

2018 Air Quality Annual Status Report (ASR)

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

July 2018

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Report Reference number	NottmCityASR2018
Date	July 2018

Executive Summary: Air Quality in Our Area

Air Quality in Nottingham City Council's administrative area

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

It has been estimated that the annual health cost to society from the impact of particulate matter and nitrogen dioxide in the UK is between £25.3 and £29.7 billion[3].

Nottingham City currently has two Air Quality Management Areas (AQMAs): both for nitrogen dioxide (NO2) and non-compliance with the annual mean Air Quality Objective (AQO).

Latest Air Quality Monitoring data

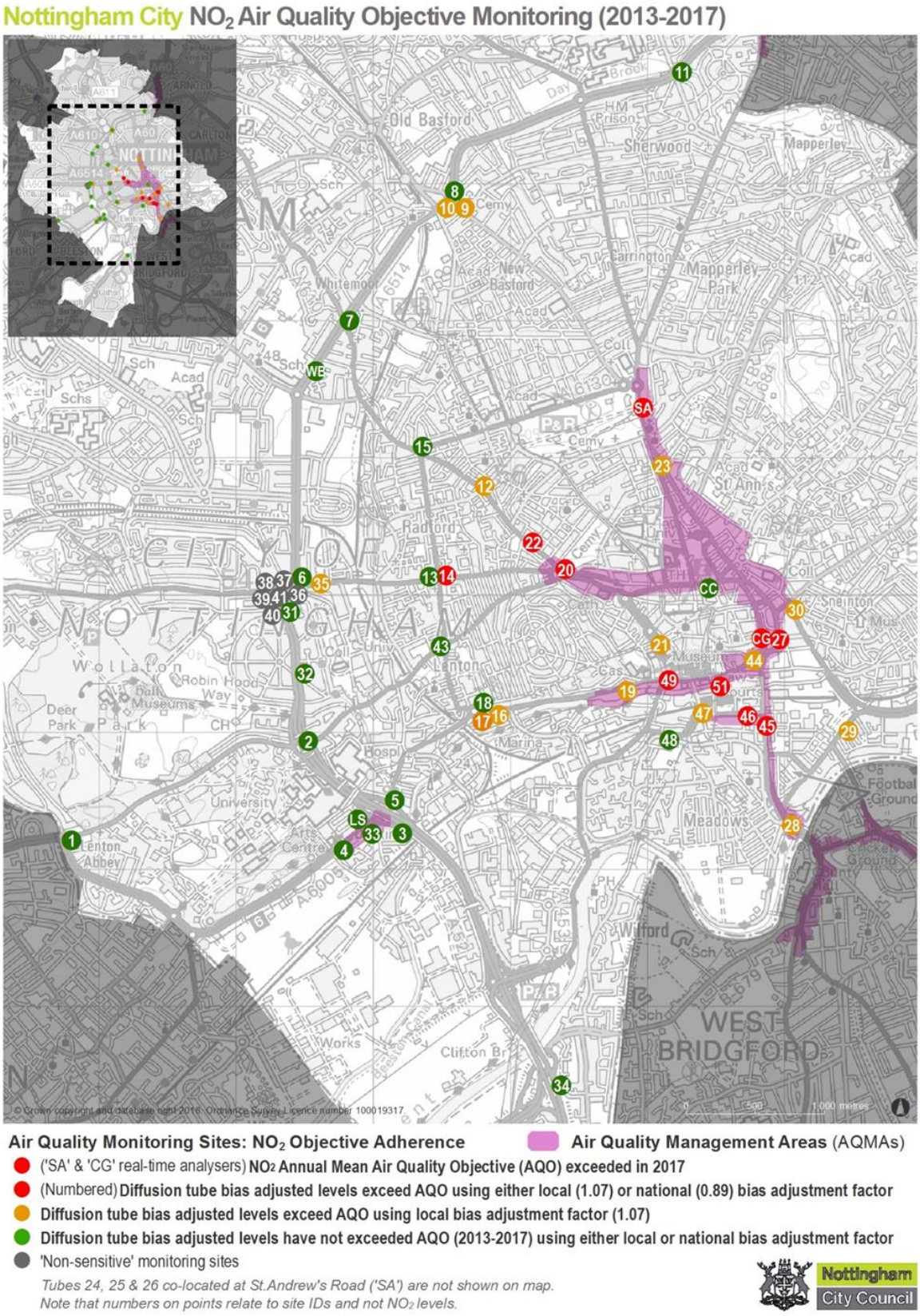
Nottingham uses both real time analysers and nitrogen dioxide diffusion tubes to measure NO2 concentrations.

To assist the visualisation of the monitoring data Figure 1 combines 2017 real time analyser monitoring results, historical monitoring results (from 2013 to 2017) and an approach that highlights the diffusion tube (DT) monitoring locations where an exceedance of the AQO is likely to have occurred.

The 2017 NO2 air quality monitoring data shows that a number of City Centre roads exceeded, or are likely to have exceeded, the NO2 annual mean air quality objective. During 2017 a number of these arterial routes were (and continue to be in 2018) affected by congestion caused by construction and redevelopment activities in the City Centre.

[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. Valuing impacts on air quality: Updates in valuing changes in emissions of Oxides of Nitrogen (NOX) and concentrations of Nitrogen Dioxide (NO2) September 2015.

Fig. 1 Summary of 2017 monitoring data and historical monitoring data from 2013.



What does this mean for Nottingham?

The Environment Act 1995 Section 83 requires that where there are locations where monitoring demonstrates that air pollution levels exceed, or modelling predicts it will exceed, a relevant Air Quality Objective, local authorities must declare an AQMA.

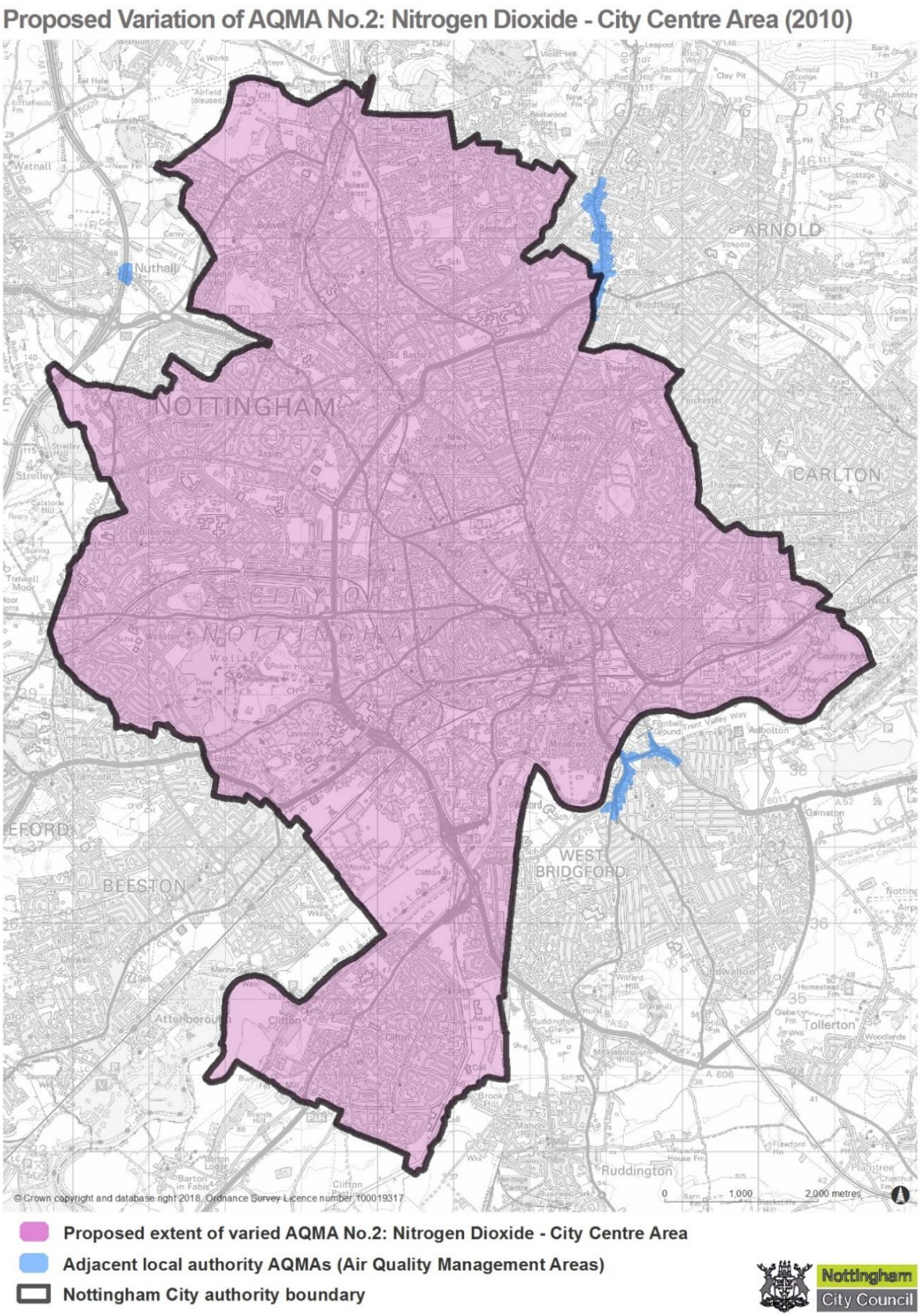
Recent detailed air quality modelling work, undertaken as part of the CAZ project, predicts exceedences of the NO2 annual mean AQO in a number of locations both inside and outside the existing AQMAs and, unless additional action is taken, they will continue to exceed the AQO until at least 2020.

Furthermore, Nottingham City Council has received both specific complaints and wider concerns that, in a number of locations (e.g. outside schools, and at taxi ranks), vehicles regularly wait with their engines idling, contributing to relatively high local concentrations of PM and NO2 in those location, and are thus unnecessarily contributing to ambient pollution levels across the City and wider conurbation. As a number of these locations are currently outside the existing AQMAs Nottingham City Council is unable to use engine anti-idling legislation to discourage this unnecessarily polluting behaviour.

Therefore Nottingham City Council proposes the following:

1. **To vary AQMA No.2 (City Centre) and extend it to encompass the whole of the City's administrative area: to include those areas where monitoring shows the NO2 annual mean AQO was, or was likely, exceeded in 2017, and detailed air quality modelling predicts it is likely to be exceeded in 2018 and 2020.**
2. **To revoke AQMA No.3 (Beeston Road, Dunkirk), as the area will be within the area of the amended AQMA No.2.**
3. **To seek authority from the Secretary of State to be a 'designated local authority' under The Road Traffic (Vehicle Emissions) (Fixed Penalty) (England) Regulations 2002.**

Fig.2 Proposed varied AQMA No.2 (note AQMA 3 revoked)



Actions to Improve Air Quality

Nottingham Local Plan and Emerging Local Plan

Nottingham City Council has been working to improve air quality by reducing emissions of CO2, NOx/NO2 and particles by increasing energy efficiency across Nottingham City Council and Nottingham City Homes building stock, and investing in alternative energy generation.

https://www.nottinghamcity.gov.uk/planning-and-building-control/planning-policy/the-local-plan-and-planning-policy/

Air Quality Strategy

Nottingham City Council along with all other Nottinghamshire Local Authorities and other agencies (e.g. Environment Agency) are signatories to the Nottinghamshire Air Quality Strategy 2008, which details a range of strategies and actions that, if adopted by businesses and individuals, reduce emissions and improve air quality.

In 2016 Nottingham City Council, in conjunction with partners and stakeholders, carried out a review of the Nottinghamshire Air Quality Strategy identifying further opportunities and potential synergies of a range of statutory plans to improve air quality, health and wellbeing. It is proposed to publish the revised strategy in the Autumn 2018.

http://cms.nottinghamshire.gov.uk/nottsairqualityimprovementstrategy2008.pdf

Air Quality Action Plan

The current Air Quality Action Plan (AQAP - embedded within the Local Transport Plan) is focussed solely on reducing emissions from road transport. The AQAP will be revised to cover all significant sources and promote the transition to plant/equipment with lower or zero emissions at point of use.

Fuel cell project

In 2016 Nottingham City Council successfully obtained funding from DEFRA to investigate and trial the feasibility of replacing natural gas fired boiler plant with zero NO2/NOx emission fuel cell technology.

Nottingham City Council Energy Projects Service undertook a successful tender process to appoint a contractor to undertake the design and installation of the fuel cell units. The units are due to be installed and operational by the end of September 2018.

East Midlands Air Quality Network

Partnership working between professions and local authorities is being strengthened by the establishment of an East Midlands Air Quality Network.

This network brings together a range of professions and organisations: public and environmental health, transport and spatial planning, to develop guidance, identify practical solutions and a consistent approach to improve health by reducing emissions of, and exposure to, air pollution.

Nottingham Health and Wellbeing Strategy and Environment Action Plan

Significant work has been undertaken to ensure air quality and its health impacts are recognised and addressed in Nottingham and Nottinghamshire's Joint Strategic Needs Assessments, and improving air quality is prioritised for action within the City's Health and Wellbeing Strategy.

http://www.healthynottingham.co.uk/health-and-wellbeing-strategy-2016-2020/

Nottingham Local Transport Plan

Nottingham City Council has also reduced CO2, NOx/NO2 and particle emissions through its long term commitment to promoting public transport, the expansion of its tram network, walking and cycling and, more recently as technology has developed, the promotion and facilitation of the transition to Zero and Ultra Low Emission vehicles.

Nottingham's local transport plan outlines the City Council's long term transport strategy. Please visit

http://www.nottinghamcity.gov.uk/transport-parking-and-streets/transport-strategies-funding-bids-and-current-consultations/

With respect to reducing nitrogen dioxide concentrations from traffic the transport plan and strategy has, and continues to:

- constrain traffic growth in the City area,
- reduce traffic levels and congestion by facilitating and promoting a comprehensive public transport network, with integrated ticketing,
- encourage and facilitate walking and cycling (active travel)
- encourage and facilitate the transition to Zero and Ultra-low Emission Vehicles

Conclusions and Priorities

Air pollution remains a concern to Nottingham City Council, its citizens and businesses. Monitoring results in a number of locations show continuing, new, or renewed exceedances of the NO2 annual mean AQO, and there is greater awareness and individual citizen experiences of localised air pollution problems.

Monitoring data indicates that roadside locations with lower levels of traffic congestion and/or greater opportunity for dispersion and dilution, e.g. Lace Street, Western Boulevard AURN, and most of the DTs in sensitive receptor locations along the ring road, did not exceed the NO2 annual mean AQO. The diffusion tube location DT 10 Valley Road/Nottingham Road Junction, a relatively narrow stretch of road compared to other parts of the ring road, is subject to high traffic volumes and congestion and the bias adjusted annual mean NO2 concentration potentially exceeded the AQO.

St Andrews Road and Carter Gate monitoring stations measured an increase in the annual mean NO2 concentration, with both measuring 41 ug/m3, exceeding the annual mean AQO by 1 *u*g/m3.

Detailed air quality modelling undertaken for the CAZ feasibility study predicts future non-compliance in locations outside the AQMAs.

It is therefore necessary to vary (or declare a new AQMA) to include the locations of probable non-compliance outside the existing AQMAs.

Priorities to improve air quality

The local (and conurbation wide) priority to improve air quality continues to be how to reduce levels of nitrogen dioxide, and identify and implement practicable measures to reduce particle emissions and concentrations in the City area.

The local priorities and challenges to improve air quality in Nottingham and reduce emissions are:-

i. Clean Air Zone (CAZ) - complete the CAZ feasibility/implementation project, and achieve sign off for any proposals from the Secretary of State,

ii. Progress the declaration of a new, or variation of an existing AQMA, to encompass locations of non-compliance with the annual mean NO2 air quality objective.

iii. Seek 'designation' from the Secretary of State for designation under The Road Traffic (Vehicle Emissions) (Fixed Penalty) (England) Regulations 2002, to enable The Council to take action against drivers unnecessarily idling a vehicles engine.

iv. Go Ultra Low Nottingham - complete the range of initiatives and projects and secure additional funding to facilitate the take-up of Ultra Low Emission Vehicles (ULEV) in Nottingham,

v. Complete the feasibility study into a low emission zone for the City Centre and identify/secure funding for implementation,

vi. Continue, and secure further funding, to complete the transition to zero and low emission public transport (fully electric and compressed natural/bio gas fuelled buses),

vii. Work with Nottingham's taxi companies to introduce low and zero emission vehicles.

viii. Adopt/integrate East Midlands Air Quality Network Air Quality and Emission Mitigation guidance as Supplementary Planning Guidance in the Local Plan.

ix. Further develop plans and secure funding for extension of Nottingham's Tram network (lines 4 and 5),

x. Work with major private and public sector employers to review vehicle use to reduce emissions,

xi. Continue to roll-out/improve energy efficiency in Nottingham City Council's housing stock, as and when funding permits,

xii. Promote energy efficiency and the transition to/installation of alternative technologies that significantly reduce/negate NO2/NOx emissions in the commercial/industrial sector,

xiii. Identify opportunities and secure further funding to transition Nottingham City Council commercial vehicle fleet to ULEV (25% of Nottingham City Council's fleet are electric vehicles (EV), and a further four battery EV refuse collection vehicles and ten street sweepers will be in operation by end of 2018).

xiv. Identify and implement practicable local solutions to reduce particle emissions and concentrations.

Local Engagement and how to get involved

What is the Council doing to reduce emissions?

Nottingham City Council is concerned about air pollution, climate change, and air quality and recognises that these issues are complex and interlinked.

The Council's strategies and action on climate change and public transport have reduced CO2 emissions and air pollution in the City, but the Council recognises it is necessary reduce emissions from the range of sources that generate particles and nitrogen dioxide and impact on health further.

Portfolio Holders Air Quality Steering Group

This group comprises Nottingham City Council's Portfolio Holder for Energy and Environment (including Air Quality), Corporate Director of Development, Director of Transport, Director of Public Health, Head of Environmental Health and Safer Housing, and officers from their teams. It develops strategies, policies and implementation plans to deliver improved air quality in Nottingham.

Health and Wellbeing Board

This group comprises Nottingham City Council and a large number of organisations, including Primary Health Care commissioners and providers, Registered Social Landlords, and third sector organisations.

http://www.healthynottingham.co.uk/

Public health Steering Group

This group comprises officers from Public Health England, Nottingham City Council and Nottinghamshire County Council Public Health teams, the NHS, Nottingham City

Council's Environmental Health service, and a representative of Nottinghamshire's district Environmental Health services.

The group identifies current and emerging public/environmental health issues that require joint and concerted action to resolve, and prepares reports and chapters for the Joint Strategic Needs Assessment, used to inform the Health and Wellbeing Board and its formulation of Strategy.

Health and Wellbeing Board Air Quality group

Reporting to the HWb Board, this group comprises Officers from Nottingham City Council, the Health Sector: Clinical Commissioning Group, Nottingham University Hospitals Trust, Circle; East Midlands Ambulance Service, Nottinghamshire Fire and Rescue Service, Nottingham Trent University and University of Nottingham, and co-ordinates action to improve air quality across HWb Board member organisations.

What can I do to improve air quality?

When burned in air, carbon containing fuels e.g. wood and fossil fuels, emit carbon dioxide, nitrogen oxides (NOx) – nitrogen oxide (NO) and nitrogen dioxide (NO_2), and particles (including PM_{10} and $PM_{2.5}$). Although it does not affect local air quality, carbon dioxide is a greenhouse gas and contributes to climate change.

Nitrogen dioxide and particles adversely affect local air quality therefore reducing emissions of these pollutants will improve air quality.

Measures that help to reduce emissions of air pollution and thereby improve air quality:-

Travel choices: walk, cycle, public transport, journey/travel planning

Walking and cycling, also known as 'active travel', have mental and physical health benefits in addition to reducing air pollution. Follow the links below for more information:

Walking in Nottingham: http://www.nottinghamcity.gov.uk/transport-parking-and-streets/rights-of-way-walking-and-cycling/walking-in-nottingham/

Cycling in Nottingham: http://www.transportnottingham.com/cycling/

Nottingham has a high quality public transport network located within the City, including the NET tram network as well as an established bus network with two major operators: Nottingham City Transport and Trent Barton.

Nottingham NET: http://www.thetram.net/

Nottingham City Transport: https://www.nctx.co.uk/

Trent Barton: https://www.trentbarton.co.uk/

A car club is a membership scheme that offers pay-as-you-go basis car rental, At the end of the journey you return your car to its dedicated on-street car club parking space. Nottingham currently has a network for 14 car club vehicles in 11 locations.

Nottingham Car Club: http://www.nottinghamcity.gov.uk/transport-parking-and-streets/public-transport/car-club/

Energy efficiency:

We use energy in the form of electricity or natural gas to heat our homes, cook and power electrical equipment. Insulating our homes and using energy efficient appliances reduces energy consumption and emissions, both at power stations and locally from domestic gas boilers and gas cookers.

Visit http://www.energysavingtrust.org.uk/ for ideas on home to save energy and money.

Clean Air Day

On the 21st June 2018 Nottingham, together with other Cities and organisations across the UK, participated in the second (National) Clean Air Day. The aim of the day was to raise awareness about air pollution, what people can do, and publicise via social media what people did, to reduce emissions and their exposure to air pollution. Please visit https://www.cleanairday.org.uk/

https://www.cleanairday.org.uk/best-practice-in-nottingham

https://www.cleanairday.org.uk/Pages/Category/nottingham for more information.

Although promoted as a single ‘Clean Air Day’, the event is to highlight the year round issue of air pollution and its effects on health, enable Citizens identify what they can do on Clean Air Day and in the future to reduce personal exposure to air pollution, reduce emissions, and improve air quality.

For more information, to comment or raise your concerns about air pollution and air quality please visit

http://www.nottinghamcity.gov.uk/environmental-health-and-safer-housing/environmental-health-and-safer-places/air-pollution-and-air-quality/

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1 Local Air Quality Management

This report provides an overview of air quality in Nottingham City Council during 2017. 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 (AQOs) are likely to be achieved. Where an AQO is not met, or not likely to be achieved 'by the due date' (specified in the objectives; all of which have now passed) 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 Nottingham City Council to improve air quality and any progress that has been made towards meeting the AQO.

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

In 2003 and 2010 detailed air quality modelling undertaken by Nottingham City Council predicted the likely exceedence of the NO2 annual mean AQO of 40 ug/m3 on, and in the vicinity of, a number of the busiest and congested roads in the City and thus the need for the two AQMAs. Source apportionment, undertaken as part of the modelling, confirmed that the exceedance was primarily due to NOx/NO2 emissions from road traffic.

In 2015 air quality modelling, commissioned as part of the UK Government's National Air Quality Strategy and proposals to introduce Clean Air Zones (CAZs) to improve air quality and meet the EU NO2 annual mean limit value of 40 µg/m^3, predicted Nottingham would not meet the EU NO2 annual mean limit value until after 2020.

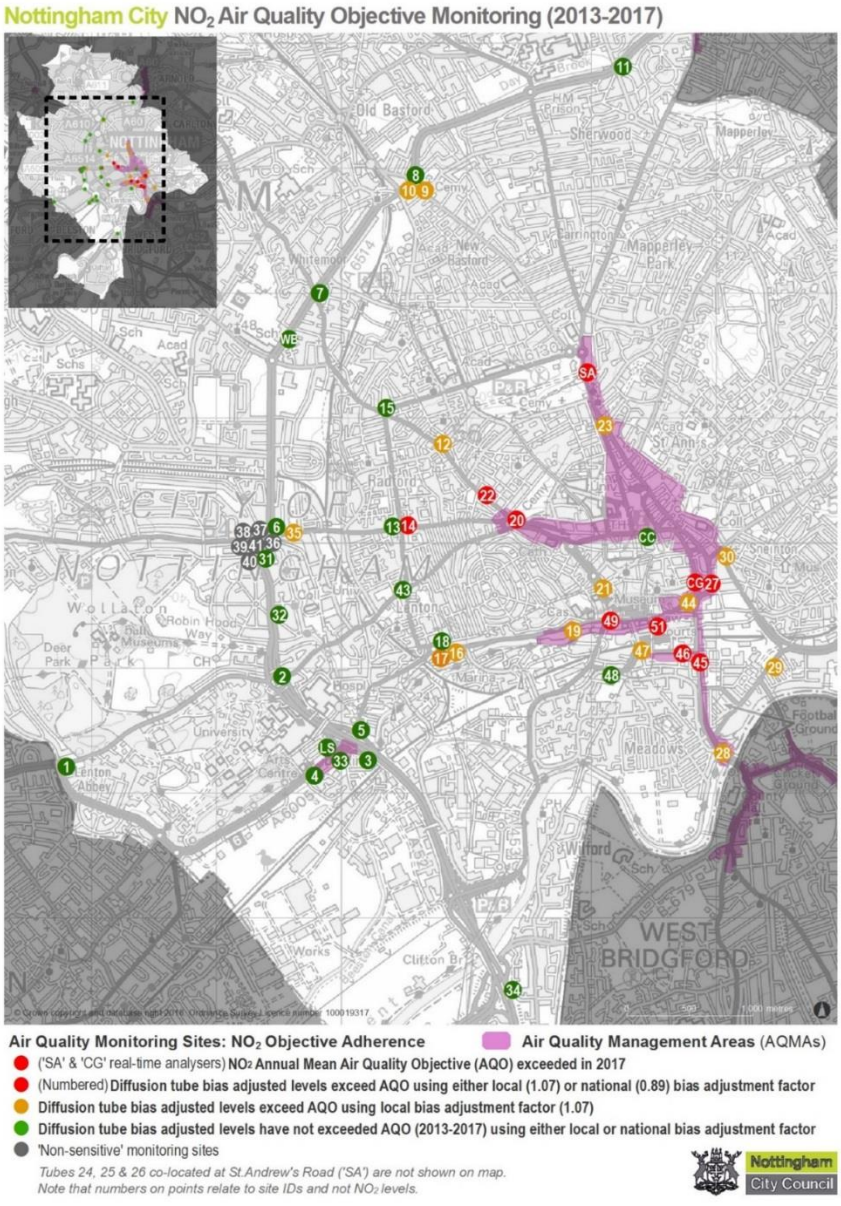
The air quality modelling also identified locations outside the two existing AQMAs where the NO2 concentrations were likely (during the period 2015-2020) to exceed the annual mean AQO. Nottingham City Council therefore commenced a programme of additional monitoring (with diffusion tubes) in a number of locations to provide information for the foreseeable air quality modelling work that would be associated with determining the need for, and extent of any, CAZs.

Throughout 2017 and 2018 Nottingham City Council has been working closely with DEFRA to determine the need for, type and extent of any CAZs.

This report focuses on air quality monitoring data gathered during 2017 and uses the detailed air quality modelling/mapping used to establish the 2016 'baseline' and 2020 model years for the CAZ feasibility work to inform its assessment of the need to declare new AQMAs or to revoke or vary its existing AQMAs.

Please note that this report does not report the CAZ feasibility study and outcome.

Fig 1. Summary of 2017 monitoring data and historical monitoring data from 2013.



2 Actions to Improve Air Quality

2.1 Air Quality Management Areas

Air Quality Management Areas (AQMAs) are declared when there is a measured exceedence or likely exceedence 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 compliance with the objectives.

A summary of AQMAs declared by Nottingham City Council can be found in Table 2.1. Further information related to declared or revoked AQMAs, including maps of AQMA boundaries are available online at https://uk-air.defra.gov.uk/aqma/local-authorities?la_id=188 .

Alternatively, see Figure 1 or Appendix D: Monitoring Locations and AQMAs, which provides a map of air quality monitoring locations in relation to the AQMA(s).

Further information detailing declared or revoked AQMAs, including maps of AQMA boundaries are available online at

https://uk-air.defra.gov.uk/aqma/details?aqma_ref=112 (AQMA No. 2)

https://uk-air.defra.gov.uk/aqma/details?aqma_ref=113 (AQMA No. 3)

and

Nottingham Insight: Nottingham's Local Air Quality Management reports

http://www.nottinghaminsight.org.uk/f/63682/Library/Environment/Air-Quality/

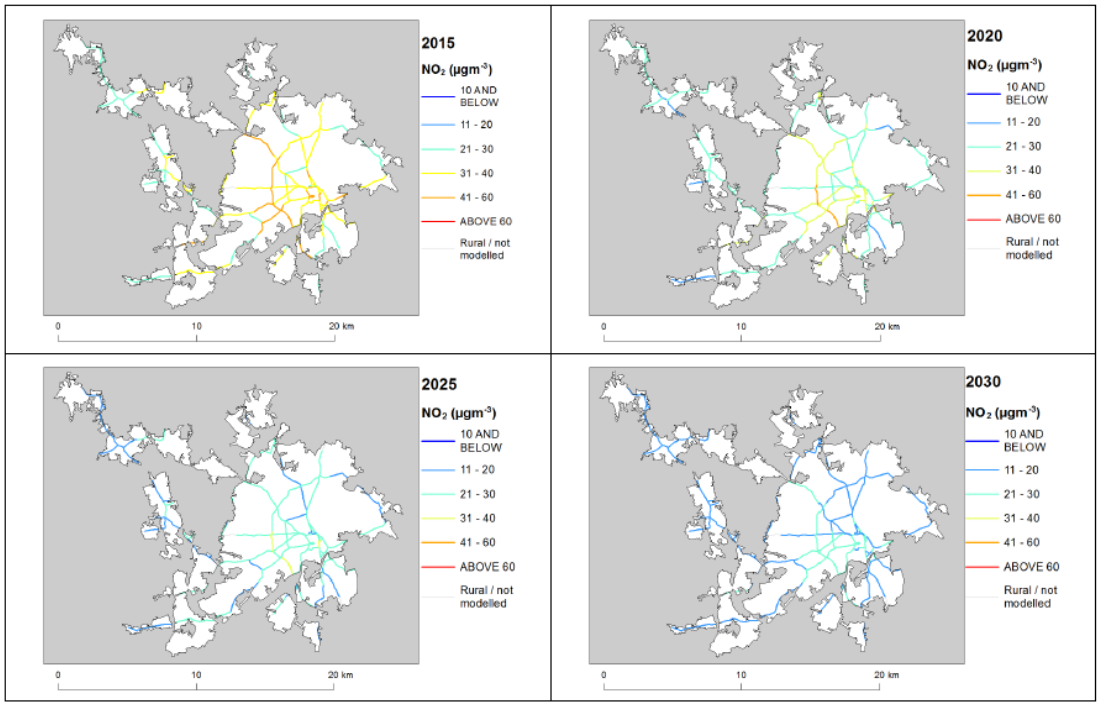
See the full list of Local Authority Air Quality Management Areas at

http://uk-air.defra.gov.uk/aqma/list

The ASR 2016, and iterations of the DEFRA PCM modelling for the National Air Quality Plan (and Clean Air Zones), identified a number of locations outside Nottingham's existing AQMAs where there was likely to be an exceedance of, and more accurately described as 'non-compliance' with, the nitrogen dioxide annual mean air quality objective of 40 ug/m3. (Fig. 3).

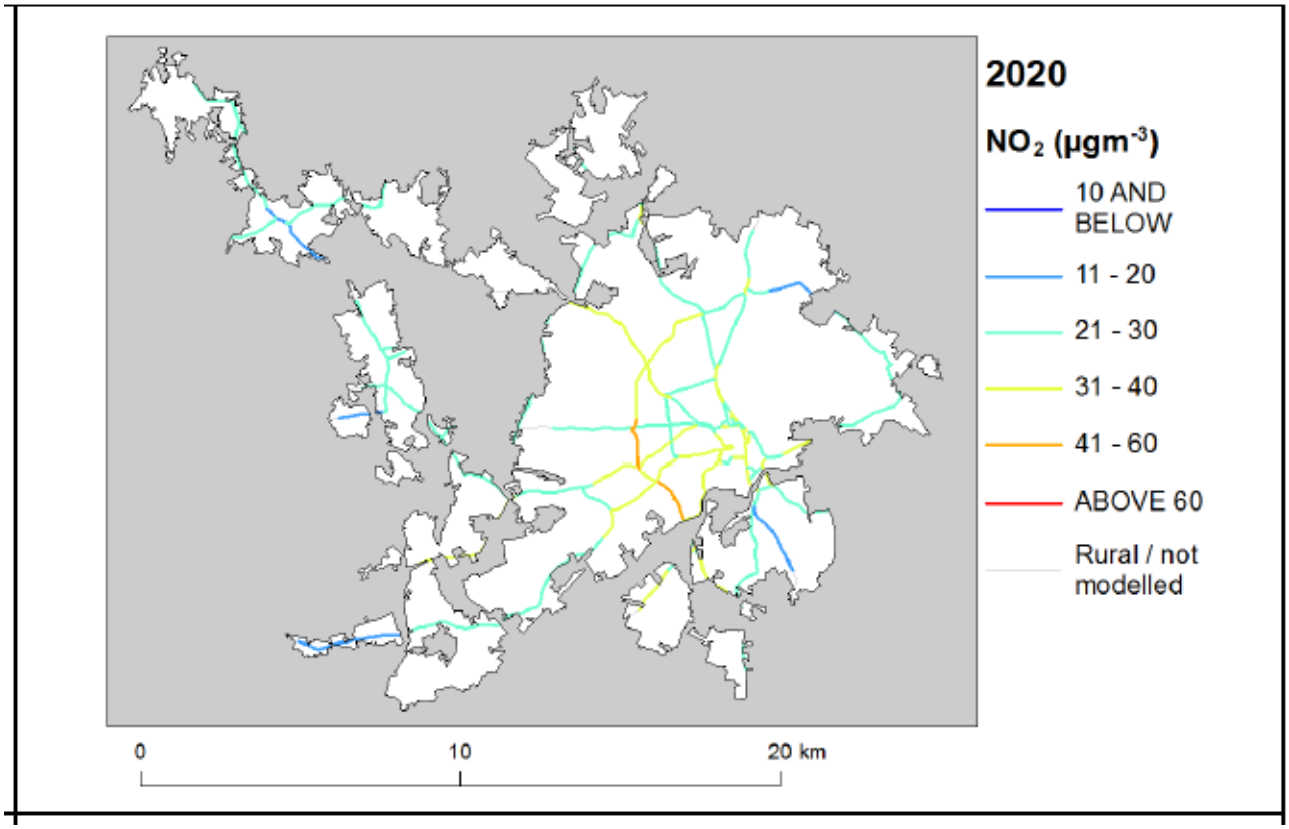
Fig. 3 - Excerpt from National Air Quality Plan (2017)

Figure 9: Roadside baseline projections of annual mean NO_2 concentrations in 2020, 2025 and 2030. 2015 is also included here for reference. Modelled exceedances of the annual limit value are shown in orange and red.



© Crown copyright. All rights reserved Defra, License number 100022861 [2017]

Fig 3a - Enlarged 2020 model prediction from National Air Quality Plan (2017)



Where monitoring or modelling identifies non-compliance of the AQO outside an AQMA the LAQM process requires the local authority to undertake a Detailed Assessment to determine the reasons, potential geographical extent of the non-compliance, and if a new Air Quality Management Area ought to be declared or an existing AQMA varied to encompass the new locations.

Detailed assessment of nitrogen dioxide concentrations and distribution

Nottingham City Council has used the air quality modelling undertaken by consultants, as part of Clean Air Zone feasibility and implementation study, to fulfil the air quality modelling element of a Detailed Assessment. The model required:

1. the compilation of an emissions database (point, line and area sources, and NO2/NOx background concentrations),
2. modelling of traffic flows, and fleet composition changes,
3. use of representative meteorological information,
4. use of a complex air quality modelling application and concentration mapping tool etc.

Appendix F contains information about some of the factors that affect Nottingham's air quality, including its geographic location, the location of other sources of pollution, and meteorology.

Detailed air quality modelling

The CAZ feasibility modelling differs from the Pollution Climate Mapping model, in that it uses local data that is more representative of the local topography, meteorology, large point source emissions and road traffic composition and speeds, than that used in the national PCM model.

As part of the CAZ feasibility work Nottingham City Council was required to provide:

1. A baseline model, verifying the data, model, and predicted NO2 concentrations at receptor locations with local monitoring data,
2. A 2020 'do-nothing' modelled year to identify locations of non-compliance based on forecast changes to fleet composition, vehicle emissions, and traffic growth/flow changes as Nottingham implements a number of route changes in the City Centre.

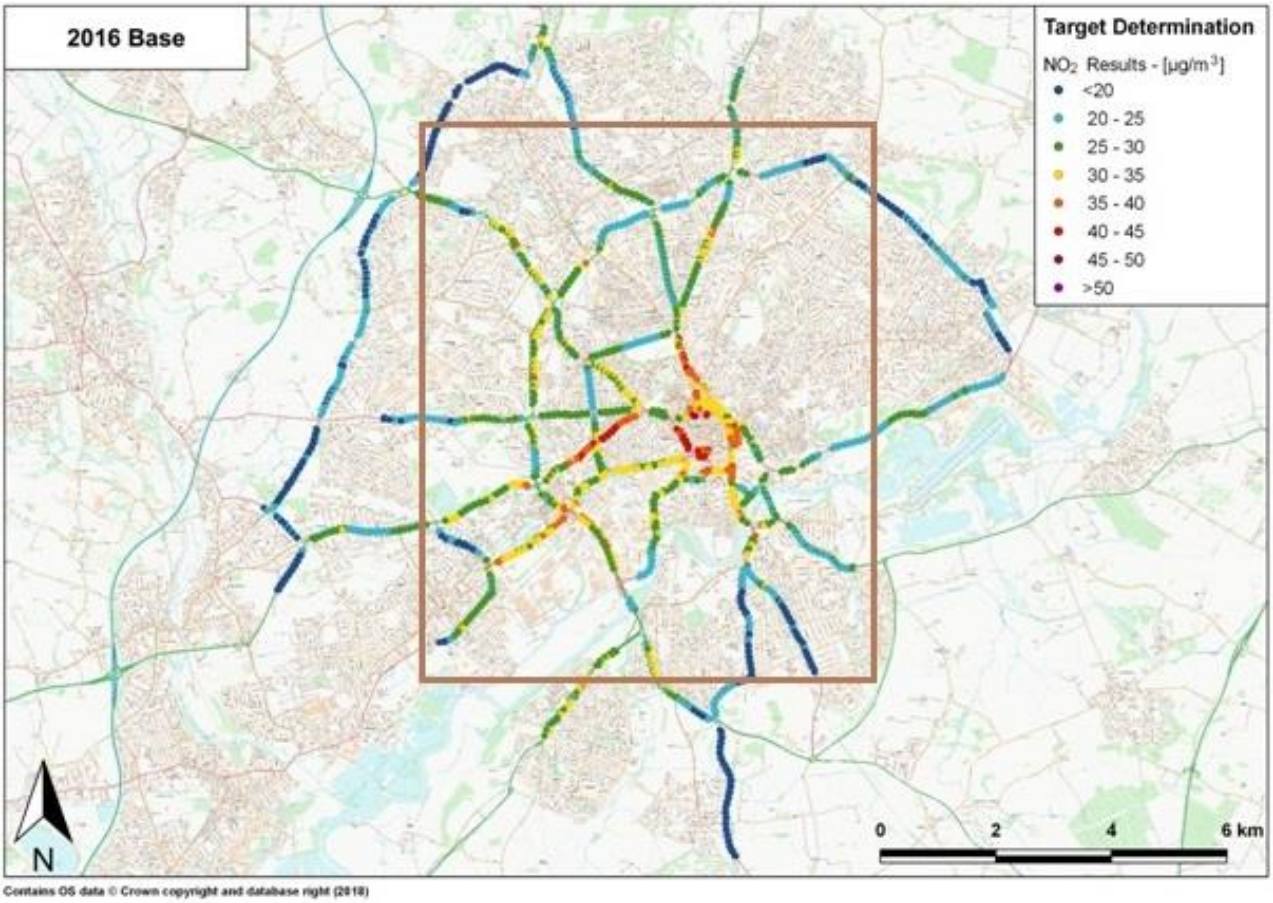
3. An interim year (2018), this was simply interpolated from the 2016 baseline and 2020 ‘do nothing’ model predictions.

Discussion of the model verification and predictions

Differences in the national and local air quality modelling predictions were expected due to the different methodologies used in their preparation, differences in the way the models calculate and predict pollutant concentrations, and the level of detail used in the local model: e.g. more accurate traffic speed/composition data, and topographical information e.g. road widths and tall building/canyon effects.

The baseline 2016 modelled and mapped predictions (Fig. 4) are presented in 5 *u*g/m3 bands and at a higher spatial resolution (<10m spacing) than those predicted by the PCM model (Fig. 3) which only shows modelled concentrations in 10u/gm3 bands (or larger) and by link (100m+ to kilometres in length). The higher resolution modelling is a closer prediction of Nottingham’s 2016 monitored NO2 levels (Fig. 1).

Fig 4. 2016 baseline model predictions.

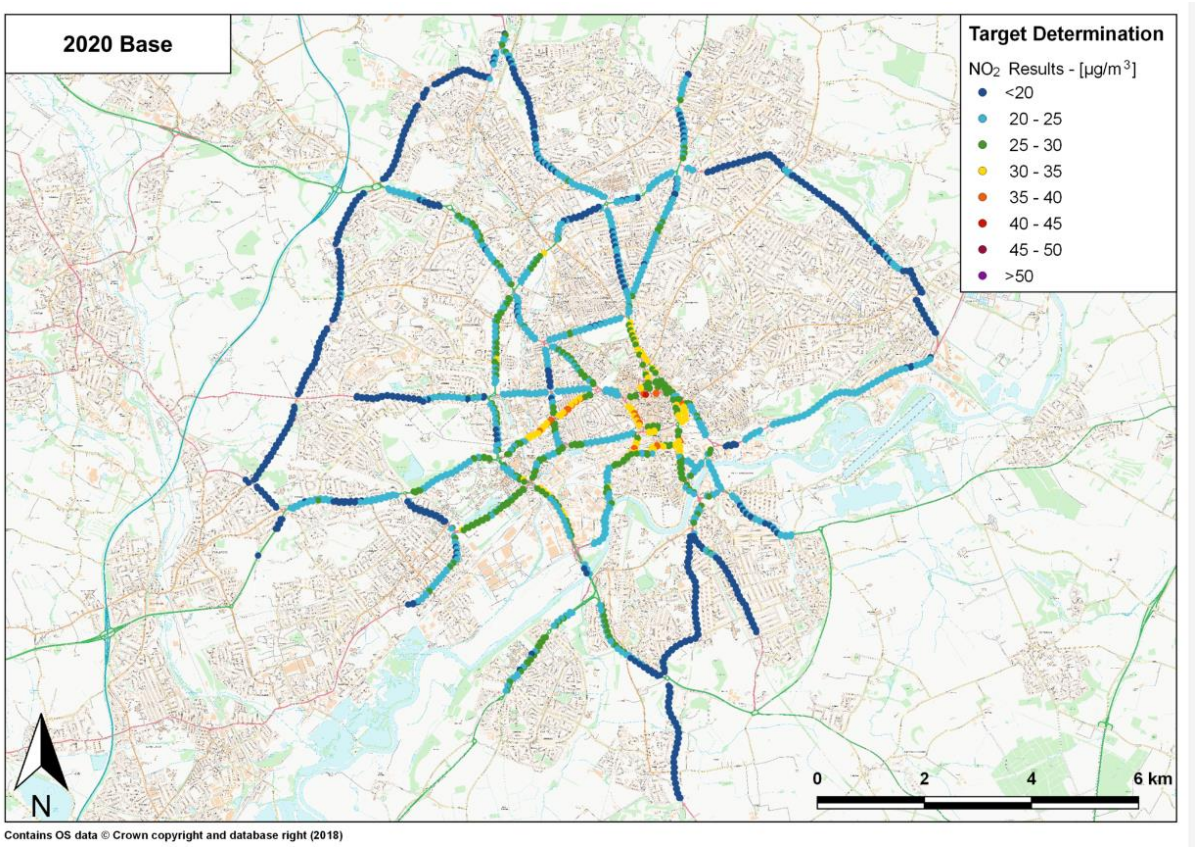


Note: The brown rectangle encloses the area detailed in Fig. 1.

The detailed modelling predicts that annual mean NO2 concentrations exceed 40 ug/m3 in the City Centre, this is in closer agreement with measured levels then the PCM model predictions.

Once a modelling methodology (and data) prediction has been verified against historical monitoring data and determined to give reasonably comparable predictions to measured pollutant concentrations, it may, with care, also be used to make predictions of air quality/pollutant concentrations in future years e.g. 2020 (Fig. 5).

Fig 5. 2020 modelled/predicted NO2 concentrations (without measures)



Detailed information on the model verification process conducted by the consultants will be available in September 2018, when the Clean Air Zone feasibility project has been completed and approved.

Conclusion

Detailed air quality modelling of nitrogen dioxide emissions and dispersion predict that, without further action to reduce nitrogen dioxide emissions, NO2 levels at some locations in Nottingham will continue to exceed the annual mean AQO until, and probably beyond, 2020.

Given the 2016 and 2017 monitoring results, and that detailed air quality modelling predicts exceedances in 2018 and 2020, Nottingham City Council considers it necessary to vary its existing Air Quality Management Areas.

Figure 2 Proposed varied AQMA No.2 (note AQMA 3 revoked)

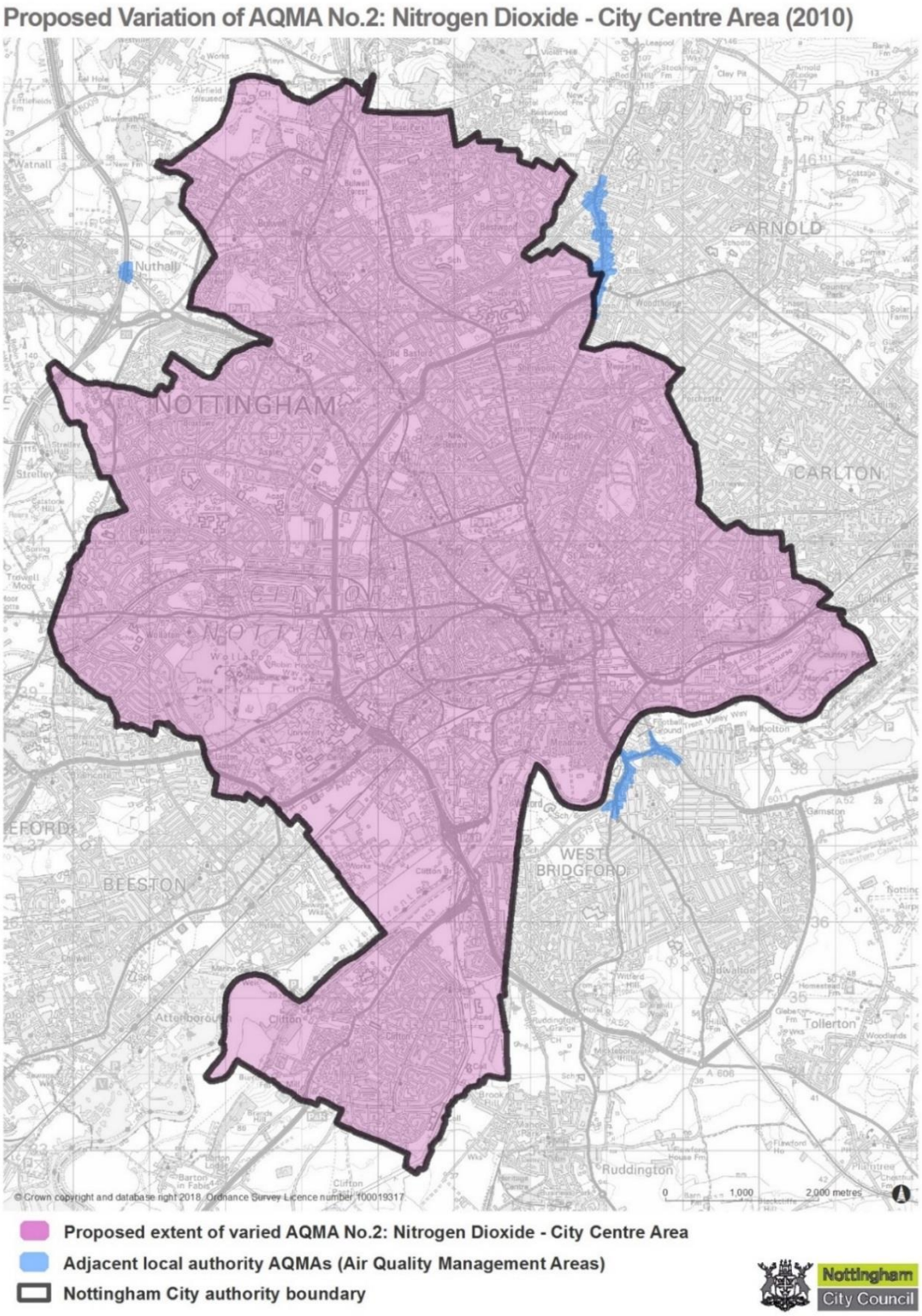


Table 2.1 – Declared Air Quality Management Areas

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 (2017)	
AQMA No. 2 (Carter Gate Real Time Analyser)	Declared 2005, Amended 2010	NO2 Annual Mean	City of Nottingham	An area encompassing the City Centre arterial routes, roads and junctions including: A60, A610, A6002, A6005, A6008, A612 and properties fronting onto these roads.	NO	44 µg/m3	41 µg/m3	Local Transport Plan Implementation Plan 2015-2017 and 2016-2019 http://www.nottinghaminsight.org.uk/insight/search/unified_search.aspx?q=transport plan]
AQMA No. 2 (St Andrews Road RTA)	Declared 2005, Amended 2010	NO2 Annual Mean	City of Nottingham	A60	NO	41 ug/m3	41 ug/m3	
AQMA No. 2 (St Andrews Road Diffusion Tubes 24,25,26)	Declared 2005, Amended 2010	NO2 Annual Mean	City of Nottingham	A60	NO	41 ug/m3	40 ug/m3 lba 41 ug/m3 lba 42 ug/m3 lba 33 ug/m3 nba 35 ug/m3 nba 34 ug/m3 nba	Both local (lba) and national (nba) bias adjustments shown

AQMA No. 2 (Canning Terrace Diffusion Tube 20)	Declared 2005, Amended 2010	NO2 Annual Mean	City of Nottingham	A610	NO	51 ug/m3	49 ug/m3 lba 41 ug/m3 nba	
AQMA No. 2 (Carter Gate Diffusion Tube 27)	Declared 2005, Amended 2010	NO2 Annual Mean	City of Nottingham	A60	NO	41 ug/m3	48 ug/m3 lba 40 ug/m3 nba	Note. Not collocated with Carter Gate real time analyser. DT only 2 meters from A60 and junction.
AQMA No.2 (Castle Boulevard DT 19)	Declared 2005, Amended 2010	NO2 Annual Mean	City of Nottingham	A6002	NO	42 ug/m3	34 ug/m3 lba 29 ug/m3 nba	
AQMA No.2 (Castle Gardens DT 16)	Declared 2005, Amended 2010	NO2 Annual Mean	City of Nottingham	A6002	NO	51 ug/m3	41 ug/m3 lba 34 ug/m3 nba	
AQMA No.2 (Mansfield Rd DT 23)	Declared 2005, Amended 2010	NO2 Annual Mean	City of Nottingham	A60	NO	45 ug/m3	47 ug/m3 lba 39 ug/m3 nba	

AQMA No. 2 (Trent Bridge Dt 28)	Declared 2005, Amended 2010	NO2 Annual Mean	City of Nottingham	A60	NO	42 ug/m3	41 ug/m3 lba 34 ug/m3 nba	
AQMA No. 2 (London Rd DT 45)	Declared 2005, Amended 2010	NO2 Annual Mean	City of Nottingham	A60	NO	42 ug/m3	61 ug/m3 lba 51 ug/m3 nba	
AQMA No. 2 (Station St DT 46)	Declared 2005, Amended 2010	NO2 Annual Mean	City of Nottingham	A60	NO	42 ug/m3	53 ug/m3 lba 44 ug/m3 nba	
AQMA No. 2 (Sheriffs Way DT 47)	Declared 2005, Amended 2010	NO2 Annual Mean	City of Nottingham	A60	NO	42 ug/m3	47 ug/m3 lba 39 ug/m3 nba	
AQMA No. 2 (Castle Blvd DT 49)	Declared 2005, Amended 2010	NO2 Annual Mean	City of Nottingham	A60	NO	42 ug/m3	53 ug/m3 lba 44 ug/m3 nba	

AQMA No. 3	Declared 2005, Amended 2010	NO2 Annual Mean	City of Nottingham	Beeston Road (A6005) and properties fronting onto it.	YES	42 µg/m3	33 µg/m3	Local Transport Plan Implementation Plan 2015-2017 and 2016-2019 http://www.nottinghaminsight.org.uk/insight/search/unified_search.aspx?q=transport plan]
AQMA No. 3 (Beeston Road DT 33)	Declared 2005, Amended 2010	NO2 Annual Mean	City of Nottingham	A6005	YES	42 ug/m3	38 ug/m3 lba 31 ug/m3 nba	
AQMA No. 3 (Beeston Road DT 4)	Declared 2005, Amended 2010	NO2 Annual Mean	City of Nottingham	A6005	YES	41 ug/m3	35 ug/m3 lba 30 ug/m3 nba	

☒ **Nottingham City 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 Nottingham City Council's area

Defra's appraisal of Nottingham City Council's 2017 ASR concluded:

The Report sets out the Annual Status Report, which forms part of the Review & Assessment process required under the Environment Act 1995 and subsequent Regulations.

The Local Authority has two AQMA's that they declared in 2002 and amended in 2010. A further AQMA was revoked in 2007. Both of these current AQMA's are within the central area of the city and are declared for exceedance of the annual mean objective for nitrogen dioxide.

The City Council's current AQAP is contained within the Local Transport Plan, but from 2017 will be a separate document encompassing measures other than transport only measures. The City has a strong recent record on strategies for sustainable and low carbon transport initiatives that are well represented within recent transport and implementation plans. Recent strategies have been based upon restraining traffic in the city, whilst promoting alternatives to private vehicle use through investment in public transport.

Future transport planning involves a joint approach with Derby City Council. Both these cities have been identified by DEFRA for the development of Clean Air Zones by 2020. The Council recognise that there is a requirement to consider AQMA's across the County Council and Highways England road networks within the immediate region, through integrated transport programmes. Measures to date have been based both within and outside of the current AQMA's.

Measures within the current AQAP are wide ranging, including effective network management, effective parking management, travel planning, infrastructure improvements for walking & cycling and passenger transport infrastructure improvements, promotion of cleaner vehicles and development control.

On the basis of the evidence provided by the local authority the conclusions reached are acceptable for all sources and pollutants, with the provisos listed in the commentary below.

Commentary

We recognise the detailed measures that have been developed within the local transport plan over recent years, including several high profile sustainable transport schemes within the City, that can expect to contribute to a strong public transport infrastructure over future years. However, the monitoring information provided within the ASR suggests there is still work to do, in order to achieve the air quality objectives, with a future focus on developing a Clean Air Zone in conjunction with Derby City Council.

1. *On this basis, the action plan needs to reconsider the prioritisation of measures that can significantly impact on reducing pollution below objective levels on a clear understanding of current and future transport management within the city.*
2. *It will also be beneficial to review the level of further emissions reductions required at hotspot locations to achieve the air quality objectives, in order to inform the development of the measures within the new AQAP.*
3. *In relation to reporting, it will be helpful if the monitoring locations can be clearly identified in relation to the AQMA's, to assist in interpreting the results. Current monitoring results reported in Tables A2 and A3 suggests that there are eleven sites with relevant exposure that exceed the annual mean objective for nitrogen dioxide but that only three of these are within an AQMA.*
4. *If the designation of these monitoring sites are correct, these results suggest that the extent of the current AQMA needs reviewing. It may also be beneficial to review the current monitoring and assessment programme as a basis for providing a clear set of local indicators to aid in the assessment of further measures to achieve the air quality objectives.*

Nottingham City Council has considered the issues and specific points raised in the appraisal.

With respect to point 3; Nottingham has revised the way it visually presents the air quality monitoring data (Figure 1) to show clearly those locations where monitoring by real time analysers and bias adjusted diffusion tube data measure or indicate annual mean NO2 concentrations in excess of 40 ug/m3.

With respect to point 4; the opportunity was taken to use the detailed air quality modelling conducted out as part of the Clean Air Zone feasibility/implementation project to review the need for and extent of the AQMAs.

With respect to points 1 and 2; The work undertaken for the CAZ project, based on more accurate local data, has concluded that non-compliance with the NO2 annual mean AQO beyond 2020 is only likely on a number of roads in the City Centre area (See Fig 2 and 2a and Appendix B). Source apportionment identified diesel fuelled buses, and low speed/congestion, as the main contributor to the modelled non-compliances in the City Centre.

Nottingham City Council has taken forward a number of direct measures during the current reporting year of 2017 in pursuit of improving local air quality. Details of all measures completed, in progress or planned are set out in Table 2.2.

More detail on these measures will be found in their respective Action Plans contained within the annual LTP Implementation Plan for 2018-2021. http://www.nottinghamcity.gov.uk/transport-parking-and-streets/transport-strategies-funding-bids-and-current-consultations/

Key completed measures are:

- the completion of the Southern Growth Corridor works,

- Cycle City Ambition Programme Works and

- continuation of the Go Ultra Low City programme.

Further details regarding completed projects are in the LTP 2016/17 Annual Monitoring Report: https://www.nottinghaminsight.org.uk/d/188433 .

Nottingham City Council expects the following measures to be completed over the course of the next reporting year:

- Boots Enterprise Zone

- Sustainable Transport Package.

Nottingham City Council's priorities for the coming year are the Southside Transport Strategy (Broadmarsh) redevelopment works.

The principal challenges and barriers to implementation that Nottingham City Council anticipates facing are implementing the required measures within a coordinated manner, the impact of High Speed Two on travel in the conurbation and future funding uncertainties regarding local and major transport projects.

Progress on the following measures has been slower for the Boots Enterprise Zone Sustainable Transport package than expected due to delays in securing required permission from Network Rail to install a bridge over a live rail line, along with several design refinements for the scheme.

Whilst the measures stated above and in Table 2.2 will help to contribute towards compliance, Nottingham City Council anticipates that further additional measures will be required to achieve compliance and enable the revocation of any remaining AQMAs.

Table 2.2 – Progress on Measures to Improve Air Quality

Measure No.	Measure	EU Category	EU Classification	Organisations involved and Funding Source	Planning Phase	Implementation Phase	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to implementation
1	Southside Transport Strategy (Broadmarsh)	Traffic Management	Strategic Highway Improvements, Reprioritising road space away from cars including Access management, selective vehicle priority, bus priority, high vehicle occupancy lane	Nottingham City Council. Funding from Local Growth Fund, LTP and prudential borrowing.	2014/15 - 2015/16	January 2016-2020		Positive major effect on City Centre AQMA	Works to demolish car park undertaken over 2017.Further roadspace works planned to take place from 2018.	2020	Large-scale regeneration project. High number of dependencies for the works
2	Nottingham Enterprise Zone Sustainable Transport Package	Transport Planning and Infrastructure	Cycle Network	Nottingham City Council. Funding from Local Growth Fund and developer contributions.	2016/17	2016/17 – 2018/19	Public Transport usage (Bus), LTP Indicator: Cycle Index	Nil	Works planned to start in Summer 2018.	March 2019.	Delay due to Network Rail / design refinements
3	Connecting Eastside Phase 2	Traffic Management	Strategic Highway Improvements, Reprioritising road space away from cars including Access management, selective vehicle priority, bus	Nottingham City Council	2017/18	Unknown	Positive major effect on City Centre AQMA		Design work being undertaken at present. Exact implementation date to be determined	To be determined	Funding

			priority, high vehicle occupancy lane								
4	Smarter Travel Hubs / Access Fund	Promoting Travel Alternatives	Personalised Travel Planning	Nottingham City Council	2015	2015/16 – 2019/20	Specific outputs / behavioural change	City-wide effect	Procurement taking place for scheme	2020	
5	Nottingham Workplace Parking Levy (WPL)	Traffic Management	Workplace Parking Levy, Parking Enforcement on Highway	Nottingham City Council	2011	2012 - onwards	WPL liable businesses, WPL compliance	City-wide effect	Ongoing	2037	
6	Midland Mainline Enhancements	Transport Planning and Infrastructure	Public Transport Improvements – interchanges, stations and services.	Network Rail	2016 / 2017	2016 - 2023		Positive Minor effect on City Centre AQMA	Electrification to Nottingham cancelled. New rolling stock may deliver improvements to air quality	2023	Electrification cancelled. Uncertainty relating to enhancements on Midland Mainline. New rolling stock may contribute to improving air quality.
7	A52 Nottingham Junctions Improvement	Traffic Management	Strategic Highway Improvements, Reprioritising road space away from cars including Access management, selective vehicle priority, bus priority, high vehicle occupancy lane.	Highways England	2016-19	2019 onwards		Impact on the Dunkirk AQMA (Area 3)		2021	
8	M1 Smart Motorway	Traffic Management	Strategic Highway Improvements, Reprioritising road space away from cars including Access management, selective vehicle priority, bus priority, high vehicle occupancy lane.	Highways England	2017			Impact on AQMAs along M1 motorway (Greater Nottingham area)	Now on site.	2020	

9	Go Ultra Low Nottingham Programme	Promoting Low Emission Transport	Procuring alternative Refuelling infrastructure to promote Low Emission Vehicles, EV recharging, Gas fuel recharging	Office of Low Emission Vehicles (OLEV)	2015	2016/17 – 2019/20		City-wide effect		2020	
10	Clean Air Zone	Promoting Low Emission Transport	Low Emission Zone (LEZ)	Joint Air Quality Unit	2017/18	2019/20		Likely positive effect. Scope/scale Unknown at present	Initial modelling and scoping of works underway.	2020	Dependent on DEFRA steer relating to Clean Air Zone scope.

2.3 $PM_{2.5}$ – Local Authority Approach to Reducing Emissions and/or Concentrations

Local authorities are expected to work towards reducing emissions and/or concentrations of PM2.5 (particulate matter with an aerodynamic diameter of 2.5µm or less. Policy Guidance LAQM.PG16 (Chapter 7). There is clear evidence that PM2.5 has a significant impact on human health, including premature mortality, allergic reactions, and cardiovascular diseases.

Nottingham City Council is implementing and considering the following measures to address $PM_{2.5}$:

Existing measures are focused on:-

i. reducing emissions from transport by constraining traffic growth and encouraging/facilitating walking, cycling and use of public transport and

ii. on-going regulatory activity re Permitted Processes, ensuring compliance with the City's existing Smoke Control Orders, discouraging bonfires and uncontrolled burning, and ensuring construction/demolition activity implement dust minimisation measures.

Additional measures being considered include:-

i. Reducing emissions from non-vehicle fixed and mobile sources and

ii. Planting to reduce weathering/entrainment of soil/surface particles and increasing green surface area for adsorption/impingement/entrapment of particles by foliage.

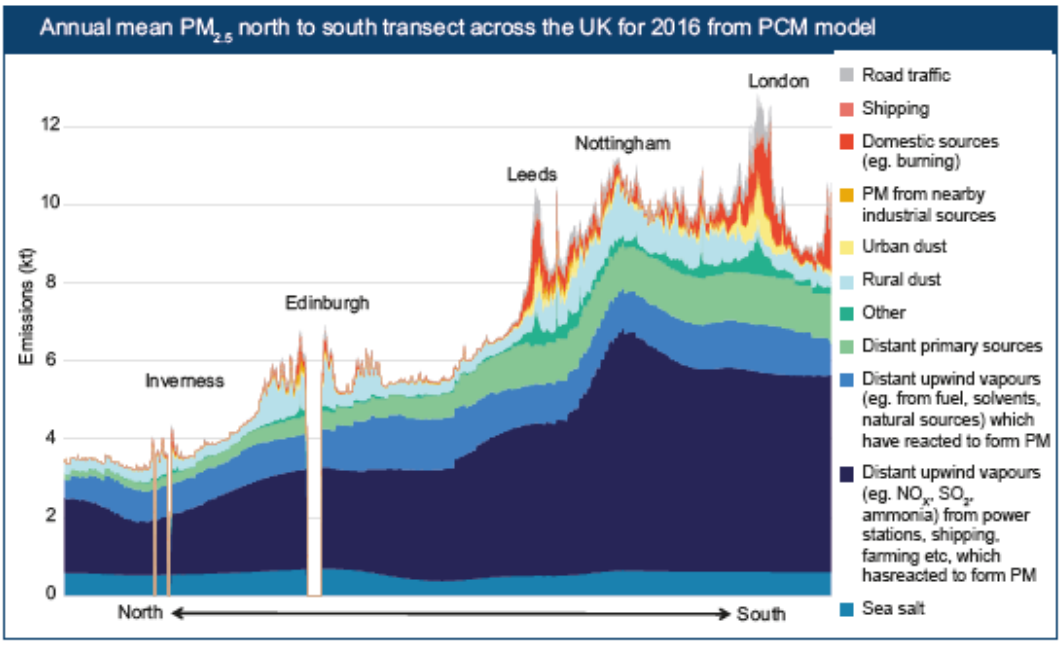
It should be noted that the UK Governments latest consultation on Air Quality (May 2018) details PM2.5 source contribution to annual mean concentrations across the UK, highlighting a number of cities that fall on the chosen transect line, including Nottingham. Fig 12.

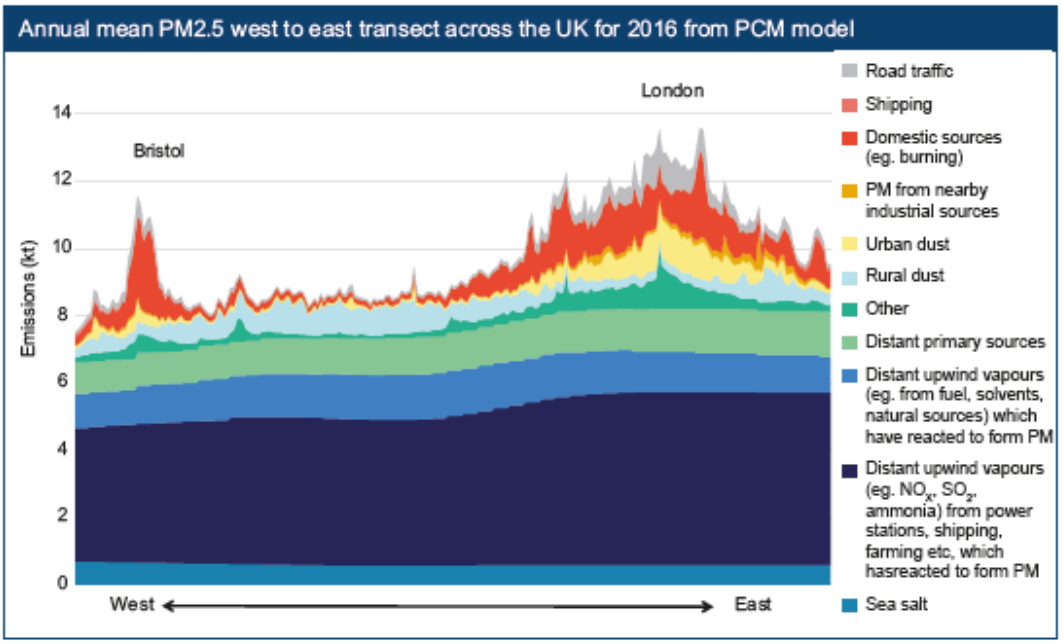
The PCM model indicates that as much as 80% of Nottingham's PM2.5 levels come from distant sources e.g. agricultural sources outside the City's boundary and surrounding the Greater Nottingham conurbation and therefore any action by Nottingham City Council will probably only have a small impact on PM2.5 levels.

Figure 6: PM2.5 distribution and source apportionment from draft Clean Air Strategy 2018 consultation DEFRA May 2018.

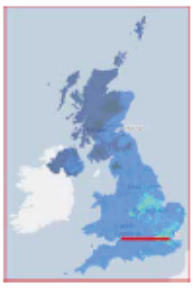
CLEAN AIR STRATEGY

These images show how particulate matter from across the country can build up in the atmosphere as 'background pollution' and the role that this can play in combination with local sources in areas with a pollution challenge.









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

2.4 Summary of Monitoring Undertaken

2.4.1 Automatic Monitoring Sites

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

Nottingham City Council has an air quality monitoring network comprising three NOx/NO2 real time analysers and 49 NO2 diffusion tubes. There are also two DEFRA AURN air quality monitoring stations located in the City area.

Nottingham City Council undertook automatic (continuous) monitoring at three sites during 2017. Table A.1 in Appendix A shows the details of the sites. National monitoring results are available at https://uk-air.defra.gov.uk/data/data_selector

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

Carter Gate NOx (CG), Carter Gate, City Centre

This unit has been located at Carter Gate monitoring since December 2003. The site is a suburban mixed commercial/residential area of the City adjacent to the A60. It is approximately 10 metres from the A60 which is a major traffic route and, approximately 3 metres from a busy B road. It is classed as a ‘Roadside’ site. There are residential properties approximately 12 metres from the unit and 2 metres away from the A60.

Lace Street NOx (LS), Lace Street, Dunkirk

This is a fixed unit located at Lace Street since March 2007. The site is a suburban, mixed education/commercial/residential area of the City adjacent to the A6005, a busy road traffic route. It is approximately 4 metres from the A6005 and 1 metre from a minor road and is classed a ‘Roadside’ site. The unit is located within an enclosure sited on the pavement at the boundary with a residential property and in-line with the front-facade building line.

St Andrews Road NOx (SA), St Andrew's Road, Mapperley

This site was established in June 2010 following the expansion of Nottingham City Council's Air Quality Management Area No.2. The monitoring unit is located on a small residential street - St Andrews Road, approximately 13 metres from the A60 Mansfield Road. The A60 is a major traffic route through the City, and south across the River Trent.

The SA NOx is a fixed unit sited on the pavement at the boundary of a residential property. It is classed as a 'Kerbside' site.

To give a complete overview of Automatic Monitoring Sites in the Nottingham City Area it is also necessary to mention the two DEFRA funded Automatic Urban Rural Network (AURN) stations: at Clinton Street East (comprising a suite of air quality monitoring equipment, including NOx/NO2, PM10 and PM2.5 and classed as an Urban Centre), and Western Boulevard (comprising NOx/NO2 and PM10) near its junction with Aspley Lane (NO2 and PM10 and classed as Roadside).

Further information is available at: https://uk-air.defra.gov.uk/ and

https://uk-air.defra.gov.uk/networks/find-sites

2.4.2 Non-Automatic Monitoring Sites

Nottingham City Council undertook non- automatic (passive) monitoring of NO_2 at 47 different locations during 2017.

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

Maps showing the location of the monitoring sites are provided in Appendix D. Further details on Quality Assurance/Quality Control (QA/QC) for the diffusion tubes, including bias adjustments and any other adjustments applied (e.g. "annualisation" and/or distance correction), are included in Appendix C.

Local Air Quality monitoring results

Figure 1 indicates the spatial distribution of all the air quality monitoring sites in Nottingham. Real time analyser monitoring locations are identified by letters, and diffusion tubes by numbers. Note diffusion tubes 24, 25, 26 are collocated with the real time analyser marked SA.

To assist the visualisation of the monitoring data Figure 1 combines 2017 real time analyser monitoring results, historical monitoring results (from 2013 to 2017) and an

approach that highlights the diffusion tubes monitoring locations where an exceedance of the AQO is likely to have occurred. Nottingham's NO2 diffusion tube monitoring results, adjusted using both the national and local bias adjustment factors, are detailed in Appendix B Table B1.

See Appendix A Tables A1 and A2 for detailed information about the locations, and Table A3 for 2013-2017 monitoring results.

Nottingham's (and the DEFRA AURN station) NO2 real time analysers use the chemiluminescence technique recognised by EU legislation and DEFRA as a reference method for monitoring NO2 concentrations.

In addition to real time analysers, Nottingham uses nitrogen dioxide diffusion tubes to measure NO2 (Appendix B Table B1). Diffusion tubes are not a 'reference method', and only give an average NO2 concentration for the period of exposure. They have low accuracy, and their measurements require a correction, known as bias adjustment. The bias adjustment factor is derived from a collocation study with a local real time analyser (the reference methodology), or by applying a national bias adjustment derived from a large number of national collocation studies (Appendix C). For more information https://laqm.defra.gov.uk/bias-adjustment-factors/bias-adjustment.html

Advice was obtained from the LAQM helpdesk concerning the use of local and national diffusion tube data. Nottingham City Council's 2017 collocation study satisfied the range of criteria (LAQM.TG16. Box 7.11) necessary to have confidence in the use of the local bias adjustment factor in preference to the national bias adjustment factor.

For mapping purposes, and to give comparability with the real time analyser results and greater confidence in the likelihood of exceedance of the AQO, only those locations where applying both local and national bias adjustment factors to the diffusion tube measurements resulted in levels higher than 40 ug/m3 are shown as red dots in Fig. 1.

It will be noted from the data (Appendix A Table 2) and Fig 1. that there are locations outside the existing AQMAs where diffusion tube measurements indicate probable exceedance of the NO2 annual mean AQO of 40 *u*g/m^3.

2.5 Individual Pollutants

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

2.5.1 Nitrogen Dioxide (NO_2)

Nottingham City Council conducts nitrogen dioxide monitoring in 47 different locations (4 diffusion tubes are collocated with real time analysers, 7 tubes are not in a relevant/sensitive location) as detailed in Table A.1 and table A.2.

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

For diffusion tubes, the full 2017 dataset of monthly mean values is provided in Appendix B.

Figure 7

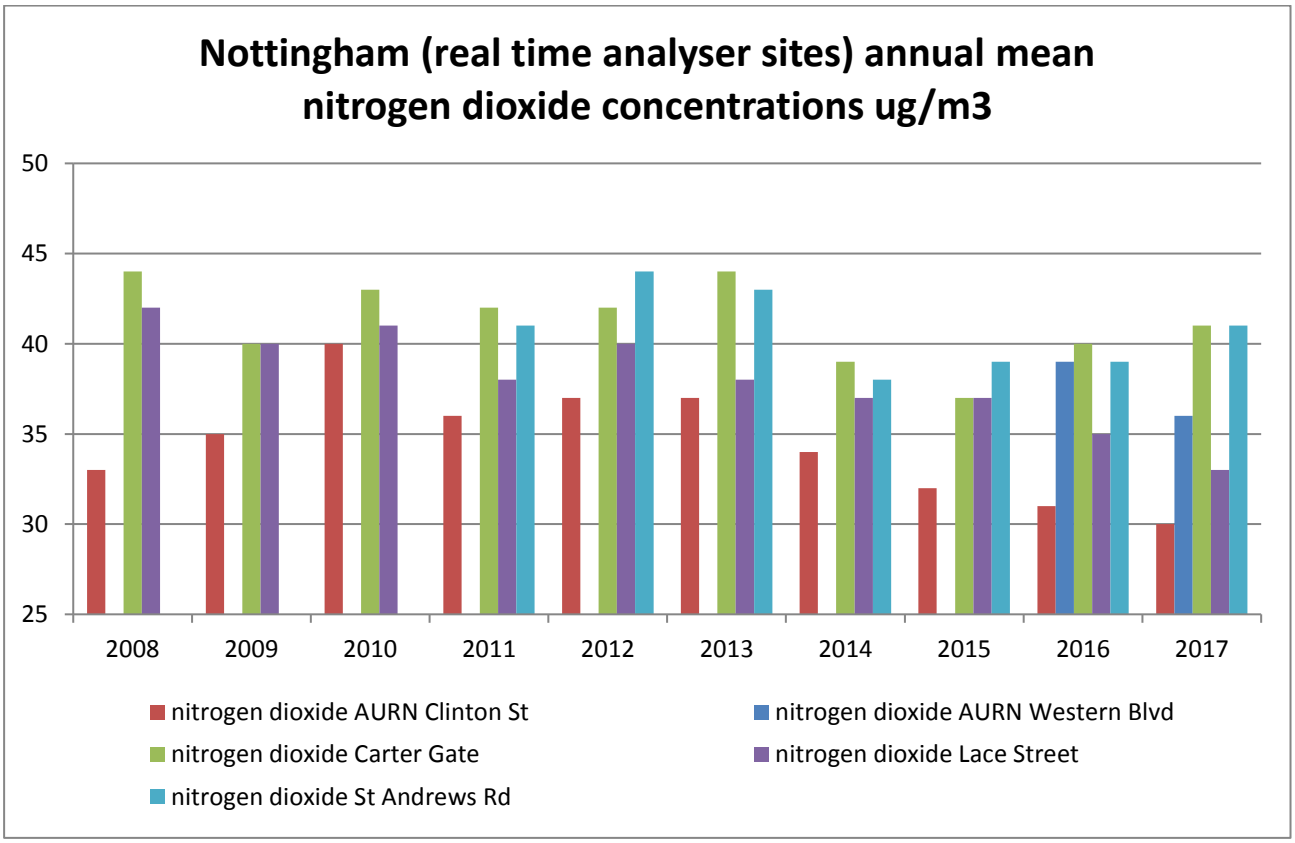


Table A.4 in Appendix A compares the ratified continuous monitored NO_2 hourly mean concentrations for the past 5 years with the air quality objective of 200µg/m^3, not to be exceeded more than 18 times per year.

One of the diffusion tubes (tube 45) show a local 'bias adjusted' annual mean of 61 ug/m3. It is therefore possible that there have been exceedances of the 1-hour air quality objective in this location.

2.5.2 Particulate Matter (PM_{10})

Nottingham City Council does not undertake its own monitoring for PM_{10}. However, monitoring is undertaken at the DEFRA AURN station located in the City centre and therefore reported here. Monitoring since 2011, when the PM_{10} FDMS, unit was installed, shows levels meet both annual mean and daily mean air quality objectives (Fig. 4).

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

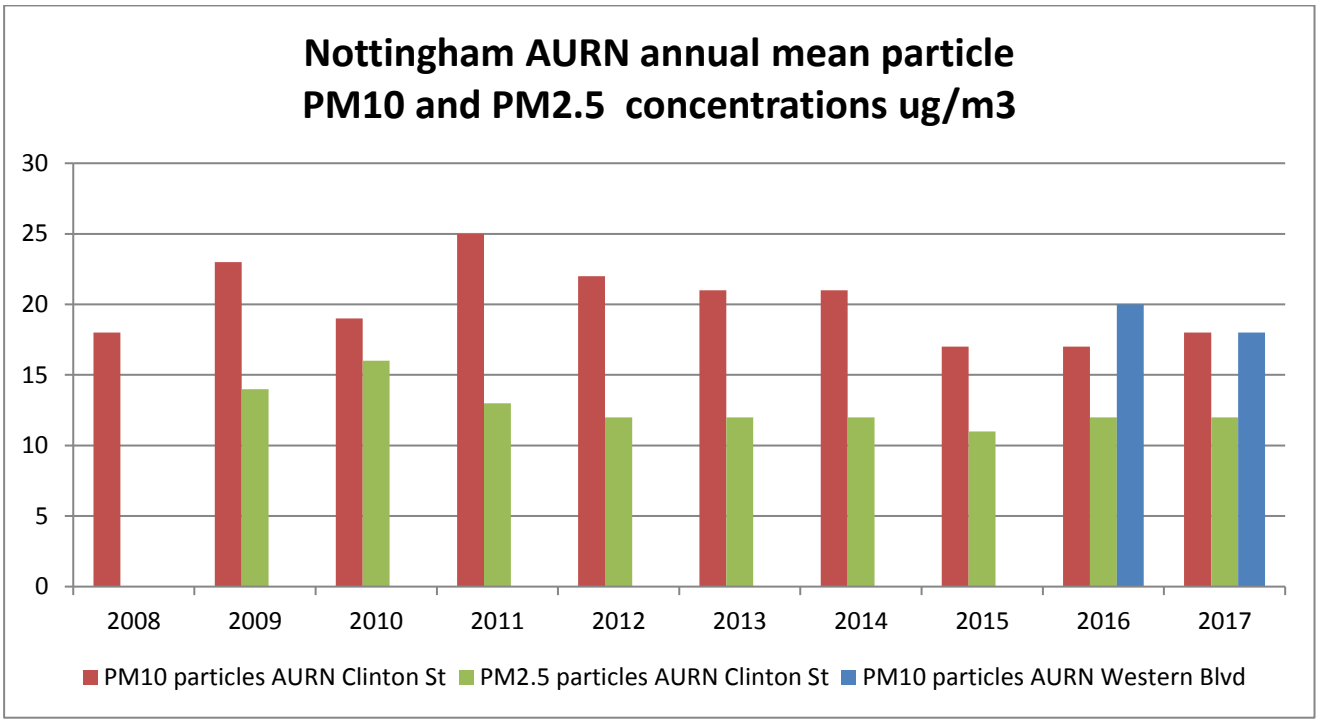
Table A.6 in Appendix A compares the ratified continuous monitored PM_{10} daily mean concentrations for the past 5 years with the air quality objective of 50µg/m^3, not to be exceeded more than 35 times per year.

2.5.3 Particulate Matter ($PM_{2.5}$)

Nottingham City Council does not undertake its own monitoring for PM2.5. However, monitoring is undertaken at the DEFRA AURN station located in the City centre and therefore reported here. There are no air quality objectives for PM2.5 in England.

Table A.7 in Appendix A presents the ratified and adjusted monitored $PM_{2.5}$ annual mean concentrations for the past 5 years.

Figure 8



2.5.4 Sulphur Dioxide (SO_2)

Nottingham City Council does not undertake its own monitoring for sulphur dioxide. However, monitoring is undertaken at the DEFRA AURN station located in the City centre and therefore reported here. Monitoring shows levels meet all air quality objectives.

Table A.8 in Appendix A compares the ratified continuous monitored SO_2 concentrations for year 2017 with the air quality objectives for SO_2.

3.3 Conclusion

Inside the Air Quality Management Areas

AQMA No. 3 Beeston Road, Dunkirk.

The A6005 connecting the A52 ring-road junction at Dunkirk to Woodside Road/Queens Road, Beeston is a significant route for commuters and commercial travel activity as it provides the most direct road transport link between Nottingham, Beeston, Chilwell and Long Eaton. It also provides access to Lilac Grove and the eastern part of the Boots plc site and the Queens Road, Beeston, commercial /industrial area.

University Boulevard, Beeston Road and Dunkirk Island junction, were historically subject to high levels of congestion at peak times, mainly associated with commuter travel, hence the AQMA.

In 2011 work commenced on extensions to the NET tram network, with a tram line running from Nottingham City Centre to Toton. Part of the route runs adjacent to University Boulevard, through the University of Nottingham and NHS QMC campuses, re-joining the A6005 at Abbey Street/Leen Gate.

Traffic disruption during early construction work is likely to have caused the peak in NO2 levels measured in 2012 at Lace Street. However, the ongoing disruption was also likely to have led to commuters finding alternative routes and travel modes into Nottingham as NO2 and traffic levels have been falling since 2013 and, since the Beeston Tram line opened in 2015, have continued to fall.

As monitored levels have remained below the NO2 annual mean AQO since 2013 it is appropriate to consider and prepare for the revocation of AQMA No. 3.

AQMA No.2 City Centre

The City Centre AQMA encompasses a number of major arterial routes of the City, operating close to their efficient capacity.

As a busy City, Nottingham's roads require routine maintenance and regular and emergency repair. Furthermore, the main arterial routes (e.g. A60, A610, A6002) are adjacent to land/sites that are subject to regeneration and redevelopment.

It has been noted that the activity associated with maintenance, repair, traffic management schemes and construction activity on and near them have significant knock-on effects some distance from their location, particularly on the A60 and A610.

It is probable that alterations to access to Station Street and Queens Road, together with preparatory work for the redevelopment of Broadmarsh Centre (aka The Southern Gateway project) has increased congestion on the A60 and A6008, with increases in NO2 from Trent Bridge to St Andrews Road. These increases, although small (1-3 ug/3), are significant as levels at monitoring sites around the City Centre are now again (or in the case of the diffusion tubes probably) above the NO2 annual mean AQO.

Outside the Air Quality Management Areas

Monitoring data from a number of diffusion tubes outside the two existing Air Quality Management Areas indicate exceedences of the NO2 annual mean air quality objective. The detailed assessment predicts exceedence of the NO2 annual mean AQO in a number of locations in 2016, and if no additional measures to reduce emissions are implemented, in 2018 and 2020.

Next steps

It is considered that the diffusion tube data, together with the CAZ project detailed air quality modelling predictions, are sufficiently robust, indicate NO2 levels over and above the NO2 annual mean AQO, and support the need for variation of the existing AQMAs.

Technical guidance (TG16.Feb2018) recommends that local authorities should avoid declaring and then varying/revoking AQMAs year to year as weather and localised temporary changes to traffic flow affect air pollution levels.

In Nottingham, this potentially requires the designation of a substantial geographic area, in order to avoid regular variation of an AQMA or declaration of a number of AQMAs, and include likely/foreseeable future locations of non-compliance.

Furthermore, Nottingham City Council has received both specific complaints and wider concerns that, in a number of locations (e.g. outside schools, and at taxi ranks), vehicles regularly wait with their engines idling, contributing to relatively high local concentrations of PM and NO2 in those location, and are thus unnecessarily contributing to ambient pollution levels across the City and wider conurbation. The majority of these locations are currently outside the existing AQMAs and Nottingham City Council is therefore currently unable to use engine anti-idling legislation to discourage this unnecessarily polluting behaviour.

Therefore

i. to discharge its legal duty under The Environment Act 1995 Section 83,

ii. increase awareness amongst citizens, business, public sector organisations and neighbouring local authorities that air quality is a public health priority,

iii. enable Nottingham City Council to effectively use engine anti-idling powers in locations where it occurs unnecessarily to reduce emissions of NO2 and particles,

Nottingham City Council proposes:

i. to vary AQMA No.2 (City Centre) to include those areas where monitoring shows the NO2 annual mean AQO was, or was likely, exceeded in 2017, and detailed air quality modelling predicts it is likely to be exceeded in 2018 and 2020, and extended to encompass the whole of the City's administrative area.

ii. To revoke AQMA No.3 (Beeston Road, Dunkirk), as the area will be within the area of the amended AQMA No.2.

iii. To seek authority from the Secretary of State to be a 'designated local authority' under The Road Traffic (Vehicle Emissions) (Fixed Penalty) (England) Regulations 2002.

Appendix A: Monitoring Results

Table A.1 – Details of Automatic Monitoring Sites

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Monitoring Technique	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Inlet Height (m)
CG NOx	Carter Gate	Roadside	457946	339668	NO2 NO NOx	Y	Chemiluminescent	12	4	2.5
LS NOx	Lace Street	Roadside	454941	338315	NO2 NO NOx	Y	Chemiluminescent	3	9	1.5
SA NOx	St. Andrews Road	Roadside	456967	341382	NO2 NO NOx	Y	Chemiluminescent	12	13	1.7
CC AURN	Clinton St East.	Urban background	457437	340049	PM2.5,PM10 NO2, NO, NOx O3 SO2	N	FDMS, FDMS Chemiluminescent Ultra Violet Absorption (UVA) Ultra Violet Fluorescence (UVF)	N/A	35	3
WB AURN	Western Boulevard	Kerbside	454573	341643	PM10 NO2	NO	FDMS Chemiluminescent	15	1	2.5

Notes:

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

(2) N/A if not applicable.

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

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)
1	Woodside Road	Roadside	452795	338219	NO2	N	0	10	N	2
2	Derby Road	Roadside	454520	338931	NO2	N	0	23	N	2
3	Marlborough Street	Roadside	455208	338277	NO2	N	0	5	N	2
4	Beeston Rd	Roadside	454784	338146	NO2	Y	0	10	N	2
5	Abbey Street	Roadside	455153	338510	NO2	N	0	5	N	2
6	Western Blvd	Roadside	454466	340111	NO2	N	0	17	N	2
7	Wilkinson St	Roadside	454829	342013	NO2	N	0	21	N	2
8	Nottingham Rd	Roadside	455606	342840	NO2	N	0	13	N	2
9	Nottingham Road	Roadside	455573	342860	NO2	N	0	3	N	2
10	Valley Road	Roadside	455529	342826	NO2	N	0	7	N	2
11	Danethorpe Vale	Roadside	457248	343813	NO2	N	0	17	N	2
12	Bentinck Rd - Sch	Roadside	455809	340800	NO2	N	0	6	N	2
13	Ilkeston Road	Roadside	455439	340131	NO2	N	0	3	N	2
14	Ilkeston Road	Roadside	455485	340135	NO2	N	0	4	N	2
15	Gregory Blvd	Roadside	455358	341086	NO2	N	0	10	N	2
16	Castle Gardens	Roadside	455870	339133	NO2	N	0	3	N	2
17	Castle Boulevard	Roadside	455955	339129	NO2	N	0	5	N	2
18	LP 3P17 Park Road	Roadside	455809	339178	NO2	N	4	27	N	2
19	Castle Blvd	Roadside	456853	339303	NO2	Y	0	4	N	2

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube collocated with a Continuous Analyser?	Height (m)
20	Canning Terrace	Roadside	456399	340191	NO2	Y	0	5	N	2
21	Maid Marian Way	Roadside	457083	339637	NO2	N	0	3	N	2
22	LP 80A01 Alfreton Rd	Roadside	456156	340383	NO2	N	0	3	N	2
23	Mansfield Rd	Roadside	457102	340946	NO2	Y	0	2	N	2
24	St Andrew's Rd B	Roadside	456967	341382	NO2	Y	12	13	Y	1.5
25	St Andrew's Rd M	Roadside	456967	341382	NO2	Y	12	13	Y	1.5
26	St Andrew's Rd T	Roadside	456967	341382	NO2	Y	12	13	Y	1.5
27	Cartergate	Roadside	457963	339681	NO2	Y	0	8	N	2
28	Trent Bridge	Roadside	458060	338276	NO2	Y	0	2	N	2
29	Meadow Lane	Roadside	458459	339011	NO2	N	0	3	N	2
30	LP 53890 Manvers Street	Roadside	458078	339891	NO2	N	0	3	N	2
31	Middleton Boulevard	Roadside	454399	339886	NO2	N	0	17	N	2
32	Middleton Boulevard	Roadside	454493	339402	NO2	N	0	19	N	2
33	Lace Street NOx RTA	Roadside	454941	338314	NO2	Y	0	9	N	2
34	24 Bradbourne Avenue	Roadside	456364	336425	NO2	N	0	23	N	2
35	Lampost 70 Wollaton Road	Roadside	454587	340097	NO2	N	10	3	N	2
36	Western Boulevard Pedestrian Crossing	Roadside	454434	340114	NO2	N	28	1	N	2
37	Wollaton Road Subway	Roadside	454327	340056	NO2	N	30	1	N	2
38	Lampost 180 Wollaton Road	Roadside	454246	340057	NO2	N	11	1	N	2
39	Wollaton Rd/Crown Island Crossing	Roadside	454253	340034	NO2	N	20	1	N	2

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube collocated with a Continuous Analyser?	Height (m)
40	Lampost Middleton Boulevard/Crown Island	Roadside	454321	339931	NO2	N	15	5	N	2
41	Crossing Middleton Boulevard/Crown Island	Roadside	454313	339991	NO2	N	37	6	N	2
42	Inside 328 Derby Road	Roadside	455724	337813	NO2	N	-	-	N	2
43	Outside 328 Derby Road	Roadside	455453	339595	NO2	N	6	3	N	2
44	Parking Post Cliff Road	Roadside	457775	339530	NO2	Y	4	17	N	2
45	66 London Road	Roadside	457871	339051	NO2	Y	3	20	N	2
46	Hicking Building Queens Road	Roadside	457781	339123	NO2	Y	0	3	N	2
47	Sheriffs Way/ Railway Station	Roadside	457398	339183	NO2	Y	23	16	N	2
48	Kinglake Place	Roadside	457151	338953	NO2	Y	0	12	N	2
49	2 Castle Boulevard	Roadside	457150	339384	NO2	Y		4	N	2
TB50	Travel Blank (Byron House)	-	-	-	NO2	-			-	-
51	Trent Street	Roadside	457528	339339	NO2	N		2	N	2

Notes:

(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 NO_2 Monitoring Results

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2017 (%) (2)	NO_2 Annual Mean Concentration ($\mu g/m^3$) (3)					
					2013	2014	2015	2016	2017* LBA 1.07	2017** NBA 0.89
CG NOx	Roadside	Automatic		99	**44**	39	37	40	**41**	**41**
LS NOx	Roadside	Automatic		90	38	37	37	35	33	33
SA NOx	Roadside	Automatic		99	**43**	38	39	39	**41**	**41**
AURN	Urban Background	Automatic		99	37	34	32	31	30	30
AURN	Roadside	Automatic		99				39	35	35
1	Roadside	Diffusion Tube		100	**-**	38	38	35	37	31
2	Roadside	Diffusion Tube		100	-	28	30	27	32	26
3	Roadside	Diffusion Tube		100	-	31	25	25	27	22
4	Roadside	Diffusion Tube		100	40	37	33	32	35	30
5	Roadside	Diffusion Tube		100	-	33	36	33	36	30
6	Roadside	Diffusion Tube		100	33	32	31	30	36	30
7	Roadside	Diffusion Tube		100	32	31	31	31	36	30
8	Roadside	Diffusion Tube		92	37	39	38	38	39	33
9	Roadside	Diffusion Tube		83	36	**42**	**42**	**42**	**46**	39

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2017 (%) (2)	NO_2 Annual Mean Concentration ($\mu g/m^3$) (3)					
					2013	2014	2015	2016	2017* LBA 1.07	2017** NBA 0.89
10	Roadside	Diffusion Tube		100	35	38	39	38	**41**	34
11	Roadside	Diffusion Tube		100	29	30	30	29	34	29
12	Roadside	Diffusion Tube		92	36	35	32	38	**40**	33
13	Roadside	Diffusion Tube		100	-	36	36	35	35	29
14	Roadside	Diffusion Tube		100	-	**45**	**41**	**47**	**50**	**41**
15	Roadside	Diffusion Tube		100	32	32	36	31	35	29
16	Roadside	Diffusion Tube		75	**49**	**52**	**48**	37	**41**	34
17	Roadside	Diffusion Tube		100	-	**42**	**48**	39	38	32
18	Roadside	Diffusion Tube		92	-	32	32	29	32	26
19	Roadside	Diffusion Tube		100	40	40	37	33	34	29
20	Roadside	Diffusion Tube		92	**52**	**50**	**48**	**49**	**49**	**41**
21	Roadside	Diffusion Tube		100	-	**44**	**44**	**43**	**46**	39
22	Roadside	Diffusion Tube		100	-	**48**	**41**	**46**	**48**	**40**
23	Roadside	Diffusion Tube		100	-	**45**	**43**	**46**	**47**	39

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2017 (%) (2)	NO_2 Annual Mean Concentration ($\mu g/m^3$) (3)					
					2013	2014	2015	2016	2017* LBA 1.07	2017** NBA 0.89
24	Roadside	Diffusion Tube		100	-	40	38	36	40	33
25	Roadside	Diffusion Tube		100	-	39	38	36	**42**	35
26	Roadside	Diffusion Tube		100	-	**41**	39	34	**41**	34
27	Roadside	Diffusion Tube		83	-	**41**	**42**	40	**48**	**40**
28	Roadside	Diffusion Tube		100	**42**	**42**	37	39	**41**	34
29	Roadside	Diffusion Tube		100	-	**44**	**42**	**45**	**46**	38
30	Roadside	Diffusion Tube		100	-	**45**	**41**	**45**	**46**	39
31	Roadside	Diffusion Tube		100	-	28	31	29	37	30
32	Roadside	Diffusion Tube		100	-	23	26	27	32	27
33	Roadside	Diffusion Tube		100				34	38	31
34	Roadside	Diffusion Tube		100				27	31	26
35	Roadside	Diffusion Tube		92				**42**	42	35
36	Roadside	Diffusion Tube		100				**49**	**54**	**45**
37	Roadside	Diffusion Tube		100				40	**45**	37

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2017 (%) (2)	NO_2 Annual Mean Concentration ($\mu g/m^3$) (3)					
					2013	2014	2015	2016	2017* LBA 1.07	2017** NBA 0.89
38	Roadside	Diffusion Tube		100				34	38	32
39	Roadside	Diffusion Tube		100				**43**	**46**	38
40	Roadside	Diffusion Tube		100				38	36	30
41	Roadside	Diffusion Tube		100				**55**	**50**	**42**
42	Roadside	Diffusion Tube		42				33	-	-
43	Roadside	Diffusion Tube		92				30	35	29
44	Roadside	Diffusion Tube		92				39	**41**	34
45	Roadside	Diffusion Tube		92				**53**	**61**	**51**
46	Roadside	Diffusion Tube		100				**45**	**53**	**44**
47	Roadside	Diffusion Tube		100				**45**	**47**	39
48	Roadside	Diffusion Tube		83				28	33	27
49	Roadside	Diffusion Tube		100				**51**	**53**	**44**
TB50	N/A blank	Diffusion Tube		100				0	0	0
51	Roadside	Diffusion Tube		75					**49**	**41**

☒ **Diffusion tube data has been bias corrected – note both local and national bias adjusted results are presented**

☒ **Annualisation has been conducted where data capture is <75%**

Notes:

Exceedances of the NO_2 annual mean objective of 40µg/m^3 are shown in **bold**.

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

(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.

* **Local Bias Adjustment factor of 1.07 applied to annual mean**

** **National Bias Adjustment factor of 0.89 applied to annual mean**

Figure A.1 – Trends in Annual Mean NO_2 Concentrations

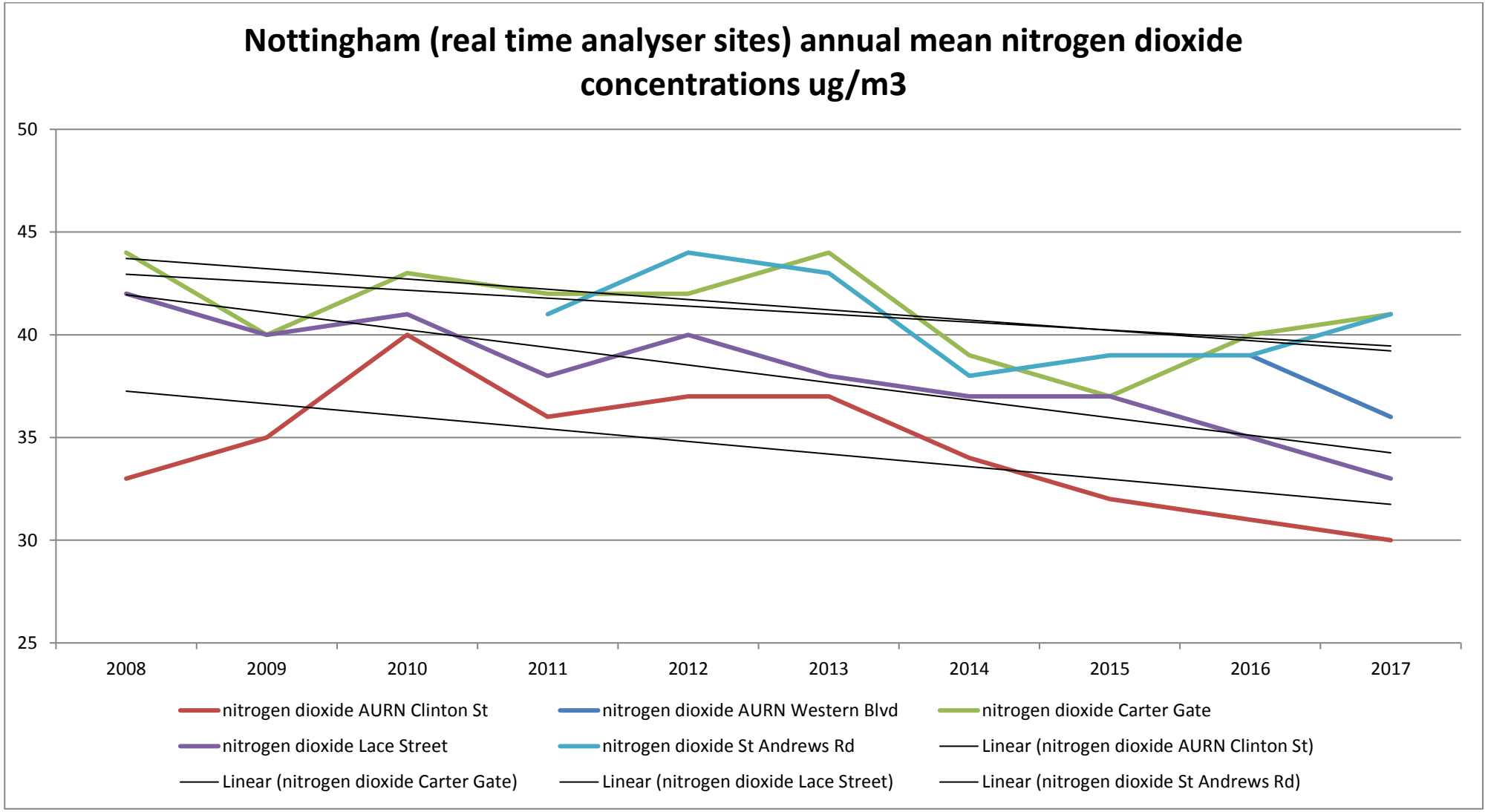


Table A.4 – 1-Hour Mean NO_2 Monitoring Results

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2017 (%) (2)	NO_2 1-Hour Means > 200µg/m^3 (3)				
					2013	2014	2015	2016	2017
CG NOx	Roadside	Automatic	99	99	0	0	0	0	0
LS NOx	Roadside	Automatic	90	90	0	0	0	0	0
SA NOx	Roadside	Automatic	99	99	0	0	0	0	2
CC AURN	Urban Background	Automatic	99	99	0	1	0	0	0
WB AURN	Kerbside	Automatic	99	99	-	-	-	0	0

Notes:

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

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

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

(3) If the period of valid data is less than 85%, the 99.8th percentile of 1-hour means is provided in brackets.

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

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2017 (%) (2)	PM_{10} Annual Mean Concentration (µg/m^3) (3)				
				2013	2014	2015	2016	2017
CC AURN	Urban Background	94	94	21	21	17	17	18
WB AURN	Kerbside	97	97	n/a	n/a	n/a	20	18

Notes:

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

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

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

(3) All means have been "annualised" as per Boxes 7.9 and 7.10 in LAQM.TG16, valid data capture for the full calendar year is less than 75%. See Appendix C for details.

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

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2017 (%) (2)	PM_{10} 24-Hour Means > 50µg/m^3 (3)				
				2013	2014	2015	2016	2017
CC AURN	Urban Background	94	94	8	9	6	4	5
WB AURN	Kerbside	97	97	-	-	-	5	8

Notes:

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

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

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

(3) If the period of valid data is less than 85%, the 90.4th percentile of 24-hour means is provided in brackets.

Table A.7 – $PM_{2.5}$ Monitoring Results

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2017 (%) (2)	$PM_{2.5}$ Annual Mean Concentration (µg/m^3) (3)				
				2013	2014	2015	2016	2017
CC AURN	Urban Background	98	98	12	12	11	12	12

☒ **Annualisation has been conducted where data capture is <75%**

Notes:

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

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

(3) All means have been "annualised" as per Boxes 7.9 and 7.10 in LAQM.TG16, valid data capture for the full calendar year is less than 75%. See Appendix C for details.

Table A.8 – SO_2 Monitoring Results

Site ID	Site Type	Valid Data Capture for monitoring Period (%) (1)	Valid Data Capture 2017 (%) (2)	Number of Exceedances 2017 (percentile in bracket) (3)		
				15-minute Objective (266 µg/m^3)	1-hour Objective (350 µg/m^3)	24-hour Objective (125 µg/m^3)
CC AURN	Urban Background	99	99	0	0	0

Notes:

Exceedances of the SO_2 objectives are shown in **bold** (15-min mean = 35 allowed a year, 1-hour mean = 24 allowed a year, 24-hour mean = 3 allowed a year)

(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 85%, the relevant percentiles are provided in brackets.

Appendix B: Full Monthly Diffusion Tube Results for 2017

Table B.1 – NO_2 Monthly Diffusion Tube Results – 2017

	NO_2 Mean Concentrations ($\mu g/m^3$)															
													Annual Mean			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Raw Data	Bias Adjusted (1)	Bias Adjusted (2)	Distance Corrected to Nearest Exposure (3)
1	42.22	21.08	39.96	39.12	33.76	31.51	30.24	32.06	30.09	32.22	41.69	40.63	34.55	37.0	30.7	37
2	41.74	19.18	33.65	27.78	23.61	23.74	23.08	26.38	30.67	31.93	37.68	35.04	29.54	31.6	26.3	32
3	43.82	16.35	30.26	21.95	22.72	17.76	14.81	18.85	23.37	23.81	33.05	31.36	24.84	26.6	22.1	27
4	44.11	22.25	35.95	30.88	28.53	28.68	30.31	29.62	34.23	36.53	39.43	37.30	33.15	35.5	29.5	35
5	54.08	22.51	39.20	32.98	30.77	27.99	26.61	26.06	27.15	28.60	41.90	40.89	33.23	35.6	29.6	36
6	43.53	19.75	37.26	33.06	27.23	28.49	29.08	31.47	30.49	34.21	42.58	43.11	33.35	35.7	29.7	36
7	45.13	19.80	40.33	37.38	27.50	28.05	28.26	31.38	26.44	34.47	43.31	42.18	33.69	36.0	30.0	36
8	51.43	23.76	0.00	40.11	32.35	36.11	32.64	31.12	36.65	37.48	38.89	45.26	36.89	39.5	32.8	39
9	51.84	0.00	0.00	43.06	36.62	44.78	40.30	38.94	44.42	39.93	48.06	45.92	43.39	**46.4**	38.6	**46**
10	52.44	23.13	40.50	42.71	37.45	35.08	35.10	32.86	37.86	33.82	45.04	45.56	38.46	**41.2**	34.2	**41**
11	41.91	18.05	35.18	38.46	24.40	30.22	27.40	30.42	28.05	32.49	39.06	40.70	32.20	34.4	28.7	34
12	48.87	19.90	36.74	36.23	29.29	29.93	35.18	33.26	33.31	-	68.88	41.16	37.52	**40.2**	33.4	**40**
13	45.64	20.01	39.73	32.22	34.24	29.41	27.51	26.91	31.56	31.25	35.22	33.79	32.29	34.6	28.7	35
14	73.12	27.70	59.22	44.88	43.04	38.38	40.68	38.84	40.15	45.11	57.35	49.76	46.52	**49.8**	41.4	**50**
15	48.38	19.71	35.35	35.46	26.56	27.99	26.94	30.05	31.28	31.39	39.13	38.21	32.54	34.8	29.0	35

	NO_2 Mean Concentrations ($\mu g/m^3$)															
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean		Bias Adjusted (2)	Distance Corrected to Nearest Exposure (3)
													Raw Data	Bias Adjusted (1)		
16	0.00	0.00	44.54	42.53	0.45	34.92	30.76	30.32	35.16	38.99	43.83	46.99	38.67	**41.4**	34.4	**41**
17	53.33	21.35	39.41	39.30	34.27	32.40	34.92	28.49	33.55	20.68	47.67	45.38	35.90	38.4	31.9	38
18	44.66	17.48	31.61	30.99	24.46	23.69	24.80	24.68	27.50	-	36.67	39.08	29.60	32.2	26.3	33
19	49.41	22.46	38.49	33.03	32.00	25.31	24.93	25.06	30.93	31.05	35.58	36.17	32.03	34.3	28.5	34
20	60.96	24.99	52.65	51.27	53.00	42.19	38.08	39.93	45.31	45.18	0.00	48.04	45.60	**48.8**	40.6	**49**
21	58.35	26.83	46.84	51.56	41.97	38.83	41.56	37.43	42.58	39.77	53.15	41.71	43.38	**46.4**	38.6	**46**
22	102.22	23.89	42.89	36.91	43.75	28.91	34.71	36.48	40.46	33.59	67.65	44.89	44.70	**47.8**	39.8	**48**
23	61.18	25.99	48.09	45.40	48.66	37.86	41.12	37.43	49.68	38.68	50.32	43.96	44.03	**47.1**	39.2	**47**
24	48.85	17.45	41.05	42.88	30.80	36.46	26.10	34.56	34.71	38.02	53.48	46.07	37.54	**40.2**	33.4	**40**
25	48.11	21.87	43.22	45.62	28.30	37.59	34.83	39.85	39.55	42.83	41.23	49.58	39.38	**42.1**	35.0	**42**
26	45.83	20.58	38.87	45.23	27.55	35.03	35.74	33.88	38.77	40.71	49.17	48.07	38.29	**41.0**	34.1	**41**
27	49.02	20.28	0.00	40.79	37.81	36.99	33.25	36.84	38.66	41.69	0.28	108.72	44.40	**47.5**	39.5	**48**
28	67.49	22.93	38.96	39.37	36.03	36.19	34.18	32.25	33.65	32.72	41.29	40.49	37.96	**40.6**	33.8	**41**
29	59.93	29.09	47.61	43.53	42.97	37.26	40.21	36.83	39.55	38.58	54.07	47.04	43.06	**46.1**	38.3	**46**
30	63.52	25.43	52.19	42.76	42.95	39.76	40.77	39.53	42.22	42.97	42.92	45.66	43.39	**45.7**	38.6	**46**
31	42.22	17.36	33.70	77.37	27.00	27.60	26.92	27.02	27.93	29.48	37.65	36.58	34.24	36.6	30.5	37
32	44.57	17.54	34.42	31.73	23.13	25.89	25.27	25.51	29.24	31.69	37.81	37.68	30.37	32.5	27.0	32
33	51.34	20.97	39.36	33.61	33.90	30.03	28.78	30.43	33.84	38.49	41.87	41.38	35.33	37.8	31.4	38
34	43.70	17.98	32.85	30.07	23.00	23.08	24.30	26.10	27.55	29.23	34.18	35.35	28.95	31.0	25.8	31

	NO_2 Mean Concentrations ($\mu g/m^3$)															
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean		Bias Adjusted (2)	Distance Corrected to Nearest Exposure (3)
													Raw Data	Bias Adjusted (1)		
35	57.87	21.37	45.78	41.89	33.09	37.29	0.00	31.64	36.30	41.11	40.71	46.92	39.45	42.2	35.1	38
36	69.76	28.72	58.31	43.17	46.03	46.41	42.81	43.49	49.62	58.57	58.81	58.07	50.31	53.8	44.8	34
37	71.61	26.19	49.34	44.08	36.37	36.40	32.39	37.24	34.86	42.91	43.16	50.72	42.11	45.1	37.5	30
38	60.09	20.27	40.70	32.82	34.47	30.88	28.46	27.57	31.66	35.25	41.55	43.13	35.57	38.1	31.7	31
39	69.29	25.26	50.20	36.52	44.17	35.82	34.18	36.37	37.20	44.60	52.78	47.66	42.84	45.8	38.1	33
40	47.92	20.17	48.78	28.43	39.93	26.17	28.55	28.40	28.44	27.72	37.16	39.20	33.41	35.7	29.7	33
41	55.88	19.92	52.06	52.60	47.71	45.35	44.12	42.25	45.99	53.39	52.02	51.83	46.93	50.2	41.8	36
42	47.70	26.00	0.00	31.69	39.36	31.38	0.00	0.00	0.00	-	0.00	0.00	35.22	37.7	31.3	38
43	0.71	71.81	35.77	26.86	29.84	22.69	23.28	22.86	29.27	31.96	34.57	32.60	32.86	35.2	29.2	35
44	60.03	10.66	47.35	38.45	37.17	34.00	33.67	29.07	0.00	36.70	46.44	48.87	38.40	**41.1**	34.2	**42**
45	69.15	27.69	60.47	53.71	47.51	0.00	50.25	50.00	57.19	67.24	73.66	75.27	57.47	**61.5**	51.1	**59**
46	67.43	26.33	54.10	50.82	44.10	41.66	46.22	43.01	49.53	50.78	64.00	52.82	49.23	**52.7**	43.8	**53**
47	65.02	29.77	52.27	42.49	47.93	37.32	39.48	36.50	43.86	39.54	51.13	45.75	44.25	**47.4**	39.4	**52**
48	45.82	16.74	40.18	27.86	24.09	20.10	0.17	0.00	29.88	26.81	33.02	40.61	30.51	32.6	27.2	33
49	71.37	26.33	57.20	59.00	47.94	41.91	47.18	40.56	39.53	46.54	61.99	51.47	49.25	**52.7**	43.8	**41**
50	0.23	0.10	0.31	0.18	0.23	0.37	0.31	0.47	0.26	0.21	0.05	0.35	0.26	0.3	0.2	N/A
51	72.78	31.05	59.82	54.52	27.61	38.90	0.00	38.18	44.89	45.19	4.03	0.00	45.88	**49.1**	40.8	37

☒ **Local bias adjustment factor used (1.07)**

☐ National bias adjustment factor used (0.89)

☒ **Annualisation has been conducted where data capture is <75%**

☒ **Where applicable, data has been distance corrected for relevant exposure**

Notes:

Exceedances of the NO_2 annual mean objective of 40µg/m^3 are shown in **bold**.

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

(1) Local Bias Adjustment applied. See Appendix C for details on bias adjustment and annualisation.

(2) National Bias Adjustment applied.

(3) Distance corrected to nearest relevant public exposure.

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

QA/QC for Diffusion Tube Monitoring

Gradko International supply and analyse Nottingham City Council's diffusion tubes. The organisation is UKAS accredited and is assessed annually for compliance to ISO 17025 and participates in other proficiency schemes.

Gradko have confirmed that their procedures follow the guidance issued on behalf of Defra (AEA Energy & Environment, Feb 2008) relating to the preparation, extraction, analysis and calculation procedures for passive NO_2 diffusion tubes

Gradko participate in a number of QA/QC monitoring systems to demonstrate satisfactory performance including the Workplace Analysis Scheme for Proficiency (WASP) programme to ensure uniformity in data throughout the year.

Precision vs Accuracy (Bias)

A further aspect of QA/QC for a laboratory is the reproducibility of results i.e. precision. Precision should not be confused with accuracy. Diffusion tube precision can be described as the ability of a measurement to be consistently reproduced, i.e. how similar the results of duplicate or triplicate tubes are to each other.

Accuracy represents the ability of the measurement to represent the 'true' value, which for the monitoring results, is defined as the results from the automatic analysers. When averaged over a number of sets of results bias can be evident. This represents the overall tendency of the diffusion tubes to depart from the 'true' value, i.e. to systematically over-or under-read when compared against the reference method.

Once identified, bias can be adjusted for to improve the accuracy of diffusion tube results. This is done using bias adjustment factors which have been found to be specific to a laboratory and tube preparation method. See Appendix A subsection A-1 above.

Unlike bias, poor precision cannot be adjusted for. It can only be improved by careful handling of the tubes in both the laboratory and the field.

The LAQM website provides a link to the summary of precision results for individual laboratories - **Summary of Diffusion Tube Precision 2008-2017 (updated March 2018)**. It can be downloaded as a PDF from http://laqm.defra.gov.uk/diffusion-tubes/precision.html.

The 2017 precision rating for Gradko supplied/analyzed diffusion tubes was 'good'. This precision reflects the laboratory's performance/consistency in preparing and analyzing the tubes, as well as the subsequent handling of the tubes in the field.

Nottingham City Council's collocation study data contributes to the rating. The data spreadsheet also allows NCC to determine whether its collocation study's bias adjustment factor should be used in preference to the national bias adjustment factor derived from collocation studies conducted by other local authorities.

Nottingham City Council's 2017 collocation study results.

Checking Precision and Accuracy of Triplicate Tubes

AEA Energy & Environment
From the AEA group

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	04/01/2017	01/02/2017	48.85	48.11	45.83	48	1.6	3	3.9
2	01/02/2017	28/02/2017	17.45	21.87	20.58	20	2.3	11	5.6
3	28/02/2017	28/03/2017	41.05	43.22	38.87	41	2.2	5	5.4
4	28/03/2017	25/04/2017	42.88	45.62	45.23	45	1.5	3	3.7
5	25/04/2017	30/05/2017	30.8	28.3	27.55	29	1.7	6	4.2
6	30/05/2017	27/06/2017	36.46	37.59	35.03	36	1.3	4	3.2
7	27/06/2017	01/08/2017	26.1	34.83	35.74	32	5.3	17	13.2
8	01/08/2017	30/08/2017	34.56	39.85	33.88	36	3.3	9	8.1
9	30/08/2017	27/09/2017	34.71	39.55	38.77	38	2.6	7	6.5
10	27/09/2017	01/11/2017	38.02	42.83	40.71	41	2.4	6	6.0
11	01/11/2017	05/12/2017	53.48	41.23	49.17	48	6.2	13	15.4
12	05/12/2017	03/01/2018	46.07	49.58	48.07	48	1.8	4	4.4
13									

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

Automatic Method		Data Quality Check	
Period Mean	Data Capture (% DC)	Tubes Precision Check	Automatic Monitor Data
50.6	99.6	Good	Good
38.9	99.8	Good	Good
40.9	99.7	Good	Good
51	99.7	Good	Good
46.9	99.6	Good	Good
30.8	99.6	Good	Good
34.8	96.5	Good	Good
33.9	99.7	Good	Good
34.7	99.6	Good	Good
39.9	99.8	Good	Good
49.3	99.8	Good	Good
41.8	99.6	Good	Good
	Overall survey -->	Good precision	Good Overall

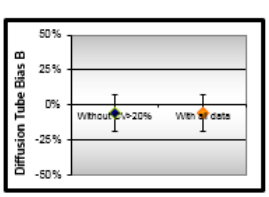
(Check average CV & DC from Accuracy calculations)

Site Name/ ID:

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

Accuracy (with 95% confidence interval) without periods with CV larger than 20%
Bias calculated using 12 periods of data
Bias factor A 1.07 (0.94 - 1.24)
Bias B -7% (-19% - 6%)
Diffusion Tubes Mean: 38 µgm^{-3}
Mean CV (Precision): 7
Automatic Mean: 41 µgm^{-3}
Data Capture for periods used: 99%
Adjusted Tubes Mean: 41 (36 - 48) µgm^{-3}

Accuracy (with 95% confidence interval) WITH ALL DATA
Bias calculated using 12 periods of data
Bias factor A 1.07 (0.94 - 1.24)
Bias B -7% (-19% - 6%)
Diffusion Tubes Mean: 38 µgm^{-3}
Mean CV (Precision): 7
Automatic Mean: 41 µgm^{-3}
Data Capture for periods used: 99%
Adjusted Tubes Mean: 41 (36 - 48) µgm^{-3}



Jaume Targa, for AEA
Version 04 - February 2011

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

National Diffusion Tube Bias Adjustment Factor Spreadsheet — Spreadsheet Version Number: 03/18

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

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

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

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

This spreadsheet will be updated at the end of June 2018

LAQM Helpdesk Website

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

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

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

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

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

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

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

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

Step 4: Where there is only one study for a chosen combination, you should use the adjustment factor shown with caution. Where there is more than one study, use the overall factor[3] shown in blue at the foot of the final column.

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

Analysed By[1]	Method	Year[5]	Site Type	Local Authority	Length of Study (months)	Diffusion Tube Mean Conc. (Dm) (µg/m³)	Automatic Monitor Mean Conc. (Cm) (µg/m³)	Bias (B)	Tube Precision[6]	Bias Adjustment Factor (A) (Cm/Dm)
Gradko	20% TEA in water	2017	R	Borough Council of King's Lynn & West Norf	12	29	25	16.0%	G	**0.86**
Gradko	20% TEA in water	2017	R	Bath & North East Somerset	12	45	45	-0.2%	G	**1.00**
Gradko	20% TEA in water	2017	R	NOTTINGHAM CITY COUNCIL	12	38	41	-6.6%	G	**1.07**
Gradko	20% TEA in water	2017	R	Lancaster City Council	12	35	32	9.7%	G	**0.91**
Gradko	20% TEA in water	2017	R	Thurrock Borough Council	12	54	52	3.3%	S	**0.97**
Gradko	20% TEA in water	2017	R	Thurrock Borough Council	11	35	33	7.0%	G	**0.93**
Gradko	20% TEA in water	2017	R	Thurrock Borough Council	9	33	29	14.3%	G	**0.87**
Gradko	20% TEA in water	2017	UB	Thurrock Borough Council	11	30	28	8.0%	S	**0.93**
Gradko	20% TEA in water	2017	R	Dudley MBC	12	50	50	0.8%	G	**0.99**
Gradko	20% TEA in water	2017	UB	Dudley MBC	12	24	19	26.6%	G	**0.79**
Gradko	20% TEA in water	2017	R	City of Lincoln Council	12	42	31	33.2%	G	**0.75**
Gradko	20% TEA in water	2017	R	Gedling Borough Council	12	35	31	10.1%	G	**0.91**
Gradko	20% TEA in water	2017	R	Gateshead Council	12	36	37	-2.7%	G	**1.03**
Gradko	20% TEA in water	2017	R	Gateshead Council	12	29	25	17.5%	G	**0.85**
Gradko	20% TEA in water	2017	R	Gateshead Council	12	34	35	-5.3%	G	**1.06**
Gradko	20% TEA in water	2017	R	LB Hounslow	12	65	54	22.2%	G	**0.82**
Gradko	20% TEA in water	2017	R	LB Hounslow	12	59	53	10.6%	G	**0.90**
Gradko	20% TEA in water	2017	B	LB Hounslow	11	28	30	-6.0%	G	**1.06**
Gradko	20% TEA in water	2017	R	LB Hounslow	11	43	34	28.8%	G	**0.78**
Gradko	20% TEA in water	2017	B	LB Hounslow	9	38	33	14.9%	G	**0.87**
Gradko	20% TEA in water	2017	R	LB Hounslow	11	52	42	24.4%	G	**0.80**
Gradko	20% TEA in water	2017	UB	Liverpool	11	20	17	15.2%	G	**0.87**
Gradko	20% TEA in water	2017	R	North Ayrshire Council	12	26	21	23.2%	G	**0.81**
Gradko	20% TEA in water	2017	R	South Gloucestershire Council	12	25	23	10.3%	G	**0.91**
Gradko	20% TEA in water	2017	KS	Marylebone Road Intercomparison	12	101	79	28.6%	G	**0.78**
Gradko	20% TEA in water	2017		**Overall Factor[3] (34 studies)**				**Use**		**0.89**

QA/QC Information for Automatic Monitoring

Quality Control, Maintenance, Calibration

AURN Site

The analysers at the AURN site are subject to a four weekly calibration regime. The calibrations are undertaken by a trained local site operator (LSO) and conducted in accordance with the Local Site Operators' Manual.

CG NOx, LS NOx and SA NOx Sites

At Nottingham City Council's CG NOx, LS NOx and SA NOx sites calibrations are carried out fortnightly. The calibrations, using zero air and span gases, are undertaken by the LSOs that prior to 2016 were also the LSOs for the City Centre AURN site. Calibrations are conducted using the same principles and procedures as given in the AURN LSO Manual.

The equipment is fully serviced every six months by EnviroTechnology Services plc, Gloucester.

Calibration Gas Traceability

AURN Site

Calibration gases used in the AURN are supplied by AIR Liquide who have demonstrated compliance with relevant quality control procedures in the preparation of gas mixtures. The gas mixtures are certified by AEA Energy & Environment.

CG NOx, LS NOx and SA NOx Sites

Calibration gases used in the CG NOx, LS NOx and SA NOx monitoring sites are supplied by AIR Liquide who have demonstrated compliance with relevant quality control procedures in the preparation of gas mixtures. The gases are supplied with a certificate of analysis.

Data Collection and Processing

AURN Site

The AURN station's data is continuously interrogated by Bureau Veritas the Central Management and Co-ordination Unit (CMCU). The data obtained is validated by CMCU and passed to the Data Dissemination Unit (DDU).

Information about the AURN station and available data can be found on the internet at http://uk-air.defra.gov.uk

CG NOx, LS NOx and SA NOx Sites

During 2017 data collection, validation and ratification was carried out by Air Quality Data Management Ltd.

Throughout 2017, data from the CG NOx, LS NOx and SA NOx sites was polled remotely directly from the analysers and collected as 15 minute averages using Envista ARM data collection software. The data has been scaled and converted into hourly (or other values) using the Envista ARM data management system.

The software allows users to remotely view, analyse, report and distribute environmental quality data. Manipulation of raw data to verified data can be conducted in a structured approach.

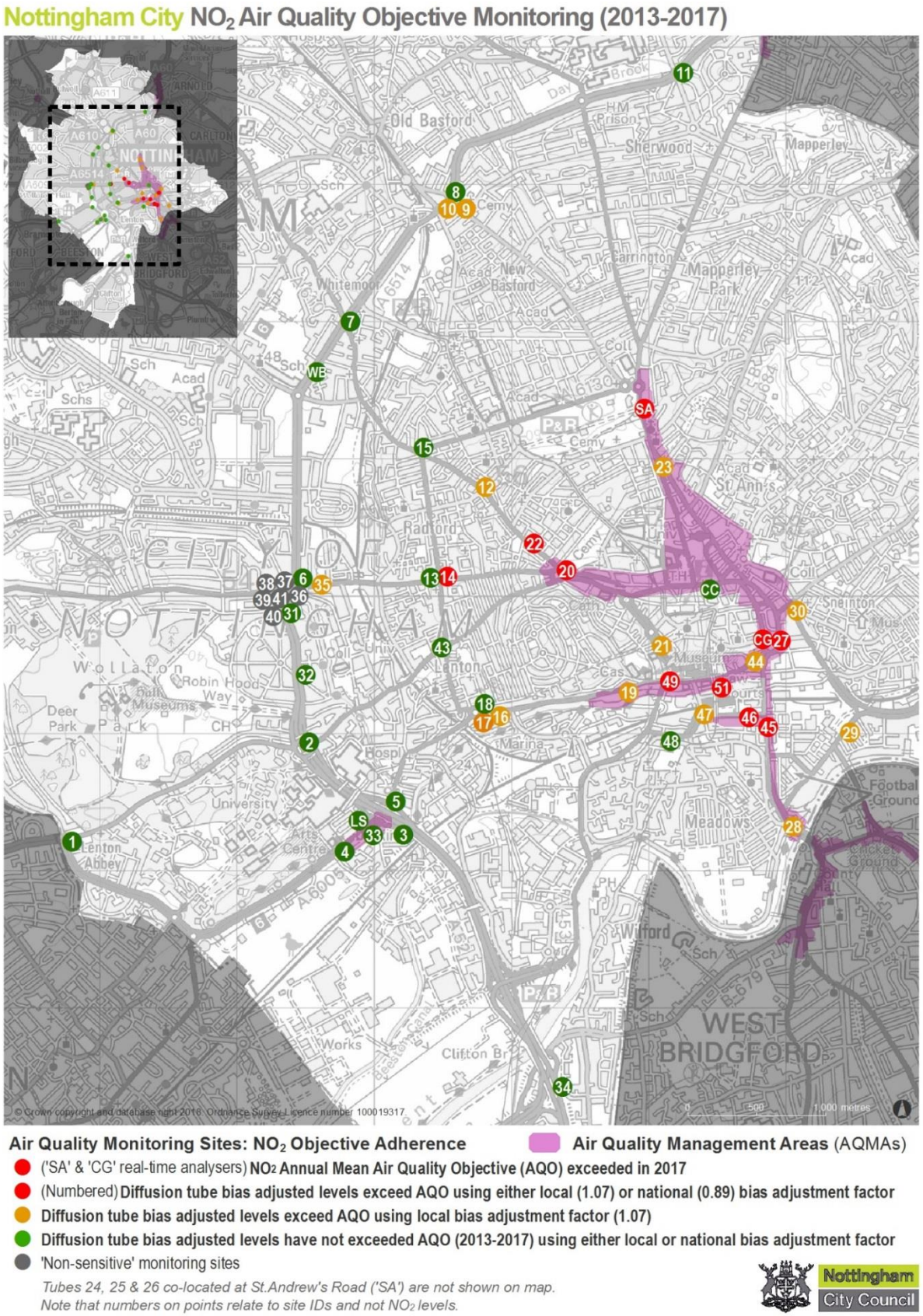
Data validation is carried out and involves screening the scaled values to identify unusual measurements, errors due to equipment failure etc. and flagging them for further investigation.

Data ratification is carried out monthly. This involves looking at the data more closely and includes:

- examination of calibration records to ensure correct application of calibration factors;
- examination of data for other pollutants and monitoring sites to highlight any anomalies;
- deletion of data shown from chart or other records to be spurious, for example, spikes generated by the analyser;
- correction of any baseline drift as indicated by examination of daily automatic calibration records.

Once this process has been carried out and data has been verified, amended or rejected as appropriate, the data is ratified. This final data set is used for the R & A process.

Appendix D: Monitoring Locations and AQMAs



Appendix E: Summary of Air Quality Objectives in England

Table E.1 – Air Quality Objectives in England

Pollutant	Air Quality Objective[4]	
	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

Table E.2 – Examples of Where the Air Quality Objectives Should Apply

Averaging Period	Objectives should apply at:	Objectives should generally not apply at:
Annual mean	All locations where members of the public might be regularly exposed. Building façades of residential properties, schools, hospitals, care homes etc.	Building façades of offices or other places of work where members of the public do not have regular access. Hotels, unless people live there as their permanent residence. Gardens of residential properties. Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short term.
24-hour mean and 8-hour mean	All locations where the annual mean objective would apply, together with hotels. Gardens of residential properties[9].	Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short term.
1-hour mean	All locations where the annual mean and 24 and 8-hour mean objectives apply. Kerbside sites (for example, pavements of busy shopping streets) Those parts of car parks, bus stations and railway stations etc. which are not fully enclosed, where members of the public might reasonably be expected to spend one hour or more. Any outdoor locations where members of the public might reasonably expected to spend one hour or longer.	Kerbside sites where the public would not be expected to have regular access.
15-min mean	All locations where members of the public might reasonably be exposed for a period of 15 minutes	

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

Appendix F

Background – Nottingham's geography and weather.

A location's air quality is affected by both local and distant emissions, from a wide range of sources, seasonal and day-to-day weather conditions, and the prevailing wind direction.

Nottingham's location in England means it does not experience daily coastal sea-breeze effects and is simply subject to the wind direction associated with air masses moving across the UK. The wind rose (Figure 9 is typical of data measured at Watnall meteorological station on the western edge of the Nottingham conurbation) shows the wind direction with the greatest frequency as the large lobe at 220^0. This 'prevailing wind' direction is roughly from the southwest. Thus, Nottingham's air quality is significantly influenced by sources ranged in an arc from the west-south-west to the south-south-west.

Fig 9: Nottingham City Council's geographic location in England and example Windrose (Watnall)

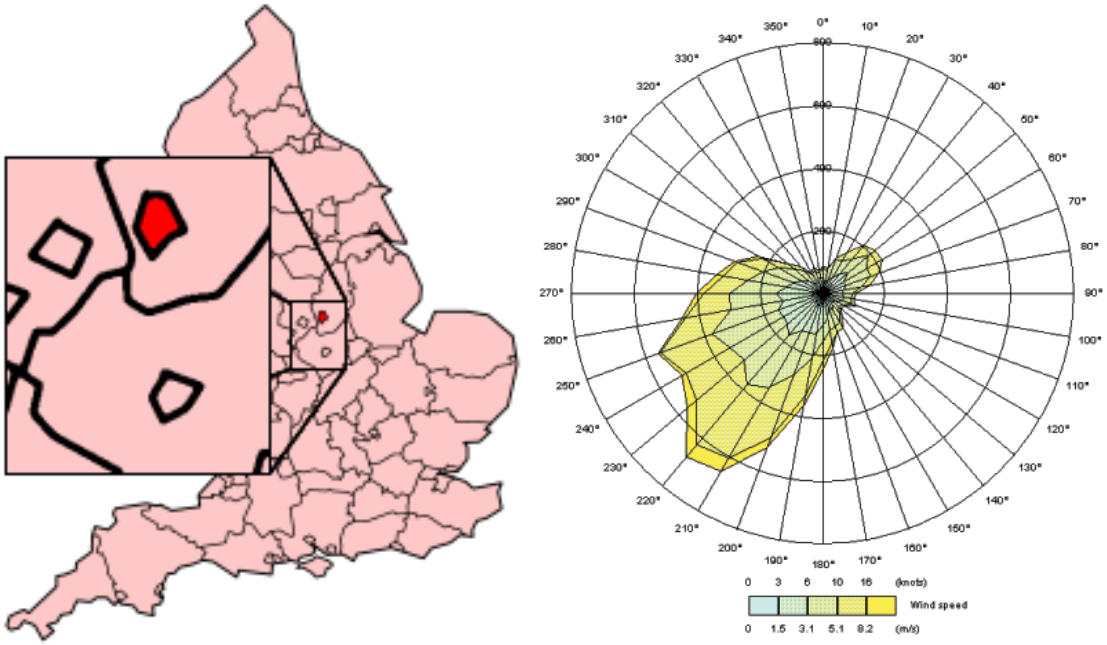
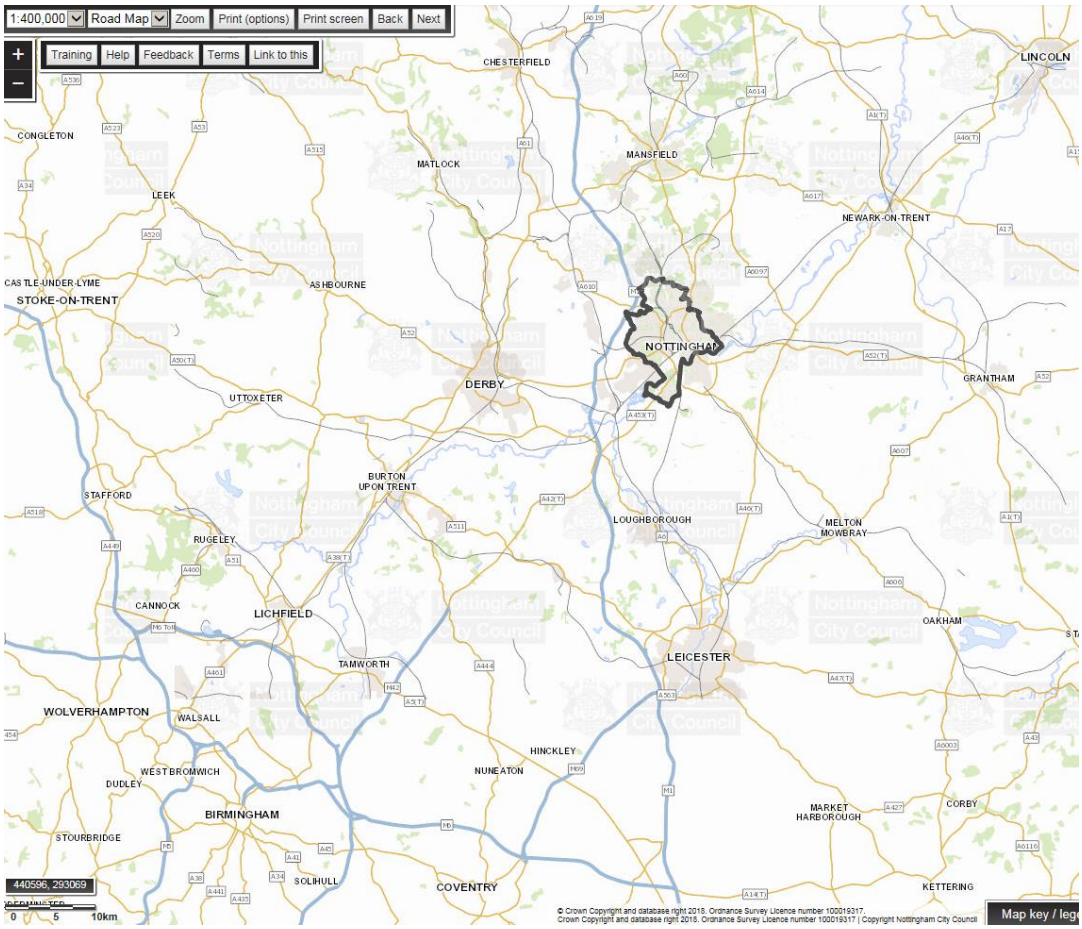


Fig 10: Nottingham City Council's geographic location (detailed)



Nottingham is surrounded by agricultural land, the M1 motorway bounds Nottingham to the west, and the very large urban industrial conurbation of the West Midlands is approximately 40 miles to its southwest (Fig. 10). Emissions from agricultural activity outside the conurbation as well as those from closer and more distant domestic, commercial, industrial and transport sources outside Nottingham contribute to the levels of NO2 and particles measured in Nottingham.

When carrying out air quality modelling it is necessary to quantify and include the contribution these distant and local sources make to modelled concentrations.

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
AQO/AQOs	Air Quality Objective(s)
ASR	Air quality Annual Status Report
Defra	Department for Environment, Food and Rural Affairs
DMRB	Design Manual for Roads and Bridges – Air quality screening tool produced by Highways England
EU	European Union
FDMS	Filter Dynamics Measurement System
LAQM	Local Air Quality Management
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides
PM_{10}	Airborne particulate matter with an aerodynamic diameter of 10µm (micrometres or microns) or less
$PM_{2.5}$	Airborne particulate matter with an aerodynamic diameter of 2.5µm or less
QA/QC	Quality Assurance and Quality Control
SO_2	Sulphur Dioxide
…	…

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