



2020 Air Quality Annual Status Report (ASR)

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

July 2020

Gedling Borough Council

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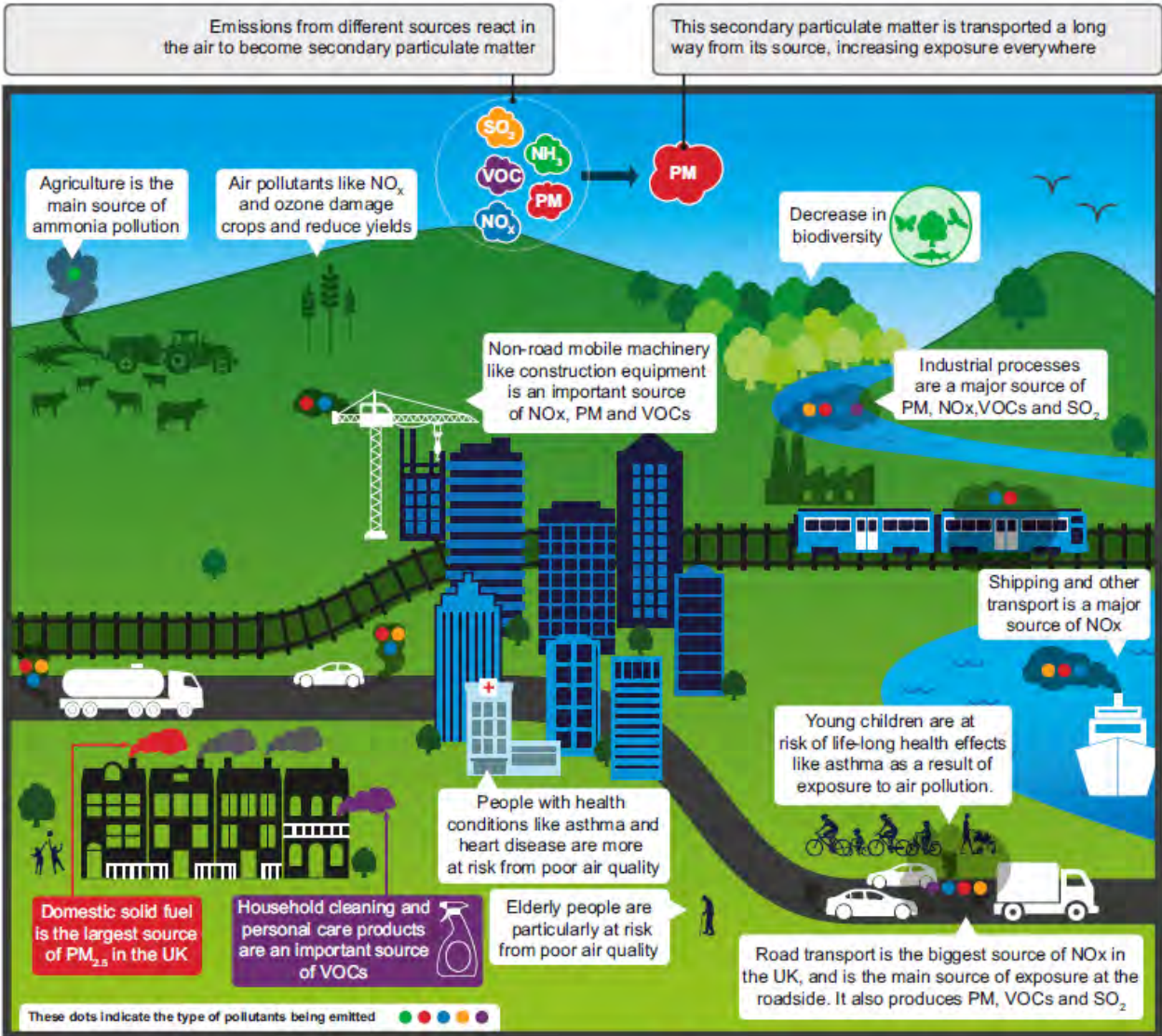
Executive Summary: Air Pollution in Our Area

What is Air Pollution?

Air pollution is defined as a mixture of gases and particles that have been emitted into the atmosphere by man-made processes. The combustion of fuels such as:

- coal,
- oil,
- gas,
- petrol or diesel
- wood burning

are the most significant sources of the key pollutants of concern to local authorities.



Types of pollution	Ammonia (NH₃)	Primary Particulate Matter (PM_{2.5})
Nitrogen oxides (NO_x)	Sulphur dioxide (SO₂)	Volatile organic compounds (NMVOCs)

Source – Defra 2017

What are Particles?

Particle pollution (also called particulate matter or PM) is the term for a mixture of solid particles and liquid droplets found in the air. Some particles, such as dust, dirt, soot, or smoke, are large or dark enough to be seen with the naked eye. Others are so small they can only be detected using an electron microscope.

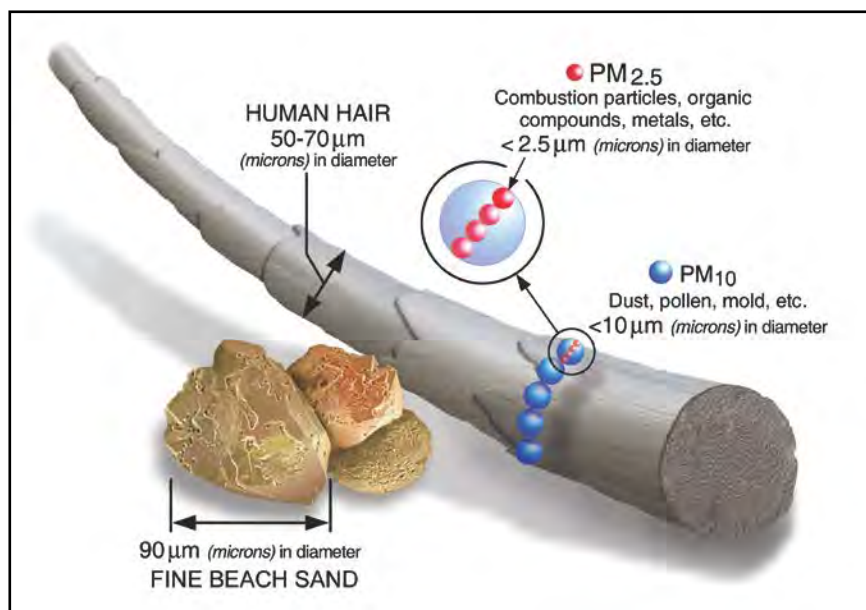
Particulate matter is made of lots of different sorts of things including: vehicle exhausts; poorly combusted fuel; particles of metal from engine chambers; bits worn from brake pads; bitumen asphalt or concrete dust work from the road; biological and other waste ground up on the road; and it's formed by reactions between other pollution in the air too.

How big is Particle Pollution?

Particle pollution includes "inhalable coarse particles," with diameters larger than 2.5 micron (μm) and smaller than $10\mu\text{m}$ and "fine particles," with diameters that are $2.5\mu\text{m}$ and smaller.

How small is $2.5\mu\text{m}$? Think about a single hair from your head. The average human hair is about $70\mu\text{m}$ in diameter; making it 30 times larger than the largest fine particle.

(See diagram below)



Source: USEPA - <https://www3.epa.gov/pm/basic.html>

These particles come in many sizes and shapes and can be made up of hundreds of different chemicals. Some particles, known as **primary particles** are emitted directly from vehicles and road surfaces, chimney stacks, dust from storage areas, spoil heaps, emissions from buildings (ventilation, boilers and solid fuel combustion), materials handling and construction sites.

Particles may form when substances react in the atmosphere. These are often from the oxidation of sulphur and nitrogen oxides, which form nitrates and ammonium salts. These are usually less than 10µm diameter, and originate from combustion and natural sources; these particles, known as **secondary particles**.

What is Nitrogen Dioxide?

Nitrogen dioxide is a brown gas, with the chemical formula NO₂. It is chemically related to nitric oxide, a colourless gas with the chemical formula NO. These abbreviations are often used instead of writing the names of the chemicals in full.

Together, NO and NO₂ are known as Nitrogen Oxides or NO_x. NO_x is released into the atmosphere when fuels are burned (for example, petrol or diesel in a car engine or natural gas in a domestic central heating boiler).

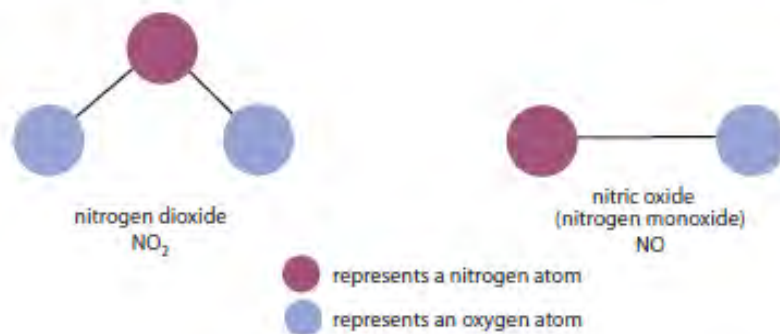


Diagram of the structures of NO₂ and NO

NO_x emissions from burning fossil fuels are mainly as NO, but some sources can release a lot of NO_x as NO₂. These **primary** NO₂ emissions are particularly important from diesel vehicles (especially when moving slowly), and can make up as much as 25% of the total NO_x emissions from this source.

One reason for this is as a side-effect of measures that have been developed to reduce emissions of particulate matter (PM) from diesel vehicles by treating the exhaust using diesel particulate filters.

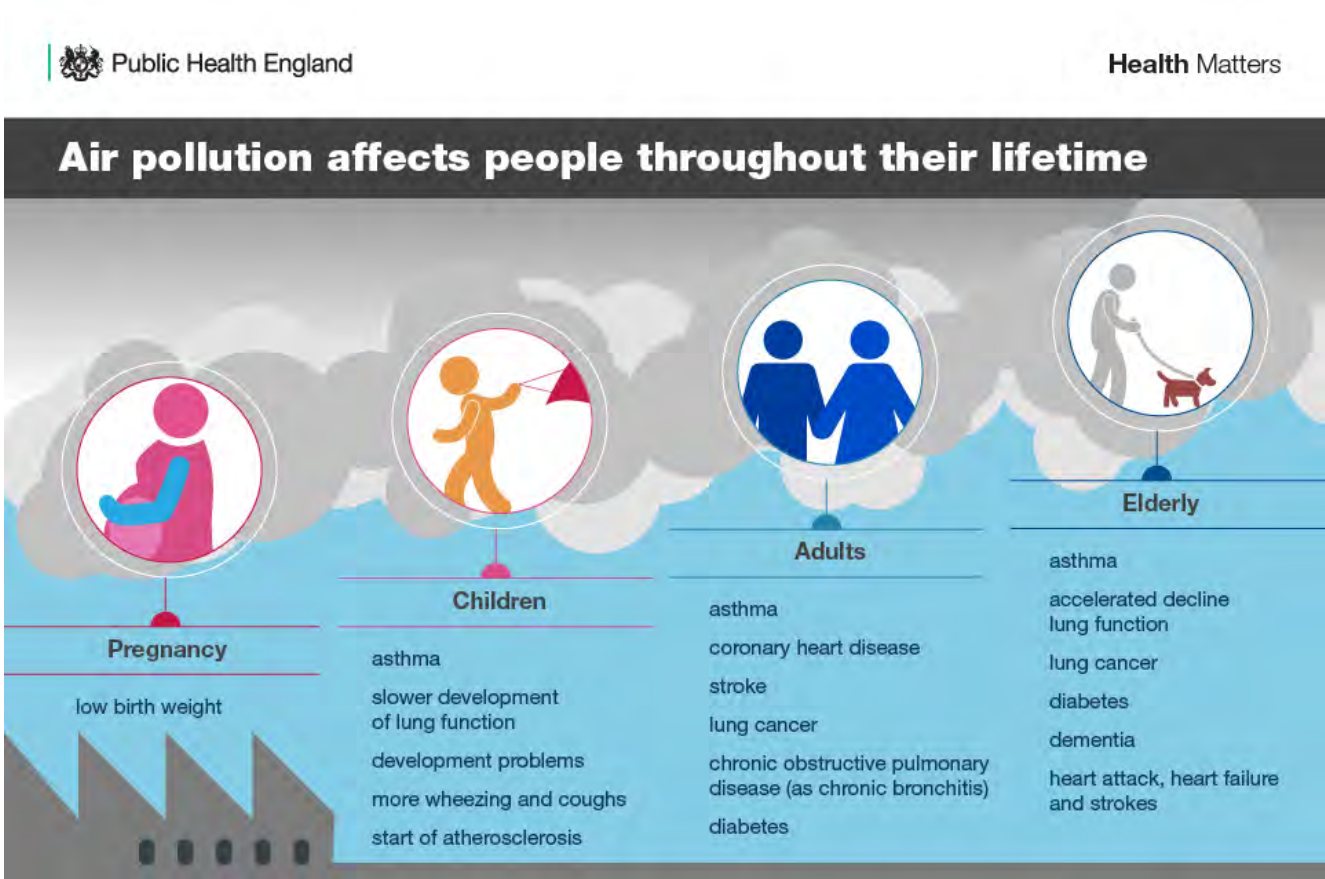
These primary NO₂ emissions can lead to high concentrations of NO₂ at the roadside, especially where there are many diesel vehicles.

NO₂ is also formed in the atmosphere in a chemical reaction between NO and ozone (O₃). Because this NO₂ is not released straight into the atmosphere, but is formed there by a chemical reaction, it is known as **secondary** NO₂.

Sometimes this reaction cannot take place because there is not enough O₃ for the NO to react with. This is most common close to where NO is released, for example, nearby busy roads.

Why should I be Concerned?

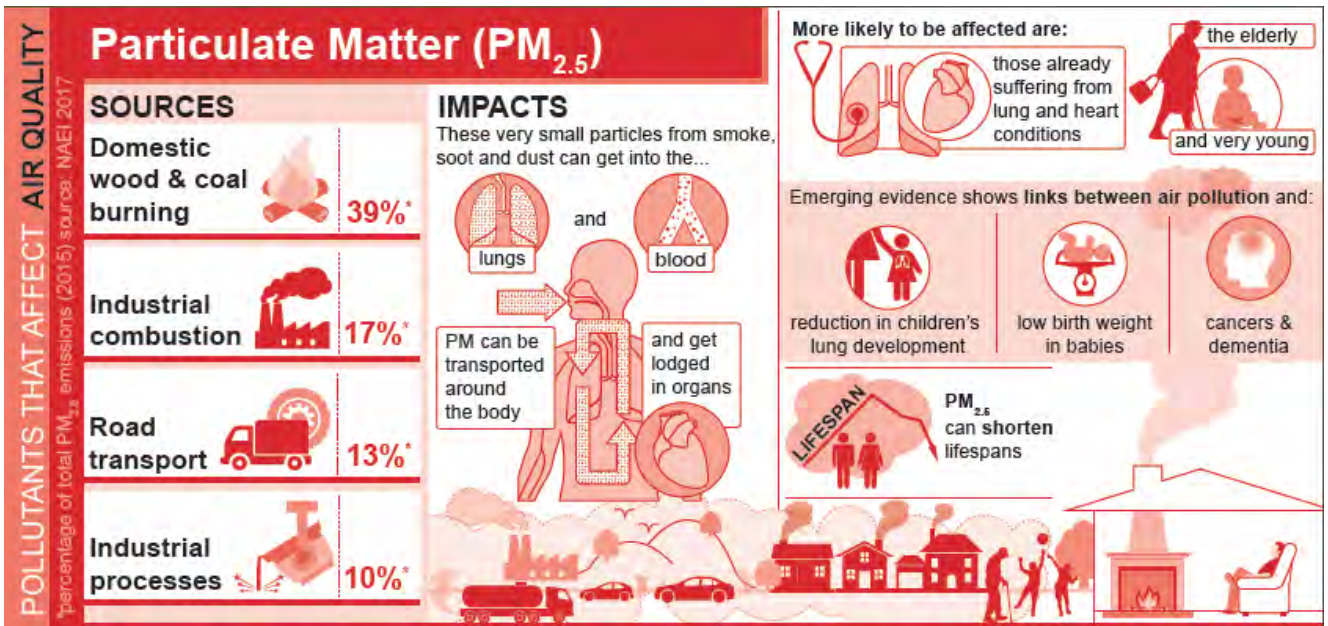
Air pollution is associated with a number of adverse health impacts. It is recognised as a contributing factor in the onset of heart disease and cancer.



Source – Public Health England 'Health Matters' 2018

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 billion³.

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



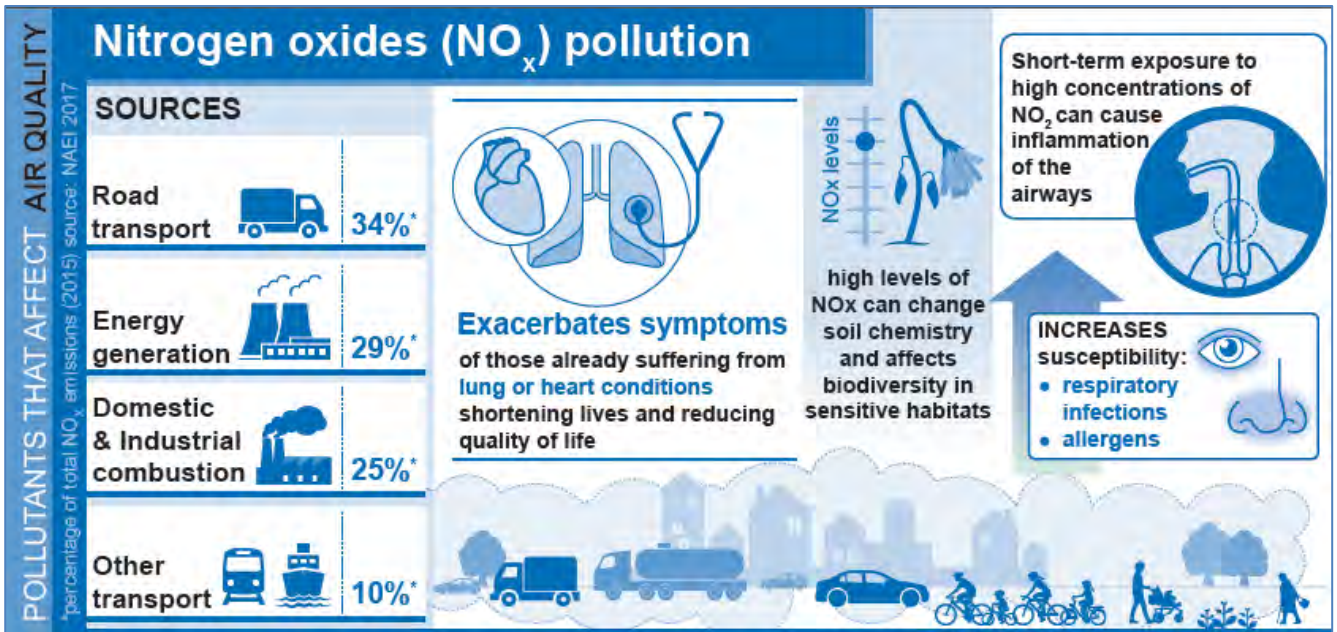
Source: DEFRA 2017

Fine (PM_{2.5}) and ultrafine (PM_{0.1})⁴ particulates can cause these problems because they are so small that they can be drawn into the lungs and can pass into the bloodstream. Once there it is transport around the body and can be deposited in body issues and interfere and affect the body's metabolic processes. As particulate matter is made up of a range of different chemical compounds and materials it can affect the body's processes in different ways.

Studies have shown associations of nitrogen dioxide (NO₂) in outdoor air with adverse effects on health, including reduced life expectancy. It has been unclear whether these effects are caused by NO₂ itself or by other pollutants emitted by the same sources (such as traffic). Evidence associating NO₂ with health effects has strengthened substantially in recent years and we now think that, on the balance of probability, NO₂ itself is responsible for some of the health impact found to be associated with it in epidemiological studies.⁵

⁴ PM_{0.1}; particles that are less than 0.1 µm in diameter

⁵ Statement on the evidence for the effects of nitrogen dioxide on health - <https://www.gov.uk/government/publications/nitrogen-dioxide-health-effects-of-exposure>



Source: DEFRA 2017

Estimating the impacts

The UK Committee on the Medical Effects of Air Pollutants (COMEAP) examined existing papers compiled in a number of countries, including the UK, looking at the effect that long-term exposure to NO₂ may have on mortality.

However, after several years of analysis and deliberation over the available data, Committee members concluded that uncertainty in assessing the impact of NO₂ individually compared to other pollutants, such as PM_{2.5}, made it difficult to arrive at an individual figure wholly attributable to NO₂.

One reason for this is that both pollutants can often be emitted from a single source, for example from road transport, meaning that it can be difficult to differentiate between the individual effects of each pollutant.

The report⁶ does include exploratory calculations based on both PM_{2.5} and NO₂, using information from studies in which the overlap of effects associated with the two pollutants has been accounted for; although there was disagreement within the committee a majority view was published:

⁶ Committee On The Medical Effects Of Air Pollutants: Associations of long-term average concentrations of nitrogen dioxide with mortality, Accessed 01/10/2018 <https://www.gov.uk/government/publications/nitrogen-dioxide-effects-on-mortality>

“the range of estimates of the annual mortality burden of human-made air pollution in the UK is estimated as an effect equivalent to 28,000 to 36,000 deaths.”

These figures are thought to be the closest overall estimate to the mortality impact of air pollution in the UK – however as more research on the impacts of nitrogen dioxide is carried out, this could yet be further refined.

Public Health England (PHE) publishes an annual indicator in the Public Health Outcome Framework relating to air quality⁷. The indicator is a summary measure of the impact on death rates of long term exposure to man-made particulate air pollution.

PHE have also estimated the mortality burden are based on modelled annual average concentrations of fine particulate matter (PM_{2.5}) in each local authority area originating from human activities, based on the attributable mortality in 2010.

Using this information and the COMEAP lower level of confidence figure for both particles and NO₂ (28,000 deaths) the local public health team have calculated the following local estimates for particles and NO₂: **Table i**.

Table i: Estimated effects on annual mortality in 2018 of human-made PM_{2.5} and NO₂ air pollution.

Area	Attributable Fraction	Attributable* deaths aged 25+	Associated Life-years Lost
EAST MIDLANDS	4.9	2,883	27,505
Nottingham City	5.2	151	1,594
Gedling Borough	4.9	78	807

Sources: local secondary analysis combining:

- PHE Public Health Outcomes Framework (Indicator 3.01) (last accessed June 2020)
- ONS Mortality 2018 (last accessed via NOMIS June 2020)
- COMEAP "Mortality Effects of Long-Term Exposures to Particulate Air Pollution in the United Kingdom" (2010)

* in reality, air pollution is likely to contribute a small amount to the deaths of a larger number of exposed individuals rather than being solely responsible for the number of deaths equivalent to the calculated figure of attributable deaths.

⁷ Public Health Profiles, PHE Online:
<https://fingertips.phe.org.uk/search/air%20quality#page/0/gid/1/pat/6/par/E12000004/ati/101/are/E07000174/cid/4/page-options/oww-do-0>

To place these figures in context, **Table ii** presents a comparison of deaths attributable to some other key risk factors in Nottinghamshire County and Nottingham City.

Table ii: Comparison of deaths attributable to human-made air pollution, smoking and deaths related to alcohol consumption, Nottinghamshire County and Nottingham City.

Area	Deaths attributable to human-made air pollution	Deaths attributable to smoking	Deaths related to alcohol consumption	Deaths (deaths including serious injury) caused by road traffic accidents
Nottinghamshire County	450	3,928*	405‡	28 ^α (314)
Nottingham City	183	1408	153‡	5 ^α (111)

*Estimate based on 1/3 of deaths attributable for 2015-2017, PHE Tobacco Control Profiles, <http://www.tobaccoprofiles.info/profile/tobacco-control>

‡ Estimates for 2017, PHE Local Alcohol Profiles for England, 4.01 Alcohol-related mortality (persons) <http://fingertips.phe.org.uk/profile/local-alcohol-profile>

^α Reported casualties by severity, by local authority area, Great Britain, 2017 <https://www.gov.uk/government/statistical-data-sets/ras30-reported-casualties-in-road-accidents#table-ras30008>

Air Quality Issues in Gedling Borough

The main pollutants of concern in the Borough relate to the tail pipe emissions from motor vehicles. As such the main commuter routes into Nottingham, through the Borough, are the main areas of concern: the A60 Mansfield Road, A612 Colwick Loop Road and B684 Mapperley Plains/Woodborough Road. Ambient background levels are affected by emissions from domestic heating: NOx from domestic gas boilers and PM from wood/coal burners.

Nitrogen Dioxide is the primary pollutant of concern in the Borough; Gedling Borough has an Air Quality Management Area (AQMA) along the A60 Mansfield Road.

Nitrogen Dioxide monitoring results for the last year (2019) show no exceedances within the AQMA, but continue to be of concern in the AQMA and along the Colwick Loop Road.

Background levels of PM_{2.5} across some areas of the Borough are modelled to be over the World Health Organisation guideline level. (See Appendix D)

Due to the traffic related issues of our AQMA and more widely across the Borough the Council works with colleagues from the County Council Highway Department to implement actions to help:

- Ease congestion thereby maintaining a flow of traffic (reducing the stop/start)
- Promote Public Transport use.
- Promote cycling/walking as an alternative.

More generally the Public Protection Service works with colleagues in the Planning Service to ensure air quality issues are considered in the forward planning process and during consultation for new developments.

Actions to Improve Air Quality

Below is a brief summary of core actions to target sources of pollution in Gedling over the past year.

ECO Stars Fleet Recognition Scheme



The ECO Stars Fleet Recognition Scheme (<http://ecostar.web10.indzine.net/>) 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.

The Nottingham ECO Stars scheme began as a scheme in Gedling Borough in 2012 and then expanded the following year to cover the whole of the Nottingham conurbation.

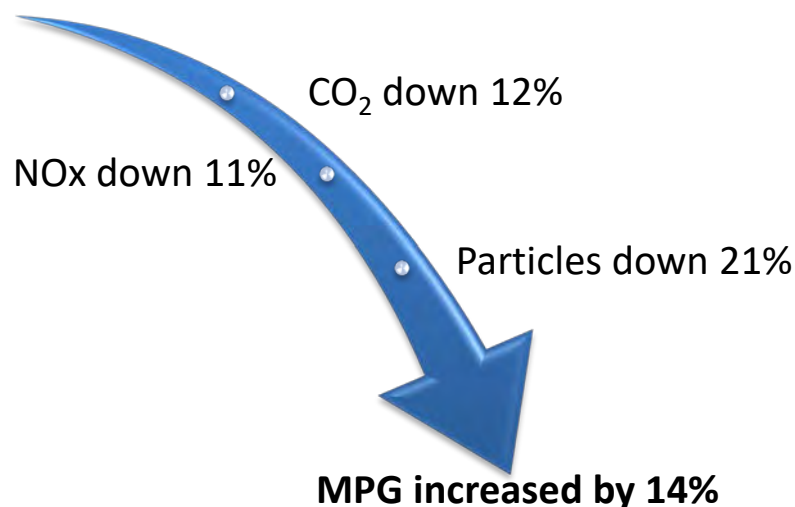
Membership stands at 118 members operating over 7475 vehicles.

Is the scheme having any benefit?

The South Yorkshire ECO Stars group have developed a Scheme Assessment Toolkit, developed by the University of the West of England, whereby emissions output as well as fuel consumption have been modelled using data supplied by operators that have been active members of the scheme.

Gedling Borough Council's own fleet participated in an evaluation of their ECO Stars led improvement; results summarised below:

Reduction in Emissions



Additionally, eight ECO Stars members of the South Yorkshire Scheme have also been modelled: All of the companies showed an improvement in NOx emissions, 6 companies showed improvement in PM and CO2 emissions; for, example:

- **Company A** had a 46% reduction in PM, 8% reduction in NOx, and a 24% reduction in CO₂.
- **Company B** had a 73% reduction in PM, a 9% reduction in NOx, and a 15% reduction in CO₂.

Local Planning Document - Guidance on Air Quality Mitigation

Informal guidance on Air Quality has been prepared to set out the measures, which will be taken to help reduce vehicle emissions that occur as a result of development proposals. ([LINK](#)) The guidance applies across the whole Borough in order to improve air quality and avoid other areas having to be designated as AQMAs. At the present time the guidance carries some weight as a material consideration in determining planning applications; the Council seeks agreement with developers to include many of the mitigation measures on a voluntary basis.

The Council's Local Planning Document was published and adopted in the summer of 2018. The Plan includes **Policy LPD11: Air Quality** which states:

Planning permission will not be granted for development proposals that have the potential to adversely impact on air quality, unless measures to mitigate or offset their emissions and impacts have been incorporated, in accordance with the Council's Air Quality and Emissions Mitigation guidance and other associated guidance documents.

In areas where air quality is a matter of concern, development proposals will be required to deliver a positive impact on air quality.

Development proposals must not exacerbate air quality beyond acceptable levels, either through poor design or as a consequence of site selection.

This will bring the requirements of the guidance into the statutory development plan giving it more weight.

Marketing and promotion of sustainable transport alternatives

Both the County Council and Gedling Borough Council continue to develop and deliver programmes to encourage more sustainable travel. These include infrastructure improvements such as the County Council's integrated transport programme delivering improvements for pedestrians, cyclists and bus users; as well as marketing materials and campaigns developed in partnership with stakeholders such as passenger transport operators.

Go-Ultra Low programme

The County Council, in partnership with Nottingham and Derby City councils, successfully secured £6.1m of funding to deliver the Go-Ultra Low programme between 2016 and 2020. The programme includes the development and delivery of an area-wide electric vehicle charging infrastructure network; and during 2017 the partnership procured a preferred delivery partner of the charging infrastructure. To date, 123 locations in the county have been investigated for the potential provision of electric vehicle (EV) charge points. This has resulted in the installation of EV charge points at 23 locations in 17 towns in Nottinghamshire (providing a total of 10 rapid and 55 fast chargers across these locations). Within Gedling borough 19 locations have been investigated but the provision of EV charge points is currently only feasible at four of those locations. This has resulted in the provision of two rapid and seven fast charge points within car parks in four towns within the borough (Arnold, Carlton, Mapperley and Netherfield). Alternative funding sources are currently being sought to continue this programme.

Nottinghamshire Air Quality Strategy

The County, City and Borough/District councils have worked in partnership to review and update the Nottinghamshire Air Quality Strategy which has been approved at both the Nottinghamshire and Nottingham Health and Wellbeing Boards.

Retrofitting of buses

In February 2018 it was announced that the County Council (and Nottingham City Transport) had successfully secured funding from the Green Technology Fund to retrofit some of the most polluting buses in the county – including a number of buses that travel in the AQMA. Work is now underway to retrofit the identified vehicles (and will continue in to 2020).

Effective network management

The County Council continues to work with stakeholders to effectively manage its highway network. Along with the co-ordination of works, contingency planning, and effective event and incident planning, during 2019/20 the County Council purchased a third camera enforcement car to effectively enforce parking violations

Personal travel planning with residents

The DfT Access Fund funded personalised travel planning project targeted 4,976 households in Daybrook during 2019; with 1,188 households opting to take part in the project and receiving travel advice. Single occupancy car use for work trips fell by 6 percentage points amongst those that took part on the project

Workplace Travel Plans

Gedling Borough Council and Nottinghamshire County Council have completed a council travel plan to help promote sustainable travel amongst staff as part of both their journeys to work and whilst undertaking Council business. Travel Plans are also developed with businesses through the development control process.

Cycle network improvements

Work was completed on the delivery of enhancements to a number of cycle routes in the Arnold area utilising Local Growth Fund, developer contributions and integrated transport block funding. This delivered 2.7km of new off-road facilities and 14.5km of signed routes.

Traffic signal upgrades

Traffic signals at the A60/Sir John Robinson Way junction were upgraded with the installation of MOVA and pedestrian detection to enhance the existing SCOOT system.

Local Priorities and Challenges

Below is a brief summary of the priorities for the local authority in addressing air quality for the coming year:

- 1) The Borough Council is, as a member of the Nottinghamshire Environmental Protection Working Group (NEPWG), through which links have been established with colleagues in Public Health. Engagement with Health and Well Being Boards (Nottingham City and Nottinghamshire County) has led to Air Quality being included within the Joint Strategic Needs Assessment (JSNA) for the County and City since 2015 ([JSNA Air Quality](#)). The Council will continue to promote air quality issues via the NEPWG with health colleagues to promote air quality issues in emerging work.
- 2) Continue to monitor for Nitrogen Dioxide in the areas of concern.
- 3) Promotion of Air Quality Planning Guidance Document – with regard to the planning guidance document mentioned above, at the current time the document is informal. Therefore, the Council are encouraging developers, via planning consultations, to install mitigation as standard (for example electric vehicle charging points) proportionate to development size.

Our priorities in partnership with Nottinghamshire County Council are predominately measures to make the best use of the transport networks and through smarter travel measures that will encourage people to travel more sustainably. Measures will include:

- Ongoing effective land use planning and securing of appropriate levels of developer contributions for mitigation (including travel planning) and sustainable transport improvements.
- Measures to encourage the take-up of low emission vehicles, including charging infrastructure and promotion events; and through the Bus Quality Partnerships, including the purchase of new vehicles and the retrofitting of buses.

- Ongoing management of on-street parking to help keep traffic moving
- Traffic control and information provision to minimise disruption and delay on County Council managed roads (including the A60) such as contingency planning, the effective co-ordination of works and the provision of real-time travel information
- Development of an online school travel advice toolkit
- Travel planning such as the development of new travel plans at businesses across the county through planning conditions
- The encouragement of smarter travel behaviour such as the marketing and promotion of passenger transport, walking and cycling, provision of cycling and walking route maps, cycle training programmes, and web-based journey planners
- Enhancements to the local cycling and walking networks
- The facilitation of smarter travel behaviour such as the provision of a car sharing scheme and integrated and concessionary passenger transport ticketing schemes
- Measures to reduce the need to travel at peak times such as the provision and encouragement of flexible working arrangements
- Undertake feasibility work on a number of significant projects for delivery in future years, including:
 - Cycling improvements, including along the A612 corridor
 - Bus based Park & Ride site at Leapool roundabout; and associated bus priority measures

How to Get Involved

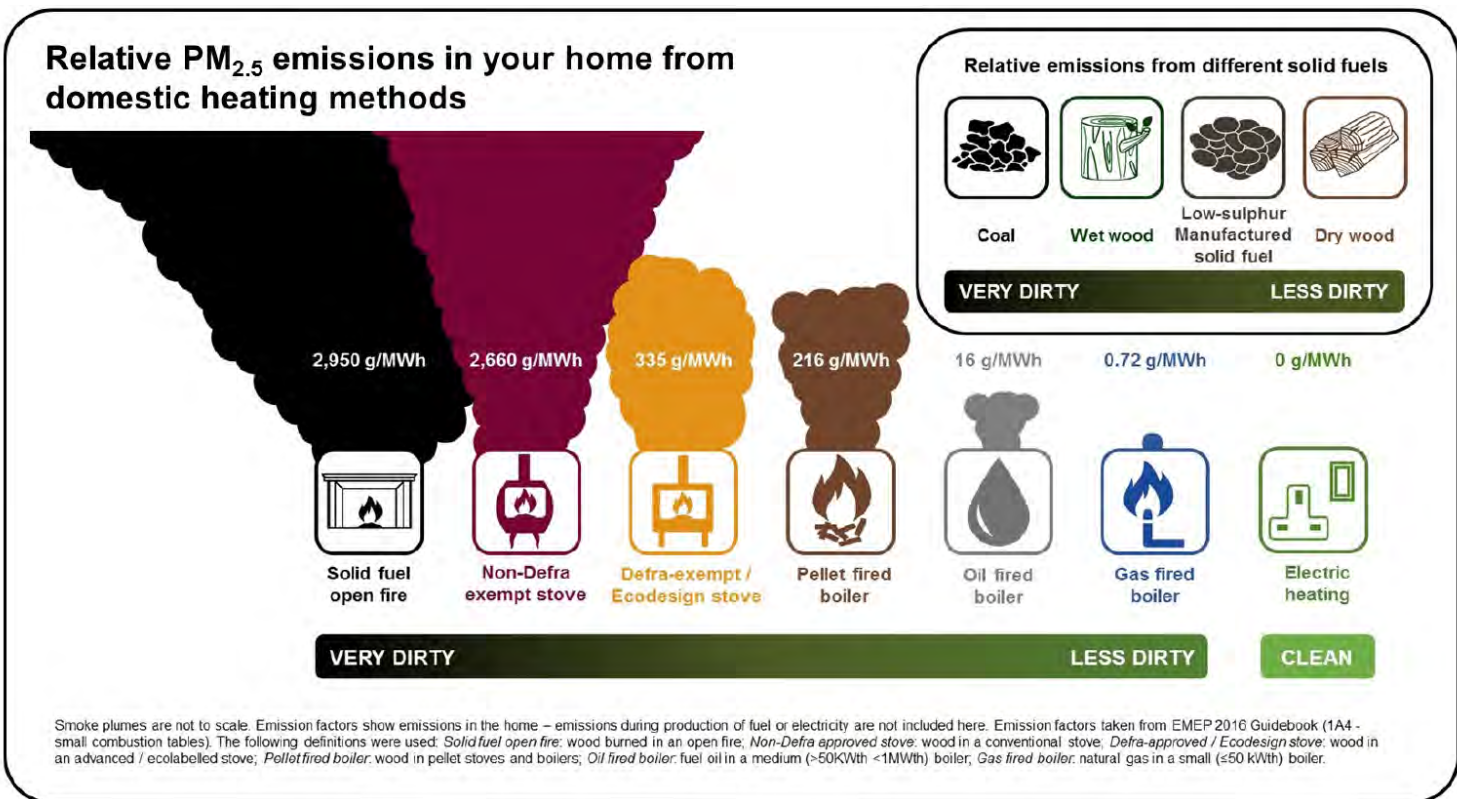
As a resident of Gedling Borough you can help to make a difference

Transport Choices

- trying alternatives to car travel or preferably taking the active option - bus, train, walking and cycling.
- when buying a new or used car consider the alternatives to diesel – electric/hybrid/petrol.

Heating your Home

- when buying a new boiler for your home consider the NOx emissions – go for a low NOx model.
- if you are thinking of installing a solid fuel burner make sure you are not in a smoke control area. If you are, make sure the appliance is certified for use in a smoke control area; buy a **SIA Ecodesign Ready** model, where available.



Defra, 2018

- keeping gas appliances and solid fuel burners in good repair and make sure any chimney/flue is cleaned regularly.

See



- If you are using wood burning appliance make sure the wood is



Changing your behaviour can reduce your exposure to pollution

Pollution levels vary over very short distances: in general, the closer you are to the sources, the more you breathe in.

- If you're walking or cycling, you can easily avoid the worst pollution by travelling along quieter streets. Even walking on the side of the pavement furthest from the road can help.
- One of the worst places for pollution is inside vehicles on busy roads where levels inside the car are typically as high as just outside.
- The health benefits of physical activity (walking or cycling) outweigh the risks from air pollution. If you're in a vehicle, you just get the risks with none of the benefits.

Air pollution is a local problem. It comes from local sources, it has local health impacts, and it can be tackled by local action.

The collective effect of actions by individuals, together with action by local councils and governments, can make a significant difference to pollutant exposure.

Royal College of Physicians. Every breath we take: the lifelong impact of air pollution. Report of a working party. London: RCP, 2016

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1 Local Air Quality Management

This report provides an overview of air quality in Gedling Borough during 2019. 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 Gedling Borough 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 Gedling Borough can be found in Table 2.1. Further information related to declared or revoked AQMAs, including maps of AQMA boundaries are available online at the [Councils Air Quality webpages](#).

Alternatively, see Appendix D: Maps of Monitoring Locations and AQMAs, which provides for a map of air quality monitoring locations in relation to the AQMA(s).

Table 2.1 – Declared Air Quality Management Areas

AQMA Name	Date of Declaration	Pollutants and Air Quality Objectives	City / Town	One Line Description	Is air quality in the AQMA influenced by roads controlled by Highways England?	Level of Exceedance (maximum monitored/modelled concentration at a location of relevant exposure)		Action Plan (inc. date of publication)
						At Declaration	Now	
Gedling No:2	16/03/2011	NO2 annual mean	Gedling	A60 Manfield Road (Oxclose Lane to Egerton Road)	NO	45 µg/m ³	39 µg/m ³	Action Plan 2019

Gedling Borough Council confirm the information on UK-Air regarding their AQMA(s) is up to date

2.2 Progress and Impact of Measures to address Air Quality in Gedling Borough

Defra's appraisal of last year's ASR concluded:

On the basis of the evidence provided by the local authority the conclusions reached are acceptable for all sources and pollutants

Gedling Borough has taken forward a number of direct measures during the current reporting year of 2020, found in the revised Air Quality Action Plan. Details of all measures found in the new Action Plan are set out in Table 2.2.

Gedling Borough expects the following measures to be completed over the course of the next reporting year, working in partnership with the County Council:

- Construction of improved cycle routes in Gedling – Funding has been secured to deliver further cycling improvements in the borough along the A612 corridor. Further feasibility work on the proposals is underway and it is hoped construction will start in 2020.
- Emergency Active Travel Fund (Tranche 1) – Nottinghamshire has been given a Tranche 1 indicative allocation of £573,000 from Government's £250m Emergency Active Travel Fund to encourage more walking and cycling. The aim of the funding is to try and embed walking and cycling as part of long-term commuting habits to secure the associated health, air quality and congestion benefits. In the short-term this will also help avoid overcrowding on public transport as the economy restarts. The County Council has made a submission to the DfT and is awaiting further discussion with/confirmation from the DfT on the proposals. Should the Tranche 1 funding be awarded the schemes within it will be delivered during 2020.
- Development of an online school travel advice toolkit – An online school travel advice toolkit has been developed which aims to provide information for the whole school community (pupils, parents, school staff/teachers, governors, local residents, etc.). It is being trialled with four pilot schools in the county during the 2019/20 academic year. Should the schools find the toolkit useful and useable it is proposed to make it available to all schools during the 2020/21 academic year.

- Retrofitting of buses – This work (using existing funding sources) is expected to be completed during 2020/21.
- Local Cycling & Walking Infrastructure Plan (LCWIP) – the County Council (in partnership with Derby City, Derbyshire County, and Nottingham City councils) are developing a D2N2 LCWIP. It is anticipated that the D2N2 LCWIP will be completed in Summer 2020; and will include a prioritised list of proposed improvements.

Gedling Borough Council's priorities, working in partnership with the County Council, for the coming year are predominantly through measures to make the best use of the transport networks and through smarter travel measures that will encourage people to travel more sustainably. Measures will include:

- Ongoing effective land use planning and securing of appropriate levels of developer contributions for mitigation (including travel planning) and sustainable transport improvements
- Measures to encourage the take-up of low emission vehicles, including charging infrastructure and promotion events; and through the Bus Quality Partnerships, including the purchase of new vehicles and the retrofitting of buses
- Ongoing management of on-street parking to help keep traffic moving
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- The encouragement of smarter travel behaviour such as the marketing and promotion of passenger transport, walking and cycling, provision of cycling and walking route maps, cycle training programmes, and web-based journey planners.
- Enhancements to the local cycling and walking networks
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- Undertake feasibility work on a number of significant projects for delivery in future years, including:
 - Cycling improvements, including along the A612 corridor
 - Bus based Park & Ride site at Leapool roundabout; and associated bus priority measures

Progress on the following measures continues to been slower than expected due to:

- Introduction of a car club in the county.
- Expansion of the cycle hire scheme due to the lack of revenue funding available for such schemes.

2.2.1 Target Pollution Reduction(s) in the AQMA

The reduction in NO₂ emissions required, based on 2017 worse case adjusted diffusion tubes results this would equate to a **3µg/m³ reduction in NO₂ from 43 to 40µg/m³.**

The reduction in road NO_x emissions required to meet the 40µg/m³ objective has been calculated as **7.15µg/m³ which represents a 14% reduction in roadside NO_x.**

Quantification of emissions and/or concentrations reduction can be difficult for most of the action plan measures. There are often various confounding factors that make it difficult to directly attribute concentration changes, as a result of intervention measure implementation. Quantification of the emissions reduction will often be easier to calculate than an estimate of the concentration reduction; which would otherwise require the application of detailed dispersion models to make suitable predictions.

Where direct quantification of emissions reduction cannot be achieved, LAs are asked to apply best judgement in a qualitative manner; such as a matrix based approach whereby each measure is assigned an indicative reduction of NO₂ with associated timescales.

Air Quality Impacts		Timescale	
Score	Indicative Reduction in NO ₂ Concentration		Years
7	>5 µg/m ³	Short (S) ↓	<2
6	2 - 5 µg/m ³		
5	1 - 2 µg/m ³		
4	0.5 - 1 µg/m ³	Medium (M) ↓	2.5
3	0.2 - 0.5 µg/m ³		
2	0 - 0.2 µg/m ³		
1	0 µg/m ³	Long (L)	>5

Table 2.2 – Progress on Measures to Improve Air Quality

No.	Measure	EU Category	EU Classification	Date Measure Introduced	Organisations involved	Funding Source	Key Performance Indicator	Reduction in Pollutant/ Emission from Measure	Progress to Date	Estimated /Actual Completion Date	Comments / Barriers to implementation
Priority 1 - Work with the Highway Authority to manage traffic volume and improve flows.											
1	Traffic control and management - Consideration and installation of SCOOT/MOVA and other traffic signal efficiency improvements	Traffic Management	Strategic highway improvements, Re-prioritising road space away from cars, including Access management, Selective vehicle priority, bus priority, high vehicle occupancy lane	2019/20	NCC/Via EM; integrated transport block funding		Restrain average journey times in the morning peak to a 1% increase per year	5(L)	SCOOT and MOVA equipped signals within AQMA rephrased but require periodic review.		Signal improvements at A60/Sir John Robinson Way delivered during 2019/20
2	Traffic control and management - traffic control centre that monitors traffic movement and provides real time traffic control over many traffic signal installations	Traffic Management	UTC, Congestion management, traffic reduction	Ongoing 2019-2024	Nottinghamshire County Council (NCC)/Via EM Ltd/Nottingham City Council (NCIC); NCC and NCIC revenue funding		Restrain average journey times in the morning peak to a 1% increase per year	4(S)		Ongoing	
3	Traffic control and management - co-ordination of street works to minimise traffic disruption and unnecessary congestion	Traffic Management	UTC, Congestion management, traffic reduction	Ongoing 2019-2024	NCC/Via EM/NCIC; NCC and NCIC revenue funding		Restrain average journey times in the morning peak to a 1% increase per year	3(S)		Ongoing	
4	Traffic control and management - management of incidents to minimise traffic disruption and unnecessary congestion	Traffic Management	UTC, Congestion management, traffic reduction	Ongoing 2019-2024	NCC/Via EM/NCIC/Highways England (HE); NCC, NCIC, HE revenue funding		Restrain average journey times in the morning peak to a 1% increase per year	2(S)		Ongoing	
5	Traffic control and management - Effective contingency planning to minimise traffic disruption and unnecessary congestion	Traffic Management	UTC, Congestion management, traffic reduction	Ongoing 2019-2024	NCC/Via EM Ltd; NCC revenue funding		Restrain average journey times in the morning peak to a 1% increase per year	2(S)		Ongoing	Information conveyed by all forms of media (press, radio, website, social media etc.). Implementation ongoing
6	Parking management and control - Bus stop clearways	Traffic Management	UTC, Congestion management, traffic reduction		NCC/Via EM Ltd; NCC revenue funding			3(S)	Bus stop clearways introduced at bus stops within the AQMA where parked vehicles were identified as impeding traffic flows	Ongoing	Additional bus stop clearways will be considered in the future should vehicles parking in bus stops be identified as impeding traffic flows at additional locations
7	Parking management and control - Ensure that car parking in and around the AQMA is managed and reviewed	Traffic Management	Workplace Parking Levy, Parking Enforcement on highway		NCC; NCC revenue funding		Manage parking to improve journey time reliability	2(S)	Introduction of junction protection and targeted roadside parking restrictions along feeder corridors into the AQMA.	Ongoing	Improvements will only be considered should vehicles parking be identified as impeding traffic flows. Parking restrictions already in place along the A60. No additional side-road/off-line locations currently identified as requiring restrictions to aid traffic flow.

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No.	Measure	EU Category	EU Classification	Date Measure Introduced	Organisations involved	Funding Source	Key Performance Indicator	Reduction in Pollutant/ Emission from Measure	Progress to Date	Estimated /Actual Completion Date	Comments / Barriers to implementation
8	Improving links with local transport strategy	Transport Planning and Infrastructure	Other	Ongoing 2019-2024	NCC/GBC		N/A	N/A(S)		Ongoing	Ensuring existing strategies complement and enable actions to improve air quality
9	Analyse journeys through AQMA	Other	Other		NCC/GBC		survey	N/A(M)	none		Project would require acquiring origin/destination journey data over a massive geographic area and therefore would be very expensive to deliver. GBC therefore need to determine and secure funding before such surveys could be undertaken
10	Consider walking infrastructure and facility enhancements	Transport Planning and Infrastructure	Other policy	Ongoing	NCC/GBC		Increased walking trips	3(S)	In 2019/20 integrated transport improvements to encourage more people to walk more often included a new pedestrian crossings on Cross St, Arnold	Ongoing	Walking infrastructure improvements delivered as part of annual integrated transport programme. GBC secure s38 and s106 funding for improvements as part of new development
11	Consider cycling infrastructure and facility enhancements	Transport Planning and Infrastructure	Other policy	Ongoing	NCC/GBC		Increased cycling trips	3(S)	NCC secured LGF and NCC funding to deliver cycle network improvements in the Arnold area during 2018/19 and 2019/20 (2.7km of new off-road facilities and 14.5km of signed routes). Funding has also been secured to deliver further improvements along the A612 corridor (construction programmes TBD)	Ongoing	Cycling infrastructure improvements delivered as part of annual integrated transport programme. GBC secure s38 and s106 funding for improvements as part of new development. The emerging D2N2 LCWIP will be used to help identify and prioritise future improvements should DfT funding be made available for their delivery

No.	Measure	EU Category	EU Classification	Date Measure Introduced	Organisations involved	Funding Source	Key Performance Indicator	Reduction in Pollutant/ Emission from Measure	Progress to Date	Estimated /Actual Completion Date	Comments / Barriers to implementation
Priority 2 - Ensure that future development is designed to reduce exposure and improve air quality.											
12	Improve links with local planning and Local Development Framework - Ensure sustainable development on vacant sites within and in the vicinity of the AQMA	Policy Guidance and Development Control	Other policy	Ongoing	GBC		No. of AQ impact assessments related to AQMA	3(S)	none in reporting year	Ongoing	
13	Improve links with local planning and Local Development Framework - Co-ordination of land-use planning and transport infrastructure	Policy Guidance and Development Control	Other policy	Ongoing 2019-2024	GBC/NCC		N/A	4(S)		Ongoing	
14	Improve links with local planning and Local Development Framework - Secure appropriate levels of developer contributions (Section 106 and/or CIL) for use on air quality improvement projects	Policy Guidance and Development Control	Other policy	Ongoing 2019-2024	GBC/NCC		Sums collected for air quality projects	4(S)	none in reporting year	Ongoing	
15	Improve links with local planning and Local Development Framework - Use of planning conditions for mitigation; inc. travel plans etc. enforcement to ensure compliance	Policy Guidance and Development Control	Other policy	Ongoing 2019-2024	GBC		N/A	4(M)	AQ mitigation Conditions requested on 96 planning applications throughout the Borough	Ongoing	
16	Encourage the uptake of alternative fuels - wider network of charging points	Promoting Low Emission Transport	Procuring alternative Refuelling infrastructure to promote Low Emission Vehicles, EV recharging, Gas fuel recharging	2019-2020	GBC		N/A	4(M)	£6.1m funding secured (GoUltra Low) for 2016-2020.		123 locations in the county have been investigated for the potential provision of EV charge points as part of GUL project - 19 in Gedling ; of which four were currently feasible; providing two rapid and seven fast charge points within car parks in four towns within the borough. Funding for the programme ended in 2020; additional funding to continue the programme is being sought.

No.	Measure	EU Category	EU Classification	Date Measure Introduced	Organisations involved	Funding Source	Key Performance Indicator	Reduction in Pollutant/ Emission from Measure	Progress to Date	Estimated /Actual Completion Date	Comments / Barriers to implementation
Priority 3 - Promotion and education											
17	Communication and education - awareness raising of local air quality issues - Tackling the school run – communication with school children and parents	Public Information	Via other mechanisms	Ongoing 2019-2024	GBC/NCC Public Health			3(M)	Commissioned toolkit for school communities to use		GBC and Public Health looking to KS2 education performance programme put on hold during Covid 19
18	Communication and education - awareness raising of local air quality issues - the link with poor health	Public Information	Via other mechanisms	Ongoing 2019-2024	GBC/NCC Public Health		Publication of relevant promotional material	1(M)		Ongoing	Air Quality Strategy for Nottingham and Nottinghamshire recently published linked to wider work carried out at County Level
19	Travel plans - Work with local businesses/ organisations to encourage the development and implementation of travel plans	Promoting Travel Alternatives	Workplace Travel Planning	Ongoing 2019-2024	GBC planning/NCC		Restrain average journey times in the morning peak to a 1% increase per year	3(S)	Developed with businesses as part of planning conditions		Targeted travel planning (funded by the County Council) was held at workplaces within the AQMA during 2014/15
20	Promoting travel choices - Undertake personalised travel planning in Commuter Areas	Promoting Travel Alternatives	Personalised Travel Planning	2019	NCC		Restrain average journey times in the morning peak to a 1% increase per year	3(M)	Funding DfT Access Fund funding secured by NCC to deliver PTP during 2019	2019	The 2019 DfT Access Fund funded PTP project targeted 4,976 households in Daybrook; with 1,188 households opting to take part in the project and receiving travel advice.
21	Promotion of EV Charging Network	Promoting Low Emission Transport	Procuring alternative Refuelling infrastructure to promote Low Emission Vehicles, EV recharging, Gas fuel recharging	2018-2020	NCC/NCIC			4(M)	Go Ultra Low promotion of charging infrastructure and vehicle events	2020	OLEV funding secured to promote take-up of ULEVs. Funding ended March 2020
22	Promoting travel choices - Consideration of extending existing city-based car club into the county	Alternatives to private vehicle use	Car Clubs		NCC		Restrain average journey times in the morning peak to a 1% increase per year	2(L)	Dependent on demonstration of success of existing Car Club		Nottm City scheme introduced in 2014. Expansion of scheme into county dependent on demonstration of its success
23	Promoting travel choices - The promotion and facilitation of car sharing schemes.	Alternatives to private vehicle use	Car & lift sharing schemes	Ongoing 2019-2024	NCC		Restrain average journey times in the morning peak to a 1% increase per year	2(S)	3,545 members registered. Implementation ongoing	Ongoing	It is estimated that during the 2019 calendar year the Nottinghamshire car share scheme delivered reductions of 1.3m miles travelled, 298t of CO2 emissions, and 1.35t of NOx emissions.
24	Promoting travel choices - Residential Travel Packs, to be issued to all new built homes	Promoting Travel Alternatives	Other	Ongoing 2019-2024	GBC/NCC		N/A	2(M)		Ongoing	Planning conditions to ensure travel plans are required where appropriate
25	Public transport - Development of ITSO smartcard ticketing	Transport Planning and Infrastructure	Public transport improvements- interchanges stations and services	Ongoing 2019-2024	NCC/NCiC/PT operators		Increased passenger transport patronage	2(S)	Implementation ongoing	Ongoing	Integrated ticketing strategy developed in 2014/15. New smartcard platform introduced in 2014. Robin Hood card scheme introduced in 2015
26	Public transport - Deliver the free countywide off-peak concessionary fare scheme for the over 60s and disabled.	Transport Planning and Infrastructure	Public transport improvements- interchanges stations and services	Ongoing 2019-2024	NCC/NCiC/PT operators		Increase passenger transport patronage	2(S)	Implementation ongoing	Ongoing	

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No.	Measure	EU Category	EU Classification	Date Measure Introduced	Organisations involved	Funding Source	Key Performance Indicator	Reduction in Pollutant/ Emission from Measure	Progress to Date	Estimated /Actual Completion Date	Comments / Barriers to implementation
27	Public transport - publicise web based journey planners	Public Information	Other	Ongoing 2019-2024	NCC		Increased walking/cycling/ passenger transport trips	2(S)	Implementation ongoing	Ongoing	Available at http://www.nottinghamshire.gov.uk/transport/public-transport/plan-journey
28	Public transport - Consider bus provision on the A60 and surrounding area.	Transport Planning and Infrastructure	Public transport improvements- interchanges stations and services		NCC/PT operators		Increased bus patronage	2(S)		Ongoing	Bus service provision is provided on a commercial basis with support from NCC where justified; and reviewed periodically
29	Public transport - Consider capacity increases on the GO2 services along the A60 corridor	Transport Planning and Infrastructure	Other		NCC		N/A	2(S)		Ongoing	Capacity increases will be considered by operators should passenger information demonstrate that there is insufficient capacity on existing services
30	To encourage adoption of cycling and walking as alternatives to using private vehicles - Develop and undertake annual cycling promotional marketing	Promoting Travel Alternatives	Promotion of cycling	2019-2020	NCC		Increased cycling trips	2(S)		Ongoing	General promotion (e.g. website and literature) implementation ongoing. In addition to the above, PTP was offered to 4,976 households in Daybrook during 2019 following completion of cycle route improvements
31	To encourage adoption cycling and walking as alternatives to using private vehicles - Deliver adult and child cycle training	Promoting Travel Alternatives	Promotion of cycling	Ongoing 2019-2024	NCC; DfT funding		Increased cycling trips	1(S)		Ongoing	9,383 people received cycle training during 2019/20. Implementation ongoing
32	To encourage adoption cycling and walking as alternatives to using private vehicles - Develop and undertake annual walking promotional marketing	Promoting Travel Alternatives	Promotion of cycling	Ongoing 2019-2024	NCC		Increased cycling trips	1(S)		Ongoing	Greater Nottingham cycling maps produced; to be reviewed as network enhanced

No.	Measure	EU Category	EU Classification	Date Measure Introduced	Organisations involved	Funding Source	Key Performance Indicator	Reduction in Pollutant/ Emission from Measure	Progress to Date	Estimated /Actual Completion Date	Comments / Barriers to implementation
Priority 4 - Reduce emissions from buses and taxis.											
33	Promotion of low emission vehicles through taxi licensing.	Promoting Low Emission Transport	Taxi emission incentives	Ongoing 2019-2024	GBC		Review of Taxi Licence criteria	3(M)	ECO Stars Taxi Scheme pilot project	Sept 2020	DEFRA Grant funding secured for 19/20
34	Target reductions in emissions from buses - ECOSTars Fleet Recognition Scheme.	Vehicle Fleet Efficiency	Fleet efficiency and recognition schemes	2018-19	GBC		Scheme membership	4(S)	7 bus/coach operator members. Operating ~740 vehicles	Sept 2020	DEFRA Grant funding secured for 19/20
35	Target reductions in emissions from buses - Ongoing delivery of Quality Bus Partnerships	Vehicle Fleet Efficiency	Promoting Low Emission Public Transport	Ongoing 2019-2024	NCC/NCiC/PT operators; NCT (operator)		Ongoing take-up of cleaner vehicles	5(M)		Ongoing	SQBP in place affecting all buses travelling through AQMA. Operator NCT secured £4.4m OLEV funding and invested a further £12.4m to upgrade its facilities to enable running of a gas fleet, including two services which travel through the AQMA.
36	Encouragement of low-emission public transport fleets (new vehicles and retro-fitting)	Vehicle Fleet Efficiency	Fleet efficiency and recognition schemes	Ongoing 2019-2024	NCC/PT operators		On-going take-up of cleaner vehicles	4(S)		Ongoing	Operator NCT secured £4.4m OLEV funding and invested a further £12.4m to upgrade its facilities to enable running of a gas fleet, including two services which travel through the AQMA NCC secured £1.3m; from the Green Bus Technology Fund in Feb 2018 to retrofit older buses, including services 'Threes', 56, 57 and 59 which operate in the AQMA
37	Target reductions in emissions from buses - Encouraging the use of emissions standards when procuring school bus contracts and supported bus services.	Promoting Low Emission Transport	Other	Ongoing 2019-2024	NCC/PT operators		On-going take-up of cleaner vehicles	4(S)		Ongoing	

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No.	Measure	EU Category	EU Classification	Date Measure Introduced	Organisations involved	Funding Source	Key Performance Indicator	Reduction in Pollutant/ Emission from Measure	Progress to Date	Estimated /Actual Completion Date	Comments / Barriers to implementation
Priority 5 - Reduce emissions from HGVs and LGVs.											
38	Target reductions in emissions from heavy and light goods vehicles - ECOStars Fleet Recognition Scheme	Vehicle Fleet Efficiency	Fleet efficiency and recognition schemes	2018-19	GBC		Scheme membership	4(S)	111 HGV/LGV Members operating ~7500 vehicles	Sept 2020	DEFRA Grant funding secured for 19/20
39	Target reductions in emissions from the council fleet and contract vehicles - Gedling Borough membership of ECOStars scheme.	Vehicle Fleet Efficiency	Fleet efficiency and recognition schemes	2018-19	GBC		N/A	3(S)	membership continues with fleet review	Continuation dependant of funding	Gedling Fleet a 4 star member
40	Target reductions in emissions from the council fleet and contract vehicles - Ensuring new vehicles procured are cleanest possible.	Vehicle Fleet Efficiency	Other	Ongoing 2019-2024	GBC		N/A	3(S)		Ongoing	GBC works in partnership with other LAs via the Transport Managers Group to procure fleet vehicles. The group is looking at ways to adopt a joint approach to fleet reviews and options for alternative fuels.
41	Target reductions in emissions from the council fleet and contract vehicles - GBC Green Procurement	Vehicle Fleet Efficiency	Other	Ongoing 2019-2024	GBC		N/A	2(M)		Ongoing	The Council is currently establishing working groups to deliver on pledges for Carbon Neutrality. Procurement will most likely be one strand of this review.
Long Term Measures/Projects influencing AQMA											
42	The creation of a park and ride scheme.	Alternatives to private vehicle use	Bus based Park & Ride		NCC			4(L)	£2.4m has been secured for the creation of a new bus-based Park & Ride facility off Leapool roundabout, to be delivered alongside a package of bus priority measures		The scheme is still subject to feasibility, business case, planning, consultation, funding availability and political and public acceptability. Further detailed feasibility work on the scheme will be undertaken during 2020/21, with an anticipated construction start date in 2022 and an anticipated completion date of 2023
43	New Trent crossing	Traffic Management	Strategic highway improvements, Re-prioritising road space away from cars, including Access management, Selective vehicle priority, bus priority, high vehicle occupancy lane		NCC/NCiC/GBC			2(L)	Funding for a new cycle/pedestrian bridge between West Bridgford and the City as part of the Nottingham Transforming Cities Fund Bid. Feasibility work is underway. Construction schedules TBD and will be dependent on the outcome of the feasibility work		Feasibility studies undertaken in 2016 determined no compelling case for inclusion in any programme. To be reviewed to be considered alongside future Local Plan growth strategies (post 2032). Future scheme dependent on feasibility, business case for any proposals, identifying appropriate site, prior to consultation and securing funding The proposed foot/cycle bridge scheme is still subject to feasibility, business case, planning, consultation, funding availability and political and public acceptability
44	Review of public transport infrastructure along A60 corridor	Transport Planning and Infrastructure	Strategic highway improvements, Re-prioritising road space away from cars, including Access management, Selective vehicle priority, bus priority, high vehicle occupancy lane		NCC/NCiC/GBC			4(L)	£2.3m has been secured to deliver a package of bus priority measures in Arnold and Bestwood (£2.33m) which will improve connectivity between and into the two district centres and the new Park & Ride site. The bus priority measures will also improve the reliability and punctuality of existing bus services		The delivery timetable for these measures is dependent on the Park & Ride construction; and any proposals are still subject to feasibility, business case, planning, consultation, funding availability and political and public acceptability

2.3 PM_{2.5} – Local Authority Approach to Reducing Emissions/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.

The Borough Council does not monitor for PM_{2.5} and so to understand the likely levels across the borough two points of reference have been taken.

- | | |
|---|--|
| 1. The nearest relevant AURN site in Nottingham | Monitored annual mean concentration for 2019 is reported as 11µg/m ³ |
| 2. Modelled background levels | Downloaded from Defra webpages the background map for 2019 in Gedling is presented in Appendix D. Levels are predicted to be generally between 8.3 – 10.5µg/m ³ . |

The Council has a new role in working towards reducing emissions and concentrations of PM_{2.5}; no Air Quality Objective has been set but the World Health Organisation guideline value is 10µg/m³.

Gedling Borough is taking the following measures to address PM_{2.5}:

- Construction Emission Strategies are routinely requested during the planning application stage of any development.
- Promotion of cleaner vehicle fleets via the ECO Stars Fleet Recognition scheme.
- Education and enforcement of Clean Air Act and Smoke Control Areas.

3 Air Quality Monitoring Data and Comparison with Air Quality Objectives and National Compliance

3.1 Summary of Monitoring Undertaken

3.1.1 Automatic Monitoring Sites

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

Gedling Borough undertook automatic (continuous) monitoring at one site during 2019. Table A.1 in Appendix A shows the details of the sites. National monitoring results are available [HERE](#).

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.

3.1.2 Non-Automatic Monitoring Sites

Gedling Borough undertook non-automatic (passive) monitoring of NO₂ at 31 sites during 2019. Table A.2 in Appendix A shows the details of the sites. The monitoring programme is constantly reviewed to ensure that locations are still relevant and new sites are not required.

A number of new tubes were added to the programme; via section 106 planning contributions to fund monitoring around a large housing development in the south of the Borough.

- New Works Cottages
- Nottingham Road, Burton Joyce
- Colwick Loop Rd /Nether Pasture

In addition one tube was repositioned in anticipation of development which may take place in the future; this tube was located near the Wickes store in the AQMA and has been moved to Mansfield Road – Redhill North

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 and other adjustments applied to the results are included in Appendix C.

Note: Local authorities do not have to report annually on the following pollutants: 1,3 butadiene, benzene, carbon monoxide and lead, unless local circumstances indicate there is a problem.

3.2 Individual Pollutants

The air quality monitoring results presented in this section are, where relevant, adjusted for bias⁸, “annualisation” (where the data capture falls below 75%), and distance correction. Further details on adjustments are provided in Appendix C.

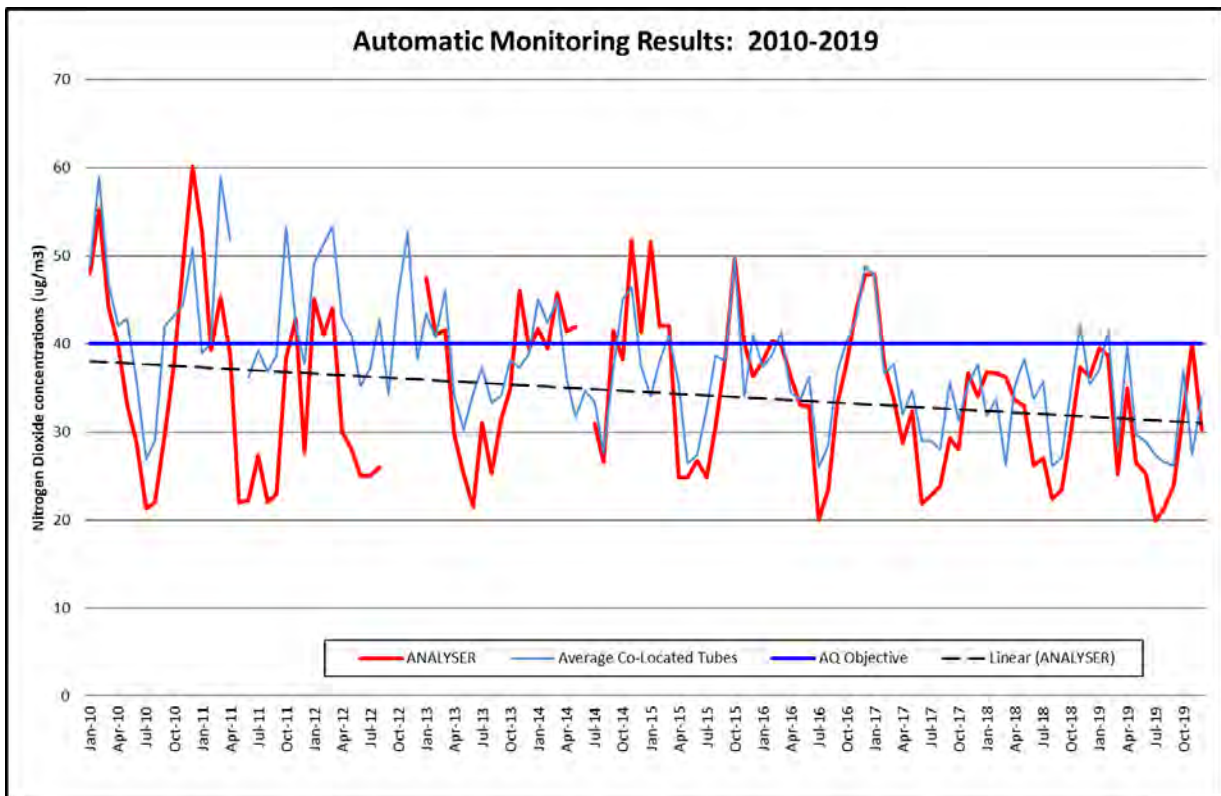
3.2.1 Nitrogen Dioxide (NO₂)

Table A.3 in Appendix A compares the ratified and adjusted monitored NO₂ annual mean concentrations for the past 5 years with the air quality objective of 40µg/m³.

For diffusion tubes, the full 2019 dataset of monthly mean values is provided in Appendix B.

Results of automatic monitoring

Table A.1 indicates the results for automatic monitoring for 2018 show no exceedances of the air quality objective for NO₂. The graph below shows a decrease in NO₂ levels over a ten-year period (2010 -2019).



Notes: the concentration data presented in Table A.3 represents the concentration at the location of the monitoring site, following the application of bias adjustment and annualisation, as required (i.e. the values are exclusive of any consideration to fall-off with distance adjustment).

The concentration data presented in Table B.1 includes distance corrected values, only where relevant.

⁸ <https://laqm.defra.gov.uk/bias-adjustment-factors/bias-adjustment.html>

Table A.4 in Appendix A compares the ratified continuous monitored NO₂ hourly mean concentrations for the past 5 years with the air quality objective of 200µg/m³, not to be exceeded more than 18 times per year.

There were no exceedances of this objective in 2019.

Results of non-automatic (passive) monitoring

The results of diffusion tube monitoring for 2019 (Table A3) show no exceedances inside the AQMA; all other monitoring results tend to indicate levels below the objective.

Appendix A includes a series of graphs plotting diffusion tube results over a 10-year period (2010 – 2019). These graphs all indicate a **declining** trend in NO₂ levels over this period. Full diffusion tube monitoring dataset, including details of bias and location adjustments are available in Appendix B and C.

3.2.2 Particulate Matter (PM₁₀)

Gedling Borough does not monitor for Particulate Matter (PM₁₀).

3.2.3 Particulate Matter (PM_{2.5})

Gedling Borough does not monitor for Particulate Matter (PM_{2.5}).

3.2.4 Sulphur Dioxide (SO₂)

Gedling Borough does not monitor for Sulphur Dioxide.

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)	Distance to kerb of nearest road (m)	Inlet Height (m)
GBC1	Daybrook Square	Roadside	457944	344596	NO ₂	Y	Chemiluminescent	75	5	2

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

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 collocated with a Continuous Analyser?	Height (m)
82492	Grove PH Daybrook Sq	Receptor	457947	344651	NO ₂	Y	0m	3.5m	N	3m
82494	Hastings street	Urban background	460391	341413	NO ₂	N	N/A	N/A	N	3m
82495	Marion Murdock Court	Urban background	461294	342826	NO ₂	N	N/A	N/A	N	3m
82937	47 Plains Road, Mapperley	Receptor	459209	343513	NO ₂	N	0m	7m	N	3m
87398	Morley Mills Building	Receptor	457969	344780	NO ₂	Y	0m	3m	N	3m
87399	Mansfield Road, Redhill	Receptor	457866	345578	NO ₂	Y	25m	10m	N	3m
87400	Daybrook Dental Surgery	Receptor	457867	345388	NO ₂	Y	30m	2.3m	N	3m

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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 collocated with a Continuous Analyser?	Height (m)
87401	19 Victoria Road	Receptor	461995	341175	NO ₂	N	0.5m	4m	N	3m
87402	36 Victoria Road	Receptor	462002	341097	NO ₂	N	4m	1.6m	N	3m
87403, 87404, 87405	Daybrook Analyser	Co-located tubes	457944	344597	NO ₂	Y	75m	5m	Y	2m
87406	Burton Rd/Shearing Hill	Receptor	462422	341972	NO ₂	N	1m	16m	N	3m
87407	The Vale PH-Thackerays Ln	Receptor	457918	344358	NO ₂	Y	15m	3.4m	N	3m
87408	Rickets Lane	Rural Background	456621	355935	NO ₂	N	N/A	N/A	N	3m
87410	Civic Centre, Arnold	Urban background	458259	344723	NO ₂	N	N/A	N/A	N	3m
87411	Colwick Park Close	Receptor	461103	340086	NO ₂	N	1m	10m	N	3m
87412	Daybrook Fish Bar	Receptor	457947	344713	NO ₂	Y	0m	3m	N	3m
87413	T&S Heating	Receptor	457950	344748	NO ₂	Y	0m	3m	N	3m
87414	Frank Keys	Receptor	457969	344827	NO ₂	Y	25m	3m	N	3m
87415	856 Plains Road	Receptor	458898	343139	NO ₂	N	0m	8m	N	3m
87460	Rectory Road/Vale Road	Receptor	461161	340122	NO ₂	N	19m	6.5m	N	3m
87461	Mile End Road	Receptor	461196	340108	NO ₂	N	0.5m	3m	N	3m

Gedling Borough Council

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 collocated with a Continuous Analyser?	Height (m)
87821	189 Plains Road	Roadside	343935	459611	NO ₂	N	4.9m	1.7m	N	3m
87822	Memorial Hall, Gedling	Roadside	342480	461879	NO ₂	N	9.5m	3.3m	N	3m
87824	Arnold Lane/High Hazels	Roadside	343196	461197	NO ₂	N	2.3m	1.8m	N	3m
87823	Howieson Court	Roadside	344159	459974	NO ₂	N	4.5m	1.9m	N	3m
87999	New Works Cottages	Roadside	341842	463150	NO ₂	N	14m	2m	N	3m
88000	Colwick Loop Rd /Nether Pasture	Roadside	340837	462615	NO ₂	N	3.8m	2.4m	N	3m
88001	Nottingham Road, Burton Joyce	Roadside	342668	463226	NO ₂	N	13m	21.5m	N	3m
88005	Mansfield Road, Redhill North	Roadside	346630	458325	NO ₂	N	4.9m	2.5m	N	3m

(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.

Table A.3 – Annual Mean NO₂ Monitoring Results

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) ⁽¹⁾	Valid Data Capture 2018 (%) ⁽²⁾	NO ₂ Annual Mean Concentration (µg/m ³) ⁽³⁾				
					2015	2016	2017	2018	2019
GBC1	Roadside	Automatic	99.7	99.7	36	36	31	32	30
82492	Receptor	Diffusion Tube	100	100	33	35	34	29	30
82494	Urban background	Diffusion Tube	100	100	21	22	22	19	20
82495	Urban background	Diffusion Tube	100	100	17	18	16	16	16
82937	Receptor	Diffusion Tube	100	100	27	29	28	25	24
87398	Receptor	Diffusion Tube	92	92	32	34	31	30	31
87399	Receptor	Diffusion Tube	100	100	25	26	23	23	24
87400	Receptor	Diffusion Tube	100	100	32	33	31	30	28
87401	Receptor	Diffusion Tube	100	100	26	29	26	23	24
87402	Receptor	Diffusion Tube	75	75	33	30	31	28	28
87403	Co-located tubes	Diffusion Tube	100	100	33	34	31	31	31
87404	Co-located tubes	Diffusion Tube	100	100	33	35	31	31	30
87405	Co-located tubes	Diffusion Tube	100	100	33	35	30	31	28
87406	Receptor	Diffusion Tube	100	100	24	26	24	23	24
87407	Receptor	Diffusion Tube	100	100	36	29	35	33	28
87408	Rural Background	Diffusion Tube	100	100	11	14	15	15	13
87410	Urban background	Diffusion Tube	100	100	18	18	18	16	16
87411	Receptor	Diffusion Tube	100	100	23	25	23	23	21
87412	Receptor	Diffusion Tube	100	100	37	44	43	39	39

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) ⁽¹⁾	Valid Data Capture 2018 (%) ⁽²⁾	NO ₂ Annual Mean Concentration (µg/m ³) ⁽³⁾				
					2015	2016	2017	2018	2019
87413	Receptor	Diffusion Tube	100	100	38	42	41	37	36
87414	Receptor	Diffusion Tube	75	75	35	37	33	31	30
87415	Receptor	Diffusion Tube	92	92	25	28	26	23	24
87460	Receptor	Diffusion Tube	100	100	29	28	27	25	24
87461	Receptor	Diffusion Tube	83	83	36	38	33	31	31
87821	Roadside	Diffusion Tube	92	92				25	21
87822	Roadside	Diffusion Tube	100	100				36	34
87824	Roadside	Diffusion Tube	92	92				20	22
87823	Roadside	Diffusion Tube	92	92				32	31
87999	Roadside	Diffusion Tube	75	75					22
88000	Roadside	Diffusion Tube	75	75					29
88001	Roadside	Diffusion Tube	75	75					20
88005	Roadside	Diffusion Tube	50	50					33

Diffusion tube data has been bias corrected

Annualisation has been conducted where data capture is <75%

If applicable, all data has been distance corrected for relevant exposure

Notes:

Exceedances of the NO₂ annual mean objective of 40µg/m³ are shown in bold.

NO₂ annual means exceeding 60µg/m³, indicating a potential exceedance of the NO₂ 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 Boxes 7.9 and 7.10 in LAQM.TG16 if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

(4) Concentrations are those at the location of monitoring and not those following any fall-off with distance adjustment.

Table A.4 – 1-Hour Mean NO₂ Monitoring Results

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) ⁽¹⁾	Valid Data Capture 2016 (%) ⁽²⁾	NO ₂ 1-Hour Means > 200µg/m ³ ⁽³⁾				
					2015	2016	2017	2018	2019
GBC1	Roadside	Automatic	99.7	99.7	22(218)	0	0	0	0

Notes: Exceedances of the NO₂ 1-hour mean objective (200µg/m³ not to be exceeded more than 18 times/year) are shown in **bold**.

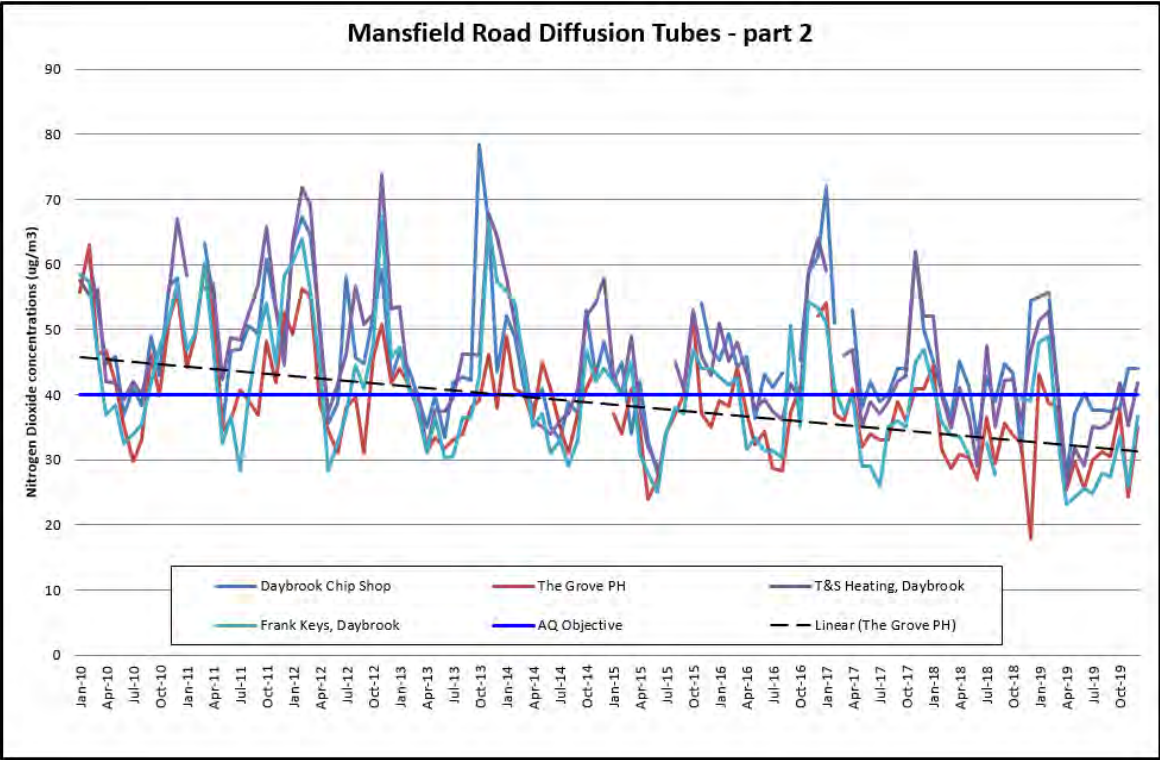
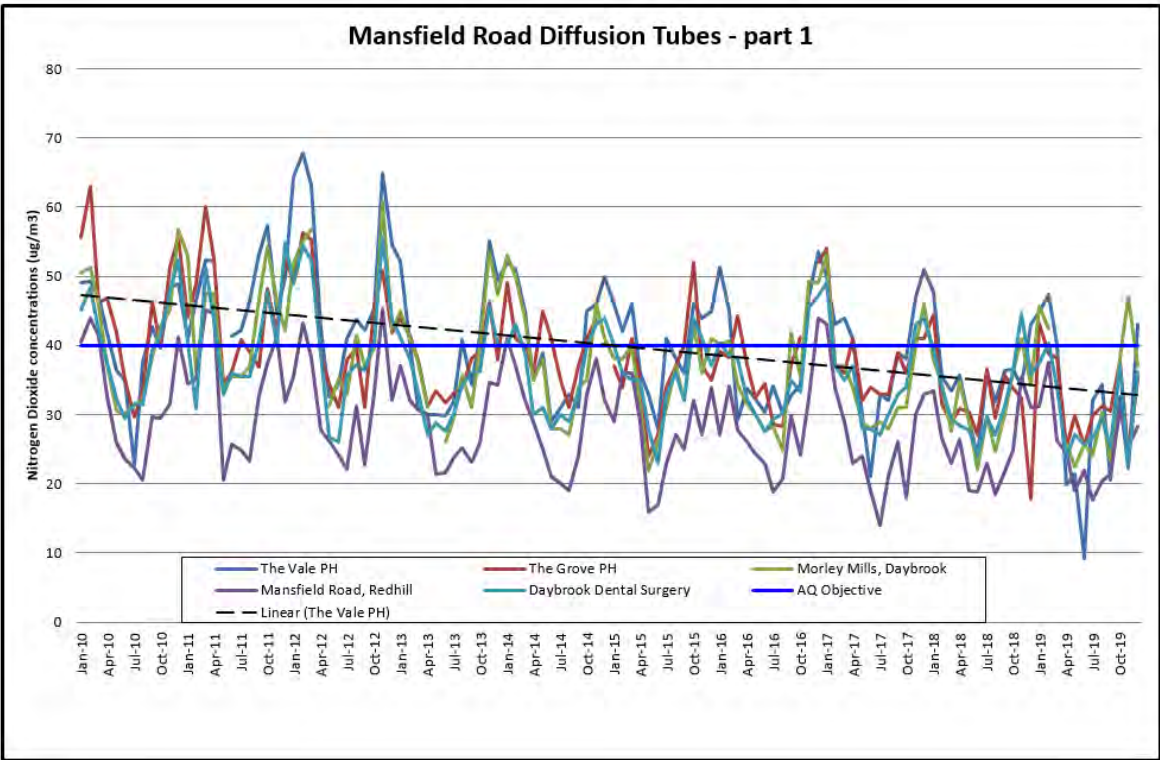
(1) data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

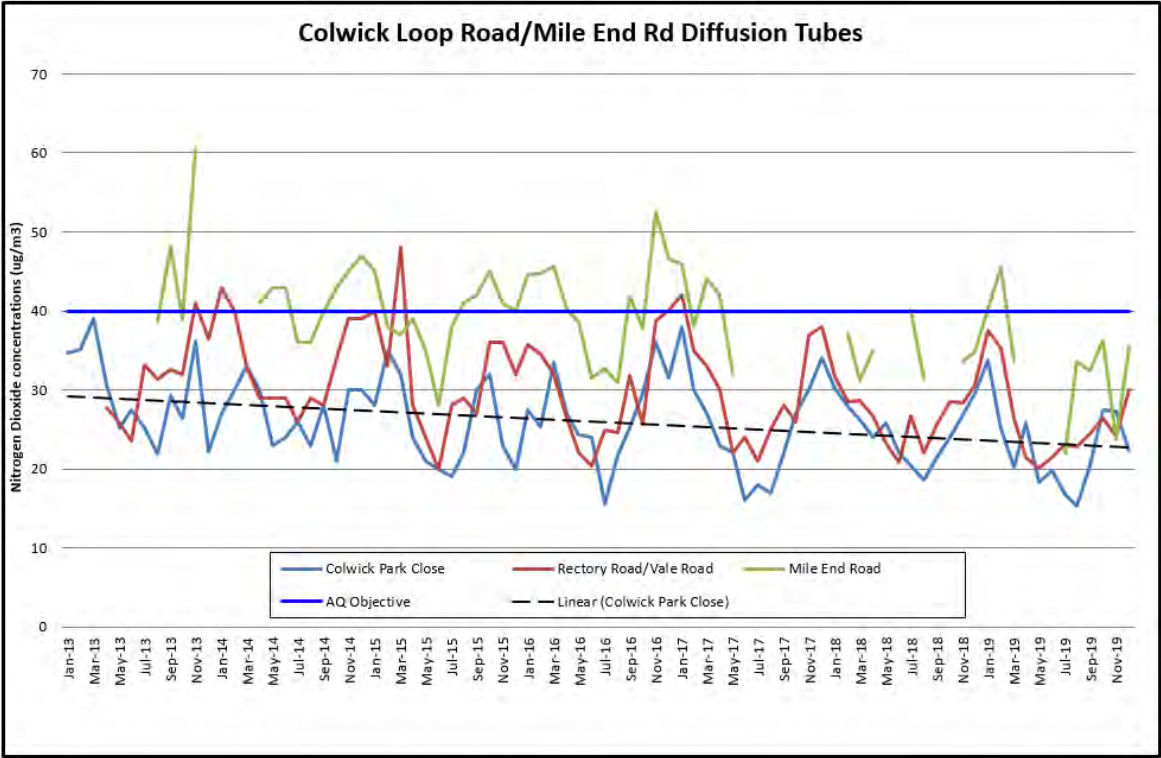
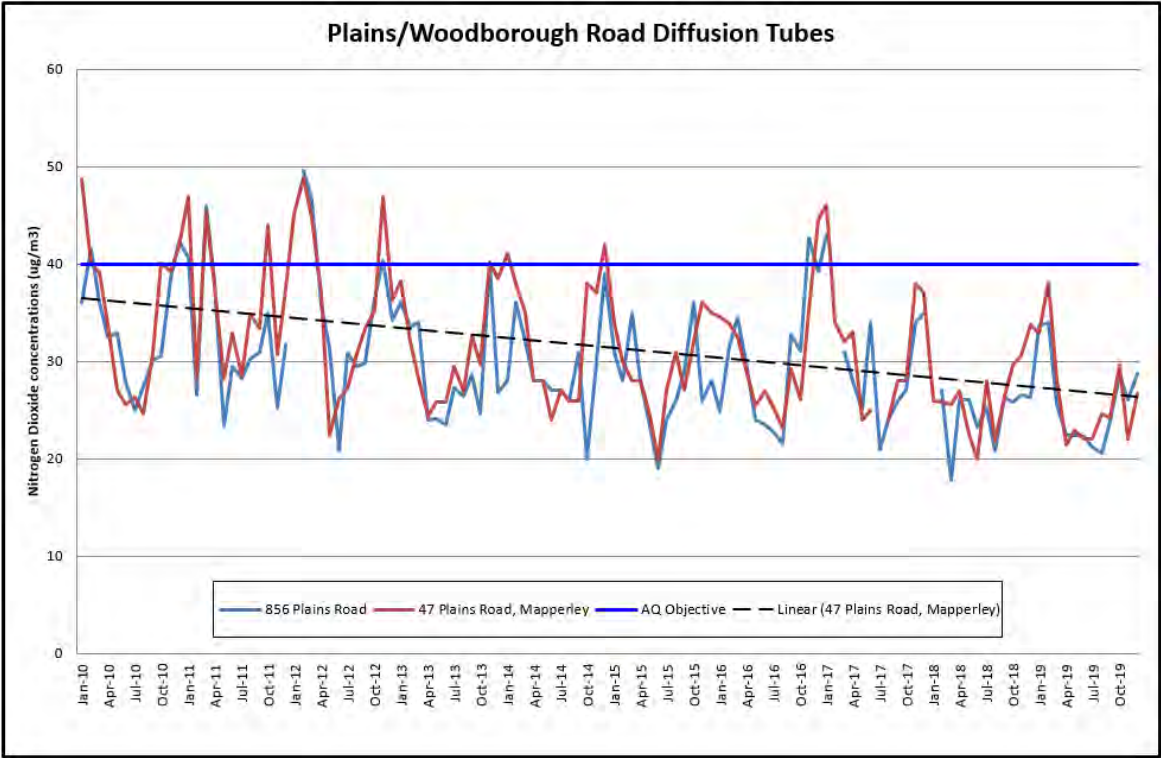
(2) data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

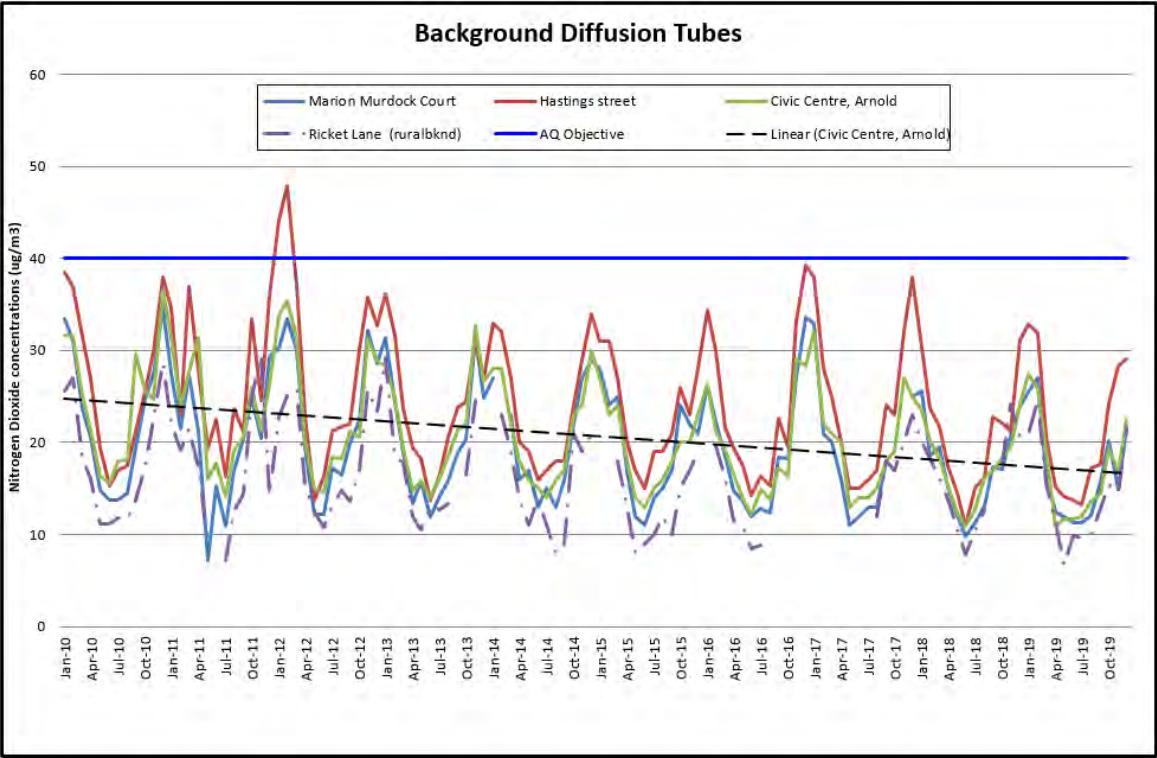
(3) If the period of valid data is less than 90%, the 99.8th percentile of 1-hour means is provided in brackets.

Figure A.1 – Trends in Annual Mean NO₂ Concentrations

Nitrogen Dioxide Diffusion Tube Results 2010 – 2019







Appendix B: Full Monthly Diffusion Tube Results for 2019

Table B.1 – NO₂ Monthly Diffusion Tube Results – 2019

Site ID	NO ₂ Mean Concentrations (µg/m ³)												Annual Mean		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Raw Data	Bias Adjusted (0.93) and Annualised ⁽¹⁾	Distance Corrected to Nearest Exposure ⁽²⁾
82492	43.2	38.7	38.3	25.3	29.9	25.5	29.9	31.3	30.5	37.7	24.3	35.2	32.5	30.2	
82494	32.8	31.9	20.7	15.1	14.1	13.8	13.3	17.2	17.7	24.1	28.3	29.1	21.5	20.0	
82495	25.5	27.0	16.5	12.5	12.0	11.4	11.3	12.1	15.7	20.2	14.9	21.8	16.7	15.6	
82937	32.9	38.2	28.1	21.4	22.9	22.1	22.0	24.6	24.3	29.6	22.0	26.6	26.2	24.4	
87398	45.6	42.5	-	25.8	22.4	25.8	24.2	30.4	23.2	38.1	47.0	37.1	32.9	30.6	
87399	31.2	37.6	26.2	24.4	18.9	21.9	17.6	20.4	21.5	30.8	25.4	28.3	25.3	23.6	
87400	37.4	40.3	34.0	23.8	27.0	25.8	26.6	29.5	25.4	37.3	22.7	36.1	30.5	28.4	
87401	34.8	32.5	25.6	31.1	19.6	23.0	21.8	21.7	23.8	28.2	22.8	31.2	26.3	24.5	
87402	41.7	-	34.3	24.4	26.6	24.5	27.4	26.6	-	-	18.7	34.4	28.7	26.7	
87403	35.9	44.0	30.1	41.8	30.4	30.4	27.7	28.0	27.3	38.9	33.0	33.9	33.4	31.1	
87404	41.2	42.7	28.0	38.5	28.8	28.5	27.3	28.4	24.7	37.2	24.3	33.7	31.9	29.7	
87405	34.0	38.0	26.8	38.9	29.9	28.0	27.2	23.4	26.5	34.9	25.0	34.0	30.5	28.4	
87406	30.1	27.6	25.2	21.5	22.6	21.5	21.3	19.8	26.4	28.7	34.7	27.4	25.6	23.8	
87407	44.8	47.3	40.2	19.9	21.3	9.2	32.1	34.2	20.6	32.5	22.4	43.1	30.6	28.5	
87408	20.9	24.7	15.5	11.4	6.6	9.9	9.6	10.0	12.8	15.4	14.5	21.5	14.4	13.4	
87410	43.2	38.7	38.3	25.3	29.9	25.5	29.9	31.3	30.5	37.7	24.3	35.2	32.5	30.2	

Site ID	NO ₂ Mean Concentrations (µg/m ³)												Annual Mean		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Raw Data	Bias Adjusted (0.93) and Annualised ⁽¹⁾	Distance Corrected to Nearest Exposure ⁽²⁾
87411	33.7	25.1	20.2	25.8	18.3	19.8	16.8	15.3	20.4	27.4	27.3	22.4	22.7	21.1	
87412	55.0	55.8	42.6	27.3	37.1	40.2	37.7	37.7	37.4	38.0	44.1	44.0	41.4	38.5	
87413	51.3	52.7	42.0	26.4	31.9	29.1	35.2	34.9	35.8	41.9	35.3	41.9	38.2	35.5	
87414	48.0	48.9	34.6	23.2	24.2	25.6	24.8	28.0	27.4	33.6	26.0	36.8	31.8	29.5	
87415	33.6	34.0	25.6	22.4	22.4	22.2	21.2	20.5	23.9	28.6	26.1	28.8	25.8	24.0	
87460	37.5	35.4	26.4	21.5	20.1	21.4	23.1	22.7	24.4	26.4	24.1	30.1	26.1	24.3	
87461	40.2	45.4	33.7	-	32.3	-	22.0	33.7	32.4	36.3	23.7	35.5	33.5	31.2	
87821	31.9	-	25.9	19.0	19.7	19.1	18.2	18.9	22.8	29.3	14.6	30.7	22.7	21.1	
87822	42.7	40.7	38.4	29.6	37.2	31.3	36.9	36.1	38.9	37.6	28.2	43.3	36.7	34.2	
87824	23.8	30.2	33.0	21.2	20.2	-	20.8	18.5	20.4	25.1	16.3	25.1	23.1	21.5	
87823	45.2	40.1	-	26.1	33.4	27.9	29.3	25.6	32.4	39.4	32.2	32.5	33.1	30.8	
87999	-	-	-	21.0	19.0	20.0	18.9	20.5	22.7	26.6	19.8	30.0	22.1	20.5	
88000	-	-	-	41.0	29.3	26.8	28.4	23.4	23.8	34.5	22.2	28.4	28.6	26.6	
88001	-	-	-	20.2	17.4	18.4	17.7	18.2	20.3	25.9	17.6	25.7	20.2	18.7	
88005	-	-	-	-	-	-	34.2	39.3	36.0	42.5	28.2	38.8	36.5	36.5	33

Local bias adjustment factor used

National bias adjustment factor used

Annualisation has been conducted where data capture is <75%

Notes:

Exceedances of the NO₂ annual mean objective of 40µg/m³ are shown in **bold**.

NO₂ annual means exceeding 60µg/m³, indicating a potential exceedance of the NO₂ 1-hour mean objective are shown in **bold and underlined**.

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

(2) Distance corrected to nearest relevant public exposure.

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

Nitrogen Dioxide Diffusion Tubes

Overview

Diffusion tubes are small clear plastic tubes open at one end with a pollutant-absorbing chemical matrix or gel at the closed end. The tubes are prepared and sealed before being transported to the monitoring site. At site, the tube is exposed, by removal of the end cap, for a period of one month. After the month the tube is resealed and sent to an analytical laboratory.

The laboratory analysis measures the quantity of pollutant absorbed and then calculates an average ambient pollutant concentration over the exposure period. Diffusion tube results are for NO₂, concentrations measured in parts per billion (ppb) and micrograms per cubic metre (µgm³).

Tubes are exposed on a monthly basis, following the timetable prescribed by the Diffusion Tube Network in which tubes are replaced generally on the first Wednesday of the month.

From April 2008 GBC entered into a Countywide contract with Gradko Ltd. for the supply and analysis of NO₂ diffusion tubes. At the same time it was agreed to use the same preparation method (20% solution of TEA in water). This harmonisation of laboratory and method for the county will allow easier comparisons of results across LA boundaries.

QA/QC Procedures

Gradko

The European Union Daughter Directive for NO₂ sets out data quality objectives for overall accuracy. Annual average NO₂ concentration results must comply with the objective of $\pm 25\%$ of the reference concentration therefore; average diffusion tube measurements should comply with this objective. The precision of analytical measurements is also an important consideration, as it is possible to arrive at an average bias of less than $\pm 25\%$ with very imprecise measurements. Following previous intercomparisons of laboratory results an arbitrary guideline figure of 3ppb for acceptable precision has been adopted.

Gradko's NO₂ diffusion tube procedures follow the Defra guideline document⁹ related to the preparation, extraction, analysis and calculation procedures for NO₂ passive diffusion tubes. Their internal analysis procedures are assessed by U.K.A.S. on an annual basis for compliance to ISO17025. Results from the Ongoing Workplace Analysis Scheme for Proficiency (WASP) programme for Gradko generally show a "Satisfactory" performance classification.

Gedling Borough Council

Tubes are stored in a refrigerator until the day of exposure. On site, when the tubes are collected the date, site and time are recorded, referenced to the tube numbers assigned by the laboratory. The tubes are then forwarded to Gradko for analysis on the day of collection, along with a 'blank' trip diffusion tube.

Chemiluminescent Monitor Data

Overview

The automatic monitoring system used (Monitor Labs ML®9841B) uses gas-phase chemiluminescence detection to perform continuous analysis of nitric oxide (NO), total oxides of nitrogen (NO_x), and nitrogen dioxide (NO₂).

The instrument consists of a pneumatic system, an NO₂-to-NO converter (molycon), a reaction cell, photomultiplier tube (PMT) detector, and processing electronics.

⁹ Diffusion Tubes for Ambient NO₂ Monitoring: Practical Guidance for Laboratories and Users

During 2001-2007 the analyser was housed in the basement of the Daybrook Baptist Chapel. In January of 2008 the analyser was moved to a Casella ROMON enclosure on the opposite side of the A60 Mansfield Road. The analyser has been operational since August 2000; data capture levels are: -

96% 2001	93% 2006	92% 2011	99% 2016
95% 2002	83% 2007	54% 2012*	99% 2017
97% 2003	81% 2008	91% 2013	99% 2018
98% 2004	95% 2009	80% 2014**	99% 2019
96% 2005	95% 2010	81% 2015*	

*data logger failure

** air conditioning unit failure in mid-May

The ML®9841B analyser has a quoted detection of ± 0.5 ppb and a precision of ± 0.5 ppb or 1% of reading, whichever is largest. Accuracy of the analyser is dependent on the calibration and the calibration gases used.

QA/QC Procedures

The analyser is subject to a fortnightly two point manual calibration, by a suitably trained site operative, which is conducted in accordance with the manufacturer's quality control procedures. Filters at the sample head are changed concurrently with calibration. The equipment is serviced twice a year by the manufacturer's accredited engineers.

Calibration gases (Air and NO) used during the fortnightly calibration are supplied by BOC, who have demonstrated compliance with relevant quality control procedures in the preparation of gas mixtures. Gas cylinders are replaced before use by dates or when the gas levels fall below 50 bar.

Data Validation and Ratification

Gedling Borough Council employ the services of Air Quality Data Management (AQDM) to collect, ratify and calibrate the data from the Daybrook Station. Officers from Gedling Borough attend site on a fortnightly basis to carry out the manual calibration of the analyser, forwarding the results onto AQDM.

Diffusion Tube Bias Adjustment Factors

National Bias Adjustment Factors (BAF) have been obtained using the co-location studies spreadsheet available at <http://laqm.defra.gov.uk/bias-adjustment-factors/national-bias.html>

The Gradko national BAF 2019 for 20% TEA in water is given as **0.93** from 27 studies of various types. (See screen shot in this appendix)

Factor from Local Co-location Studies

A co-location study was carried out with the GBC NO_x analyser.

Attached to this appendix is the AEA spreadsheet for calculating bias, precision and accuracy of triplicate tubes. The bias factor calculated is also **0.93**.

Discussion of Choice of Factor to Use

Based on guidance Box 7.11 in LAQM TG(16) GBC has used the **national** bias adjustment factor when adjusting diffusion tube results.

Adjustment for Receptor Distance

One of the diffusion tube locations is not representative of the receptor concerned and its annual average was within 10% of the air quality objective (this is however following annualisation)

1. Mansfield Road, Redhill North

Due to site constraints the tube is located as close as possible to receptors. The result has therefore been adjusted using the 'NO₂ with distance from roads' spreadsheet; available at <http://laqm.defra.gov.uk/tools-monitoring-data/no2-falloff.html>

Background concentration has been taken from the nearest urban background diffusion tube; the Civic Centre, Arnold UB tube (16µg/m³). Screen shot of the spreadsheet are attached to this appendix.

Short-term to Long-term Data adjustment

Diffusion tube data from one location were incomplete for 2019 (less than 75% data collection):

- Mansfield Road, Redhill North

As such the annual average has been “annualised” as in Box 7.10 of LAQM TG16. Table A1 below shows details of the data used and factors produced to adjust the tube results.

Table A.1 Short-Term to Long-Term Monitoring Data Adjustment

Mansfield Road, Redhill North Tube(ref.88005)

Long term site	Annual Mean 2019 (Am)	Period Mean 2019 (Pm)	Ratio
Nottingham Urban Centre	28.0	26.50	1.06
Leicester University	24.2	22.83	1.06
Chesterfield Roadside	17.4	17.17	1.01
GBC Analyser	29.8	27.93	1.07
Average ratio			1.05

Checking Precision and Accuracy of Triplicate Tubes



Diffusion Tubes Measurements									
Period	Start Date dd/mm/yyyy	End Date dd/mm/yyyy	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	09/01/2019	06/02/2019	35.9	41.2	34.0	37	3.7	10	9.2
2	06/02/2019	05/03/2019	44.0	42.7	38.0	42	3.1	8	7.7
3	05/03/2019	03/04/2019	30.1	28.0	26.8	28	1.6	6	4.1
4	03/04/2019	01/05/2019	41.8	38.5	38.9	40	1.8	5	4.5
5	01/05/2019	04/06/2019	30.4	28.8	29.9	30	0.8	3	2.0
6	04/06/2019	04/07/2019	30.4	28.5	28.0	29	1.3	4	3.2
7	04/07/2019	08/08/2019	27.7	27.3	27.2	27	0.3	1	0.7
8	08/08/2019	30/08/2019	28.0	28.4	23.4	27	2.8	11	7.0
9	30/08/2019	08/10/2019	27.3	24.7	26.5	26	1.3	5	3.3
10	08/10/2019	05/11/2019	38.9	37.2	34.9	37	2.0	5	5.0
11	05/11/2019	04/12/2019	33.0	24.3	25.0	27	4.9	18	12.1
12	04/12/2019	08/01/2020	33.9	33.7	34.0	34	0.2	1	0.4
13									

Automatic Method		Data Quality Check	
Period Mean	Data Capture (% DC)	Tubes Precision Check	Automatic Monitor Data
39.5	99.3	Good	Good
38.6	99.5	Good	Good
25.2	99.9	Good	Good
34.9	99.9	Good	Good
27	99.9	Good	Good
25	99.9	Good	Good
20	99.3	Good	Good
21	99.6	Good	Good
24	99.9	Good	Good
32	99.7	Good	Good
40.1	99.9	Good	Good
30.3	99.9	Good	Good

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

Overall survey --> **Good precision** **Good Overall DC**

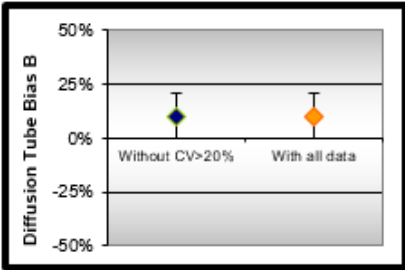
Site Name/ ID: **Daybrook Square**

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

(Check average CV & DC from Accuracy calculations)

Accuracy (with 95% confidence interval)	
without periods with CV larger than 20%	
Bias calculated using 12 periods of data	
Bias factor A	0.93 (0.85 - 1.03)
Bias B	7% (-3% - 18%)
Diffusion Tubes Mean:	32 µgm ⁻³
Mean CV (Precision):	6
Automatic Mean:	30 µgm ⁻³
Data Capture for periods used:	100%
Adjusted Tubes Mean:	30 (27 - 33) µgm ⁻³

Accuracy (with 95% confidence interval)	
WITH ALL DATA	
Bias calculated using 12 periods of data	
Bias factor A	0.93 (0.85 - 1.03)
Bias B	7% (-3% - 18%)
Diffusion Tubes Mean:	32 µgm ⁻³
Mean CV (Precision):	6
Automatic Mean:	30 µgm ⁻³
Data Capture for periods used:	100%
Adjusted Tubes Mean:	30 (27 - 33) µgm ⁻³



Jaume Targa, for AEA
Version 04 - February 2011

Co-Location Spreadsheet 2019 Gradko Analysed

Adjustment of SINGLE Tubes

Diffusion Tube Measurements														Raw Mean	Valid periods
Site Name/ID	Periods														
	1	2	3	4	5	6	7	8	9	10	11	12	13		
The Grove PH - Daybrook Sq	43.2	39.0	38.0	25.3	30.0	26.0	30.0	31.0	30.5	38.0	24.0	35.0		32.5	12
Hastings Street	32.8	32.0	21.0	15.1	14.0	14.0	13.0	17.0	17.7	24.0	28.0	29.0		21.5	12
Marion Murdock Court	25.5	27.0	17.0	12.5	12.0	11.0	11.0	12.0	15.7	20.0	15.0	22.0		16.7	12
47 Plains Road	32.9	38.0	28.0	21.4	23.0	22.0	22.0	25.0	24.3	30.0	22.0	27.0		26.3	12
Morley Mills, Daybrook	45.6	42.0	-	25.8	22.0	26.0	24.0	30.0	23.2	38.0	47.0	37.0		32.8	11
Mansfield Road, Redhill	31.2	38.0	26.0	24.4	19.0	22.0	18.0	20.0	21.5	31.0	25.0	28.0		25.3	12
Daybrook Dental Surgery	37.4	40.0	34.0	23.8	27.0	26.0	27.0	29.0	25.4	37.0	23.0	36.0		30.5	12
Victoria Road, Netherfield	34.8	32.0	26.0	31.1	20.0	23.0	22.0	22.0	23.8	28.0	23.0	31.0		26.4	12
Victoria Road, Netherfield	41.7	-	34.0	24.4	27.0	25.0	27.0	27.0	-	-	19.0	34.0		28.8	9
Burton Rd/Shearing Hill	30.1	28.0	25.0	21.5	23.0	21.0	21.0	20.0	26.4	29.0	35.0	27.0		25.6	12
The Vale PH - Thackerays Lane	44.8	47.0	40.0	19.9	21.0	9.0	32.0	34.0	20.6	33.0	22.0	43.0		30.5	12
Ricket Lane (ruralbknd)	20.9	25.0	16.0	11.4	7.0	10.0	10.0	10.0	12.8	15.0	15.0	21.0		14.5	12
Civic Centre, Arnold	27.4	26.0	19.0	10.9	12.0	12.0	12.0	14.0	14.4	19.0	17.0	22.0		17.1	12
Colwick Park Close	33.7	25.0	20.0	25.8	18.0	20.0	17.0	15.0	20.4	27.0	27.0	22.0		22.6	12
Daybrook Chip Shop	55.0	56.0	43.0	27.3	37.0	40.0	38.0	38.0	37.4	38.0	44.0	44.0		41.5	12
T&S Heating, Daybrook	51.3	53.0	42.0	26.4	32.0	29.0	35.0	35.0	35.8	42.0	35.0	42.0		38.2	12
Frank Keys, Daybrook	48.0	49.0	35.0	23.2	24.0	26.0	25.0	28.0	27.4	34.0	26.0	37.0		31.9	12
856 Plains Road	33.6	34.0	26.0	22.4	22.0	22.0	21.0	21.0	23.9	29.0	26.0	29.0		25.8	12
Rectory Road/Vale Road	37.5	35.0	26.0	21.5	20.0	21.0	23.0	23.0	24.4	26.0	24.0	30.0		25.9	12
Mile End Road	40.2	45.0	34.0	-	32.0	-	22.0	34.0	32.4	36.0	24.0	35.0		33.5	10
189 Plains Road	31.9	-	26.0	19.0	20.0	19.0	18.0	19.0	22.8	29.0	15.0	31.0		22.8	11
Memorial Hall, Gedling	42.7	41.0	38.0	29.6	37.0	31.0	37.0	36.0	38.9	38.0	28.0	43.0		36.7	12
Arnold Lane/High Hazels	23.8	40.0	33.0	21.2	20.0	-	21.0	18.0	20.4	25.0	16.0	25.0		23.9	11
Howieson Court	45.2	30.0	-	26.1	33.0	28.0	29.0	26.0	32.4	39.0	32.0	33.0		32.1	11
1 New Works Cottages	-	-	-	21.0	19.0	20.0	19.0	21.0	22.7	27.0	20.0	30.0		22.2	9

Adjusted measurement (95% confidence interval) with all the data 12 periods used in this calculations	
Bias Factor A 0.93 (0.85 - 1.03) Bias B 7% (-3% - 18%) Tube Precision: 6 Automatic DC: 100%	
Adjusted with 95% CI	30 (28 - 33)
Adjusted with 95% CI	20 (18 - 22)
Adjusted with 95% CI	16 (14 - 17)
Adjusted with 95% CI	24 (22 - 27)
Adjusted with 95% CI	30 (28 - 34)
Adjusted with 95% CI	24 (22 - 26)
Adjusted with 95% CI	28 (26 - 31)
Adjusted with 95% CI	25 (22 - 27)
Adjusted with 95% CI	27 (24 - 30)
Adjusted with 95% CI	24 (22 - 26)
Adjusted with 95% CI	28 (26 - 31)
Adjusted with 95% CI	13 (12 - 15)
Adjusted with 95% CI	16 (15 - 18)
Adjusted with 95% CI	21 (19 - 23)
Adjusted with 95% CI	39 (35 - 43)
Adjusted with 95% CI	36 (32 - 39)
Adjusted with 95% CI	30 (27 - 33)
Adjusted with 95% CI	24 (22 - 27)
Adjusted with 95% CI	24 (22 - 27)
Adjusted with 95% CI	31 (28 - 34)
Adjusted with 95% CI	21 (19 - 23)
Adjusted with 95% CI	34 (31 - 38)
Adjusted with 95% CI	22 (20 - 25)
Adjusted with 95% CI	30 (27 - 33)
Adjusted with 95% CI	21 (19 - 23)

The bias adjustment factor used in these calculations include all the data and no screening of data due to poor precision has been applied.

2019 Diffusion Gradko Analysed Tube Results part 1

Adjustment of SINGLE Tubes



Diffusion Tube Measurements															
Site Name/ID	Periods													Raw Mean	Valid periods
	1	2	3	4	5	6	7	8	9	10	11	12	13		
Colwick Lp Rd /NetherPasture	-	-	-	41.0	29.0	27.0	28.0	23.0	23.8	35.0	22.0	28.0		28.5	9
238 Nottingham Road, BJ	-	-	-	20.2	17.0	18.0	18.0	18.0	20.3	26.0	18.0	26.0		20.2	9
Mansfield Road, Redhill North	-	-	-	-	-	-	34.0	39.0	36.0	42.0	28.0	39.0		36.3	6

Adjusted measurement (95% confidence interval) with all the data
 12 periods used in this calculations

Bias Factor A 0.93 (0.85 - 1.03)
 Bias B 7% (-3% - 18%)
 Tube Precision: 6 Automatic DC: 100%

Adjusted with 95% CI **27 (24 - 29)**
 Adjusted with 95% CI **19 (17 - 21)**
 Adjusted with 95% CI **34 (31 - 37)**

The bias adjustment factor used in these calculations include all the data and no screening of data due to poor precision has been applied.

2019 Diffusion Gradko Analysed Tube Results part 2

National Diffusion Tube Bias Adjustment Factor Spreadsheet							Spreadsheet Version Number: 03/20			
<p>Follow the steps below in the correct order to show the results of relevant co-location studies</p> <p>Data only apply to tubes exposed monthly and are not suitable for correcting individual short-term monitoring periods</p> <p>Whenever presenting adjusted data, you should state the adjustment factor used and the version of the spreadsheet</p> <p>This spreadsheet will be updated every few months: the factors may therefore be subject to change. This should not discourage their immediate use.</p>							<p>This spreadsheet will be updated at the end of June 2020</p> <p>LAQM Helpdesk Website</p>			
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:	Step 2:	Step 3:	Step 4:							
Select the Laboratory that Analyzes Your Tubes from the Drop-Down List	Select a Preparation Method from the Drop-Down List	Select a Year from the Drop-Down List	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 ² shown in blue at the foot of the final column.							
If a laboratory is not chosen, we have no data for this laboratory.	If a preparation method is not chosen, we have no data for this method at this laboratory.	If a year is not chosen, we have no data.	If you have your own co-location study then see footnote ¹ . 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 ²	Year ²	Site Type	Local Authority	Length of Study (months)	Diffusion Tube Mean Conc. (Dm) ($\mu\text{g}/\text{m}^3$)	Automatic Monitor Mean Conc. (Cm) ($\mu\text{g}/\text{m}^3$)	Bias (B)	Tube Precision ⁴	Bias Adjustment Factor (A) (Cm/Dm)
Gradko	20% TEA in water	2019	R	Blackburn with darwen Borough Council	10	29	21	36.9%	G	0.73
Gradko	20% TEA in water	2019	R	Cheshire West and Chester	12	39	38	2.0%	G	0.98
Gradko	20% TEA in water	2019	R	Cheshire West and Chester	11	34	34	-2.1%	G	1.02
Gradko	20% TEA in water	2019	R	Gedling Borough Council	12	32	30	7.3%	G	0.93
Gradko	20% TEA in water	2019	R	NOTTINGHAM CITY COUNCIL	10	37	40	-7.0%	G	1.07
Gradko	20% TEA in water	2019	R	Bedford Borough Council	11	29	29	-1.0%	G	1.01
Gradko	20% TEA in water	2019	R	Bedford Borough Council	12	37	32	13.0%	G	0.89
Gradko	20% TEA in water	2019	R	Gateshead Council	12	30	25	18.1%	G	0.85
Gradko	20% TEA in water	2019	R	Gateshead Council	10	32	34	-7.2%	G	1.08
Gradko	20% TEA in water	2019	R	Gateshead Council	12	34	27	23.7%	P	0.81
Gradko	20% TEA in water	2019	R	Gateshead Council	11	40	44	-10.5%	G	1.12
Gradko	20% TEA in water	2019	KS	Marglebone Road Intercomparison	12	85	65	30.1%	G	0.77
Gradko	20% TEA in water	2019	R	Borough Council of King's Lynn and West Norfolk	9	27	21	28.4%	G	0.78
Gradko	20% TEA in water	2019	R	Lancaster City Council	13	40	34	16.4%	G	0.86
Gradko	20% TEA in water	2019	R	Lancaster City Council	12	31	31	1.6%	G	0.98
Gradko	20% TEA in Water	2019	R	Monmouthshire County Council	12	39	39	1.3%	G	0.99
Gradko	20% TEA in water	2019	UC	Belfast City Council	10	29	24	21.8%	G	0.82
Gradko	20% TEA in water	2019	R	Dudley MBC	12	33	32	4.5%	G	0.96
Gradko	20% TEA in water	2019	R	Dudley MBC	12	44	42	3.9%	G	0.96
Gradko	20% TEA in water	2019	UB	Dudley MBC	12	23	19	19.8%	G	0.83
Gradko	20% TEA in water	2019	UB	Eastleigh Borough Council	12	24	26	-7.1%	G	1.08
Gradko	20% TEA in water	2019	R	Gateshead Council	12	34	27	23.7%	P	0.81
Gradko	20% TEA in water	2019	R	Gateshead Council	11	40	44	-10.5%	G	1.12
Gradko	20% TEA in water	2019	R	Gateshead Council	10	32	34	-7.2%	G	1.08
Gradko	20% TEA in water	2019	R	Gateshead Council	12	30	25	18.1%	G	0.85
Gradko	20% TEA in water	2019	R	Thurrock Borough Council	12	29	24	21.6%	G	0.82
Gradko	20% TEA in water	2019	R	Brighton & Hove City Council	11	45	50	-9.3%	G	1.10
Gradko	20% TEA in water	2019		Overall Factor² (27 studies)					Use	0.93

Gradko 20%TEA in Water Co-location Studies 2019

BUREAU VERITAS

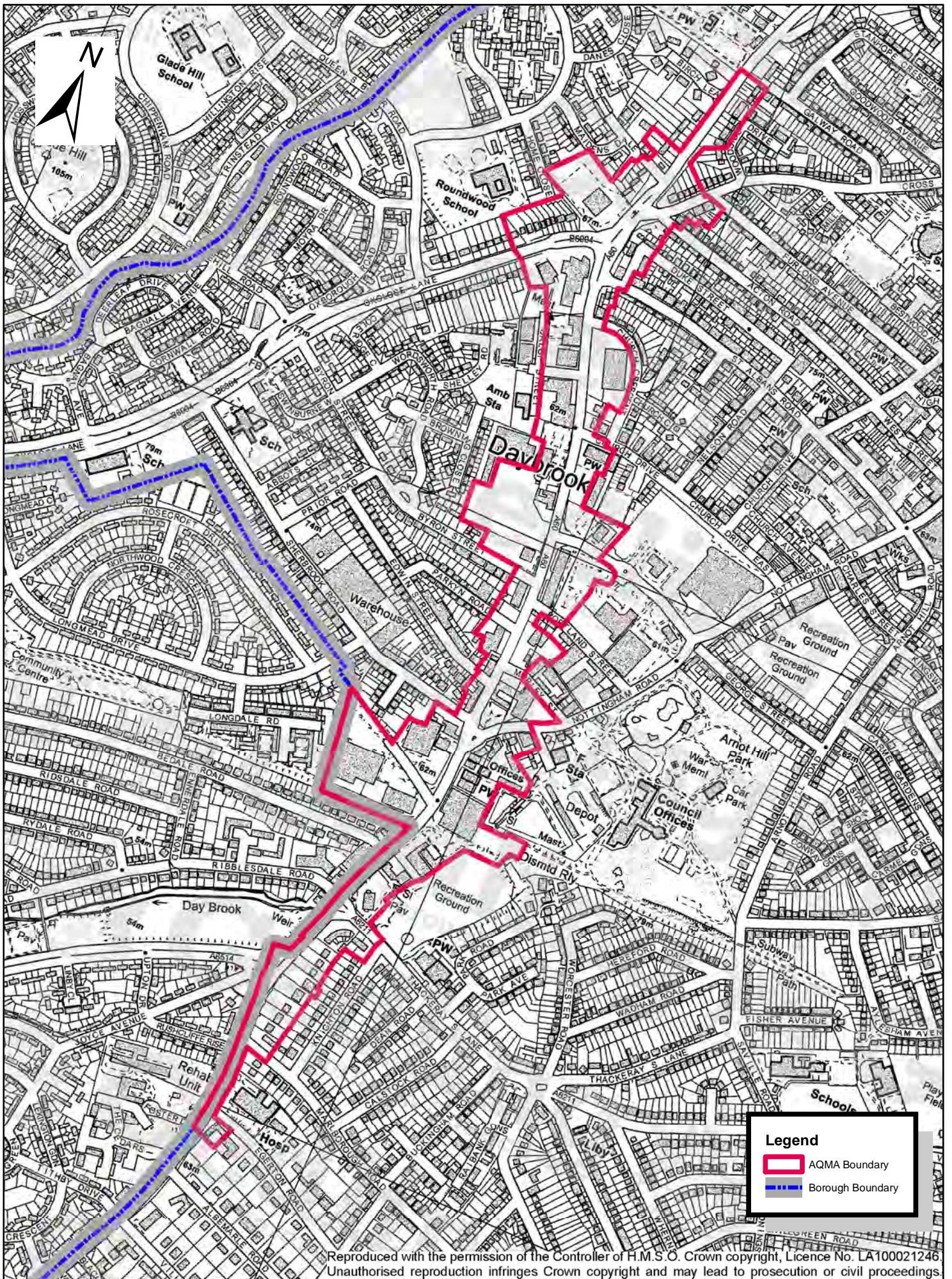
Air Quality CONSULTANTS

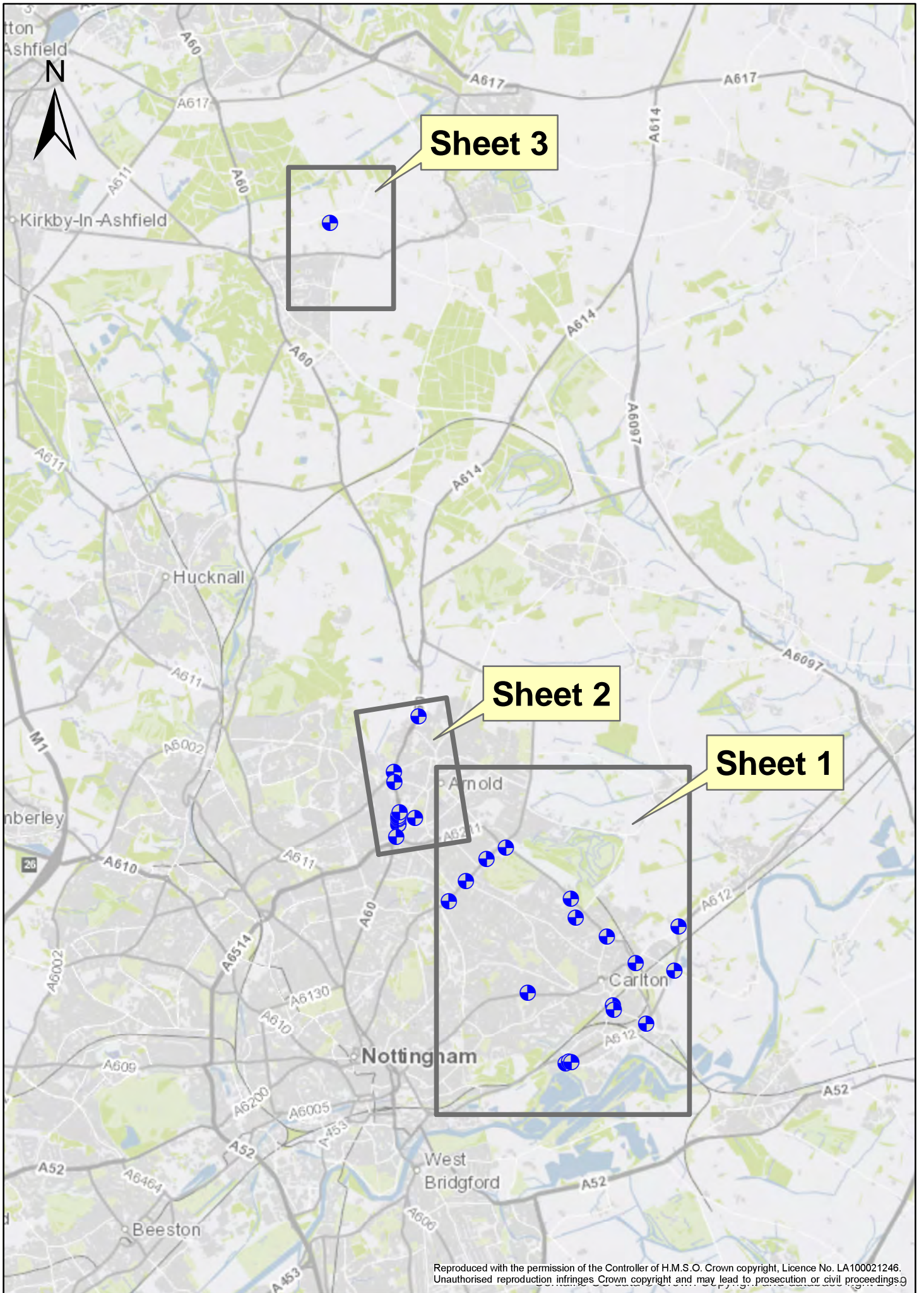
Enter data into the red cells

Step 1	How far from the KERB was your measurement made (in metres)?	2.45	metres
Step 2	How far from the KERB is your receptor (in metres)?	4.9	metres
Step 3	What is the local annual mean background NO ₂ concentration (in µg/m ³)?	16	µg/m ³
Step 4	What is your measured annual mean NO ₂ concentration (in µg/m ³)?	36	µg/m ³
Result	The predicted annual mean NO ₂ concentration (in µg/m ³) at your receptor	32.6	µg/m ³

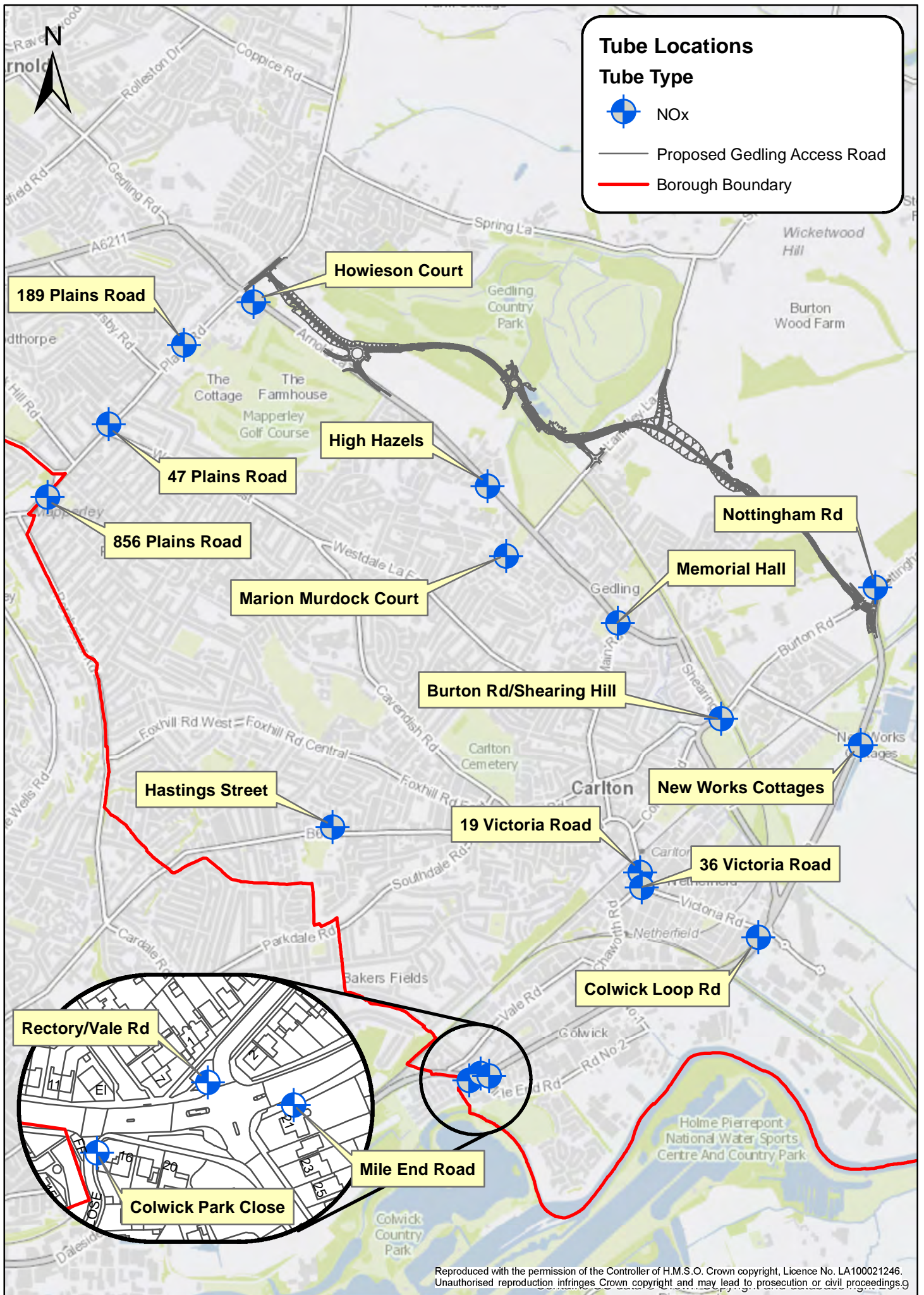
Mansfield Road – Redhill North Calculation for Distance to Receptor

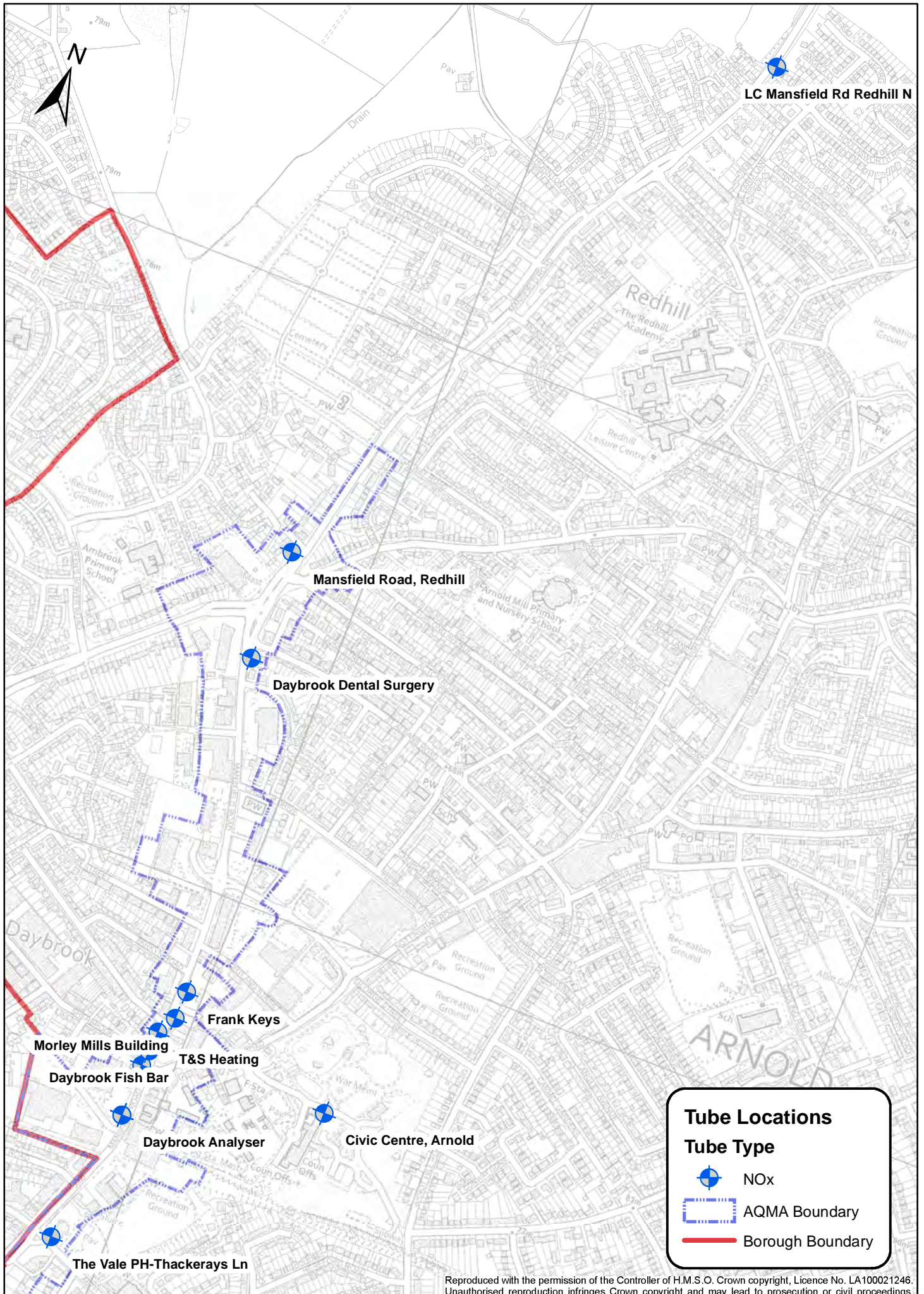
Appendix D: Maps





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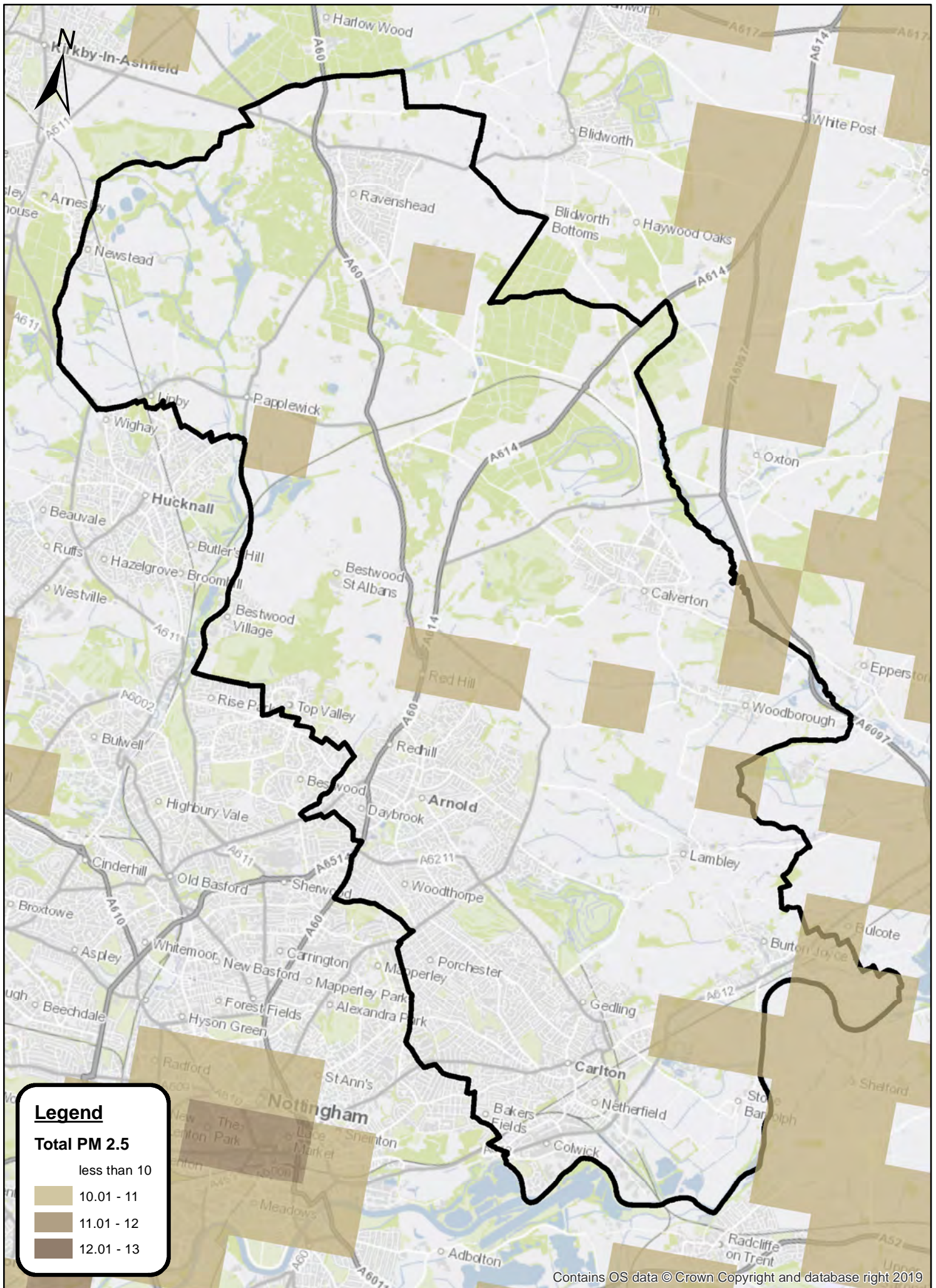




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Appendix E: Summary of Air Quality Objectives in England

Table E.1 – Air Quality Objectives in England

Pollutant	Air Quality Objective ¹⁰	
	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

¹⁰ The units are in microgrammes of pollutant per cubic metre of air (µg/m³).

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
CAZ	Clean Air Zone
Defra	Department for Environment, Food and Rural Affairs
EU	European Union
GBC	Gedling Borough Council
HGV	Heavy Goods Vehicle
JSNA	Joint Strategic Needs Assessment
LA	Local Authority
LAQM	Local Air Quality Management
NEPWG	Nottinghamshire Environmental Protection Working Group
NO ₂	Nitrogen Dioxide
NO _x	Nitrogen Oxides
NCC	Nottinghamshire County Council
PHE	Public Health England
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
WHO	World Health Organisation
WASP	Workplace Analysis Scheme for Proficiency

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