site K1 are continuing to have an annual mean concentration of around 40ug/m^3. This AQMA will remain in place until such time as all sites measure an annual mean NO_2 concentration that is consistently below the annual mean legal limit.

Porthill-Wolstanton-Maybank AQMA

There has been a steady decrease in NO_2 concentration at the established diffusion tube monitoring sites within this AQMA over the past 5 years, with the average NO_2 concentration within the Porthill-Wolstanton-Maybank AQMA for 2015 being 31.45ug/m^3.

In October 2015, diffusion tube monitoring site 103 (Grange Lane), was added to the monitoring network for this AQMA. Over the three months that it was in place (October to

December 2015), it showed that there may be an exceedance of the 1-hour mean objective at this location. It is important to note that the diffusion tube had only been exposed for a three month period over the winter when NO_2 concentrations are naturally higher, and that the data collected had to be 'annualised', to gain an estimate of the annual mean concentration at this site.

This AQMA, and diffusion tube Site 103, will remain in place as there are a number of works planned which may impact upon this area, this includes the Etruria Valley Development scheme and the planned improvement works to the A500.

Kidsgrove AQMA

NO_2 concentrations have decreased each year from 2012 onwards within this AQMA. Sites 6 (106 Liverpool Road) and Site 93 (118 Liverpool Road) show the most noticeable decrease in NO_2 concentration, with an 18.9% and 21.9% reduction respectively, between 2012 and 2015. This AQMA will remain in place until such time as all sites measure an annual mean NO_2 concentration that is consistently below the annual mean legal limit.

Madeley AQMA

The NO_2 concentration in Madeley was above the annual mean legal limit between 2010 and 2012, and has remained within 10% of the annual mean for the past 3 years. Although there has been a slight decrease in the annual mean NO_2 concentration, it is not enough to enable us to say with certainty that there will be no further exceedances at this location. As there is no significant decrease in the concentrations at this site, and due to the works that Highways England plan to implement for the M6 in this section (hard-shoulder running), this location will continue to be monitored.

Across the Borough of Newcastle under Lyme

There has been a general decrease in the annual NO_2 concentrations across the Borough over the past three years. This indicates that the strategies currently in place are already helping to reduce the NO_2 concentration within these areas of the Borough. However, work needs to be done to ensure that any further developments, and changes to the road networks across the Borough do not lead to an increase in the annual NO_2 concentration above the annual mean objective of 40µg/m^3.

Particulate Matter (PM_{10} and $PM_{2.5}$)

Particulate matter, or PM, is the term use to describe particles found in the air, including dust, dirt and liquid droplets. PM comes from both natural and man-made sources, including traffic emissions and Saharan-Sahel dust. These particles can be suspended in the air for long periods of time, and can travel across large distances.

PM less than 10 micrometers in diameter (PM_{10}) pose a health concern because they can be inhaled into and accumulate in the respiratory system. PM less than 2.5 micrometers in diameter ($PM_{2.5}$) are referred to as "fine" particles and are believed to pose the greatest health risks, as they can lodge deeply into the lungs.

Particulate matter (PM_{10}) is measured using an automatic monitor located at Queens Gardens (Site CM1) within the Town Centre AQMA. Particulate matter (PM_{10}) levels within Newcastle-under-Lyme, continues to be well below the annual mean objective level of 40µg/m^3, with the annual mean concentration for 2015 being 22.93µg/m^3.

During 2015 there were 5 days when the 24hour mean objective of 50µg/m^3 was exceeded. Three of these days were due to national levels of air pollution being high because of Saharan Dust and increased pollution levels being carried over to the UK from the continent. The other two days were due to local factors including Christmas and New Year celebrations.

Due to the health risk posed by $PM_{2.5}$, a new requirement has been brought in to monitor $PM_{2.5}$ concentrations. As Newcastle-under-Lyme does not currently monitor for this fraction of particulate matter, an estimation of the $PM_{2.5}$ concentration for

2015 has been made using the national factor for $PM_{2.5}$ and the method set out in TG16. The estimated concentration for $PM_{2.5}$ for 2015 is 16µg/m3.

Manmade $PM_{2.5}$ is estimated cause some 60 deaths per annum for adults over 30 years of age within the Borough.

The Borough Council, along with the Staffordshire County Air Quality Group, is now looking at ways in which $PM_{2.5}$ concentrations can be reduced at both a local and regional level.

Actions to Improve Air Quality

To ensure that air quality within the borough continues to improve the following areas are currently being looked into and promoted;

1. Eco-Stars
2. Involvement with planned road improvement works to the A500 at the Grange Lane junction, with Highways England
3. Managing planning applications pro-actively both at a County and Borough Planning level
4. Involvement in changes to traffic light sequencing, in conjunction with Staffordshire County Highways Department
5. Involvement with proposed changes to road layouts, with both Highways England and Staffordshire County Highways Department
6. Promotion of Health and Wellbeing through liaising with Public Health colleagues
7. Developing an air quality strategy for the Borough
8. Developing air quality action plans for the four air quality management areas
9. Developing air quality planning guidance for developers looking to build within the Borough.
10. Inclusion of air quality related planning polices in the new Newcastle under Lyme and Stoke and on Trent local plan.

Local Priorities and Challenges

The Borough is located in North Staffordshire and covers an area of 21,096 hectares (81 square miles), with a population of approximately 123,000. Newcastle's strategic location at the important junction between the roads running north from London to Carlisle and west to Chester has ensured that transport has played a major part in its growth. In

addition to these historical routes, modern trunk roads also pass through the Borough. These include the M6, which is currently one of the most heavily trafficked and congested roads in the country along with the A500, which is a major route linking many areas of Newcastle under Lyme and Stoke on Trent with junctions 15 and 16 of the M6. Both of these junctions are adjacent to the Borough boundary and thus contribute to the traffic congestion in the area. A number of main roads converge on the two main towns in the Borough, notably Newcastle under Lyme and Kidsgrove. The A34, A52, A525, A527 and the A53 pass through Newcastle and the
A50, A5011 and A34 pass though Kidsgrove.

Traffic on these roads is a significant source of air pollutants affecting the air quality of the Borough. The other sources are industry and domestic properties. Particular industries with the greatest potential to cause air pollution have been prescribed for air pollution control under the Environmental Permitting (England and Wales) Regulations 20101. Some processes are regulated by the Environment Agency (these are referred to as Part A1 processes) and others regulated by local authorities (these are referred to as Part A2 and Part B processes). Within the Borough there are two Part A1 processes, three Part A2 processes and forty-five Part B processes holding a permit.

The priorities for the local authority in addressing air quality are therefore, centred around ways in which;

1. The amount of traffic on the road can be reduced
2. Assessing and improving the vehicles using the roads within the Borough
3. Road traffic can be better managed to reduced stop-start, idling and congestion.
4. Traffic light signalling systems can be improved to enable a more fluid movement of traffic, particularly around the Town Centre ring road.
5. Residents can be encouraged to take up other forms of transport, including public transport, cycling and walking

How to Get Involved

How to Get Involved
If residents and businesses reduce the amount of fuel and chemicals used, it will improve air quality. The following ways can help:

Commute

- ✓ Leaving the car at home one day a week. Further information can be found at www.staffssaferroads.co.uk/
- ✓ Consider car sharing your journey Further guidance can be found at https://share-a-lift.co.uk/
- ✓ Using public transport whenever practicable will reduce traffic congestion and improve air quality. Travel planning APP's are available for most smart phones. You can also find information online at http://travelsmartns.co.uk/
- ✓ By avoiding idling engines and/or air conditioning running continuously - switch your engine off; to save fuel, money and improve local air quality.

School Run

- ✓ Walking or cycling to school is not only good for health but it will save on fuel costs and help reduce local air pollution. Further guidance can be found within Travel into School www.staffordshire.gov.uk/transport/Stafford/Schools/Schools.aspx
- ✓ Take turns with friends, neighbours or family to drive or walk the children to school. Check whether your school has a travel plan.

Energy Efficiency

- ✓ Improving the energy efficiency of your home / school / workplace will help reduce energy bills, as well reducing the air pollution associated with power generation. For further information, please visit the Energy Savings Trust (EST) website www.energysavingtrust.org.uk, which is a non-profit organisation that promotes energy savings, funded by the Government and private sector.

Workplace transport

- ✓ 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 green 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! ECO Stars is currently managed by specialist transport consultants, Transport and Travel Research Ltd (TTR).

  It's free and straightforward to join ECO Stars. Simply contact the ECO Stars team by phone or email.
  They can complete the application form with you. One of the team can visit you in person to take you through the application

Phone:01543416416
Email: ecostars@ttr-ltd.com
To find out more about ECO-Stars visit: http://www.ecostars-uk.com/

- ✓ Grants may be available to support your business in becoming more energy efficient and towards the purchase of cleaner vehicles and support with charging infrastructure www.gov.uk/government/organisations/office-for-low-emission-vehicles / www.energysavingtrust.org.uk

Around The Home

- ✓ Use water-based or low solvent paints, glues, varnishes and wood preservatives, look for brands with a low VOC content.
- ✓ Make sure your home is well ventilated especially during DIY or cleaning.
- ✓ Have your central heating system checked regularly to avoid risking exposure to toxic carbon monoxide.
- ✓ Keep wood stoves and fireplaces well maintained, and make sure that wood burners are exempted for use in smoke control areas. See our webpage for further advice www.newcastle-staffs.gov.uk/smokecontrolareas
- ✓ Purchase "Green Power" for the electricity in your home. (Contact your power supplier).
- ✓ Be energy efficient- make sure your house is well insulated and use energy efficient appliances. Your energy supplier may offer grants to insulate your home.
- ✓ Avoid using bonfires to dispose of waste and never burn household waste, especially plastics, rubber and treated timber. See our webpages for advice on disposal / recycling and composting. www.newcastle-staffs.gov.uk/bonfires

Newcastle under Lyme Borough Council's air quality reports and action plan documents are accessible from the following link. www.newcastle-staffs.gov.uk/laqm

For enquires or suggestions on how to improve air quality please feel free to contact us:

Write to:	The Environmental Protection Team, Newcastle under Lyme Borough Council Civic Offices Merrial Street Newcastle under Lyme ST5 2AG
Email:	environmentalhealth@newcastle-staffs.gov.uk
Telephone:	01782 717717

Further Information

More information about local and national air quality can be found at the following sites;

- **UK Air** – https://uk-air.defra.gov.uk/

  This site is maintained by the Department for Environment, Food and Rural Affairs (Defra). It has a wide range of information including daily pollution forecasts for the UK, as well as health information for people who suffer with conditions such as asthma, lung conditions and heart problems.

- **Friends of the Earth** - https://www.foe.co.uk/index

  This site contains information about how you can get involved in helping to tackle air pollution and climate change, including information about renewable energy, how to reduce waste and ways that you can help to reduce air pollution from day to day.

- **Air Quality England** - http://www.airqualityengland.co.uk/

This site has air quality monitoring data and site/pollutant air quality statistics for a number of locations within England. It has clear summary statistics on all the relevant pollutants in the context of UK and European legislation. You are also able to access the uBreathe app via this website, which provides air pollution health advice wherever you are in the UK.

Table of Contents

List of Tables

List of Figures

1 Local Air Quality Management

This report provides an overview of air quality in Newcastle-under-Lyme during 2015. It fulfils the requirements of Local Air Quality Management (LAQM) as set out in Part IV of the Environment Act (1995) and the relevant Policy and Technical Guidance documents.

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

This Annual Status Report (ASR) is an annual requirement showing the strategies employed by Newcastle-under-Lyme Borough Council to improve air quality and any progress that has been made.

The statutory air quality objectives applicable to LAQM in England can be found in **Table E.1** in **Appendix E**.

2 Actions to Improve Air Quality

2.1 Air Quality Management Areas

Air Quality Management Areas (AQMAs) are declared when there is an exceedance or likely exceedance of an air quality objective. After declaration, the authority must prepare an Air Quality Action Plan (AQAP) within 12-18 months setting out measures it intends to put in place in pursuit of the objectives.

A summary of AQMAs declared by Newcastle-under-Lyme Borough Council can be found in **Table 1**. Further information related to declared or revoked AQMAs, including maps of AQMA boundaries are available online at https://uk-air.defra.gov.uk/aqma/local-authorities?la_id=170

Table 1 – Declared Air Quality Management Areas

AQMA Name	Pollutants and Air Quality Objectives	City / Town	One Line Description	Action Plan
Newcastle-under-Lyme Town Centre	NO_2 annual mean	Newcastle-under-Lyme	An area encompassing a the town centre ring road (A34)	Action Plans for the 4 AQMAs are currently being drafted.
Maybank-Wolstanton-Porthill	NO_2 annual mean	Newcastle-under-Lyme	Covers the principal routes between Maybank, Wolstanton and Porthill.	
Kidsgrove	NO_2 annual mean	Kidsgrove	A linear AQMA running along Liverpool Road (A50), Kidsgrove.	
Little Madeley	NO_2 annual mean	Madeley	Declared around two properties at Little Madeley situated next to the M6 motorway	

2.1.1 Newcastle-under-Lyme Town Centre AQMA

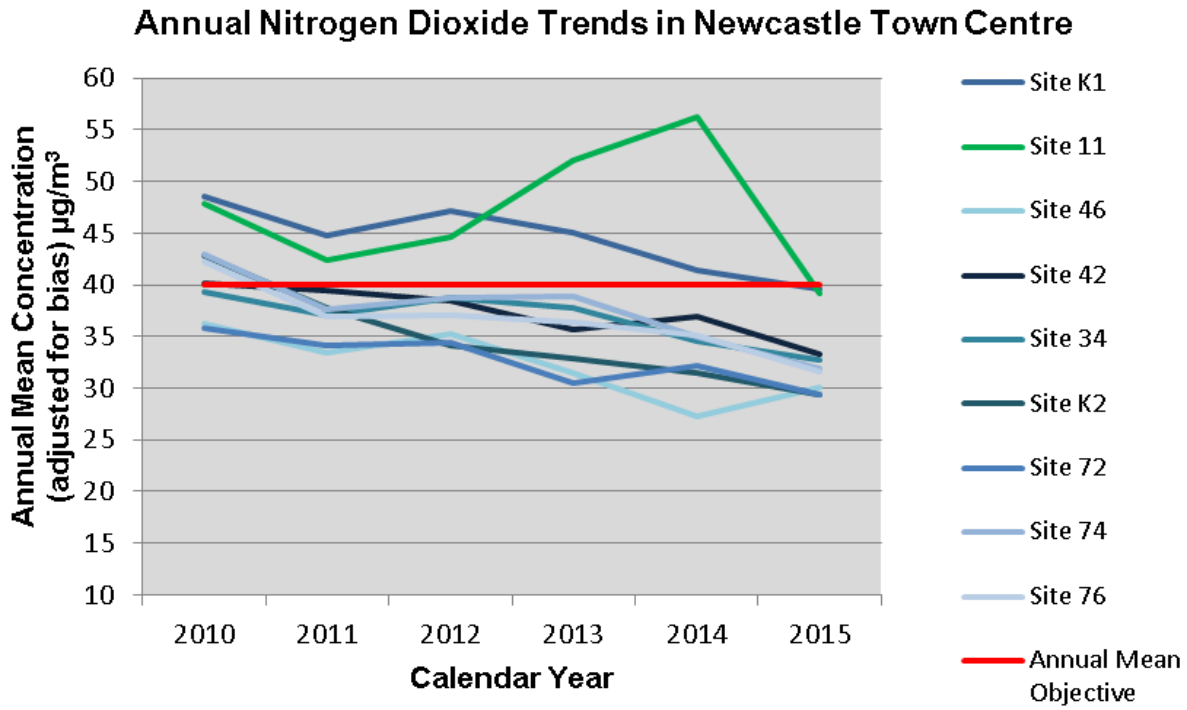

Figure 1 - Annual Nitrogen Dioxide Trends in Newcastle Town Centre AQMA between 2010 and 2015.

Figure 1 shows how the concentration of NO_2 has generally decreased each year from 2012 onwards within the Town Centre AQMA. Site 11 shows a large spike in NO_2 levels between 2012 and 2014 (increase of 25.7%), followed by a dramatic decrease in 2015 (decrease of 30.2%). Both site 11 and site K1 are continuing to have an annual mean of around 40ug/m^3. Site 46 is the only location within this AQMA which shows an increase (10%) in the annual mean NO_2 concentration.

Site 46, is located at 1 London Road (Trinity Court). It is representative of relevant exposure as it is located on the façade of a block of flats which sit on a footway adjacent to a major roundabout on the A34 and town centre ring road. This forms one of the major routes into the town centre. Traffic around this location tends to flow freely. ***Figure 1*** shows that between 2010 and 2014 there was a downward trend in NO_2 concentration at this location, however over the past 12 months concentrations of NO2 have increased from 27.2ug/m3 to 30.0ug/m3.

Site 11 is a roadside location situated at the point of a busy junction and roundabout which links London Road with the A34 ring road (Figure 2 below). Site K1 is not representative of relevant exposure as it is sited on a lamppost adjacent to the A34 dual carriageway. Site K1 does however form part of the national NO_2 diffusion tube monitoring network. The annual NO_2 concentrations may be higher at these sites than the others within the town centre as;

- This section of London Road can become heavily congested at peak times of the day, and is also affected when traffic is diverted through Newcastle-under-Lyme should there be an issue with the A500.
- London Road has a high flow of buses and HGVs
- This area of road meeting with a heavily trafficked junction and roundabout
- The street being narrow with residential properties close to the kerb on either side of the road

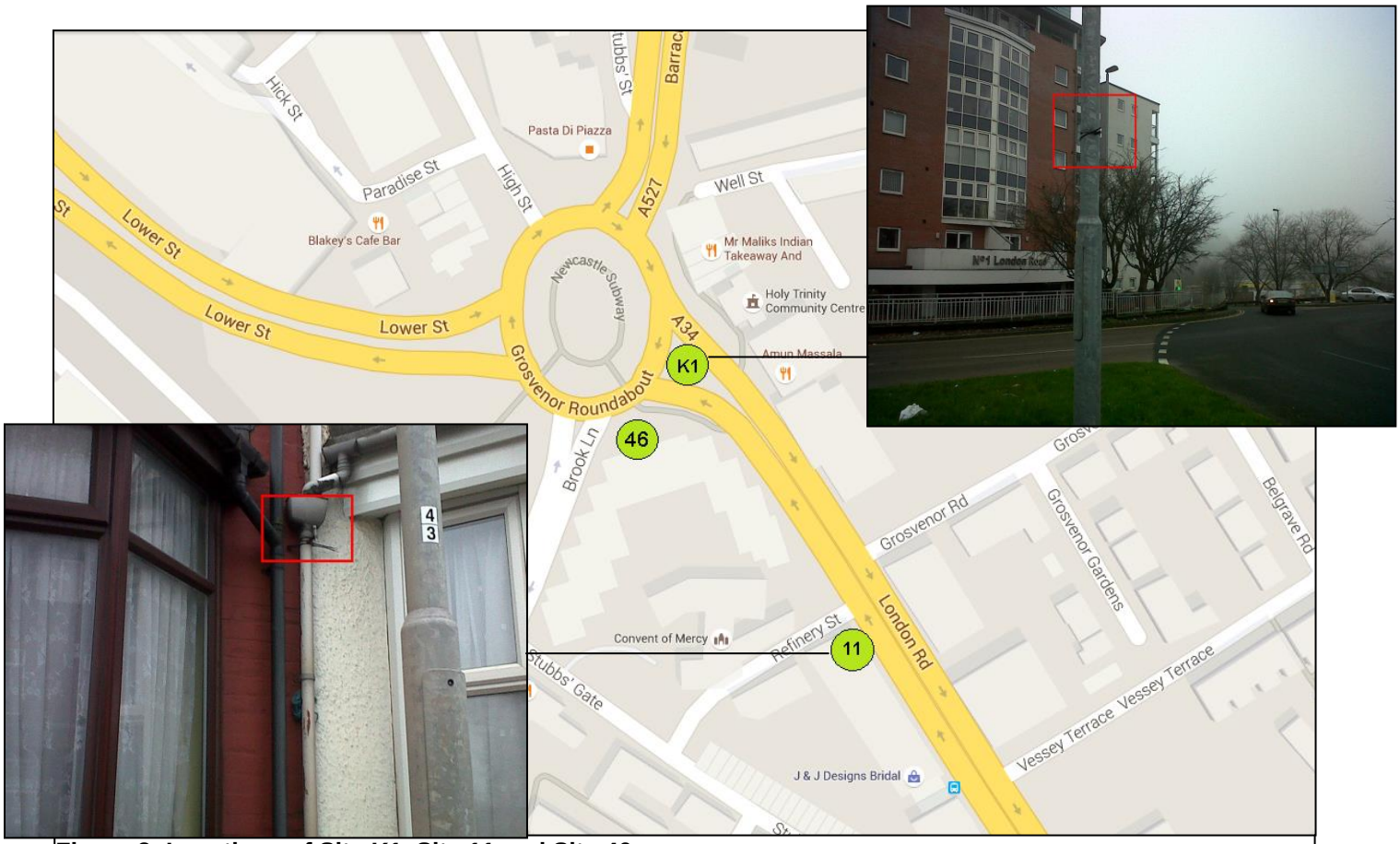

Figure 2: Locations of Site K1, Site 11 and Site 46

The causes for the increase in NO_2 at this location will be looked at in detail to try to ascertain the best control method(s) that can be included in the Action Plan to prevent further increases and bring the NO_2 concentration down to within the annual mean objective. Continued monitoring of the NO_2 concentrations at these sites will be undertaken due to their positions within the town centre ring road.

Three further diffusion tube monitoring sites were introduced towards the end of 2015 at the following locations within the Town Centre AQMA (Figure 3)

- Site 100 – Corner of Ryecroft and Liverpool Road
- Site 101 – Blackburn House, Lower Street
- Site 102 – Maxims, Lower Street

Site 101 and Site 102 were selected, to enable the Council to monitor the NO_2 concentrations at key junctions around the A34 ring road. As these diffusion tubes had not been exposed for the full 12 month period, the data collected has been annualised (see Appendix A, Table A.3 for further information). The annualised data

shows that there may be an issue with NO_2 concentrations, particularly at Site 102 (annualised concentration of 57.49ug/m^3) and at Site 101 (annualised concentration of 39.89ug/m^3). The high concentration of NO_2 at these locations indicates an issue with traffic congestion within the ring road.

The Council is continuing to receive a number of applications for change of use of vacant offices into student accommodation at locations within and adjacent to the Town Centre AQMA. The Council highlights the issue of poor air quality at the earliest available opportunity to enable and encourage the developers to take this issue into account at the design stages.

Traffic issues in the Town Centre will need to be looked at strategically due to the border with Stoke-on-Trent. Planning Departments will also play an important role as future developments are likely to increase the number of receptors and sources of pollution.

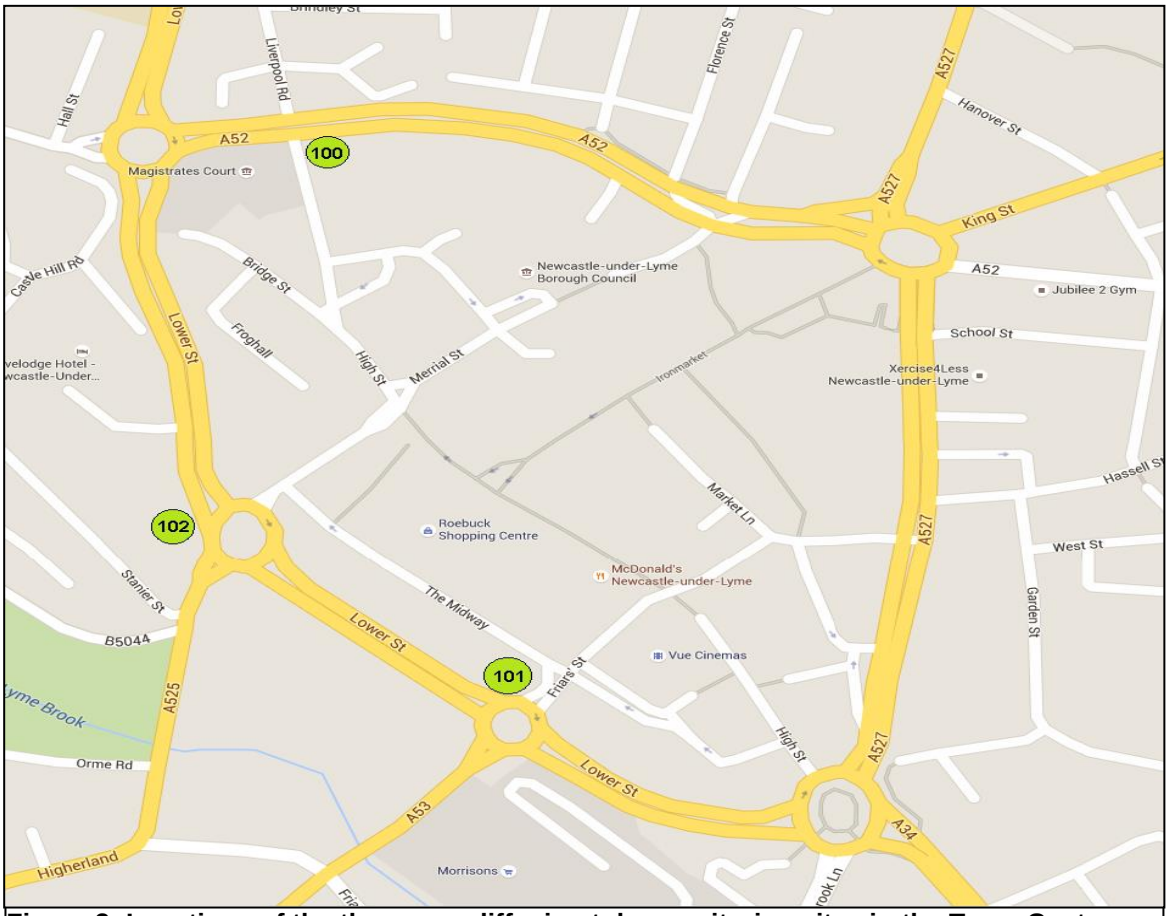

Figure 3*:* Locations of the three new diffusion tube monitoring sites in the Town Centre AQMA. Site 100 – Corner of Ryecroft and Liverpool Road; Site 101 – Blackburn House, Lower Street; Site 102 – Maxims, Lower Street

Site 100 (see ***Figure 3***), was selected as development of the Ryecroft area of the Town Centre is due to take place. Works to this area include the demolition of the Civic Offices. It is proposed that the Ryecroft area will provide student living accommodation (circa 500 bed spaces), as well as the replacement of the Civic Offices site with retail units and car parking. As yet no formal planning application has been submitted for this development.

Planning permission has been approved to build a Civic Centre Hub on the former St Giles' and St Georges' site adjacent to the Ryecroft Ring Road. An air quality assessment was undertaken which explored impacts associated with construction and transport. There was no additional impact identified on air quality within the town centre AQMA

The site has now been cleared at the former Jubilee Pool site, and construction will soon begin of the 243 bedroom student apartment complex. Green travel plans and limited onsite parking are to be put into place to ensure that the increased number of persons living in this location does not have a negative impact on the air quality within this AQMA.

Table 2 - Newcastle Town Centre AQMA Key Actions and Progress

	Key Actions	Progress	Outcomes
1	Continued monitoring of Nitrogen dioxide concentrations at all sites within this AQMA.	Monitoring is showing a downward trend in NO_2 concentration at this site No difficulties have been encountered during the 2015 monitoring programme.	Monitoring is to continue within this AQMA to enable changes to the NO_2 concentrations to be assessed against the legal limit values.
2	Air Quality to be considered for all new planning applications received inside the Town Centre AQMA	Impact assessments have been submitted for applications received during 2015. Sustainable transport options are being looked into.	Measures have been implemented via planning conditions for air quality matters.
3	Promoting travel alternatives	To be discussed during AQAP meetings.	Implement travel awareness campaigns signposting the community to walking, cycling and public transport incentives.
4	Air Quality Action plan for this AQMA to be finalised	Scheduled for completion in Winter 2016	Ongoing stakeholder meetings to discuss best way forward

2.1.2 Porthill-Wolstanton-Maybank AQMA

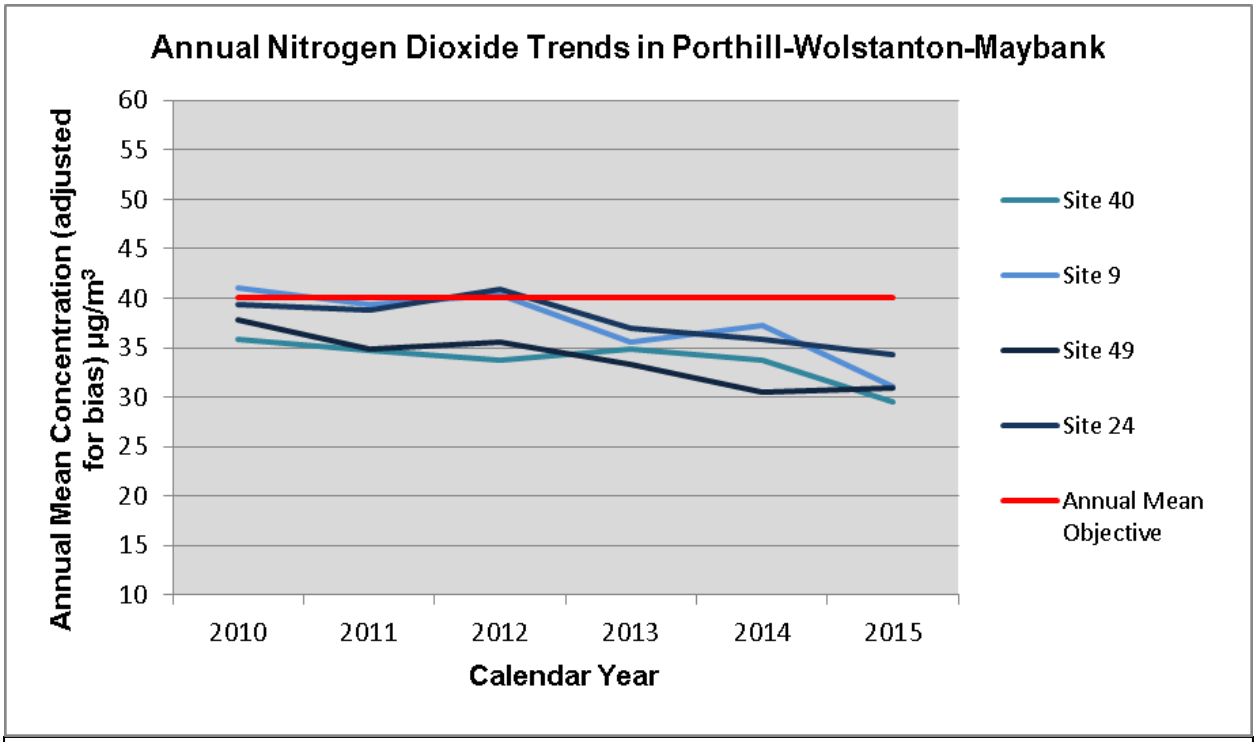

Figure 4*:* Annual Nitrogen Dioxide Trends in Porthill-Wolstanton-Maybank AQMA between 2010 and 2015.

The areas of Porthill-Wolstanton-Maybank have been linked together in an AQMA due to the geographic locations and the shared trunk road which runs through these areas. This area has 4 diffusion tube sites which measure NO_2 concentrations. All diffusion tubes are representative of relevant exposure as they are located on the façade of buildings. At peak times there is queuing traffic on the road linking these three areas.

Figure 4 shows that there has been a steady decrease in NO_2 concentration over the past 5 years within this AQMA, with the average NO_2 level within the Porthill-Wolstanton-Maybank AQMA for 2015 being 31.45ug/m^3. Only Site 49 shows a slight increase in NO_2 concentration (increase of 0.3ug/m^3 from 2014 to 2015).

A further diffusion tube monitoring site was introduced towards the end of 2015 at Site 103- Grange Lane (See ***Figure 5***). This location was chosen as Stoke-on-Trent City Council is proposing to develop an area known as Etruria Valley which is located on the border with Newcastle-Under-Lyme. The area is adjacent to the A500 trunk

road which runs alongside the Porthill-Wolstanton-Maybank AQMA. Part of this scheme may involve the development of the 'Coal Yard' land to the south of the existing Wolstanton roundabout and altering the existing roundabout to safeguard the Etruria Valley access route. AADF traffic counts published by the Department for Transport, for this stretch of the A500 (Easting:386174, Northing:347998) show that the annual average daily vehicle movements at this point during 2015 were 88,107. Through conducting works on this area of road, it may force traffic along Grange Lane and could impact upon NO_2 concentrations within this area.

Maybank continues to be a heavily trafficked area (13,452 annual average daily vehicle movements through this section of road during 2015), with stop-start traffic particularly at peak times. NO_2 concentrations will continue to be monitored at the sites along Maybank to determine what effect the Etruria Valley Development scheme has on this location.

The impact upon air quality within Newcastle under Lyme, from the Etruria Valley Development scheme has not yet been determined. These matters will be explored further in connection with the Environmental Impact Assessment for the road schemes.

As part of Highways England's 'Road Investment Strategy' for 2015/2016 to 2019/2020, works are planned to take place on the A500 between the Wolstanton and Porthill junctions, close to the Etruria Valley Development (see Figure 8 below). Further information will be made available on the Highways England website at http://www.highways.gov.uk/roads. These works are being considered in formulating the Action Plan for this AQMA. An issue with NO_2 concentration has been identified at the point where the A500 is closest to residential properties in Porthill. It is likely that more diffusion tube monitoring locations will be use to enable the Council to determine what type of affect the widening works and changes to traffic flow are having on the AQMA and surrounding area. It is hoped that by widening the carriageway at this point, it will enable traffic to move freely along the A500, and reduce the time that vehicles are idling in congested periods. It is also hoped that

through improving the A500, it will reduce the number of vehicles using the road through Porthill-Wolstanton-Maybank as shortcut.

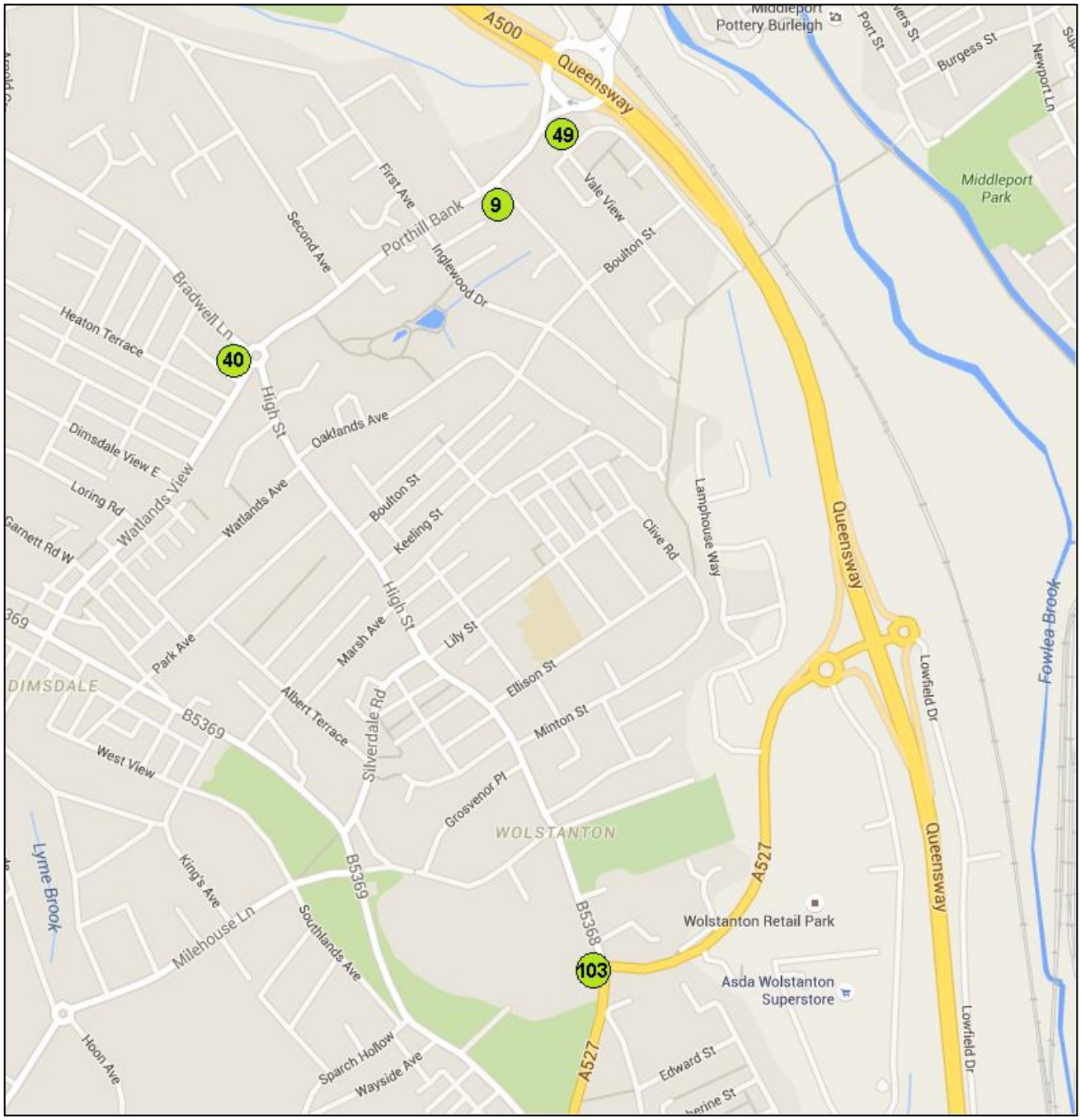

Figure 5: Location of diffusion tube monitoring sites within Porthill-Wolstanton-Maybank AQMA

Table 3 – Porthill-Wolstanton-Maybank AQMA Key Actions and Progress

	Key Actions	Progress	Outcomes
1	Continued monitoring of Nitrogen dioxide concentrations at all sites within this AQMA.	Monitoring is showing a downward trend in NO_2 concentration at this site No difficulties have been encountered during the 2015 monitoring programme.	Monitoring to continue at this site to enable changes to NO_2 concentrations in relation to altering of traffic flows during and following the development of the Etruria Valley scheme, and the A500 improvement works planned by Highways England.
2	Liaising with Highways England regarding planned works to this section of the A500	Planned works to be discussed during AQAP meetings	Ongoing
3	Liaising with Stoke-on-Trent City Council regarding planned works for the Etruria Valley Development	Planned works to be discussed during AQAP meetings	Ongoing
4	Air Quality Action plan for this AQMA to be finalised	Scheduled for completion in Winter 2016	Ongoing stakeholder meetings to discuss best way forward

2.1.3 Kidsgrove AQMA

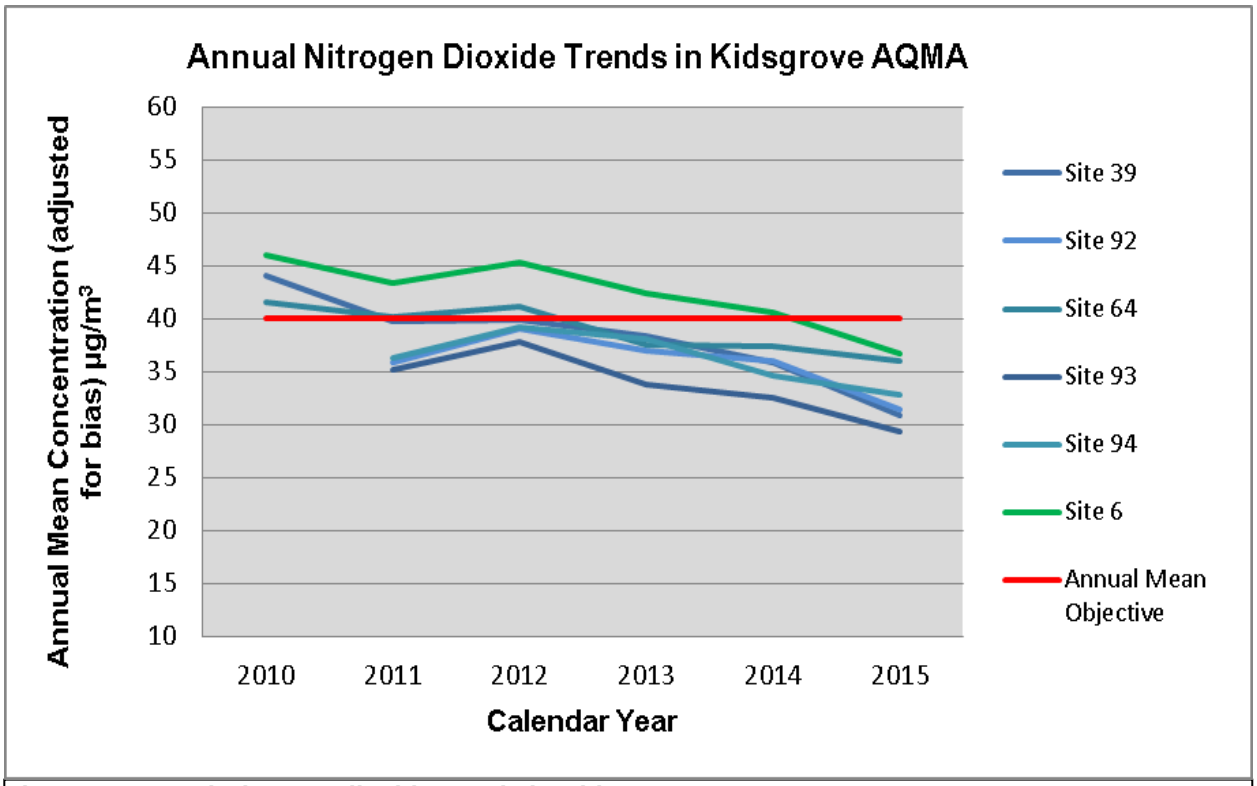

Figure 6: Annual Nitrogen dioxide trends in Kidsgrove AQMA

Figure 6 shows how the concentration of NO_2 has generally decreased each year from 2012 within the Kidsgrove AQMA. Sites 6 and 93 show the most noticeable decrease in NO_2 concentrations, with an 18.9% and 21.9% reduction respectively, between 2012 and 2015. Despite this decrease in NO_2 concentration, Site 6 and Site 64 remain within 10% of the annual mean objective.

The location of Site 64 is representative of relevant exposure, being located on the façade of a building. Properties along this road are terraced and as a result a number of cars park along the road. The location of bus stops also causes issues as some are located at the same point as the traffic lights, causing further congestion as traffic is stuck behind the bus while it is at the stop.

Figure 7: Location of NO_2 diffusion tube Site 6 and 64 within the Kidsgrove AQMA.

Currently there are issues with congestion building up at either end of Liverpool Road, at the junction with the Avenue and Heathcote Street. Both junctions are traffic light controlled with significant traffic flowing along the length of Liverpool Road. These roads are the main routes leading to the Train Station. Diffusion Tube 6 is situated at 106 Liverpool Road, which is the traffic lighted junction leading on to The Avenue provides monitoring data at this junction (see Figure 6**)**

A number of works are due to begin in the Kidsgrove area which may impact upon the AQMA. Improvements to Kidsgrove Railway Station by East Midlands Trains are scheduled to be completed by 2018 These works will include;

- Improving access to the station and car park
- Installation of park and ride facilities

Improvements to Kidsgrove Railway Station, while encouraging people to use public transport, will impact upon the air quality in the area as there is likely to be an increase in the number of vehicles driving to the train station and parking up. As the

only access to the train station is from Liverpool Road and The Avenue, the Borough Council is working with East Midlands Trains to ensure that the planned improvements do not exacerbate an existing issue with $N0_2$ in this area. Improvements to the existing highway network will be identified where appropriate.

Diffusion tube monitoring sites 6 and 64 will continue to provide good monitoring data on how the works to upgrade the Train Station and install Park & Ride facilities impact upon the air quality within this area of the AQMA.

Both Newcastle-under-Lyme Borough Council and Staffordshire County Council are currently exploring sites within the Kidsgrove area for a new council lead leisure centre. The preferred site is adjacent to the existing facility on First Avenue at the The King's CE High School

Table 4 – Kidsgrove AQMA Key Actions and Progress

	Key Actions	Progress	Outcomes
1	Continued monitoring of Nitrogen dioxide concentrations shall take place using diffusion tubes within this AQMA.	Monitoring is showing a downward trend in NO_2 concentration in this AQMA. No difficulties have been encountered during the 2015 monitoring programme.	Monitoring to continue at this site to enable changes to NO_2 concentrations in relation to altering of traffic flows during and following the improvement works to Kidsgrove Train Station, to be monitored.
2	Liaising with East Midlands Trains and Highways Department regarding works to take place at Kidsgrove Train Station	Planned works to be discussed during AQAP meetings	Ongoing
3	Better enforcement of parking restrictions along the length of Liverpool Road.	To be discussed during AQAP meetings	It is hoped that by implementing better parking enforcement, fewer cars will be parked on the double yellow lines, and that this will enable better flow of traffic through this section of the AQMA. The effectiveness of this scheme will be monitored over the next 12 months.
4	Air Quality Action plan for this AQMA to be finalised	Scheduled for completion in Winter 2016	Ongoing stakeholder meetings to discuss best way forward

2.1.4 Madeley AQMA

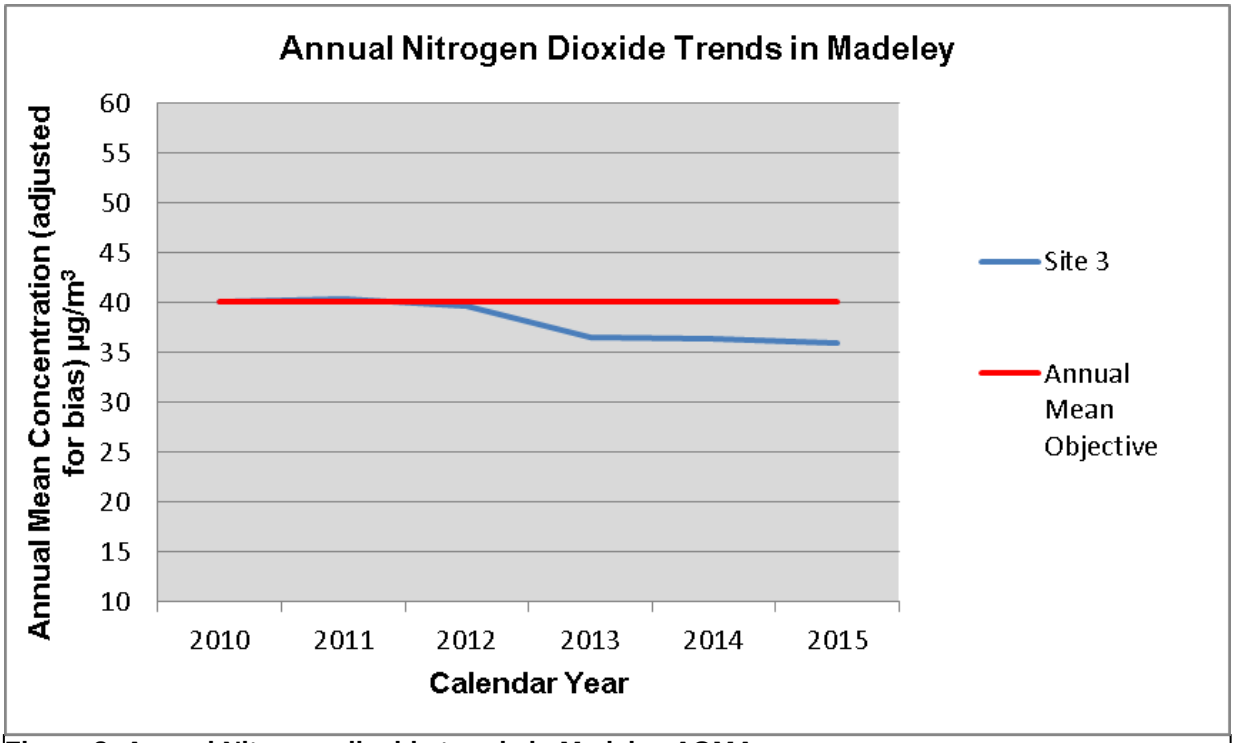

Figure 8: Annual Nitrogen dioxide trends in Madeley AQMA

Site 3 represents exposure at a single dwelling adjacent to the southbound carriageway of the M6 motorway between junctions 15 and 16. This site is currently exhibiting a decreasing trend in nitrogen dioxide exposure (see ***Figure 8***), however has exhibited an upward trend in nitrogen dioxide exposure from 2009 to 2012 and has previously exceeded the annual mean objective. There has been very little change in the annual NO_2 concentration measured in 2014 (36.3µg/m3) and 2015 (35.9µg/m3).

This site is located within an Air Quality Management Area based on results of monitoring in 2012.

The principal source of pollution at this location is emissions from vehicles on the M6 which runs at first floor level with one of the properties. Highways England are proposing to introduce hard-shoulder running to this section of the M6 over the coming years. Currently, it is unknown whether this will improve the situation or make it worse, as although the traffic will be brought closer to the property, it will be moving

at a faster speed. Further monitoring will take place at this location to determine if any improvements are made by the introduction of 'hard-shoulder running'.

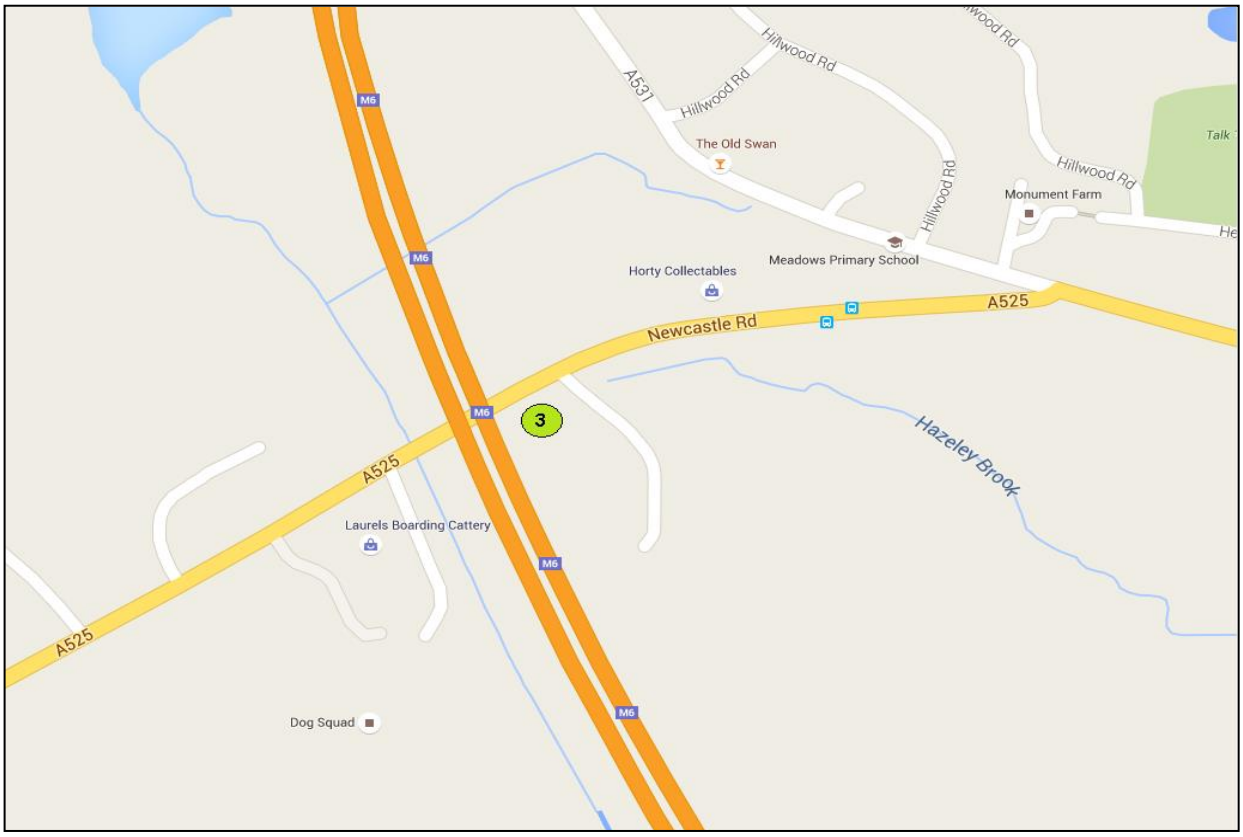

Figure 9: Location of NO_2 diffusion tube Site 3 within the Madeley AQMA

Table 5 – Madeley AQMA Key actions and Progress

	Key Actions	Progress	Outcomes
1	Continued monitoring of Nitrogen dioxide concentrations at Site 3.	Monitoring is showing a downward trend in NO_2 concentration at this site	Monitoring to continue at this site to enable changes to NO_2 concentrations in relation to altering of traffic flows on M6 to be calculated.
2	Liaising with Highways England regarding planned works to this section of the M6	Planned works to be discussed during AQAP meetings	Ongoing
3	Air Quality Action plan for this AQMA to be finalised	Scheduled for completion in Winter 2016	Ongoing stakeholder meetings to discuss best way forward

2.2 Progress and Impact of Measures to address Air Quality in Newcastle-under-Lyme

Newcastle-under-Lyme Borough Council has taken forward a number of measures during the current reporting year of 2015 in pursuit of improving local air quality. Details of all measures completed, in progress or planned are set out in Table 6.

Newcastle-under-Lyme Borough Council's priorities for the coming year are

- Finalise the air quality action plans for the Air Quality Management Areas within the Borough and to work with partners to secure outcomes
- To adopt and publish the air quality strategy for the Borough
- To adopt planning guidance for developers on air quality
- To ensure that appropriate air quality related planning policies are included in the emerging Newcastle under Lyme and Stoke on Trent Joint Local Plan
- To continue to engage with Highways England regarding upgrade works to the A500 and M6 and to understand the implications for air quality in the May Bank, Wolstanton and Porthill AQMA and Madeley AQMA respectively
- To continue to engage with Stoke on Trent City Council regarding the Etruria Valley development and to understand the implications for air quality in the May Bank, Wolstanton and Porthill AQMA.

Table 6 – Progress on Measures to Improve Air Quality

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
	Borough Wide Air Quality Strategy	Policy Guidance and Development	Other Policy	NULBC	In progress				Draft for consultation	Winter 2016	
	Air Quality Planning Guidance	Policy Guidance and Development	Air Quality Planning and Policy Guidance	NULBC	In progress				Draft for consultation	Winter 2016	
	Development of Air Quality Action Plans for the four AQMA's within the Borough	Policy Guidance and Development	Air Quality Planning and Policy Guidance	NULBC	In progress				In progress	Winter 2016	
	Inclusion of air quality related policies in the joint Newcastle under Lyme and Stoke on Trent Local Plan[4]	Policy Guidance and Development	Air Quality Planning and Policy Guidance	NULBC / S-o-T CC	In progress				Identified at scoping stage. To provide evidence base for policies	Winter 2018	
	Staffordshire and Stoke on Trent Eco-Stars[5]	Vehicle Fleet Efficiency	Fleet efficiency and recognition schemes	Cannock Chase DC		2 Year programme commenced April 2015			A number of large HGV operators based within the Borough and who travel into the Borough accredited		

[4] http://www.stoke.gov.uk/ccm/content/planning/planning-general/local-development-framework/joint-local-plan.en

[5] http://www.stoke.gov.uk/ccm/content/environment/environmental-health/pollution/air-quality/eco-stars-project.en

Newcastle-under-Lyme Borough Council

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
	Eco Stars award for Council fleet	Vehicle Fleet Efficiency	Fleet efficiency and recognition schemes	NULBC					4* award for council vehicle fleet with action plan to gain 5* accreditation		
	Agile working adopted by Newcastle under Lyme Borough Council[6]	Promoting Travel Alternatives	Encourage / Facilitate home-working	NULBC		Policy in place			Agile working policy adopted across organisation		
	Voluntary Quality Network Partnership with bus operators **Error! Bookmark not defined.**	Alternatives to private vehicle use	Other	S-o-T CC and SCC							
	Improve uptake of buses through Real Time Passenger Information**Error! Bookmark not defined.**	Alternatives to private vehicle use	Bus based Park & Ride	SCC		In progress					
May Bank, Porthill and Wolstanton AQMA											

[6] http://moderngov.newcastle-staffs.gov.uk/documents/s20852/Agile%20Working%20Guide%20Newcastle%20BC%20Draft%20Mar%2016%20TU%20comments%20Appx%20A.pdf

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
	(Maybank, Porthill Wolsaton AQMA) Improvements to Wolstanton and Porthill Junctions on A500 to reduce congestion[7]	Traffic Management	UTC, Congestion management, traffic reduction	Highways England	In progress . joint meetings with HA, NILBC and SOT CC, SCC				Awaiting details of impact on emissions particularly in Vale View and key access routes onto network		
	(Maybank, Porthill Wolstanton and Town Centre AQMA) Short term routing strategy to mitigate impact of congestion associated with works to A500	Traffic Management	UTC, Congestion management, traffic reduction	Highways England / Staffordshire County Council	In progress . joint meetings with HA, NILBC and SOT CC, SCC				Issue and concerns raised with Highways England, awaiting details of impact and mitigation		
	(Maybank, Porthill Wolstanton AQMA) Evaluate the impact of the Etruria Valley Link Road in the May Bank, Porthill, Wolstanton area and provide appropriate mitigation[8]	Traffic Management	Strategic highway improvements, Re-prioritising road space away from cars, including Access management, Selective vehicle priority, bus priority, high vehicle occupancy lane	S-o-T CC / SCC	In progress . joint meetings with HA, NILBC and SOT CC, SCC				Issue and concerns raised with Stoke on Trent City Council and to feature in EIA		

[7] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/424467/DSP2036-184_Highways_England_Delivery_Plan_FINAL_low_res_280415.pdf

[8] http://www.stoke.gov.uk/text/redirect/?oid=Article-id-867243

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
Newcastle under Lyme Town Centre AQMA											
	Development of Travel Plan for Civic Hub development[9]	Promoting Travel Alternatives	Workplace Travel Planning	SCC / NULBC / Staffs Police	Development in progress		Travel Plan in place and monitored		Imposed as a planning condition which must be discharged prior to occupancy	August 2017	
	Wayfinding strategy Newcastle under Lyme Town Centre and outlying areas for walking and cycling**Error! Bookmark not defined.**	Promoting Travel Alternatives	Promotion of cycling & walking	SCC /NULBC	In progress				Steering group convened and options discussed for consultation	2017	
	Cycle route improvements on A34 North (Cedar Road to Lower Milehouse Lane and Milehouse) and A527 (Town to Keele University)**Error! Bookmark not defined.**	Promoting Travel Alternatives	Promotion of walking	SCC / NULBC	In progress				Detailed designs to be completed in 2016/17		
Kidsgrove AQMA											

[9] https://publicaccess.newcastle-staffs.gov.uk/online-applications/applicationDetails.do?activeTab=summary&keyVal=O0HQ82BMGF800

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
	(Kidsgrove AQMA) Kidsgrove Railway Station Transport hub including parking and improved bus/rail interchange with new bus facilities closer to the station, Real Time Passenger Information provided at Kidsgrove station and at the bus stops, disabled/cycle parking, drop off and taxi facilities, and safer pedestrian and cycle access routes to the station[10]	Transport Planning and Infrastructure	Public transport improvements-interchanges stations and services	East Midlands Trains	In progress					2019	
	Traffic light optimisation to reduce congestion**Error! Bookmark not defined.**	Transport Planning and Infrastructure	Congestion management								

[10] http://www.northstaffsrail.org.uk/kidsgrove-station-project/

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
	Review location of bus stops to facilitate traffic flow**Error! Bookmark not defined.**	Transport Planning and Infrastructure	Congestion management								
	Investigate ways to relieve congestion on A50 Liverpool Road through the junctions in central Kidsgrove**Error! Bookmark not defined.** Error! Bookmark not defined.	Traffic Management	Congestion management	SCC							
Town Centre AQMA											
	(N-u-L Town Centre AQMA) A53 King Street **Local Transport Package Managing Peak Hour Congestion and C-emissions on local roads and at junctions with the trunk road network**Error! Bookmark not defined.	Traffic Management	Strategic highway improvement, re prioritising road space Congestion management Traffic reduction	SCC			Annual monitoring GPS traffic master				

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
	(N-u-L Town Centre AQMA) Cycle route improvements on A34 North (Cedar Road to Lower Milehouse Lane and Milehouse) and A527 (Town to Keele University)**Error! Bookmark not defined.**	Promoting Travel Alternatives	Promotion of cycling	SCC / NULBC	In progress				Detailed designs to be completed in 2016/17		
	(N-u-L Town Centre AQMA) **LSTF funding of cycling walking and bus links between N-u-L and Stoke**Error! Bookmark not defined.	Promoting Travel Alternatives	Promotion of cycling and walking	SCC							
	(N-u-L Town Centre AQMA) **Ring-Road enhanced signage & subway**Error! Bookmark not defined.	Traffic Management	Other	SCC							
	(N-u-L Town Centre AQMA) **Car Park VMS Street parking restrictions**Error! Bookmark not defined.	Traffic Management	Anti-idling enforcement Parking enforcement on highway	SCC							

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
	(N-u-L Town Centre AQMA) Promotion of public transport **RTPI upgrades Review of bus stop/waiting** Error! Bookmark not defined.	Alternatives to private vehicle use	Bus based Park & Ride Rail based Park & Ride	SCC			Modal share using public transport				

Note:
SCC - Staffordshire County Council
N-u-L - Newcastle-under-Lyme Borough Council
HE - Highways England

2.3 PM2.5 – Local Authority Approach to Reducing Emissions and or Concentrations

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

Particulate matter, or PM, is the term use to describe particles found in the air, including dust, dirt and liquid droplets. PM comes from both natural and man-made sources, including traffic emissions and Saharan-Sahel dust. These particles can be suspended in the air for long periods of time, and can travel across large distances.

PM less than 10 micrometers in diameter (PM_{10}) pose a health concern because they can be inhaled into and accumulate in the respiratory system. PM less than 2.5 micrometers in diameter ($PM_{2.5}$) are referred to as "fine" particles and are believed to pose the greatest health risks, as they can lodge deeply into the lungs and also pass into the bloodstream.

$PM_{2.5}$ is the pollutant which has the biggest impact on public health and on which the Public Health Outcomes Framework (PHOF) indicator 3.01[11] is based.

The Royal College of Physicians (RCP) undertook a review in February 2016 [12] where they found that long term exposure to air pollution impairs lung function growth in children, and that outdoor exposure is linked to lung cancer in adults. Within Staffordshire it is estimated that 5%of all deaths can be attributed to exposure to $PM_{2.5}$, compared to 5.3% across England (40,000 deaths annually)[4]. Overall, the estimated cost to individuals and society is more than £20 billion annually for the UK.

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[11] Public Health Outcomes Framework 2016-2019Indicator 3.01 Fraction of mortality attributable to particulate air pollution https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/520457/At_a_glance.pdf

[12] *['Every Breath we Take: The Lifelong Impact of Air Pollution; Report of a working Party, February 2016, ISBN 978-1-86016-567-2]*,

2.3.1 Particulate Matter ($PM_{2.5}$) Levels in Staffordshire and Stoke-on-Trent

A number of the Staffordshire Authorities currently monitor locally for PM_{10}. Defra's Automatic Urban and Rural Network (AURN) site Stoke-on-Trent Centre has a dedicated $PM_{2.5}$ monitor. .Table 7 presents data on the local level of $PM_{2.5}$ annual mean concentrations for the Staffordshire Authorities. Where the data is derived from PM_{10} monitoring this has been adjusted by applying a correction factor of 0.7 to derive the $PM_{2.5}$ component. The correction factor has been derived from the average of all ratios of $PM_{2.5}/PM_{10}$ for the years from 2010 to 2014 for forty sites within the Automatic Urban and Rural Network (AURN) where these substances are measured on an hourly basis and follows the guidance published in LAQM (TG16).

Table 7 Annual Mean PM10 and PM2.5 Results of monitoring by Staffordshire Authorities 2011 to 2015

Annual Mean PM_{10} and $PM_{2.5}$ Results from monitoring by Staffordshire Authorities 2011 to 2015									
Authority	Site Type	Monitor Location	OS Grid Ref		Year				
					2011	2012	2013	2014	2015
Newcastle under Lyme	Roadside	Queen's Gardens	E385057 N346137	PM_{10}	-	14.9	22.5	22	22.9
				$PM_{2.5}$	-	10.43[(1)]	15.75[(1)]	15.4[(1)]	16[(1)]
Cannock Chase	Roadside	Watling Street, Bridgtown	SJ980086	PM_{10}	22	23	21	19.6	-[(2)]
				$PM_{2.5}$	15.4[(1)]	16.1[(1)]	14.7[(1)]	13.7[(1)]	
Stoke on Trent	Roadside	A50 Meir Tunnel	E392548 N342572	PM_{10}	-	-	-	-	20[(3)]
				$PM_{2.5}$	-	-	-	-	14[(3)]
	Urban background	Stoke on Trent Central	E388351 N347895	$PM_{2.5}$	12	11	10	10	12
	Roadside	Middleport	E385780 N349376	PM_{10}	25	24	25	24	22
				$PM_{2.5}$	18[(1)]	17[(1)1]	18[(1)]	17[(1)]	15[(1)]
East Staffordshire	Roadside	Derby Turn	E424671 N324019	PM_{10}	26.9	25.4	29	31	23
				$PM_{2.5}$	18.8[(1)]	17.8[(1)]	20.3[(1)]	21.7[(1)]	16.1[(1)]

Notes: [(1)]PM2.5 results are derived from PM_{10} monitored results corrected with a 0.7 correction factor in accordance with TG16 - Annex B: Derivation of $PM_{2.5}$ to PM_{10} Ratio. All other results are directly monitored.
[(2)]Cannock Chase Watling Street Bridgetown PM_{10} monitor decommissioned
[(3)] Valid data capture for 2015 was 59%. The site was commissioned on 22 May 2015.

As can be seen from the results, concentrations of $PM_{2.5}$ within the Staffordshire Authorities are below the 2020 EU limit value of 25µg/m^3.

2.3.2 PM2.5 and Mortality in Staffordshire & Stoke-on-Trent

Although the levels of $PM_{2.5}$ within the County and City of Stoke on Trent are below the 2020 EU Limit value, the impact on adult mortality directly attributable to $PM_{2.5}$ is nonetheless still an important public health issue within Staffordshire and Stoke-on-Trent. This is revealed in data obtained from Public Health England used to inform Public Health Outcomes Framework indicator 3.01[13], as shown in Figure 10. The data presented to 2013 is the latest data available at time of publication of this report. Approximately 5% of deaths within the County and Newcastle under Lyme can be attributed to $PM_{2.5}$.

District/County	Percentage
Newcastle-under-Lyme	4.8%
Stafford	4.8%
East Staffordshire	5.0%
South Staffordshire	4.9%
Lichfield	5.1%
Staffordshire Moorlands	4.4%
Cannock Chase	5.0%
Tamworth	5.4%
Stoke	5.1%
Staffordshire County	4.9%
England	5.3%

Figure 10 Public Health Outcomes Framework Indicator 3.01- Fraction of annual all cause adult mortality attributable to anthropogenic (human made) particulate air pollution (measured as fine particulate matter, PM2.5) for Staffordshire Authorities 2010 to 2013[14]

The percentage estimated number of deaths attributable to $PM_{2.5}$ in adults over 30 has been translated into the estimated number of attributable deaths for each local authority area within Staffordshire, and are shown in Figure 11. It will be observed for Newcastle under Lyme, that for adults over the age of 30, some 60 deaths per annum are attributable to PM2.5.

13 Public Health Outcomes Framework 2016-2019Indicator 3.01 Fraction of mortality attributable to particulate air pollution https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/520457/At_a_glance.pdf

14 Source Public Health England www.fingertips.phe.org.uk- Public Health Outcomes Framework Indicator 3.01

Estimated numbers of annual all-cause adult mortality attributable to anthropogenic (human-made) particulate air pollution (measured as fine particulate matter, PM2.5*) for Staffordshire 2011 to 2013 Error! Bookmark not defined.

Fraction of annual all-cause adult mortality attributable to anthropogenic (human-made) particulate air pollution (measured as fine particulate matter, PM2.5*)

	2011			2012			2013		
District/County	Deaths - all causes persons 30+	Percentage*	Estimated attributable deaths	Deaths - all causes persons 30+	Percentage*	Estimated attributable deaths	Deaths - all causes persons 30+	Percentage*	Estimated attributable deaths
Newcastle-under-Lyme	1187	4.8%	57	1218	4.6%	56	1295	4.9%	63
Stafford	1178	4.7%	55	1195	4.6%	55	1261	4.9%	62
East Staffordshire	972	4.9%	48	966	4.8%	46	1097	5.1%	56
South Staffordshire	1009	4.9%	49	1162	4.8%	56	1102	5.1%	56
Lichfield	902	5.1%	46	953	5.0%	47	1050	5.1%	54
Staffordshire Moorlands	927	4.4%	41	1020	4.2%	43	1085	4.7%	51
Cannock Chase	766	5.0%	38	844	4.8%	41	787	5.1%	40
Tamworth	532	5.4%	29	553	5.2%	29	592	5.5%	33
Staffordshire County	7473	4.9%	366	7911	4.7%	372	8269	5.0%	417

Figure 11 Estimated number of deaths by local authority area attributable to PM2.5 within Staffordshire for adults over 30- 2011 to 2013

2.3.3 Actions being taken within Staffordshire to reduce PM2.5

A number of the Staffordshire Authorities are currently involved in implementing measures to reduce levels of $N0_2$ within their areas, which are detailed elsewhere in this report. Whilst there is currently no statutory duty imposed on Local Authorities in England to reduce $PM_{2.5}$, a number of the measures are complementary. A mapping exercise completed by the Staffordshire Air Quality Forum members details the measures currently in place which are considered to have an impact in reducing $PM_{2.5}$ within the County. These are produced in Table 8.

Table 8 Measures having an impact on $PM_{2.5}$ levels within Staffordshire

Measures category	Measure Classification	Effect on reducing NOx and PM10 emissions(low, medium, high)	Reduces PM2.5 emissions	Stoke on Trent CC	Staffordshire Moorlands DC	Newcastle-under-Lyme BC	Stafford BC	Cannock Chase DC	East Staffs BC	Lichfield DC	South Staffs DC	Tamworth BC
Traffic Management	Urban Traffic Control systems, Congestion management, traffic reduction	low	y	http://www.stoke.gov.uk/ccm/navigation/transport-and-streets/traffic-and-travel/	UTC in Leek town centre	UTC in areas of Newcastle Town Centre AQMA and Kidsgrove AQMA	UTC in Stafford town centre	UTC in Cannock town centre	UTC in Burton town centre	-	-	UTC in Tamworth town centre and Ventura Park
	Reduction of speed limits, 20mph zones	low		multiple 20mph zones in place as shown on cycle map: http://www.stoke.gov.uk/ccm/content/leisure-and-culture/sports-and-cycling/cycle-stoke-pages/get-around/stoke-on-trent-cycle-map-and-guide.en	nil	nil	20 mph zones near some schools in residential areas				nil	
	Road User Charging (RUC)/ Congestion charging	low	y	nil	nil	nil	nil	M6 Toll	nil	M6 Toll	M6 Toll	nil
	Anti-idling enforcement	low	y	nil	nil	Advisory	nil	nil	nil	nil	nil	nil
	Other			nil	nil	nil	nil	nil	nil	nil	nil	nil
Promoting Travel Alternatives	Workplace Travel Planning	low	y	Travel Plan Grant Scheme	https://www.staffordshire.gov.uk/transport/greentravel/travelplans/home.aspx							
	Encourage / Facilitate home-working	low	y	Agile working adopted by Stoke-on-Trent CC	nil	Agile working adopted by Newcastle under Lyme B.C.	nil	nil	Homeworking policy adopted	nil	Workstyle adopted by South Staffs Council	Agile working adopted by Tamworth B.C.
	School Travel Plans	low	y	https://modeshiftstars.org/schools.php	https://www.staffordshire.gov.uk/transport/Stafford/Schools/School-Travel-STARS.aspx							

Measures category	Measure Classification	Effect on reducing NOx and PM10 emissions(low, medium, high)	Reduces PM2.5 emissions	Stoke on Trent CC	Staffordshire Moorlands DC	Newcastle-under-Lyme BC	Stafford BC	Cannock Chase DC	East Staffs BC	Lichfield DC	South Staffs DC	Tamworth BC
	Promotion of cycling	low	y	http://www.stoke.gov.uk/ccm/content/leisure-and-culture/sports-and-cycling/cycle-stoke-pages/get-around/stoke-on-trent-cycle-map-and-guide.en http://travelsmartns.co.uk/how-to-travel-smart/cycling/	https://www.staffordshire.gov.uk/transport/greentravel/cycling/Cycling.aspx							
	Promotion of walking	low	y	http://travelsmartns.co.uk/how-to-travel-smart/cycling/	https://www.staffordshire.gov.uk/Search.aspx?search_keywords=walking							
	Staffordshire Share a Lift Scheme	Low	y	https://stoke.liftshare.com/	https://www.staffordshire.gov.uk/transport/greentravel/carsharing/Q002.aspx							

Measures category	Measure Classification	Effect on reducing NOx and PM10 emissions(low, medium, high)	Reduces PM2.5 emissions	Stoke on Trent CC	Staffordshire Moorlands DC	Newcastle-under-Lyme BC	Stafford BC	Cannock Chase DC	East Staffs BC	Lichfield DC	South Staffs DC	Tamworth BC
	Promote use of rail and inland waterways	medium	y	http://www.stoke.gov.uk/ccm/content/transport-and-streets/transport/public-transport/north-staffordshire-community-rail-partnership.en	Staffordshire County Council Draft Rail Strategy is available from: http://moderngov.staffordshire.gov.uk/documents/s69891/Appendix%201%20for%20Rail%20Strategy.pdf	Community Rail Partnership operating along the North Staffordshire Line including Kidsgrove Rail Station which heavily involves the local community. The County Council is a member of Rail North Ltd whose role includes the local management of rail services operating to Manchester Piccadilly. Staffordshire County Council Draft Rail Strategy is available from: http://moderngov.staffordshire.gov.uk/documents/s69891/Appendix%201%20for%20Rail%20Strategy.pdf	Community Rail Partnership operating along the North Staffordshire Line and includes Blythe Bridge Rail Station. Staffordshire County Council is a member of West Midlands Rail Ltd which will bring a change in the way that local rail services are managed and operated. The County Council Draft Rail Strategy is available from: http://moderngov.staffordshire.gov.uk/documents/s69891/Appendix%201%20for%20Rail%20Strategy.pdf	Staffordshire County Council is a member of West Midlands Rail Ltd which will bring a change in the way that local rail services are managed and operated. The County Council Draft Rail Strategy is available from: http://moderngov.staffordshire.gov.uk/documents/s69891/Appendix%201%20for%20Rail%20Strategy.pdf	Community Rail Partnership operating along the North Staffordshire Line and includes Uttoxeter Rail Station. The County Council Draft Rail Strategy is available from: http://moderngov.staffordshire.gov.uk/documents/s69891/Appendix%201%20for%20Rail%20Strategy.pdf	Staffordshire County Council is a member of West Midlands Rail Ltd which will bring a change in the way that local rail services are managed and operated. The County Council Draft Rail Strategy is available from: http://moderngov.staffordshire.gov.uk/documents/s69891/Appendix%201%20for%20Rail%20Strategy.pdf	Staffordshire County Council is a member of West Midlands Rail Ltd which will bring a change in the way that local rail services are managed and operated. The County Council Draft Rail Strategy is available from: http://moderngov.staffordshire.gov.uk/documents/s69891/Appendix%201%20for%20Rail%20Strategy.pdf	Staffordshire County Council is a member of West Midlands Rail Ltd which will bring a change in the way that local rail services are managed and operated. The County Council Draft Rail Strategy is available from: http://moderngov.staffordshire.gov.uk/documents/s69891/Appendix%201%20for%20Rail%20Strategy.pdf

Measures category	Measure Classification	Effect on reducing NOx and PM10 emissions(low, medium, high)	Reduces PM2.5 emissions	Stoke on Trent CC	Staffordshire Moorlands DC	Newcastle-under-Lyme BC	Stafford BC	Cannock Chase DC	East Staffs BC	Lichfield DC	South Staffs DC	Tamworth BC
Transport Planning and Infrastructure	Local Transport Plans and District Strategies	high	y	http://www.stoke.gov.uk/ccm/navigation/transport-and-streets/local-transport-plan/		https://www.staffordshire.gov.uk/transport/transportplanning/localtransportplan/draftnewcastleboroughtransportstrategy.pdf		https://www.staffordshire.gov.uk/transport/transportplanning/localtransportplan/draftcannockchasedistricttransportstrategy2011.pdf		https://www.staffordshire.gov.uk/transport/transportplanning/localtransportplan/LichfieldDistrictIntegratedTransportStrategyNov2015.pdf		https://www.staffordshire.gov.uk/transport/transportplanning/localtransportplan/tamworthboroughintegratedtransportstrategyjune2015final.pdf
	Public transport improvements -interchanges stations and services	low	y	Improvements around Stoke-on-Trent railway station in development		Kidsgrove Station Interchange planned for 2018 www.northstaffsrail.org.uk/kidsgrove-station-project/	Recent improvements completed at Stafford Rail Station	Planned Improvements at Cannock Station as part of Mill Green development	Planned improvements at Burton Rail Station	Planned improvements at Lichfield City as part of Friarsgate Development. LTV improvements to make the station accessible	-	Planned improvements at Tamworth Rail Station including future aspirations to integrate buses with Tamworth Rail Station
	Public cycle hire scheme	low	y	Stoke Railway Station 'Brompton Dock' Bike Hire & Cycle Hub		Nil						
	Cycle network	low	y	Stoke-on-Trent Cycle Map & Guide	https://www.staffordshire.gov.uk/transport/greentravel/cycling/Cycling.aspx							

Measures category	Measure Classification	Effect on reducing NOx and PM10 emissions(low, medium, high)	Reduces PM2.5 emissions	Stoke on Trent CC	Staffordshire Moorlands DC	Newcastle-under-Lyme BC	Stafford BC	Cannock Chase DC	East Staffs BC	Lichfield DC	South Staffs DC	Tamworth BC
	Bus route improvements	high	**y**	Improvements around Stoke-on-Trent railway station in development - station road bus routes	Proposed improvements to route 9 Biddulph-Hanley and route 99 Biddulph-Macclesfield	Proposed improvements to routes 3 and 4 Newcastle Town Centre	Proposed installation of RTPI on radial routes in Stafford	Proposed improvements to services 23,24 and 26 in Rugeley, service 2 Cannock-Walsall and service 32/33 Pye Green	RTPI Burton Town Centre	Proposed new or extended services linked to the City Centre funded via developer contributions	Proposed improvements to services linking to i54 plus RTPI, improvements to Gt Wyrley-Bloxwich corridor, Wombourne routes 256 and 255, Codsall-Wolverhampton route 5, Huntington-Walsall route 1 and Stafford-Wolverhampton route 76	Proposed improvements to local service 2 and RTPI at key locations
Alternatives to private vehicle use	Bus based Park & Ride	medium	**y**	nil		Kidsgrove Station Interchange planned for 2018 www.northstaffsrail.org.uk/kidsgrove-station-project/	nil	nil	nil	nil	nil	nil
	Car Clubs	low	**y**	nil	nil	nil	nil	nil	nil	nil	nil	nil

Measures category	Measure Classification	Effect on reducing NOx and PM10 emissions(low, medium, high)	Reduces PM2.5 emissions	Stoke on Trent CC	Staffordshire Moorlands DC	Newcastle-under-Lyme BC	Stafford BC	Cannock Chase DC	East Staffs BC	Lichfield DC	South Staffs DC	Tamworth BC
Policy Guidance and Development Control	Planning applications to require assessment of exposure / emissions for development requiring air quality impact assessment	high	**y**	Public Protection Division consulted on all planning application and included in pre-planning advice	nil	Local Validation List https://www.newcastle-staffs.gov.uk/all-services/planning/planning-applications/information-requirements-and-validation-planning. Development screened following IAQM air quality for planning guidance.http://www.iaqm.co.uk/text/guidance/air-quality-planning-guidance.pdf	nil	local plan - Policy CP16 - Climate Change and Sustainable Resource UseCannock chase. http://www.cannockchasedc.gov.uk/sites/default/files/local_plan_part_1_09.04.14_low_res.pdf	http://www.eaststaffsbc.gov.uk/planning/planning-policy/local-plan-2012-2031	https://passthrough.fw-notify.net/download/557253/https://www.lichfielddc.gov.uk/Council/Planning/The-local-plan-and-planning-policy/Resource-centre/Local-Plan-documents/Downloads/Local-Plan-Strategy/Lichfield-District-Local-Plan-Strategy-2008-2029.pdf	We ask for AQ assessments on all large scale developments	http://www.tamworth.gov.uk/sites/default/files/planning_docs/Local%20Plan%202006-2031%20FINAL%205.2.16.pdf
	Air Quality Strategy	High	**y**	Local Air Quality Strategy - Stoke-on-Trent City Council		To include PM2.5 in emerging AQS		nil	Yes	nil	To be updated	nil
	Planning Guidance for developers	High	**y**	To develop planning guidance for developers and to develop into SPD once Local Plan Polices in Place	nil	To develop planning guidance for developers and to develop into SPD once Local Plan Polices in Place	nil	http://www.cannockchasedc.gov.uk/residents/planning/planning-policy/supplementary-planning-policy-documents	nil	nil	nil	nil

Measures category	Measure Classification	Effect on reducing NOx and PM10 emissions(low, medium, high)	Reduces PM2.5 emissions	Stoke on Trent CC	Staffordshire Moorlands DC	Newcastle-under-Lyme BC	Stafford BC	Cannock Chase DC	East Staffs BC	Lichfield DC	South Staffs DC	Tamworth BC
	Developer Contributions based on damage cost calculation	High	**y**	To develop polices to secure contributions to offset pollution	nil	To develop polices to secure contributions to offset pollution	nil	http://www.cannockchasedc.gov.uk/sites/default/files/local_plan_part_1_09.04.14_low_res.pdf	nil	nil	nil	nil
	Planning Policies	High	**y**	To influence polices to support improvement in emissions through development of Staffordshire and Stoke on Trent Joint Local Plan http://www.stoke.gov.uk/ccm/content/planning/planning-general/local-development-framework/joint-local-plan.en		To influence polices to support improvement in emissions through development of Staffordshire and Stoke on Trent Joint Local Plan http://www.stoke.gov.uk/ccm/content/planning/planning-general/local-development-framework/joint-local-plan.en	nil	-	Air quality policy adopted for development control	nil	nil	nil
	STOR Sites (Short Term Operating Reserve) Energy Generation . Regulation via planning / permitting regime	high	**y**	To lobby Central Government via appropriate forums (e.g. Staffordshire Air Quality Forum / Midlands Joint Advisory Council) for consideration of air quality implications at a national level and to support local authorities and developers with appropriate guidance								

Measures category	Measure Classification	Effect on reducing NOx and PM10 emissions(low, medium, high)	Reduces PM2.5 emissions	Stoke on Trent CC	Staffordshire Moorlands DC	Newcastle-under-Lyme BC	Stafford BC	Cannock Chase DC	East Staffs BC	Lichfield DC	South Staffs DC	Tamworth BC
	Low Emissions Strategy	high	y									
Freight and Delivery Management	Freight Consolidation Centre	medium	y									
	Route Management Plans/ Strategic routing strategy for HGV's	high	y		https://www.staffordshire.gov.uk/transport/transportplanning/localtransportplan/appendixl-staffordshirefreightstrategy.pdf							
	Quiet & out of hours delivery	low	y	nil	nil	nil	nil	nil	nil	nil	nil	nil
	Delivery and Service plans	medium	y	nil	nil	nil	nil	nil	nil	nil	nil	nil
	Freight Partnerships for city centre deliveries	high	y	nil	nil	nil	nil	nil	nil	nil	nil	nil
Vehicle Fleet Efficiency	Driver training and ECO driving aids	medium	y	nil	nil	nil	nil	nil	nil	nil	nil	nil
	Promoting low emission public transport	high	y	nil	nil	nil	nil	nil	nil	nil	nil	nil
	Vehicle retrofitting programmes	medium	y	nil	nil	nil	nil	nil	nil	nil	nil	nil
	Fleet efficiency and recognition schemes	medium	y	Staffordshire and Stoke-on-Trent Eco-Stars http://www.ecostars-uk.com/eco-stars-schemes/								
low emission	Low emission zone (LEZ) Clean Air Zone (CAZ)	high	y	nil	nil	nil	nil	nil	nil	nil	nil	nil

Measures category	Measure Classification	Effect on reducing NOx and PM10 emissions(low, medium, high)	Reduces PM2.5 emissions	Stoke on Trent CC	Staffordshire Moorlands DC	Newcastle-under-Lyme BC	Stafford BC	Cannock Chase DC	East Staffs BC	Lichfield DC	South Staffs DC	Tamworth BC
	Public Vehicle Procurement - Prioritising uptake of low emission vehicles	high	y	nil	nil	nil	nil	nil	nil	nil	nil	nil
	Company Vehicle Procurement - Prioritising uptake of low emission vehicles	high	y	nil	nil	nil	nil	nil	nil	nil	nil	nil
	Procuring alternative Refuelling infrastructure to promote Low Emission Vehicles, EV recharging, Gas fuel recharging	high	y	nil	nil	nil	nil	nil	nil	Electricity Re-charge Points at some car-parks	nil	nil
	Priority parking for LEV's	high	y	http://www.stoke.gov.uk/ccm/content/transport-and-streets/parking/general-parking-information/electric-vehicle-charging-spaces.en	nil	nil	nil	nil	nil	nil	nil	nil
	Taxi Licensing conditions	medium	y	Hackney Carriage & Private Hire Licensing Policy 2016-2019 (Draft)	nil	nil	nil	nil	nil	nil	nil	nil
	Taxi emission incentives	medium	y		nil	nil	nil	nil	nil	nil	nil	nil

Measures category	Measure Classification	Effect on reducing NOx and PM10 emissions(low, medium, high)	Reduces PM2.5 emissions	Stoke on Trent CC	Staffordshire Moorlands DC	Newcastle-under-Lyme BC	Stafford BC	Cannock Chase DC	East Staffs BC	Lichfield DC	South Staffs DC	Tamworth BC
Environmental permits	Introduction/increase of environment charges through permit systems and economic instruments (Permit fees set centrally)	medium	y	Unable to achieve at a local level without central government approval								
	Measures to reduce pollution through IPPC Permits going beyond BAT	medium	y	https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/211863/env-permitting-general-guidance-a.pdf (Chapter 15)								
	Large Combustion Plant Permits and National Plans going beyond BAT	high	y	nil	nil	nil	nil	nil	nil	nil	nil	nil
	Other	??	y	nil	nil	nil	nil	nil	nil	nil	nil	nil
Other measures	Smoky Diesel Hotline		y	https://www.gov.uk/report-smoky-vehicle								
	A5 and M6 Partnership		y			nil		http://www.hinckley-bosworth.gov.uk/info/10020/strategies_plans_and_policies/1272/a5_partnership		http://www.hinckley-bosworth.gov.uk/info/10020/strategies_plans_and_policies/1272/a5_partnership		

Measures category	Measure Classification	Effect on reducing NOx and PM10 emissions(low, medium, high)	Reduces PM2.5 emissions	Stoke on Trent CC	Staffordshire Moorlands DC	Newcastle-under-Lyme BC	Stafford BC	Cannock Chase DC	East Staffs BC	Lichfield DC	South Staffs DC	Tamworth BC
	Domestic Smoke Control advice and Enforcement		y	Smoke Control Advice	nil	https://www.newcastle-staffs.gov.uk/all-services/environment/environmental-protection/smoke-control-advice	nil	http://www.cannockchasedc.gov.uk/residents/environmental-health/environmental-protection/chimney-smoke	http://www.eaststaffsbc.gov.uk/environmental-health/pollution/smoke-control-areas	https://www.lichfielddc.gov.uk/Residents/Environment/Environmental-health/Pollution/Bonfires-and-smoke-problems.aspx	Details on the website http://www.sstaffs.gov.uk/misc_pages/smokemap.aspx	nil
	Garden Bonfires - Advice and nuisance enforcement		y	nil	nil	www.newcastle-staffs.gov.uk/bonfires	nil	http://www.cannockchasedc.gov.uk/residents/environmental-health/environmental-protection/bonfire-smoke-nuisance	http://www.eaststaffsbc.gov.uk/environmental-health/pollution/bonfires	https://www.lichfielddc.gov.uk/Residents/Environment/Environmental-health/Pollution/Bonfires-and-smoke-problems.aspx	Leaflet on website http://www.sstaffs.gov.uk/pdf/EHS08%20Garden%20Bonfires2.pdf	http://www.tamworth.gov.uk/air-quality#bonfires
	Commercial burning advice and enforcement		y	nil	nil	https://www.newcastle-staffs.gov.uk/all-services/environment/environmental-protection/commercial-burning	nil	Legislation enforced - web page currently being developed	nil	nil	nil	Legislation enforced - web page currently being developed
	Multi agency working with Fire Service and Environment Agency for trade burning		y	Information shared as appropriate								

Measures category	Measure Classification	Effect on reducing NOx and PM10 emissions(low, medium, high)	Reduces PM2.5 emissions	Stoke on Trent CC	Staffordshire Moorlands DC	Newcastle-under-Lyme BC	Stafford BC	Cannock Chase DC	East Staffs BC	Lichfield DC	South Staffs DC	Tamworth BC
	Multi agency working with Staffordshire Fire Service and Local Authority Building Control regarding chimney fires and complaints about DIY domestic heating systems		y	Information shared as appropriate								
	Stoke on Trent Low Carbon District Heat Network	High	y	Stoke-on-Trent Low Carbon District Heating Network		Stoke-on-Trent Low Carbon District Heating Network						

2.3.4 $PM_{2.5}$ in Staffordshire & Stoke-on-Trent - Next steps

As $PM_{2.5}$ is an issue requiring collaboration between the district, county and city authorities within Staffordshire, the following actions are proposed in addition to those outlined in the action plan. Progress on these and the action plan will be detailed in the 2017 ASR.

- ✓ To agree a target for reducing Fraction of All Cause Mortality from $PM_{2.5}$ in each district, city and county authority by 2020
- ✓ To agree a target for reducing $PM_{2.5}$ exposure (calculated from PM_{10} exposure / background maps / local monitoring where available)
- ✓ To maintain compliance with the 2020 EU limit value of 25µg/m^3
- ✓ To include Public Health Outcome Framework Indicator 3.01 in the Staffordshire and District Authority and City Council Joint Strategic Needs Assessment for 2016/2017 onwards and to report progress to the relevant Health and Wellbeing Boards.
- ✓ To continue to identify risks affecting $PM_{2.5}$ which need to be addressed at a national level e.g.
    - A number of authorities within Staffordshire are receiving applications for STOR (Short Term Operating Reserve) sites to supplement power to the National Electricity Grid at times of peak demand. These sites typically operate during the autumn / winter months and can be high emitters of PM. There is currently a conflict in national policy which is seeking security of energy supply and the drive to reduce anthropogenic $PM_{2.5.}$ Recent approaches to DEFRA have revealed a lack of suitable guidance to local authorities and STOR operators.
    - To lobby for a suitable damage cost calculation to reflect the cost to society from $PM_{2.5}$ and to support this through local and national planning policies.

2.4 Summary of Monitoring Undertaken

2.4.1 Automatic Monitoring Sites

This section sets out what monitoring has taken place and how it compares with objectives.

Newcastle-under-Lyme Borough Council undertook automatic (continuous) monitoring at a single site located at Queens Gardens, Newcastle-under-Lyme during 2015. Table A.1 in Appendix A shows the details of the site. National monitoring results are available at https://uk-air.defra.gov.uk/networks/find-sites.

Maps showing the location of the monitoring sites are provided in **Appendix D**. Further details on how the monitors are calibrated and how the data has been adjusted are included in **Appendix C**.

The valid data capture for this site for 2015 was 98%. As this site yielded data capture of greater than 90%, it has not been necessary to annualise the results.

Figure 12, shows the comparison between the hourly NO_2 concentration and the hourly mean objective (200ug/m^3). It is clear that the automatic monitoring site has not had any hourly period which has breached this objective, with the highest recorded hourly value being 95.6ug/m^3 on the 9th April at 22:00.

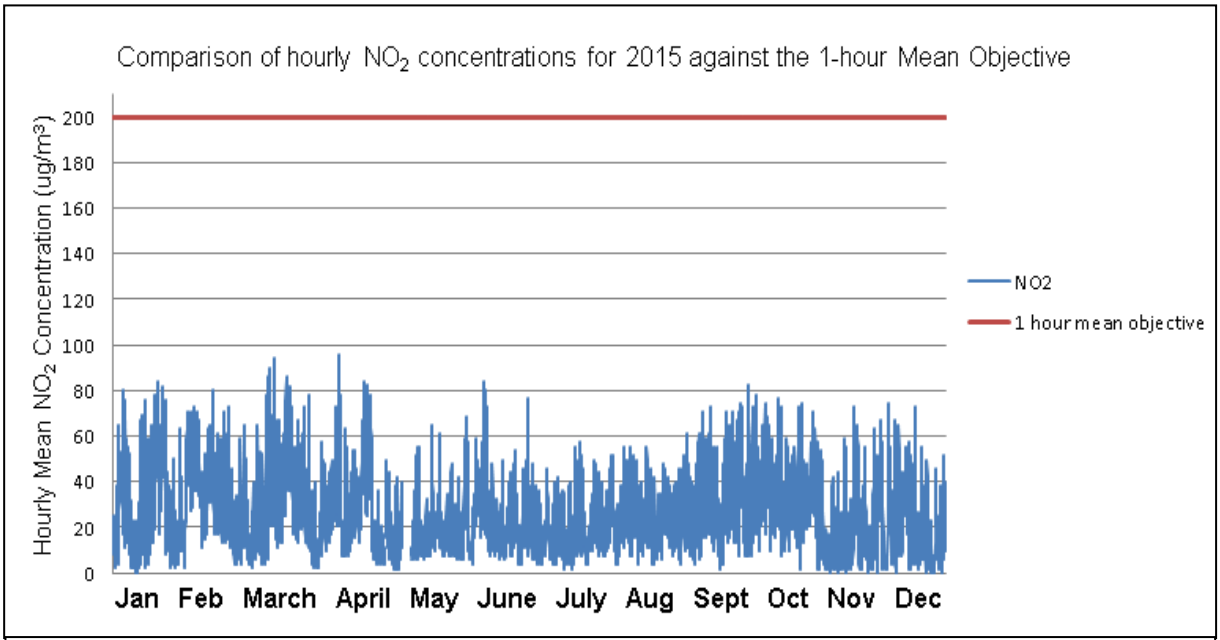


Figure 12 – Comparison of the hourly mean NO_2 concentrations for 2015 at Automatic Monitoring site CM1 (Queens Gardens), against the 1 hour mean objective (200ug/m^3)

Trends in the annual mean NO_2 concentration for the automatic monitoring site are shown in ***Table 9*** below. There continue to be no exceedances of the annual mean objective (40ug/m^3) at the Automatic Monitoring site (CM1) at Queens Gardens.

Table 9 - Trends in annual mean NO2 concentrations from 2011 to 2015

Site ID	Site Type	Monitoring Type	NO_2 Annual Mean Concentration (µg/m^3) (3)				
			2011	2012	2013	2014	2015
CM1	Roadside	Automatic	-	31.92	28.8	33	25.7

The trends in the automatic annual mean Nitrogen dioxide concentrations are shown in Figure 13 below. This graph compares the measurements taken by the automatic monitoring site within the Borough, to those of other authorities within the North Staffordshire and Midlands region.

It can be seen that the automatically monitored NO_2 concentration within Newcastle Borough has good correlation with those in the other named authorities; therefore we can be confident that the results from the automatic monitoring site are recording emissions which are representative of the conditions in this region of the U.K.

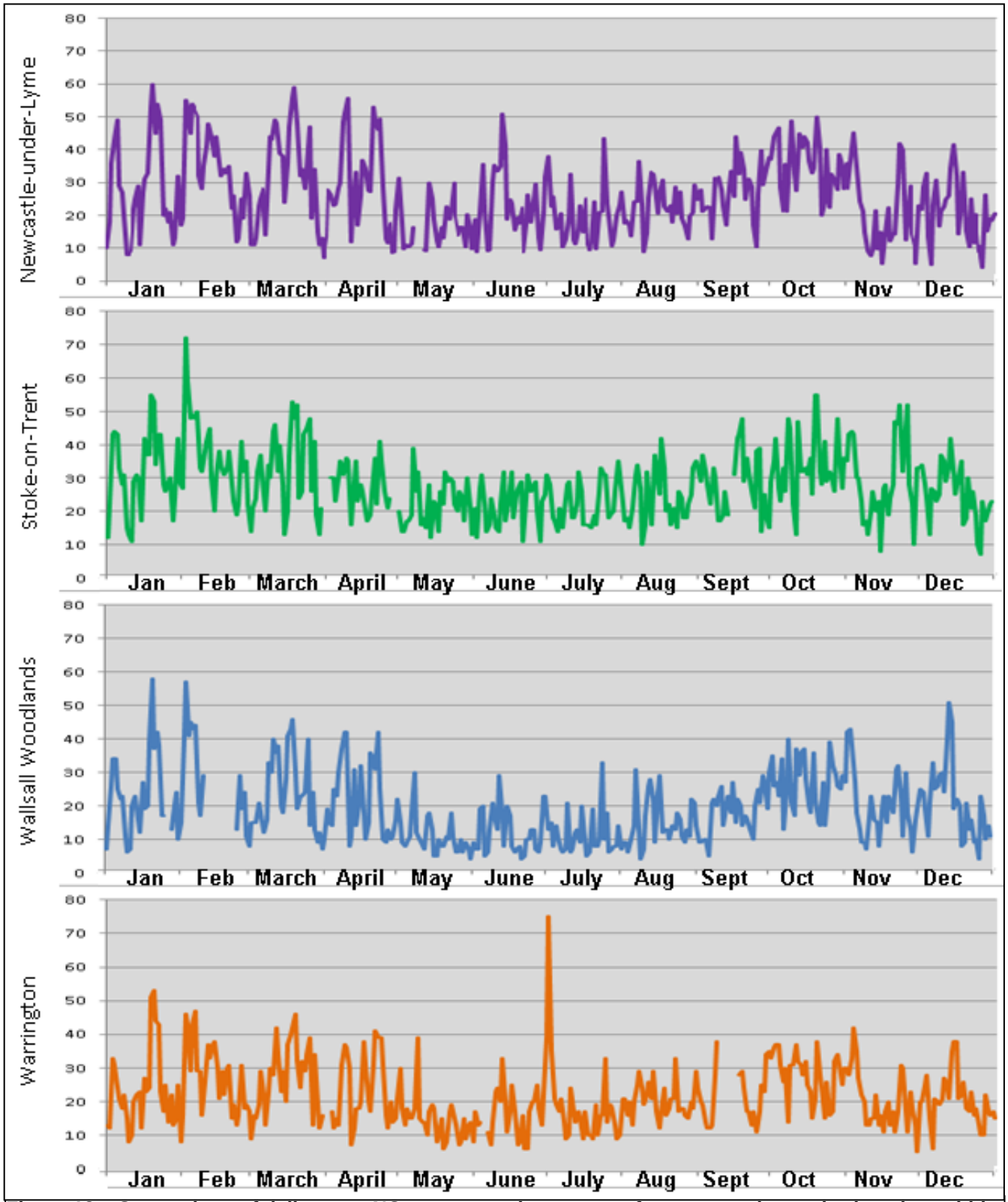


Figure 13 – Comparison of daily mean NO_2 concentrations across four automatic monitoring sites within the North Staffordshire and Midlands region.

2.4.2 Non-Automatic Monitoring Sites

Newcastle-under-Lyme Borough Council undertook non- automatic (passive) monitoring of NO_2 at 42 sites during 2015.

Table A.2 in Appendix A shows the details of the sites.

Of these 42 monitoring sites;

- Six sites were within 10% of the annual Mean legal limit. As shown in *Figure 14* below.
- Two sites (Site 102 and Site 103) were above the annual mean legal limit, as seen in *Figure 14* below. It is important to note that annualisation of the data was required for both of these sites.

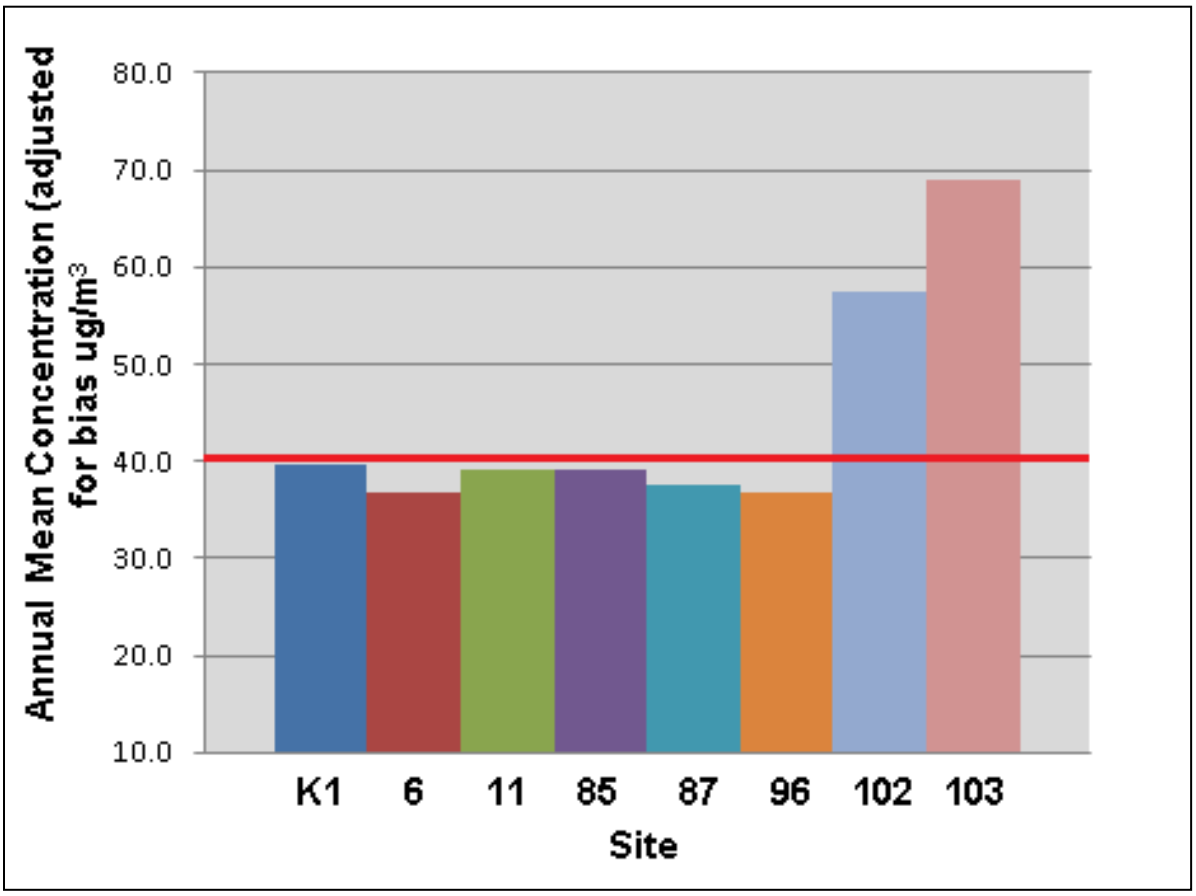


Figure 14: **NO_2 concentrations within 10% of, and in exceedance of, the annual mean objective, during 2015.**

Maps showing the location of the monitoring sites are provided in **Appendix D**. Further details on Quality Assurance/Quality Control (QA/QC) and bias adjustment for the diffusion tubes are included in **Appendix C**.

The results from the 2015 monitoring campaign support the locations and boundaries of the current four AQMAs.

2.5 Individual Pollutants

The air quality monitoring results presented in this section are, where relevant, adjusted for “annualisation” and bias. Further details on adjustments are provided in Appendix C.

2.5.1 Nitrogen Dioxide (NO_2)

Table A.3 in **Appendix A** compares the ratified and adjusted monitored NO_2 annual mean concentrations for the past 5 years with the air quality objective of 40µg/m^3.

For diffusion tubes, the full 2015 dataset of monthly mean values is provided in **Appendix B**.

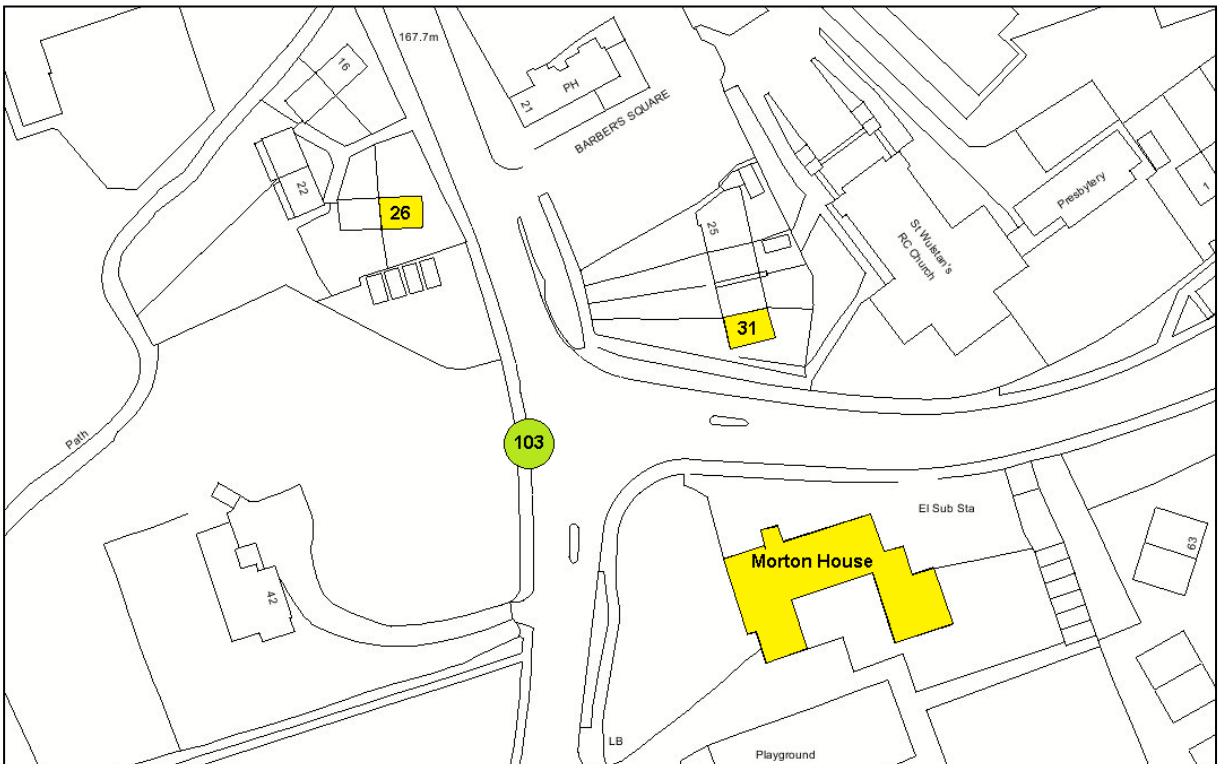
Table A.4 in **Appendix A** compares the ratified continuous monitored NO_2 hourly mean concentrations for the past 5 years with the air quality objective of 200µg/m^3, not to be exceeded more than 18 times per year.

3.2.1.1 Possible Exceedance of 1-hour mean objective

Figure 12 shows that Site 103, has an annual mean greater than 60ug/m3, which would indicate that there may be an exceedance of the 1-hour mean objective at this location. It is important to note that the annual mean for this site had to be annualised, as the diffusion tube had only been exposed for a three month period over the winter when NO_2 concentrations are naturally higher. The regulations state that likely exceedances of the objectives should be assessed in relation to the;

"*Quality of the air at locations which are situated outside of buildings or other natural or man-made structures, above or below ground, and where members of the public are regularly present*."

Diffusion tube monitoring Site 103, is located on a lampost at a height of 2meters, and approx 1meter from the road (see ***Figure 13***). There are no buildings/ structures within 20 meters of this site where members of the public are regularly present. However there are three properties, highlighed in yellow on Figure 15 below, which are within 40meters of the diffusion tube monitoring site.



As the exceedance is at a monitoring site which is not representative of public exposure, the procedure set out in Technical Guidance LAQM.TG16, has been considered to estimate the concentration at the nearest receptor. As there is in excess of 20m between the diffusion tube monitoring site (Site 103) and the nearest receptor (all three highlighted locations are approx. 40m from the diffusion tube site), it has been determined that it is not appropriate to use the 'NO_2 fall-off with distance calculator', to predict the annual mean NO_2 concentration in this instance, as the resulting figure would not be representative of the NO_2 concentrations at these properties due to the way in which concentration of NO_2 decreases with distance.

Technical Guidance LAQM.TG16, states that for diffusion tube monitoring, it can be considered that exceedances of the NO_2 1-hour objective may occur at roadside sites if the annual mean is above 60µg/m^3 .Due to the annaulised mean for Site 103, being calculated as 68.89ug/m^3, this site will be monitored closely to try to determine what is casuing this spike in $N0_2$ at this section Grange Lane, and how this may impact upon the rest of the Porthill-Wolstanton-Maybank AQMA. This diffusion tube monitoring site is of particular importance given the works that are planned to take place as pasrt of the Etruria Valley Development scheme.

3.2.1.2 Trends in background monitoring locations

The annual mean NO_2 concentration for the urban background sites shown in Figure 16 show that long term trends in background concentrations have been decreasing slightly each year since 2012. A peak in NO_2 concentrations can be seen in 2010 which corresponds with elevated levels detected nationwide in that year. The NO_2 concentration for both sites UB1 and UB2 have been consistently below the annual mean objective since over the past 5 years.

The trend in decreasing NO_2 concentration at these background sites corresponds with the general decrease that has been seen in other diffusion tube monitoring locations around the Borough, and with the automatic monitoring station (CM1) at Queens Gardens.

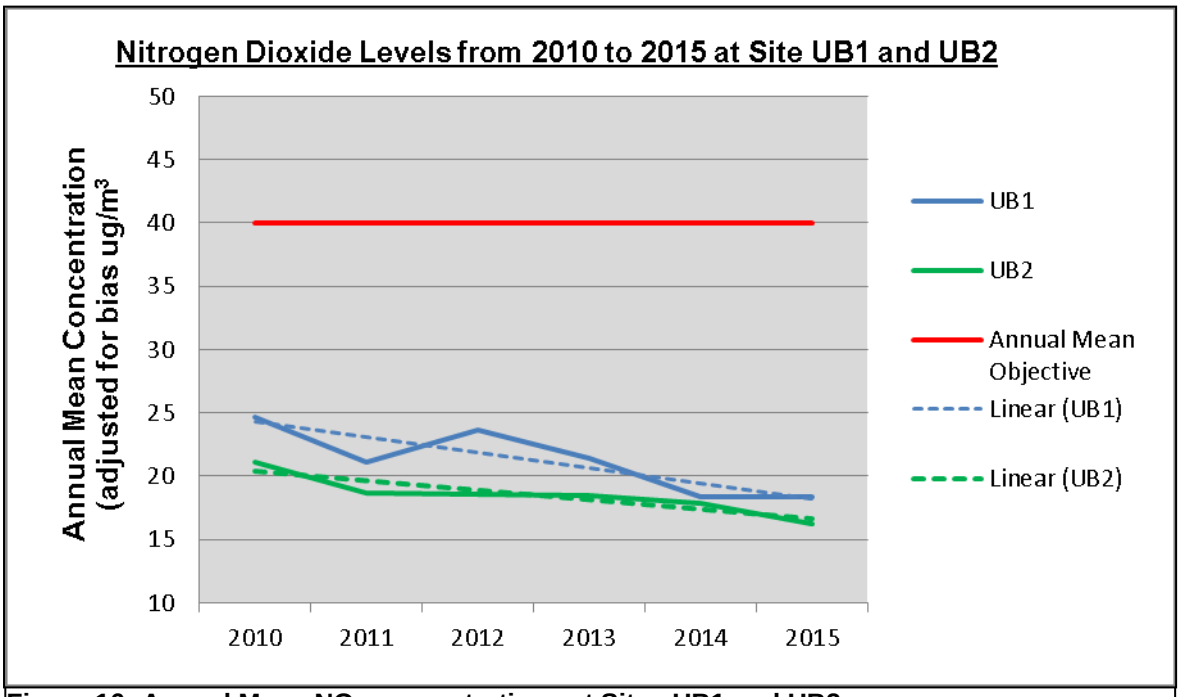


Figure 16: Annual Mean NO_2 concentrations at Sites UB1 and UB2

2.5.2 Particulate Matter (PM_{10})

Automatic Monitoring of PM_{10} is undertaken by a BAM1020 unit sited alongside the automatic Nitrogen dioxide monitor at Queens Gardens (Site CM1), the location of which is shown in Figure 17 below. Site CM1 is located within the Town Centre AQMA. The location of the monitoring station is not representative of relevant exposure.

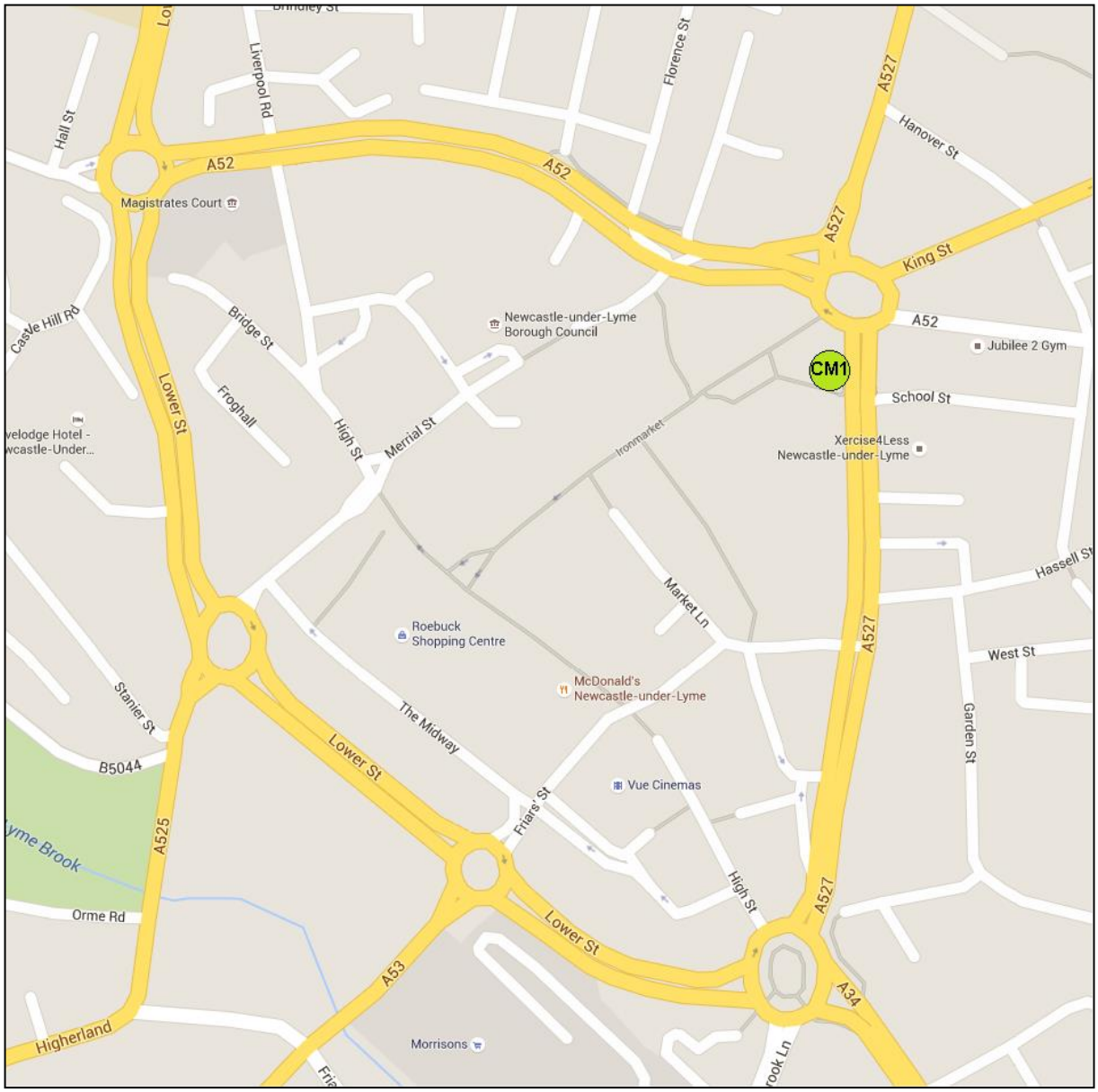


Figure 17: Map showing the location of Automatic Monitoring Site CM1.

The annual data capture for the BAM1020 unit was above the 90% target data capture (data capture of 95.16%), as a result data was not annualised and 90th percentiles have not been calculated.

Table A.5 in **Appendix A** compares the ratified and adjusted monitored PM_{10} annual mean concentrations for the past 5 years with the air quality objective of 40µg/m^3.

Table A.6 in **Appendix A** compares the ratified continuous monitored PM_{10} daily mean concentrations for the past 5 years with the air quality objective of 50µg/m^3, not to be exceeded more than 35 times per year.

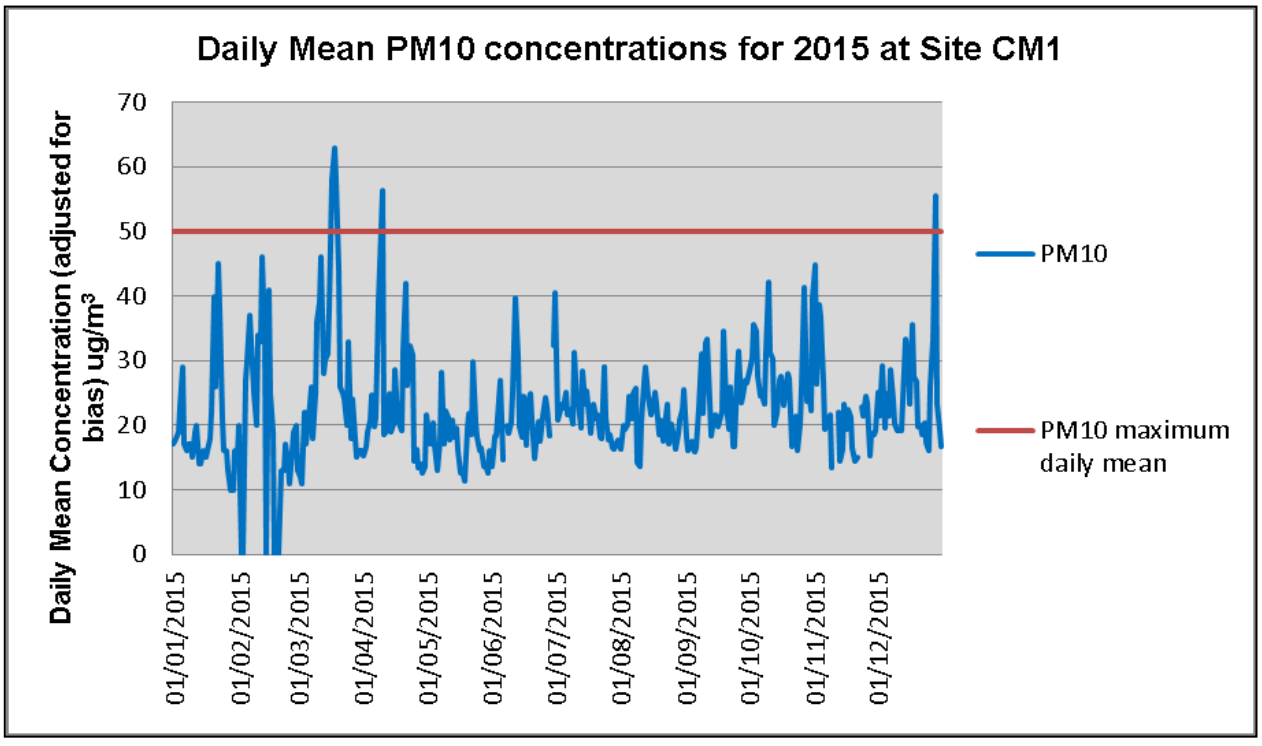


Figure 18: Daily mean PM10 concentrations for 2015 at Automatic monitoring site CM1, located at Queens Gardens, within the Newcastle Town Centre AQMA.

Figure 18, shows the daily PM_{10} concentrations for 2015. The graph shows that exceedances of the daily limit value (50µg/m^3) occurred on 5 days over 2015, with

the maximum daily mean (63µg/m3) detected on the 18th March 2015. **Table 10** has further details regarding the exceedances of the daily limit value.

As the annual allowance is 35days, the annual 24hr objective for PM_{10} was not exceeded.

The reasons for the exceedances being measured on these 5 occasions is discussed in Table 10 below.

Table 10 - Details of the daily PM_{10} exceedances in 2015 measured at Site CM1

Date	Daily PM_{10} Concentration	Reason for elevated levels
17.03.2015	58	News bulletin published by Defra on 18/03/2015, advised of the following; *'High air pollution is currently (18 March 2015) being measured across a number of regions in England and Northern Ireland. This is due to particulate matter from a combination of local sources and brought in via light winds from the continent. These levels are likely to continue to be measured across a number of regions today. Levels are expected to return to low by Friday or earlier as changes in weather conditions lead to the dispersal of pollutants.'*
18.03.2015	63	
19.03.2015	58	
10.04.2015	56	Possibly due to local conditions.
28.12.2015	55	Likely to be due to Christmas and New Year celebrations.

The annual mean PM_{10} concentration for 2015 was 22.95ug/m3, which is slightly higher than that of 2014. As Figure 19, shows, the annual mean PM_{10} concentration continues to be well below the annual mean objective of 40ug/m3.

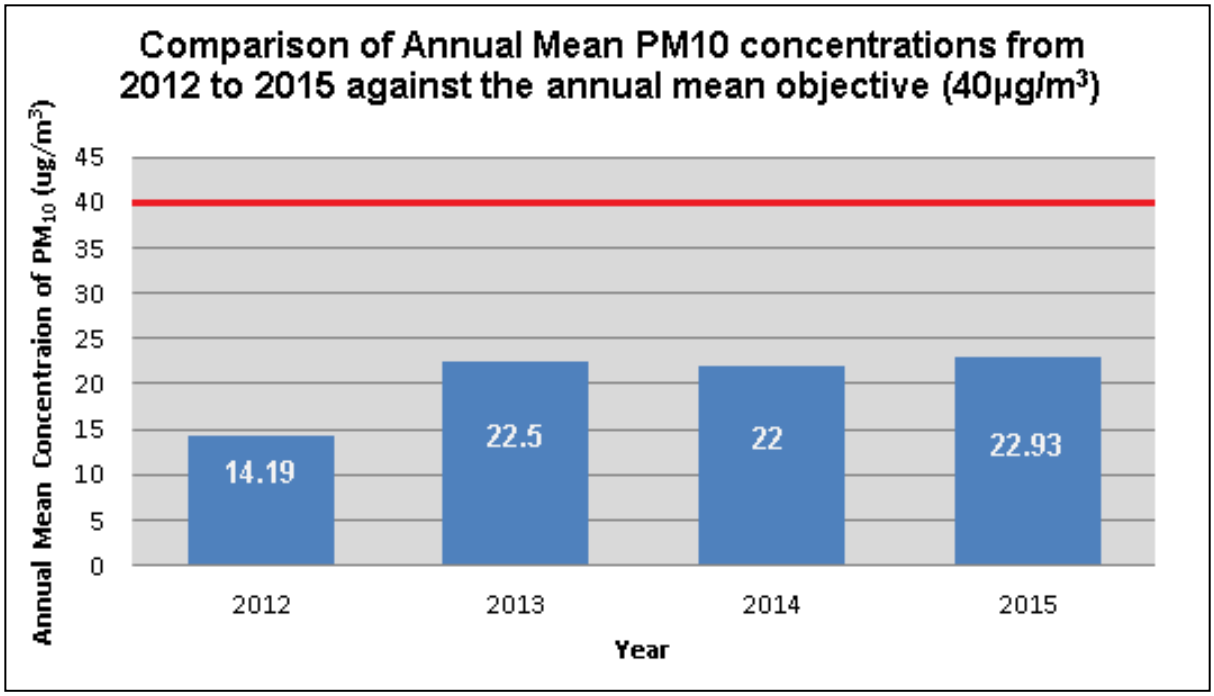


Figure 19: Comparison of the annual mean PM10 concentrations at site CM1

Appendix A: Monitoring Results

Table A.1 – Details of Automatic Monitoring Sites

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Monitoring Technique	Distance to Relevant Exposure (m) (1)	Distance to Kerb of Nearest Road (m)	Inlet Height (m)
CM1	Queens Gardens	Road-side	385046	346147	PM_{10}	Yes	Beta Attenuation	2	3	2
					NO_2		Chemiluminescence	2	3	2

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

(2) N/A if not applicable.

Table A.2 – Details of Non-Automatic Monitoring Sites

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

(2) N/A if not applicable.

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to relevant exposure (m) (1)	Distance to Kerb of Nearest Road (m) (2)	Tube co-located with a continuous Analyser	Height (m)
DT K1	A34 Holy Trinity	Kerbside	385051	345726	NO_2	**Yes**	22	3	No	3
DT K2	76 King St, N/C	Urban Centre	385469	346362	NO_2	**Yes**	0.2	3	No	2
DT UB1	Wolstanton (Haritngton St)	Kerbside	384739	348326	NO_2	**Yes**	7	2	No	3
DT UB2	Westlands (4 Sneyd Cr)	Kerbside	383916	345059	NO_2	No	23	2	No	3
DT 3	Madeley (Collingwood 3 Newcastle Rd)	Rural	378116	345488	NO_2	**Yes**	0.2	128	No	-2
DT 6	Kidsgrove (106 Liverpool Rd)	Suburban	384014	354429	NO_2	**Yes**	0.2	4	No	3
DT 9	32 Porthill Bank	Suburban	385519	349055	NO_2	**Yes**	0.2	6	No	3
DT 11	34 London Road, N/C	Suburban	385112	345636	NO_2	**Yes**	0.3	3	No	3
DT24	26 High Street, May Bank	Suburban	385574	347530	NO_2	**Yes**	0.2	4	No	3
DT 28	Limbrick Cottage Shraley Brook	Rural	377994	350105	NO_2	No	0.3	45	No	6
DT 34	15 Barracks Road	Urban Centre	385059	345840	NO_2	**Yes**	1	4	No	3
DT 39	4/6 Liverpool Road, Kidsgrove	Suburban	383560	354739	NO_2	**Yes**	0.2	2	No	3
DT40	Banktop Court, Porthill	Suburban	385128	348811	NO_2	**Yes**	0.2	20	No	5
DT 42	Jubilee Baths, Newcastle	Urban Centre	385086	346155	NO_2	**Yes**	0.2	4	No	3
DT 46	1 London Road (Trinity Court)	Urban Centre	385073	345685	NO_2	**Yes**	0.3	5	No	3
DT 47	1 London Rd (Brook La)	Urban Centre	385023	345678	NO_2	**Yes**	0.3	6	No	3
DT 49	2 Vale View, Porthill	Urban Centre	385595	349129	NO_2	**Yes**	0.2	10	No	10
DT 64	Kidsgrove Carpets 57 - 59 Liverpool Road	Roadside	383950	354445	NO_2	**Yes**	0.2	3	No	3

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to relevant exposure (m) [1]	Distance to Kerb of Nearest Road (m) [2]	Tube co-located with a continuous Analyser	Height (m)
DT 72	134 High Street Newcastle	Roadside	384980	345787	NO_2	**Yes**	0.2	4	No	3
DT 73	21 London Road Newcastle	Roadside	385070	345738	NO_2	**Yes**	0.2	4	No	3
DT 74	39 London Road Newcastle	Roadside	385132	345640	NO_2	**Yes**	0.2	2	No	3
DT 76	11 Brunswick Street Newcastle	Roadside	385226	346156	NO_2	**Yes**	0.2	2	No	3
DT 84	102 King Street Newcastle	Urban Centre	385548	346400	NO_2	**Yes**	0.2	5	No	3
DT 85	106 King Street Newcastle	Urban Centre	385575	346413	NO_2	**Yes**	0.2	5	No	2
DT 86	Hassell C.P. School Barracks Road N/C	Urban Centre	385075	345910	NO_2	**Yes**	0.2	5	No	3
DT 87	Blue Chilli 1 King Street Newcastle	Urban Centre	385105	346225	NO_2	**Yes**	0.2	5	No	2
DT 88	27 Lower Street Newcastle	Urban Centre	384709	345881	NO_2	**Yes**	0.2	5	No	3
DT 89	Queens Gardens Newcastle	Urban Centre	385054	346134	NO_2	**Yes**	1	5	**Yes**	1
DT 90	Queens Gardens Newcastle	Urban Centre	385054	346134	NO_2	**Yes**	1	5	**Yes**	1
DT 91	Queens Gardens, Newcastle	Urban Centre	385054	346134	NO_2	**Yes**	1	5	**Yes**	1
DT 92	41/43 Liverpool Road Kidsgrove	Urban Centre	383890	354461	NO_2	**Yes**	0.2	2	No	3
DT 93	118 Liverpool Road Kidsgrove	Urban Centre	384056	354393	NO_2	**Yes**	0.2	3	No	4
DT 94	116 Liverpool Road Kidsgrove	Urban Centre	384030	354416	NO_2	**Yes**	0.2	4	No	4
DT 95	76 London Road Newcastle	Roadside	385171	345539	NO_2	**Yes**	0.2	2	No	4
DT 96	52/54 London Road Newcastle	Roadside	385131	345601	NO_2	**Yes**	0.2	3	No	3
DT 97	Blackfriars/ Lower Street	Roadside	384795	345796	NO_2	**Yes**	0.2	2	No	2
DT 98	Newcastle Taxis, Brunswick Street	Roadside	385274	346124	NO_2	**Yes**	0.2	6	No	4
DT 99	Morston Drive, Newcastle	Suburban	384784	342528	NO_2	No	0.2	117	No	2

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to relevant exposure (m) [1]	Distance to Kerb of Nearest Road (m) [2]	Tube co-located with a continuous Analyser	Height (m)
DT 100	Sainsbury's Carpark Near to Courts	Roadside	384710	346282	NO_2	**Yes**			No	
DT 101	Blackburn House, Lower Street	Roadside	384806	345849	NO_2	**Yes**			No	
DT 102	Maxims, Lower Street	Roadside	384613	345999	NO_2	**Yes**			No	
DT 103	Grange Lane, Wolstanton	Roadside			NO_2	**Yes**			No	

Table A.3 – Annual Mean NO_2 Monitoring Results

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) [1]	Valid Data Capture 2015 (%) [2]	NO_2 Annual Mean Concentration ($\mu g/m^3$) [3]				
					2011	2012	2013	2014	2015
CM1	Roadside	Automatic			-	31.92	28.8	33	25.7
DT K1	Kerbside	Diffusion Tube	100	100	**44.8**	**47.1**	**45**	**41.4**	39.6
DT K2	Urban Centre	Diffusion Tube	100	100	37.8	34.2	32.9	31.4	29.3
DT UB1	Kerbside	Diffusion Tube	100	100	21.1	23.7	21.4	18.3	18.4
DT UB2	Kerbside	Diffusion Tube	100	100	18.7	18.6	18.5	17.9	16.3
DT 3	Rural	Diffusion Tube	100	100	**40.3**	39.6	36.4	36.3	35.9
DT 6	Suburban	Diffusion Tube	100	100	**43.4**	**45.3**	**42.4**	**40.5**	36.7
DT 9	Suburban	Diffusion Tube	100	100	39.3	**40.4**	35.6	37.2	31.1
DT 11	Suburban	Diffusion Tube	100	100	**42.4**	**44.7**	**52.1**	**56.2**	39.2
DT24	Suburban	Diffusion Tube	100	100	38.8	**40.9**	37	35.9	34.3
DT 28	Rural	Diffusion Tube	100	100	37.6	36.8	35.3	33.1	32.8
DT 34	Urban Centre	Diffusion Tube	100	100	37.1	38.7	37.7	34.6	32.7
DT 39	Suburban	Diffusion Tube	100	100	39.8	39.9	38.3	35.9	30.8
DT 40	Suburban	Diffusion Tube	100	100	34.7	33.8	34.8	33.7	29.5
DT 42	Urban Centre	Diffusion Tube	100	50	39.5	38.4	35.7	36.9	31.2
DT 46	Urban Centre	Diffusion Tube	100	100	33.4	35.3	31.5	27.2	30
DT 47	Urban Centre	Diffusion Tube	100	100	32.3	34.4	33.1	32.9	27.2
DT 49	Urban Centre	Diffusion Tube	100	100	34.9	35.6	33.3	30.6	30.9
DT 64	Roadside	Diffusion Tube	100	100	**40.1**	**41.1**	37.6	37.3	35.9
DT 72	Roadside	Diffusion Tube	100	100	34.1	34.4	30.4	32.2	29.4
DT 73	Roadside	Diffusion Tube	100	100	36.1	37.6	35.7	34.2	30
DT 74	Roadside	Diffusion Tube	100	100	37.6	38.8	38.9	35	32
DT 76	Roadside	Diffusion Tube	100	100	37	37	36.3	35.2	31.7
DT 84	Urban Centre	Diffusion Tube	100	100	**41.2**	**43.9**	**40.1**	39.5	35.8
DT 85	Urban Centre	Diffusion Tube	100	91.67	**52.1**	**49.1**	**45.1**	**42.4**	39.2
DT 86	Urban Centre	Diffusion Tube	100	100	33.6	37	34.8	33.2	29.1

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2015 (%) (2)	NO_2 Annual Mean Concentration ($\mu g/m^3$) (3)				
					2011	2012	2013	2014	2015
DT 87	Urban Centre	Diffusion Tube	100	100	**42**	**43.4**	**40.3**	36.8	37.6
DT 88	Urban Centre	Diffusion Tube	100	100	33.6	37.7	34	33.6	30.7
DT 89	Urban Centre	Diffusion Tube	100	100	34.2	34.9	34.9	32	25.9
DT 90	Urban Centre	Diffusion Tube	100	100	34.4	37	33.5	33.7	37.6
DT 91	Urban Centre	Diffusion Tube	100	100	34.2	36.6	32.5	33.9	28.4
DT 92	Urban Centre	Diffusion Tube	100	100	35.8	39	36.9	36	31.4
DT 93	Urban Centre	Diffusion Tube	100	100	35.2	37.8	33.8	32.5	29.3
DT 94	Urban Centre	Diffusion Tube	100	100	36.3	39.2	38.1	34.6	32.8
DT 95	Roadside	Diffusion Tube	100	100	37.1	**40.8**	**40.3**	36.3	31.5
DT 96	Roadside	Diffusion Tube	100	100	**40.5**	**44.9**	39.2	**40.6**	36.8
DT 97	Roadside	Diffusion Tube	100	100	35.2	39.6	36.7	35.5	29.6
DT 98	Roadside	Diffusion Tube	100	100	-	-	42	40.3	35.8
DT 99	Suburban	Diffusion Tube	100	100	-	-	-	27.7	25.4
DT 100	Roadside	Diffusion Tube	100	25	-	-	-	-	32.97(3)
DT 101	Roadside	Diffusion Tube	100	25	-	-	-	-	39.89(3)
DT 102	Roadside	Diffusion Tube	100	25	-	-	-	-	**57.49**(3)
DT 103	Roadside	Diffusion Tube	100	8.3	-	-	-	-	**68.89**(3)

Notes: Exceedances of the NO_2 annual mean objective of $40\mu g/m^3$ are shown in **bold**.

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

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

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

(3) Means for diffusion tubes have been corrected for bias. All means have been "annualised" as per Technical Guidance LAQM.TG16 if valid data capture for the full calendar year is less than 75%. See Appendix C for details. **DT 100**, **DT 101** and **DT 102** have a data capture of 25%. **DT 103** has a data capture of 8.3%.

Table A.4 – 1-Hour Mean NO_2 Monitoring Results

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2015 (%) (2)	NO_2 1-Hour Means > 200µg/m^3 (3)				
					2011	2012	2013	2014	2015
CM1	Roadside	Automatic	100	98.37	-	0	0	0	0

Notes: Exceedances of the NO_2 1-hour mean objective (200µg/m^3 not to be exceeded more than 18 times/year) are shown in **bold.**

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

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

(3) If the period of valid data is less than 90%, the 99.8th percentile of 1-hour means is provided in brackets.

Table A.5 – Annual Mean PM_{10} Monitoring Results

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2015 (%) (2)	PM_{10} Annual Mean Concentration (µg/m^3) (3)				
				2011	2012	2013	2014	2015
CM1	Roadside	100	95.16	-	14.19	22.5	22	22.93

Notes: Exceedances of the PM_{10} annual mean objective of 40µg/m^3 are shown in **bold.**

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

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

(3) All means have been "annualised" as per Technical Guidance LAQM.TG16, valid data capture for the full calendar year is less than 75%. See Appendix C for details.

Table A.6 – 24-Hour Mean PM_{10} Monitoring Results

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2015 (%) (2)	PM_{10} 24-Hour Means > 50µg/m^3 (3)				
				2011	2012	2013	2014	2015
CM1	Roadside	100	95.16	**-**	**3**	**7**	**9**	**5**

Notes: Exceedances of the PM_{10} 24-hour mean objective (50µg/m^3 not to be exceeded more than 35 times/year) are shown in **bold.**

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

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

(3) If the period of valid data is less than 90%, the 90.4th percentile of 24-hour means is provided in brackets.

Appendix B: Full Monthly Diffusion Tube Results for 2015

Table B.1 – NO_2 Monthly Diffusion Tube Results - 2015

Site ID	NO_2 Mean Concentrations (µg/m^3)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean	
													Raw Data	Bias Adjusted (1)
DT K1	**48.66**	**50.3**	**50.27**	33.24	36.90	**40.09**	37.17	**42.78**	39.06	**58.76**	**42.23**	**42.33**	**43.5**	39.6
DT K2	33.52	35.2	35.15	30.91	26.17	28.28	27.51	29.93	32.41	**44.38**	29.90	33.27	32.2	29.3
DT UB	26.74	23.8	23.78	17.10	14.05	13.67	15.35	15.36	20.84	31.51	18.05	22.42	20.2	18.4
DT UB2	23.90	21.4	21.38	17.98	10.57	11.90	14.35	16.14	18.89	24.17	16.04	18.11	17.9	16.3
DT 3	**49.34**	**52.1**	**52.12**	35.06	39.22	32.66	35.70	35.44	29.68	32.33	39.39	39.93	39.4	35.9
DT 6	**46.17**	**43.1**	**43.12**	**40.87**	32.69	37.50	39.59	39.13	**43.28**	**46.29**	33.94	38.12	**40.3**	36.7
DT 9	**42.14**	**40.1**	**40.05**	33.26	3.21	30.63	31.79	37.32	38.12	38.04	37.28	38.37	34.2	31.1
DT 11	**48.96**	**46.4**	**46.39**	**46.72**	33.54	38.16	38.47	**44.62**	38.33	**49.17**	**46.05**	**40.66**	**43.1**	39.2
DT 24	**44.55**	**41.8**	**41.82**	31.65	30.49	23.50	34.15	35.40	**41.84**	**46.50**	**42.28**	37.85	37.7	34.3
DT 28	**44.36**	**45.0**	**45.02**	25.80	35.34	31.67	32.76	33.14	34.83	33.33	**41.26**	29.94	36.0	32.8
DT 34	**41.03**	32.9	32.86	36.58	28.43	30.43	31.46	36.31	**46.73**	**44.86**	35.72	34.14	36.0	32.7
DT 39	38.53	33.8	33.79	33.52	26.89	31.81	31.18	35.39	37.65	**45.98**	28.87	29.31	33.9	30.8
DT 40	36.83	35.2	35.15	29.12	29.60	29.40	26.11	28.19	33.76	**42.88**	30.49	32.40	32.4	29.5
DT 42	36.00	**44.8**	**44.79**	34.61	27.84	31.05	*No Tube*	*No Tube*	*No Tube*	*No Tube*	*No Tube*	*No Tube*	36.5	33.2
DT 46	39.44	37.4	37.41	29.59	29.43	29.19	29.41	29.95	34.01	38.29	37.10	24.96	33.0	30.0
DT 47	32.46	31.2	31.23	34.89	23.20	26.52	26.05	25.15	33.35	**43.19**	23.33	27.85	29.9	27.2
DT 49	**41.10**	37.9	37.88	29.69	26.43	30.09	32.59	28.97	37.85	**40.37**	33.05	31.68	34.0	30.9
DT 64	**43.27**	**46.7**	**46.72**	37.64	29.18	31.71	35.82	**40.61**	36.06	**47.99**	39.60	38.52	39.5	35.9
DT 72	37.23	35.6	35.55	26.78	24.93	26.48	29.35	30.87	34.27	**40.39**	31.86	34.12	32.3	29.4
DT 73	38.06	31.4	31.38	36.46	29.34	28.98	30.05	33.25	35.49	**40.09**	29.83	31.84	33.0	30.0
DT 74	**41.77**	37.2	37.19	37.43	30.75	28.79	30.75	35.28	**40.32**	**44.30**	29.06	28.60	35.1	32.0
DT 76	**43.83**	36.0	36.02	29.84	26.48	31.40	33.96	38.72	35.60	**46.74**	31.83	27.17	34.8	31.7

DT 84	37.61	46.8	46.83	34.24	31.23	35.10	35.76	38.28	**40.89**	45.74	37.77	42.44	39.4	35.8
DT 85	**42.38**	**45.8**	**45.83**	**43.16**	36.33	*No tube*	**41.12**	**46.27**	**47.39**	**56.65**	31.44	37.69	**43.1**	39.2
DT 86	33.75	38.1	38.07	33.14	26.78	27.13	29.81	31.71	32.58	36.27	29.14	27.76	32.0	29.1
DT 87	**49.48**	**48.3**	**48.26**	37.98	39.03	35.45	38.09	43.34	38.41	42.49	**40.39**	34.14	**41.3**	37.6
DT 88	**40.17**	**45.0**	**44.99**	31.54	25.17	30.19	30.29	31.14	33.13	38.38	30.59	23.89	33.7	30.7
DT 89	35.12	36.2	36.24	29.02	21.56	27.24	25.72	30.94	29.79	12.40	26.92	29.77	28.4	25.9
DT 90	36.10	34.0	34.01	31.47	24.40	24.86	26.33	32.43	32.31	39.68	22.48	25.93	30.3	27.6
DT 91	36.44	36.6	36.60	33.55	21.67	25.32	25.19	31.88	29.20	**40.91**	26.53	31.25	31.3	28.4
DT 92	**41.15**	37.9	37.91	32.30	26.82	30.08	30.59	34.87	31.93	**45.60**	33.44	31.22	34.5	31.4
DT 93	36.79	34.3	34.33	34.56	27.80	29.82	32.53	28.13	35.27	35.95	27.67	28.54	32.1	29.3
DT 94	**44.46**	38.3	38.28	37.47	29.92	34.76	34.31	39.47	35.30	**43.74**	29.22	27.66	36.1	32.8
DT 95	**42.67**	33.1	33.07	34.79	28.03	27.33	33.54	35.12	37.00	**44.07**	34.99	31.17	34.6	31.5
DT 96	**51.78**	**48.9**	**48.85**	38.94	33.37	31.85	35.28	37.18	**40.44**	**47.67**	37.10	34.32	**40.5**	36.8
DT 97	35.15	37.7	37.65	27.65	24.06	30.50	38.88	35.98	31.08	**41.77**	25.90	24.43	32.6	29.6
DT 98	**41.93**	**44.4**	**44.44**	**46.96**	30.41	33.63	28.14	39.81	39.75	**43.23**	38.29	**41.56**	39.4	35.8
DT 99	35.87	35.5	35.49	25.14	22.24	14.16	26.01	28.85	26.72	27.01	30.13	27.99	27.93	25.41
DT 100	*No tube*	*No tube*	*No tube*	*No tube*	*No tube*	*No tube*	*No tube*	*No tube*	*No tube*	37.87	27.58	26.27	30.57	27.82
DT 101	*No tube*	*No tube*	*No tube*	*No tube*	*No tube*	*No tube*	*No tube*	*No tube*	*No tube*	**51.52**	28.98	30.51	37.00	33.67
DT 102	*No tube*	*No tube*	*No tube*	*No tube*	*No tube*	*No tube*	*No tube*	*No tube*	*No tube*	**66.03**	**44.41**	**50.42**	**53.62**	**48.79**
DT 103	*No tube*	*No tube*	*No tube*	*No tube*	*No tube*	*No tube*	*No tube*	*No tube*	*No tube*	*No tube*	*No tube*	25.76	25.76	23.44

(1) See Appendix C for details on bias adjustment

Appendix C: Supporting Technical Information / Air Quality Monitoring Data QA/QC

C.1 QA/ QC on monitoring data

C.1.1. Calibration Checks - The Chemiluminescence nitrogen oxide analyser has fortnightly calibration checks and maintenance visits which followed documented procedures.

These procedures were drawn up in accordance with equipment manuals and the manufacturer's instructions. During the calibration checks, a two point calibration is carried out using a zero air scrubber and Nitric Oxide calibration gas, supplied by **BOC ,** to quantify the analyser 'zero' and 'span' response. The 'zero' response is the response of the analyser when the pollutant species being measured is not present in the sample air stream.

The 'span' response is the response of the analyser to a gas mixture of accurately known concentration. In addition to the fortnightly checks, **ESU1** carried out six monthly reference calibrations.

C.1.2. Equipment service and maintenance – The Council has an ongoing service and maintenance contract with **ESU1** for the analysers. The contract provides the following cover:

- Routine six monthly service visits in accordance with the manufacturers'
- instructions
- Guaranteed breakdown call out response
- Written report showing work carried out and status of instrumentation
- All work and documentation is carried out in accordance with a BS ISO 9002 accredited system
- Dedicated telephone support in normal working hours

C.1.3 Data processing - Data management and ratification is handled by **Air Quality Data Management (AQDM)** with regular data downloads during the day.

The raw data collected has to be converted to more useful pollutant concentrations and this conversion is achieved using the 'zero' and 'span' responses that are recorded during the fortnightly visits. The 'zero' response, Vz, is the response in measurement units of the analyser when the pollutant species being measured is not present in the sample air stream.

The 'span' response, Vs, is the response of the analyser to an accurately known concentration, c, in ppb (parts per billion) of the pollutant species. The instrument 'zero' and 'span' factors are then calculated using these data as follows:

Instrument zero = Vz
Instrument span, F = c/(Vs-Vz)

Ambient pollution data are then calculated by applying these factors to logged output signals as follows:

Pollutant concentration (ppb) = F(Va-Vz)

Where Va is the recorded signal from the analyser sampling ambient air. The fortnightly calibration factors applied to the raw data are then filed.

C.1.4. Data validation and ratification - Once the calibration factors have been applied to the raw data, the data is screened, by visual examination to see if they contain any spurious and/or unusual measurements. Any suspicious data, such as large spikes or spurious high concentrations can be 'flagged' and investigated more fully.

This process is known as validation. Data validation is followed by data ratification, which is carried out at 3 – 6 month intervals. Steps in the ratification process include:

- Examination of calibration records to ensure correct application of calibration factors
- Examination of data for other pollutants and monitoring sites to highlight any anomalies
- Deletion of data shown i.e. spikes generated by the analyser
- Correction of any baseline drift as indicated by examination of daily calibration records
- Examination of any local scale changes to the site environment

When data verification has been completed then the data is ready for further statistical and critical examination for reporting purposes.

C.1.5. PM Monitoring Adjustment - PM_{10} monitoring was completed using an un-heated MetOne1020 BAM monitor. To ensure gravimetric equivalence, data has been bias-adjusted by dividing by a factor of 1.2. This follows the advice given by Defra.

C.1.6. Short-term to Long-term Data Adjustment **-** Data adjustment was required on the following five diffusion tubes; DT 42; DT100, DT101, DT102 and DT 103 as they were not in place for the full 12 month period, and all had been exposed for less than 9 months. Annualisation of the results from these diffusion tubes, was undertaken using the method set out in Box 7.10 of TG(16). Continuous site (CM1) was used as it has greater than 85% data capture for the year. The tubes were set out in accordance with the recommended calendar for 2015. The results are as follows;

Table C.1: Details of Annualisation of data

Start Date	End Date	DT 42	DT 100	DT 101	DT 102	DT 103	CM1
January	February	36.0					27.50
February	March	44.8					35.07
March	April	44.7					30.56
April	May	34.61					28.99
May	June	27.84					16.89
June	July	31.05					23.04
July	August						19.45
August	September		37.87	51.52	66.03		22.56
September	October		27.58	29.98	44.41		27.93
October	November		26.27	30.51	50.42	25.76	35.16
November	December		30.57	37	53.62	25.76	20.64
December	January		27.82	33.67	48.79	23.44	21.01
Annual Mean (A_m)		36.50	30.02	36.54	52.65	74.96	25.77
Period Mean (P_m)		27.01	21.46	21.46	21.46	25.6	

Ratio (A_m/ P_m)	0.95	1.20	1.20	1.20	1.01	
Annualised Average	34.67	36.24	43.84	63.18	75.71	
Bias Corrected	**31.20**	**32.97**	**39.89**	**57.49**	**68.89**	

All other data was collected over the full 12month period with data capture being above 90% for both PM_{10} and NO_2, therefore annualisation did not need to take place.

C.4.7. Diffusion Tube Bias Adjustment Factors - Since January 2012, diffusion tubes have been supplied and analysed by Gradko Laboratories using the 20% TEA in water method.

Results were bias adjusted for 2015 by utilising the bias adjustment from the National Diffusion Tube Bias Adjustment Factors Spreadsheet for March 2016 (***Figure A1***) which yielded a bias adjustment factor of 0.91 for Gradko Laboratories 20% TEA in water.

National Diffusion Tube Bias Adjustment Factor Spreadsheet

Spreadsheet Version Number: 03/16

Follow the steps below **in the correct order** to show the results of **relevant** co-location studies

Data only apply to tubes exposed monthly and are not suitable for correcting individual short-term monitoring periods

Whenever presenting adjusted data, you should state the adjustment factor used and the version of the spreadsheet

This spreadhseet will be updated every few months: the factors may therefore be subject to change. This should not discourage their immediate use.

This spreadsheet will be updated at the end of June 2016

LAQM Helpdesk Website

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

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

Step 1: Select the Laboratory that Analyses Your Tubes from the Drop-Down List

If a laboratory is not shown, we have no data for this laboratory.

Step 2: Select a Preparation Method from the Drop-Down List

If a preparation method is not shown, we have no data for this method at this laboratory.

Step 3: Select a Year from the Drop-Down List

If a year is not shown, we have no data [2]

Step 4:

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

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

Analysed By[1]	Method	Year[5]	Site Type	Local Authority	Length of Study (months)	Diffusion Tube Mean Conc. (Dm) (µg/m^3)	Automatic Monitor Mean Conc. (Cm) (µg/m^3)	Bias (B)	Tube Precision[6]	Bias Adjustment Factor (A) (Cm/Dm)
Gradko	20% TEA in water	2015	R	Ards and North Down Borough Council	12	38	26	48.6%	G	**0.67**
Gradko	20% TEA in water	2015	UC	Breckland Council	12	30	29	1.5%	G	**0.99**
Gradko	20% TEA in water	2015	R	Cheltenham Borough Council	12	35	35	2.7%	G	**0.97**
Gradko	20% TEA in water	2015	R	Lisburn & Castlereagh City Council	10	36	29	24.8%	G	**0.80**
Gradko	20% TEA in water	2015	R	Luton Borough Council	12	46	44	6.0%	G	**0.94**
Gradko	20% TEA in water	2015	R	Monmouthshire County Council	12	41	37	11.0%	G	**0.90**
Gradko	20% TEA in water	2015	B	Pembrokeshire Council	10	4	3	36.7%	G	**0.73**
Gradko	20% TEA in water	2015	R	City of Lincoln Council	12	39	33	17.9%	G	**0.85**
Gradko	20% TEA in water	2015	R	Borough Council of King's Lynn and West No	12	29	22	32.5%	G	**0.75**
Gradko	20% TEA in water	2015	R	Cheshire West and Chester	10	38	40	-5.2%	G	**1.06**
Gradko	20% TEA in water	2015	R	Dudley MBC	12	47	50	-5.9%	G	**1.06**
Gradko	20% TEA in water	2015	R	Dudley MBC	12	40	35	14.0%	G	**0.88**
Gradko	20% TEA in water	2015	R	Dudley MBC	12	34	31	10.0%	G	**0.91**
Gradko	20% TEA in water	2015	UB	Dudley MBC	11	23	19	20.9%	G	**0.83**
Gradko	20% TEA in water	2015	KS	Glasgow City Council	12	60	61	-0.9%	P	**1.01**
Gradko	20% TEA in water	2015	UB	Glasgow City Council	10	25	25	3.3%	P	**0.97**
Gradko	20% TEA in water	2015	R	Glasgow City Council	9	30	31	-2.8%	P	**1.03**
Gradko	20% TEA in water	2015	R	Glasgow City Council	12	43	38	14.0%	P	**0.88**
Gradko	20% TEA in water	2015	KS	Marylebone Road Intercomparison	12	102	81	26.2%	G	**0.79**
Gradko	20% TEA in water	2015	UB	Liverpool	12	20	22	-9.0%	G	**1.10**
Gradko	20% TEA in water	2015	R	Preston City Council	12	29	27	8.9%	G	**0.92**
Gradko	20% TEA in water	2015	R	Thurrock Borough Council	12	28	45	-37.1%	G	**1.59**
Gradko	20% TEA in water	2015	R	Gateshead Council	11	33	33	-0.8%	G	**1.01**
Gradko	20% TEA in water	2015	R	Gateshead Council	10	36	33	11.2%	G	**0.90**
Gradko	20% TEA in water	2015	R	Gateshead Council	12	28	25	9.2%	G	**0.92**
Gradko	20% TEA in water	2015	KS	New Forest DC	11	47	36	31.1%	P	**0.76**
Gradko	20% TEA in water	2015	R	New Forest DC	11	33	25	31.7%	G	**0.76**
Gradko	20% TEA in water	2015	R	Wokingham Borough Council	11	36	33	-69.0%	G	**0.93**
Gradko	20% TEA in water	2015	UC	Southampton City Council	12	28	29	-3.5%	G	**1.04**
Gradko	20% TEA in water	2015		**Overall Factor[3] (29 studies)**				**Use**		**0.91**

Figure C.1. National Diffusion Tube Bias Adjustment Factors Spreadsheet for March 2016 (http://laqm.defra.gov.uk/bias-adjustment-factors/national-bias.html)

Appendix D: Map(s) of Monitoring Locations

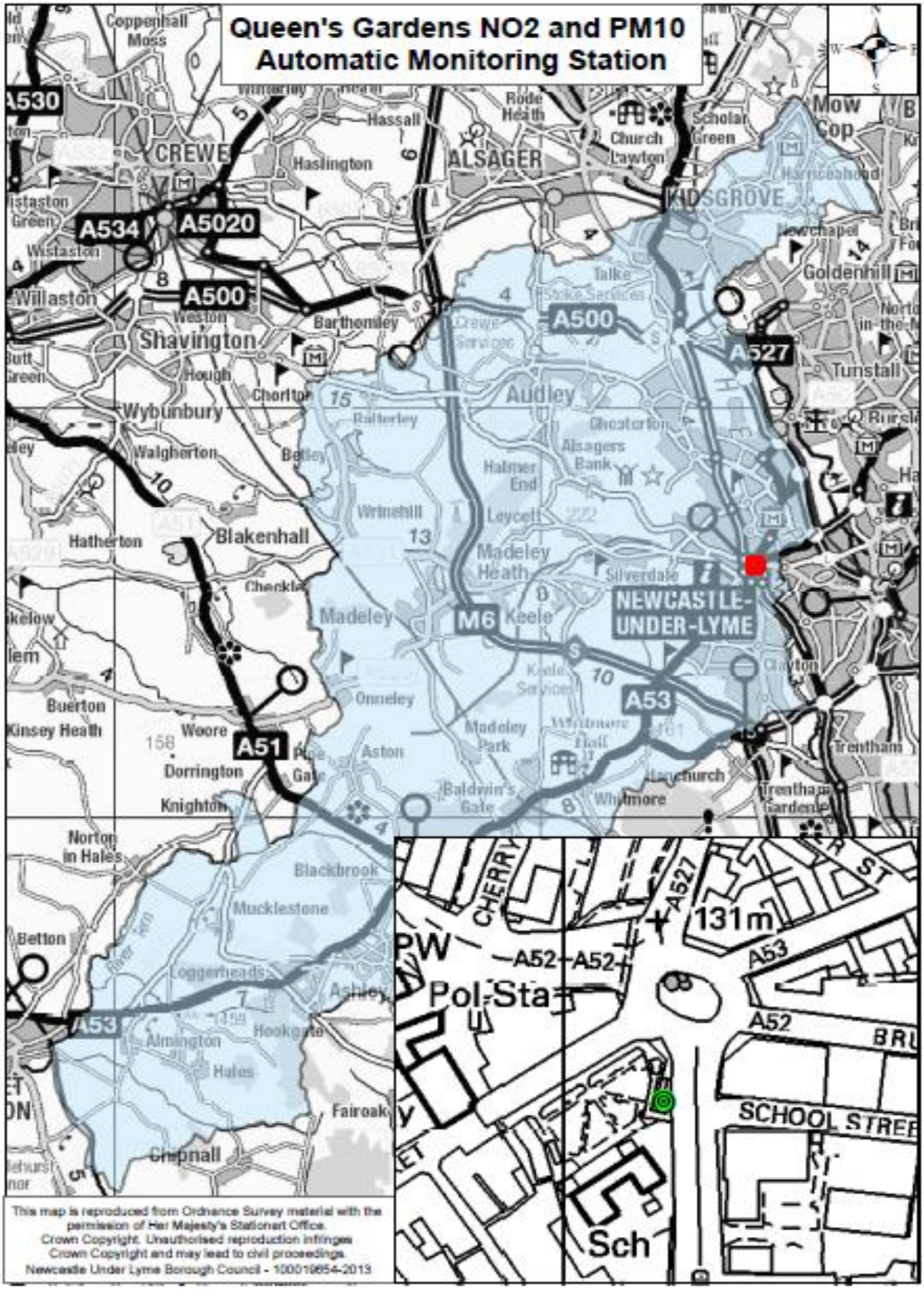


Figure 20: Location of automatic monitoring station at Queens Gardens, Newcastle-under-Lyme

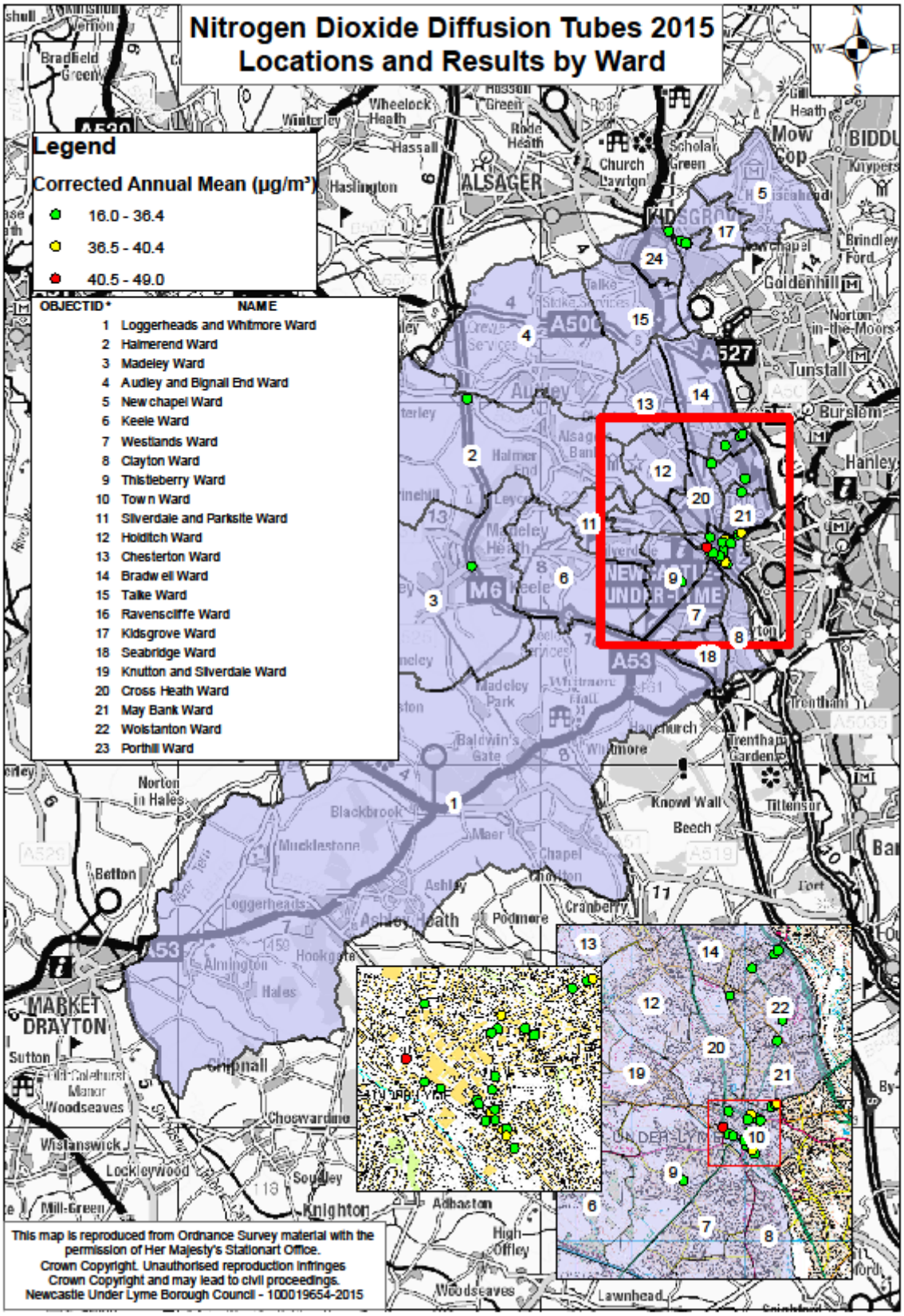


Figure 21 Diffusion tube locations and results by ward 2015

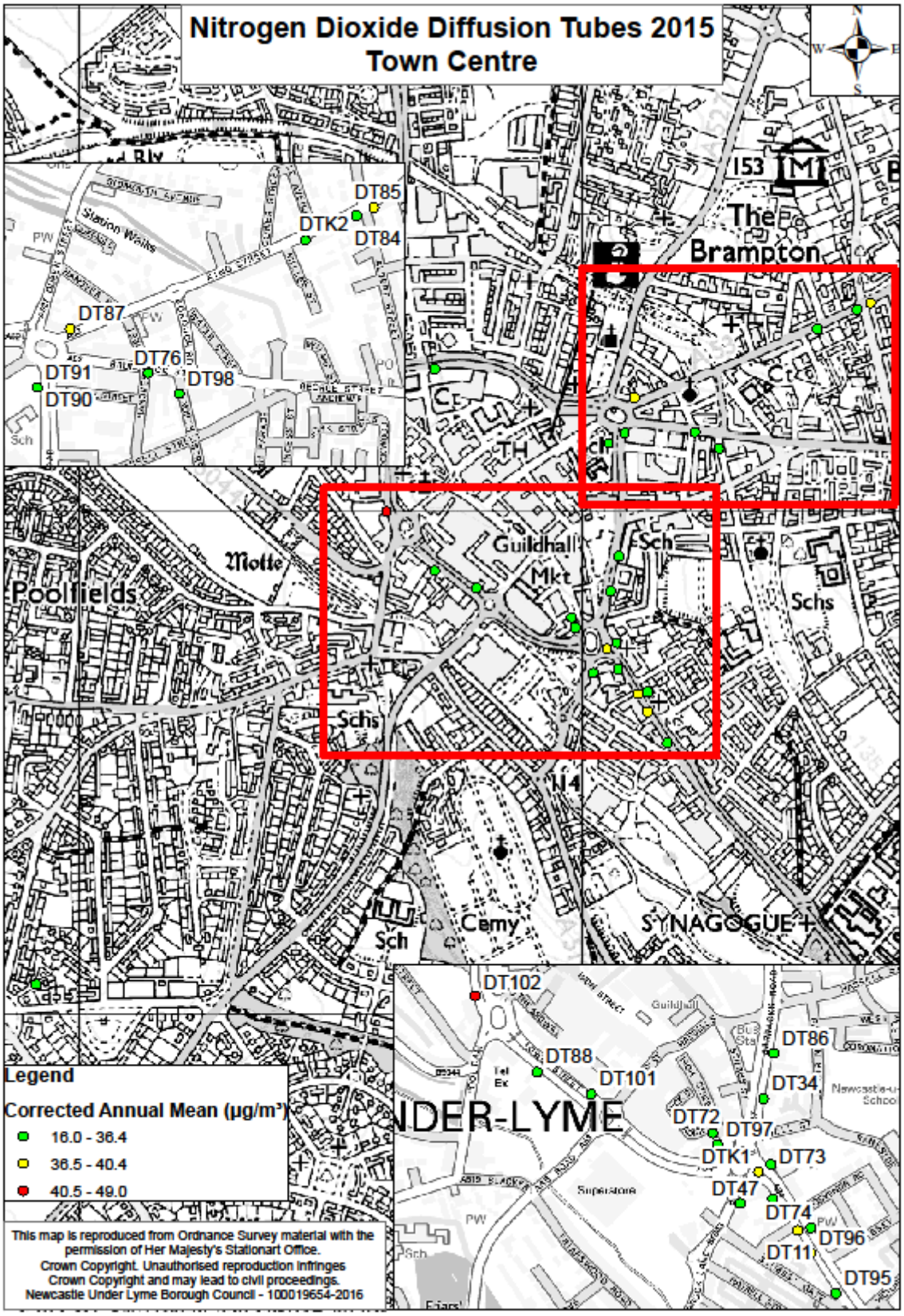


Figure 22 Nitrogen Dioxide Diffusion tube results and locations 2015, Town Centre

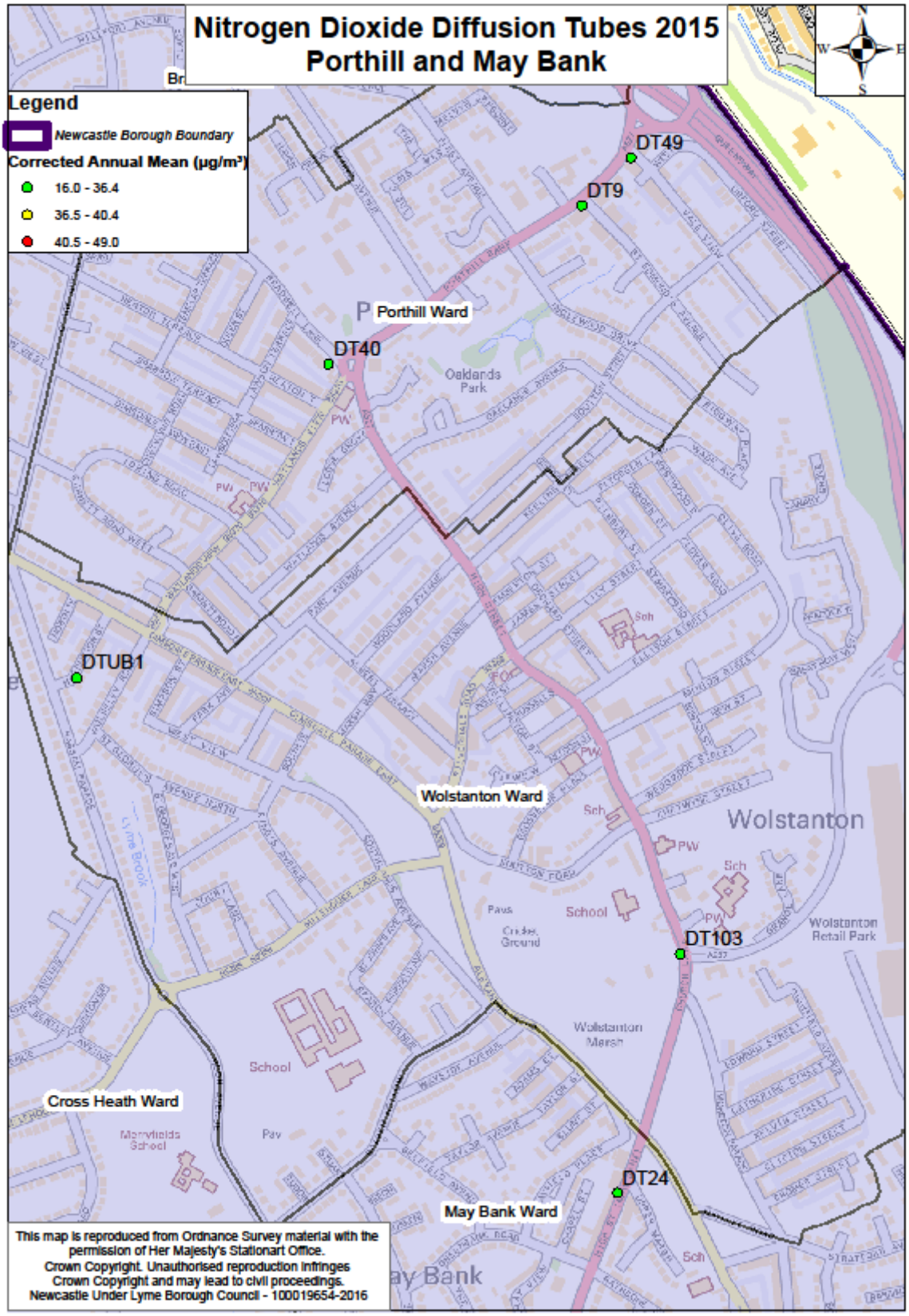


Figure 23 Nitrogen Dioxide Diffusion tube results and locations 2015, May Bank, Wolstanton, Porthill.

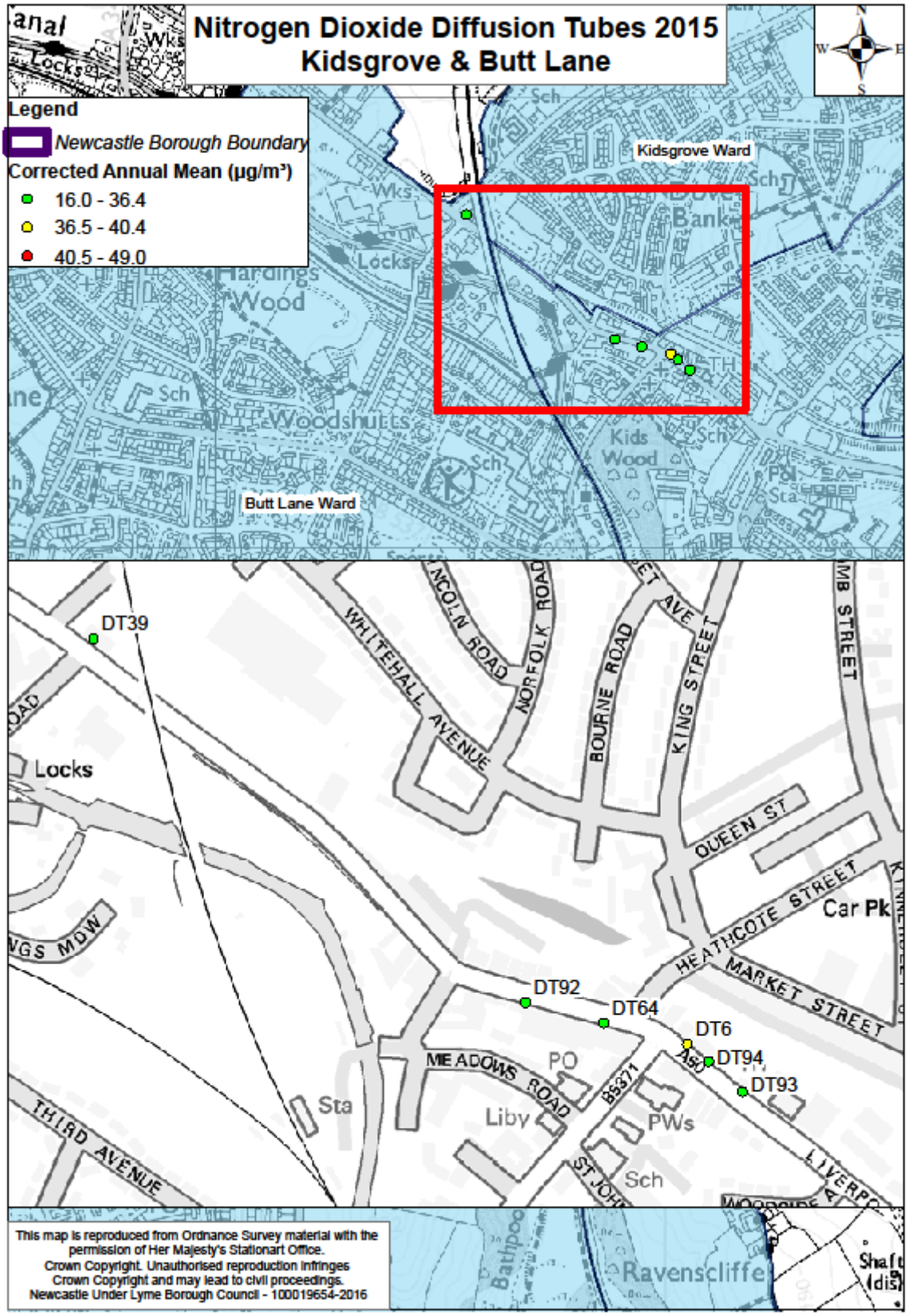


Figure 24 Nitrogen Dioxide Diffusion tube results and locations 2015, Kidsgrove and Butt Lane

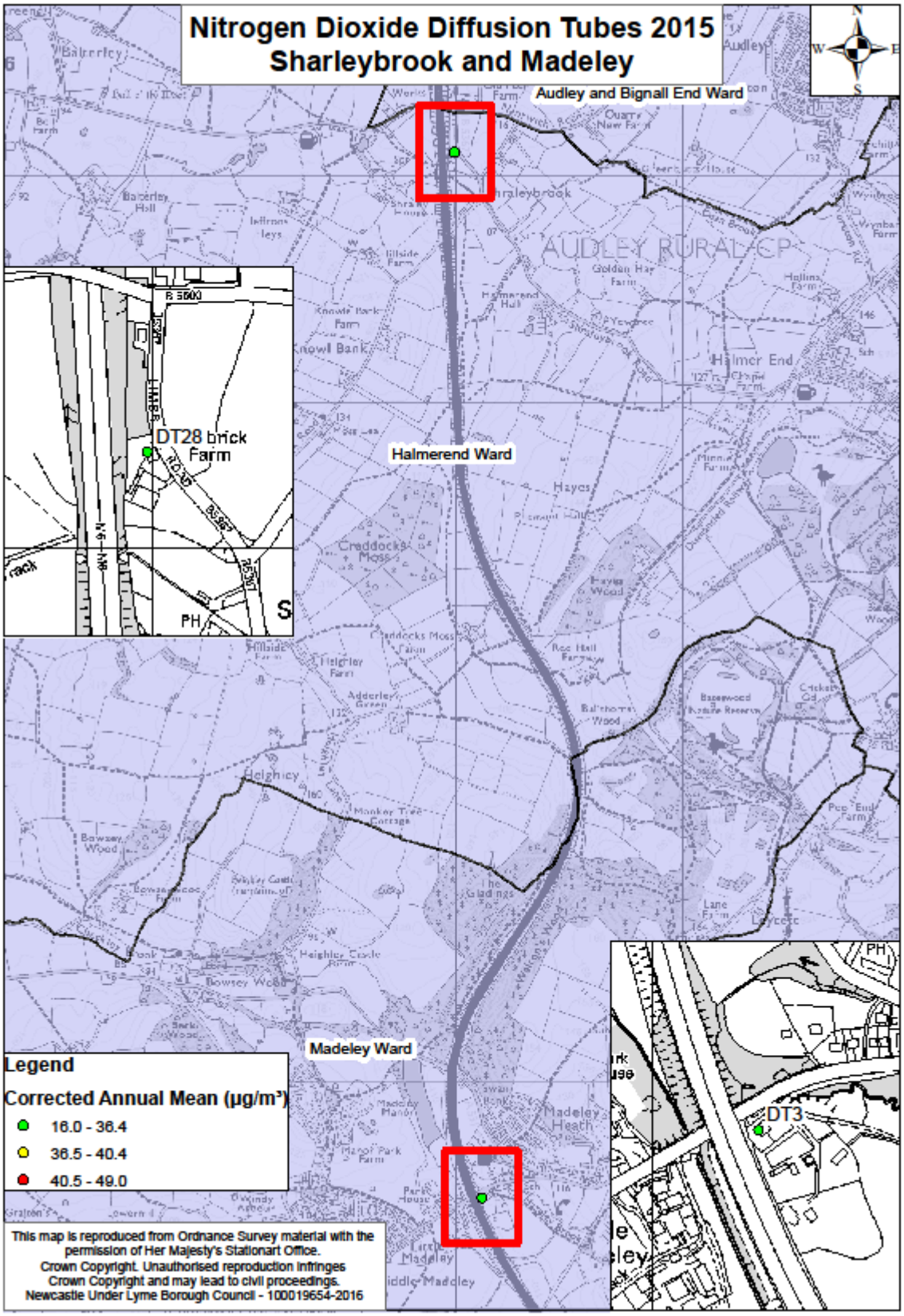


Figure 25 Nitrogen Dioxide Diffusion tube results and locations 2015, Shraley Brook

APPENDIX E: Precision and Accuracy of Triplicate Tubes - Comparison with Automatic Monitoring Station CM

Checking Precision and Accuracy of Triplicate Tubes

AEA Energy & Environment
From the AEA group

Diffusion Tubes Measurements								
Period	Date	Tube 1 µgm^{-3}	Tube 2 µgm^{-3}	Tube 3 µgm^{-3}	Triplicate Mean	Standard Deviation	Coefficient of Variation (CV)	95% CI of mean
1	Jan	35.1	36.1	36.4	36	0.7	2	1.7
2	Feb	36.2	34.0	36.6	36	1.4	4	3.5
3	March	36.2	34.0	36.6	36	1.4	4	3.5
4	April	29.0	31.5	33.6	31	2.3	7	5.6
5	May	21.6	24.4	21.7	23	1.6	7	4.0
6	June	27.2	24.9	25.3	26	1.3	5	3.1
7	July	25.7	26.3	25.2	26	0.6	2	1.4
8	August	30.9	32.4	31.9	32	0.8	2	1.9
9	September	29.8	32.3	29.2	30	1.7	5	4.1
10	October	12.4	39.7	40.9	31	16.1	52	40.0
11	November	26.9	22.5	26.5	25	2.5	10	6.1
12	December	29.8	28.9	31.3	30	1.2	4	2.9
13								

It is necessary to have results for at least two tubes in order to calculate the precision of the measurements

Automatic Method		Data Quality Check	
Period Mean	Data Capture (% DC)	Tubes Precision Check	Automatic Monitor Data
27.5	99.6	Good	Good
35.07	100	Good	Good
30.56	99.46	Good	Good
28.99	99.03	Good	Good
16.89	85.22	Good	Good
23.04	99.72	Good	Good
19.45	99.87	Good	Good
22.56	99.06	Good	Good
27.93	99.58	Good	Good
35.16	99.87	Poor Precision	Good
20.64	99.72	Good	Good
21.01	99.87	Good	Good
Overall survey -->		Good precision	Good Overall

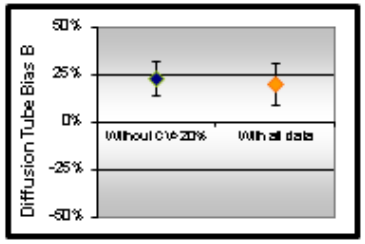
(Check average CV & DC from Accuracy calculations)

Site Name/ ID:	CM1, Queens Gardens

Precision 11 out of 12 periods have a CV smaller than 20%

Accuracy (with 95% confidence interval) without periods with CV larger than 20%	
Bias calculated using 11 periods of data	
Bias factor A	0.83 (0.77 - 0.9)
Bias B	21% (11% - 30%)
Diffusion Tubes Mean:	30 µgm^{-3}
Mean CV (Precision):	5
Automatic Mean:	25 µgm^{-3}
Data Capture for periods used:	98%
Adjusted Tubes Mean:	25 (23 - 27) µgm^{-3}

Accuracy (with 95% confidence interval) WITH ALL DATA	
Bias calculated using 12 periods of data	
Bias factor A	0.86 (0.78 - 0.94)
Bias B	17% (6% - 28%)
Diffusion Tubes Mean:	30 µgm^{-3}
Mean CV (Precision):	9
Automatic Mean:	26 µgm^{-3}
Data Capture for periods used:	98%
Adjusted Tubes Mean:	26 (23 - 28) µgm^{-3}



Jaume Targa, for AEA
Version 04 - February 2011

If you have any enquiries about this spreadsheet please contact the LAQM Helpdesk at: LAQMHelpdesk@uk.bureauveritas.com

Appendix F: Summary of Air Quality Objectives in England

Table E.1 – Air Quality Objectives in England

Pollutant	Air Quality Objective[15]	
	Concentration	Measured as
Nitrogen Dioxide (NO_2)	200 µg/m^3 not to be exceeded more than 18 times a year	1-hour mean
	40 µg/m^3	Annual mean
Particulate Matter (PM_{10})	50 µg/m^3, not to be exceeded more than 35 times a year	24-hour mean
	40 µg/m^3	Annual mean
Sulphur Dioxide (SO_2)	350 µg/m^3, not to be exceeded more than 24 times a year	1-hour mean
	125 µg/m^3, not to be exceeded more than 3 times a year	24-hour mean
	266 µg/m^3, not to be exceeded more than 35 times a year	15-minute mean

[15] The units are in microgrammes of pollutant per cubic metre of air (µg/m^3).

Glossary of Terms

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

References

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2. Air Quality (England) Regulations 2000 (SI 928), The Air Quality (England) (Amendment) Regulations 2002 (SI 3043)
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4. http://laqm.defra.gov.uk/technical-guidance/index.html?d=page=38
5. http://www.londonair.org.uk
6. www.metoffice.gov.uk
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8. http://uk-air.defra.gov.uk/news?view=183
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11. EMEP/EEA Emission Inventory Guidance2013