Borough Council of
King's Lynn &
West Norfolk

2020 Air Quality Annual Status Report (ASR)

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

August 2020

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Executive Summary: Air Quality in Our Area

Air Quality in Borough Council of King's Lynn and West Norfolk

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

The annual health cost to society of the impacts of particulate matter alone in the UK is estimated to be around £16 billion[3].

The Borough of King's Lynn and West Norfolk is located in Norfolk. The main source of pollution within the borough is road traffic emissions from several major roads including the A148- Lynn Road, A148- Wootton Road, A148- London Road, and A148- Railway Road. These roads, amongst others, carry high volumes of traffic within the Borough through areas of exposure such as King's Lynn Town Centre.

As a result of these emissions, the Borough Council of King's Lynn and West Norfolk (BCKLWN) currently enforce two Air Quality Management Areas (AQMAs) due to exceedances of the annual mean nitrogen dioxide (NO_2) air quality standard (AQS) objective: Town Centre AQMA and the Gaywood Clock AQMA. More details regarding the AQMAs can be found online at https://uk-air.defra.gov.uk/aqma/localauthorities?la_id=138, with more information presented in Table 2.1 and boundary maps in Appendix D.

An Air Quality Action Plan (AQAP) was produced and adopted in 2015. The AQAP sets out a programme to improve air quality in and around the AQMAs, and thus the Borough, and was prepared by the BCKLWN in partnership with Norfolk County Council (the local transport authority). In 2017 an updated sourced apportionment study was completed, providing a revised understanding of the vehicle contributors within both AQMAs. Additionally, in 2019 the BCKLWN commissioned Bureau

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

Veritas to complete a baseline dispersion modelling study of the borough as part of the King's Lynn Transport Study (KLTS). The BCKLWN propose to use both the source appointment study and the outputs from the baseline study to update the AQAP, following the completion of the KLTS. The King's Lynn Transport Study aims to continue the stability of annual mean NO_2 concentrations below the AQS objective level within Gaywood Clock AQMA, whilst ensuring future year compliance within the Town Centre AQMA through investigating, modelling and implementing various transport improvement schemes in the Borough, to help reduce pollutant contributions from vehicular traffic.

In 2019 the BCKLWN undertook monitoring of NO_2, PM_{10} and $PM_{2.5}$ at a number of locations within the Borough. These pollutants are discussed in turn. The BCKLWN have also undertaken an Air Quality Screening Assessment in line with the screening tools and methodology outlined within Chapter 7 of Defra TG(16) Guidance. No new sources of air pollution were identified during the review, and no additional air quality monitoring is required within the borough. The Screening Assessment can be found in Appendix F.

Nitrogen Dioxide

Concentrations of NO_2 are monitored at 70 sites across the Borough, comprising of 71 diffusion tubes and two automatic monitors, including a triplicate co-location study.

During 2019, one site (Site 2) reported an exceedance of the NO_2 annual mean AQS objective limit and four others reported concentrations to be within 10%. Three of these monitoring sites were located within the boundary of the Town Centre AQMA (Sites 1, 2 & 3), one within the Gaywood Clock AQMA (Site CM2), with Site 15 located adjacent to the Town Centre AQMA.

Site 2 has reported the highest annual mean NO_2 concentration within the Borough four times (inclusive) since 2015. Site 2 is located on a façade of a residential house (deemed to represent relevant exposure) along a stretch of Railway Road; an arterial one-way route passing through the Town Centre where congestion is considered to be prevalent.

Looking at the past five years, exceedances of the annual mean AQS objective have been recorded at only two sites within the Borough, Site CM2 (last exceedance recorded in 2016) and Site 2. The number of sites recording concentrations within

10% of the AQS objective have also remained steady over the last five years. Overall, annual mean NO_2 concentrations have remained stable, with decreases recorded at many sites; most importantly Site 2.

The annual mean NO_2 concentration was not greater than 60µg/m^3 at any non-automatic monitoring site. In particular, the diffusion tube located at Site 5 (King's Lynn Transport Interchange) reported concentrations below 60µg/m^3; where short term exposure is most relevant. Therefore, in accordance with Defra's TG(16), an exceedance of the 1-hour mean objective during 2019 at any monitoring location within King's Lynn is unlikely. Furthermore, both continuous NO_2 monitors present within King's Lynn (CM1 & CM2) reported no exceedance of the 1-hour objective throughout 2019, or since 2015.

Particulate Matter

The BCKLWN's 2019 PM_{10} network comprises of one PM_{10} TEOM monitor and four indicative Osiris dust monitors. Full details of the monitoring sites are provided in Table A.1. PM_{10} concentrations reported at these sites have remained below the annual mean and 24-hour mean AQS objective limits since 2015.

During 2019, the BCKLWN continued to monitor PM_{10} concentrations within Stoke Ferry using a TEOM (CM4) and two Osiris dust monitors (OS4 and OS5). No exceedances of either the 24-hour or annual mean PM_{10} AQS objective were recorded in Stoke Ferry within 2019. A technical note has now been completed that assessed the monitoring results within the village and concluded that an AQMA declaration was not required. The technical note detailing the full results is included within Appendix E.

$PM_{2.5}$ is regulated by standards in the UK which presently places no statutory duty on Local Authorities to report against annual mean objective limit. These standards are scheduled to be legally enforced in 2020. Nonetheless, the BCKLWN undertake monitoring of $PM_{2.5}$ within the borough indirectly via four Osiris dust monitors. This monitoring however is indicative only. Concentrations recorded since 2016 (first year of $PM_{2.5}$ monitoring) have been below the obligatory annual mean standard of 25µg/m^3. As the monitoring is completed using Osiris instruments that do not hold an accreditation for $PM_{2.5}$ monitoring, the concentrations reported should not be taken as absolutes.

Full details of the $PM_{2.5}$ monitoring completed within the borough are provided in Table A.1.

Actions to Improve Air Quality

The declaration of the two AQMAs (Gaywood Clock and the Town Centre), and the adoption of the AQAP, have previously driven the actions being taken to improve air quality across the Borough. The AQAP comprises Policy, Road Traffic and Emissions actions to help reduce pollutant levels. The measures are wide ranging and include considerations of air quality impacts within the planning process by commenting on specific planning applications as well as making sure air quality is embedded within local policies. On-going actions include investigating potential changes to road layout within the town centre gyratory, improved cycling and walking provision and the promotion of electric vehicle charging. A full list of measures is detailed in Table 2.2.

An update to the source apportionment study, providing a revised technical understanding of key vehicle contributors in both AQMAs, was completed in December 2017. The study found cars to be the greatest vehicle contributor to NOx emissions within both AQMAs, but the NOx contribution from HGVs and buses/coaches was higher in the Town Centre AQMA compared to the Gaywood Clock AQMA.

During 2019, the BCKLWN, with Norfolk County Council (NCC) progressed the King's Lynn Transport Study, which focuses on investigating, modelling and implementing various transport improvement schemes in the Borough to help reduce pollutant contributions from vehicular traffic. Potential schemes focus on exploring the promotion of active transport, public transport and changes to the existing road layout along arterial routes and junctions within both AQMAs. The Transport Study attempts to continue the stability of annual mean NO_2 concentrations below the AQS objective level within Gaywood Clock AQMA, whilst ensuring future year compliance within the Town Centre AQMA. The study has progressed in 2019, with the KLTS Implementation Plan due to be adopted by both the BCKLWN and NCC in February 2020, with additional feasibility work planned to be undertaken on the town centre gyratory and Hardings Way in 2020/21. Additional air quality monitoring will also commence within 2020 to assist in the decision-making process, through the addition of new monitoring sites to the non-automatic NO_2 monitoring network. The BCKLWN have also commissioned Bureau Veritas to undertake baseline air quality dispersion

modelling as part of the KLTS. The Council intend to utilise the model outputs from this, and the source apportionment exercise to update the current AQAP, following completion of the KLTS.

Local Engagement and How to get Involved

Information detailing air quality in the borough is available on BCKLWN's website[4], with air quality for the Norfolk region viewable at Norfolk Air Quality[5]; with live data from the BCKLWN's continuous monitoring stations published regularly.

During 2019, the BCKLWN worked in partnership with a number of local interest groups through stakeholder engagement as part of the KLTS. Additionally, the BCKLWN undertook a social media campaign as part of Clean Air Day to educate the public on the dangers of air pollution, and how they could help to reduce it.

The following are suggested for the public as alternatives to private vehicular travel that would contribute to improving air quality in the Borough:

- Use public transport where available- This reduces the number of private vehicles in operation reducing pollutant concentrations through the number of vehicles and reducing congestion;
- Walk or cycle if your journey allows- From choosing to walk or cycle for your journey the number of vehicles is reduced and there is the added benefit of keeping fit and healthy;
- Car/ lift sharing- Where a number of individuals are making similar journeys, such as travelling to work or to school, car sharing reduces the number of vehicles on the road and therefore the amount of emissions released. This can be promoted via personal travel plans which can be obtained from Norfolk County Council;
- Alternative fuel/ more efficient vehicles- Choosing a vehicle that meets the specific needs of the owner, fully electric, hybrid fuel and more efficient cars are available, and all have different levels benefits by reducing the amount of emissions being released; and

[4] https://www.west-norfolk.gov.uk/info/20137/air_quality
[5] http://norfolkairquality.net/

- Turning engines off where possible- Reducing the number of idling vehicles, for example when dropping children at school or waiting at level crossings, will help reduce harmful emissions from vehicle exhausts.

Table of Contents

List of Tables

List of Figures

1. Local Air Quality Management

This report provides an overview of air quality in Borough Council of King's Lynn and West Norfolk during 2019. It fulfils the requirements of Local Air Quality Management (LAQM) as set out in Part IV of the Environment Act (1995) and the relevant Policy and Technical Guidance documents.

The LAQM process places an obligation on all local authorities to regularly review and assess air quality in their areas, and to determine whether or not the air quality objectives are likely to be achieved. Where an exceedance is considered likely the local authority must declare an Air Quality Management Area (AQMA) and prepare an Air Quality Action Plan (AQAP) setting out the measures it intends to put in place in pursuit of the objectives. This Annual Status Report (ASR) is an annual requirement showing the strategies employed by Borough Council of King's Lynn and West Norfolk to improve air quality and any progress that has been made.

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

2. Actions to Improve Air Quality

2.1 Air Quality Management Areas

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

A summary of AQMAs declared by Borough Council of King's Lynn and West Norfolk 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=138 with a full list available at https://uk-air.defra.gov.uk/aqma/list. Alternatively, see Appendix D: Maps of Monitoring Locations and AQMAs, which provides for a map of air quality monitoring locations in relation to the AQMAs.

The BCKLWN propose to keep the two current designated AQMAs in the Borough and continue to review the NO_2 monitoring network surrounding these AQMAs. No changes to the current AQMA boundaries or revocation are required.

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		
						At Declaration		Now		Name	Date of Publication	Link
Gaywood Clock	01/04/2009	NO_2 Annual Mean	King's Lynn	An area encompassing several properties at the junction of the A148 (Lynn Road/Wootton Road) and the A1076 (Gayton Road)	NO	45.1	µg/m^3	37.0	µg/m^3	Borough Council of King's Lynn and West Norfolk AQAP	2015	https://www.west-norfolk.gov.uk/info/20137/air_quality/170/air_quality_management_areas
Town Centre	Declared: 01/11/2013 Amended: 01/02/2007	NO_2 Annual Mean	King's Lynn	A 'P' shaped area encompassing a number of properties comprising of the main road to/from the town centre of King's Lynn (London Road and St James' Road) and the one-way system (Railway Road, Austin Street and Blackfriars Road)	NO	55.0	µg/m^3	42.4	µg/m^3	Borough Council of King's Lynn and West Norfolk AQAP	2015	https://www.west-norfolk.gov.uk/info/20137/air_quality/170/air_quality_management_areas

☒ **Borough Council of King's Lynn and West Norfolk confirm the information on UK-Air regarding their AQMAs is up to date**

2.2 Progress and Impact of Measures to address Air Quality in Borough Council of King's Lynn and West Norfolk?

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

"The report is well structured, detailed, and provides the information specified in the Guidance. The following comments are designed to help inform future reports.

1.Trends are clearly presented and discussed and a robust comparison with air quality objectives is provided.

2.The diffusion tube and AQMA mapping is comprehensive and clearly demonstrates the monitoring network.

3.The relocations of the PM TEOM and Osiris monitors in response to public concerns is welcomed to ensure the most relevant sites of public exposure are monitored.

4.The continuing review of NO_2 monitoring locations with historically low NO_2 levels is supported and any updates should be reported on in the 2020 APR.

5.The council is planning to update the AQAP with the outcomes of the King's Lynn Transport Study, any updates to this should be reported on in next year's ASR.

6. QA/QC of the data was considered to be thorough, with annualisation of data carried out at one Osiris site and a local bias adjustment factor used for the non-automatic network.

7.The report included measures to address $PM_{2.5}$ and links to Public Health outcomes Frameworks. This is encouraged to be continued in future ASRs.

8.Clear priorities for 2019 were identified, which is welcomed. Progress made on these priorities should be reported on in next year's report.

9.Comments from the previous appraisal have been included and addressed, which is welcomed."

The comments made within the appraisal report, as shown above, have been considered for the completion of the 2020 ASR.

Borough Council of King's Lynn and West Norfolk has taken forward a number of direct measures during the current reporting year of 2019 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 can be found in the BCKLWN's 2015 Action Plan[6]. A list of measures completed prior to 2019, can be found in last year's ASR.

The BCKLWN expects the following measure to be completed over the course of the next reporting year:

- Measure 14: King's Lynn Transport Study

During 2019, the BCKLWN, with Norfolk County Council (NCC) progressed the King's Lynn Transport Study, which focuses on investigating, modelling and implementing various transport improvement schemes in the Borough to help reduce pollutant contributions from vehicular traffic. Potential schemes focus on exploring the promotion of active transport, public transport and changes to the existing road layout along arterial routes and junctions within both AQMAs. The Transport Study attempts to continue the stability of annual mean NO_2 concentrations below the AQS objective level within Gaywood Clock AQMA, whilst ensuring future year compliance within the Town Centre AQMA. The study has progressed in 2019, with the KLTS Implementation Plan due to be adopted by both the BCKLWN and NCC in February 2020, with additional feasibility work planned to be undertaken on the town centre gyratory and Hardings Way in 2020/21, and the creation of a Local Cycling and Walking Implementation Plan (LCWIP). Additional air quality monitoring will also be undertaken within 2020 to assist in the decision-making process, through the addition of new monitoring sites to the non-automatic NO_2 monitoring network. The BCKLWN have also commissioned Bureau Veritas to undertake baseline air quality dispersion modelling to support the KLTS.

The AQAP is due to be updated in-line with the findings from a source apportionment exercise completed in 2017 and the baseline dispersion modelling - following completion of the KLTS. The source appointment study found cars to be the greatest vehicle contributor to NOx emissions within both AQMAs, but the NOx contribution from HGVs and buses/coaches was higher in the Town Centre AQMA compared to the Gaywood Clock AQMA. This updated insight into prominent NOx contributors relevant within both AQMAs, and the soon to be completed baseline study (as part of the KLTS), will aid the discussion and implementation of effective AQAP measures.

[6] https://www.west-norfolk.gov.uk/info/20137/air_quality/169/air_quality_information

Potential measures are expected to be discussed in support of the scheduled update of the AQAP.

Table 2.2 – Progress on Measures to Improve Air Quality

Measure No.	Measure	EU Category	EU Classification	Date Measure Introduced	Organisations involved	Funding Source	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to implementation
1	Consideration of Air Quality Impacts when providing comments on planning application within an AQMA or where an AQMA could be impacted or created	Policy Guidance and Development Control	Air Quality Planning and Policy Guidance	2014	Borough Council (LPA & Env Quality Team)	Borough Council	Number of pre application discussions and planning applications responded to	Up to 1	In 2019 61 applications were commented upon which had potential air quality impacts. They were screened according to Environmental Protection UK (EPUK) & Institute of Air Quality Management (IAQM) guidance and air quality assessments required where appropriate. Best practice measures were also recommended.	N/A - on going measure	This will always be an on-going measure as long as relevant planning application are received
2	With regard to National Planning Policy Framework, include air quality considerations in the Local Plans and adopt an air quality Development Management Policy.	Policy Guidance and Development Control	Air Quality Planning and Policy Guidance	2014	Borough Council (LPA & Env Quality Team)	Borough Council	Production of documents	Up to 1	Completed	Completed	The King's Lynn and West Norfolk Local Plan - Site Allocations & Development Management Policies (SADMP) Plan was formally adopted on 29 September 2016. This includes policy DM15 Environment, Design and Amenity, which provides for the assessment of air quality in planning applications. This policy approach is continued in the Local Plan Review (March 2019) as Policy LP18. The July 2011 Adopted Core Strategy's Transport Policy CS11 aimed to achieve improvements where there were air quality issues in the towns of Downham Market, Hunstanton and King's Lynn. The Local Plan Review (March 2019) Policy LP12 continues this approach, particularly with reference to the emerging King's Lynn Transport Study and Strategy.
3	With regard to National Planning Policy Framework, adopt Norfolk Technical Guidance on Air Quality and provide preapplication	Policy Guidance and Development Control	Air Quality Planning and Policy Guidance	2014	Borough Council (LPA & Env Quality Team)	Borough Council	Production of documents	Up to 1	Completed	Completed	Norfolk Technical Guidance now superseded by IAQM EPUK Guidance.

	advice on planning applications										
4	Develop Parking Management Plan	Transport Planning and Infrastructure	Other	2014	County Council/ Borough Council	Future High Streets Fund	Publication of and implementation of plan	Up to 2	A King's Lynn Parking Study is currently underway, which will consider car parking arrangements in the town centre.	2020/2021	
5	New access road from Wisbech Road through Friars to Boal Street.	Traffic Management	UTC, Congestion management, traffic reduction	2010	County Council/ Borough Council	County Council/ Borough Council	Continued air quality monitoring. Bus flow counts on London Road and new route	2 to 3	The new access road has been completed and is well used by buses	2020/2021	Consideration is being given to the road as part of the King's Lynn Transport Study with the Harding's Way Feasibility Study due to be completed in 2020/2021.
6	Incentivise the use of public transport.	Alternatives to private vehicle use	Other	2014	County Council	County Council	Continued air quality monitoring. Bus usage figures	Up to 1	The King's Lynn Transport Interchange has been completed making a physically nicer environment for public transport users. New air conditioned and wifi enabled train carriages were introduced on routes between King's Lynn and London in May 2017.	2017	Consideration is being given to public transport, and encouraging its use, as part of the King's Lynn Transport Study
7	Implementation of Urban Traffic Control system (UTC) at principal junctions within AQMA and adjacent to AQMA	Traffic Management	Strategic highway improvements, re-prioritising road space away from cars, including access management, selective vehicle priority, bus priority, high vehicle occupancy lane	2010	County Council	County Council	Continued air quality monitoring. Queue length at junctions at peak times	2 to 5	Completed		Will be reviewed within the Kings Lynn Transport Study currently underway
8	Installation of selective vehicle detection (SVD) system	Traffic Management	Strategic highway improvements, Re-prioritising road space away from cars, including Access management,	2011	County Council	County Council	Number of vehicles fitted with SVD Annual average daily traffic numbers	Up to 1	Completed	Completed	None

			Selective vehicle priority, bus priority, high vehicle occupancy lane								
9	Decriminalisation of parking. Review of parking controls and enforcement in AQMAs and King's Lynn Town Centre	Transport Planning and Infrastructure	Other	December 2010 option validation Jan-March 2011	Borough Council/ County Council/ Future High Streets Fund	Borough Council/ County Council	Implementation of enforcement in AQMAs and Town Centre. Continued air quality monitoring.	Up to 1	A King's Lynn Parking Study is currently underway, which will consider car parking arrangements in the town centre.	On going	
10	Variable car parking rates	Transport Planning and Infrastructure	Other	2014	Future High Streets Fund	Borough Council	Continued air quality monitoring, car park usage and queue lengths	Up to 1	Car parking rates will be considered as part of the King's Lynn Parking Study which is currently underway.	On going	
11	Variable message signs	Traffic Management	Other	2014	Borough Council/ County Council	Borough Council/ County Council	Peak hour parking usage, car park usage and continued air quality monitoring queue lengths	Up to 1	Signs have been installed on approach to King's Lynn town centre to indicate where spaces are available.	Completed	These will be reviewed as part of the King's Lynn Parking Study.
12	Investigate potential for residents only parking in or close to AQMAs	Traffic Management	Workplace Parking Levy, Parking Enforcement on highway	2014	Borough Council	Borough Council	Peak hour parking usage Car park usage Continued air quality monitoring	Up to 1	Residents parking permits have been introduced in South Quay area, on Portland Road (the link between the railway station and the King's Lynn Transport Interchange) , Highgate and Archdale Street which are all close to the town centre AQMA. This had made these areas unavailable for commuter parking.	On going	A King's Lynn Parking Study is currently underway, which will consider car parking arrangements in the town centre.
13	Support the use of West Lynn ferry	Promoting Travel Alternatives	Promote use of rail and inland waterways	2012	Borough Council	Borough Council	Number of passengers using ferry	Up to 1	BCKLWN has provided funding for the West Lynn ferry, and the ferry will be considered as part of the King's Lynn Transport Study	On going	The ferry service is currently closed and is still for sale.

14	Changes to the Road Layout within the King's Lynn Gyratory as proposed by Kings Lynn Transport Study	Traffic Management	UTC, Congestion management, traffic reduction	2011	County Council	County Council	Continued air quality monitoring. Daily traffic flow data and queue lengths.	2 to 10	The King's Lynn Transport Study is underway, this will identify possible transport schemes and develop a model to test them and develop a preferred strategy.	2020/2021	The Gyratory Scheme Feasibility Study describing implementable schemes, setting out budget cost estimates, a high-level project plan, and programme for delivery will be completed by 2020/2021.
15	Traffic Management at London Road and Southgates	Traffic Management	UTC, Congestion management, traffic reduction	2014	County Council	County Council	Continued air quality monitoring. Queue length at junctions at peak times	1 to 5	The King's Lynn Transport Study will include London Road and the Southgates area.	2020/2021	Feasibility work was carried out last year looking at London Road and the Southgates area. This priority area from the Transport Strategy gave rise to the submission of the South Gate Gateway project in the Future High Street Fund (FHSF) bid.
16	Traffic Management at Gaywood clock	Traffic Management	UTC, Congestion management, traffic reduction	2014	County Council	County Council	Continued air quality monitoring. Traffic queue lengths.	1 to 5	The King's Lynn Transport Study will include the Gaywood Clock area.	2020/2021	Traffic management at Gaywood Clock is considered within measure STS11 within the King's Lynn Transport Study Implementation Plan.
17	Promotion of travel plans, school travel plans and promotion of car sharing	Promoting Travel Alternatives	Personalised Travel Planning	2014	County Council/ Borough Council	County Council/ Borough Council	Continued air quality monitoring. Number of travel plans	Up to 1	Travel plans are requested by BCKLWN and County Council in response to relevant planning application	On going	The promotion of travel plans for schools are considered within measure STM17 of the King's Lynn Transport Study Implementation Plan.
18	Improved cycling and walking provision	Promoting Travel Alternatives	Promotion of cycling	2014	County Council/ Borough Council	County Council/ Borough Council	Cycle usage and walking provision. Number of cycle/foot path improvements.	Up to 1	Active transport will be considered in the King's Lynn Transport Study through the Local Cycling and Walking Implementation Plan.	2020/2021	Improved cycling and walking provision are considered within measures SAM5, SAM6, SAM7, SAM8, and MAM4 within the King's Lynn Transport Study Implementation Plan.
19	Investigate feasibility and if viable, provide Electric Vehicle charging points in car parks and in new developments	Promoting Low Emission Transport	Procuring alternative Refuelling infrastructure to promote Low Emission Vehicles, EV recharging, Gas fuel recharging	2014	Borough Council	Borough Council	Number & use of EV charging points installed	Up to 1	Charging points are recommended on new developments as a mitigation measure in line with IAQM guidance Principles of Good Practice	On going	The introduction of electric charging points within car parks will be considered within the Parking Strategy and the King's Lynn Transport Study.
20	Quality Bus Partnerships and Contracts	Promoting Low Emission Transport	Public Vehicle Procurement- Prioritising uptake of low emission vehicles	2014	County Council	County Council	Continued air quality monitoring. % buses Euro 3 or better. Installation of SVD.	Up to 1	A quality bus partnership is in place but there are still a high number of older vehicles used on King's Lynn Town Centre routes.	On going	Bus providers have been included within stakeholder engagement as part of the King's Lynn Transport Study.

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

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

The BCKLWN monitors $PM_{2.5}$ concentrations at four locations within the Borough, two within King's Lynn and two within Stoke Ferry. Monitoring is completed using four indicative Osiris instruments that do not hold a MCERTs accreditation for the monitoring of $PM_{2.5}$, therefore the reported concentrations should not be taken as absolute.

The highest annual mean $PM_{2.5}$ concentration reported in the Borough during 2019 was 7.0µg/m^3 – recorded at OS3 and OS4, located at Estuary Road and Wretton Road respectively. This is well below the $PM_{2.5}$ obligatory standard of 25µg/m^3.

The Public Health Outcomes Framework[7] data tool complied by Public Health England quantifies the mortality burden of $PM_{2.5}$ within England on a county and local authority scale. The 2018 fraction of mortality attributable to $PM_{2.5}$ pollution across England is 5.2%, which is the same as the fraction within the BCKLWN. This is lower than the fraction of mortality attributable to $PM_{2.5}$ pollution in the East of England region, which was estimated to be 5.5%.

The measures already being undertaken in the BCKLWN's AQAP have been reviewed against the Action Toolbox within Annex A of LAQM.TG(16) to determine which can have an effect on reducing $PM_{2.5}$ emissions. It was determined, that measures 6, 7, 8, 13, 14, 15, 16, 17, 18, and 20 will have an impact on reducing $PM_{2.5}$ emissions.

[7] https://fingertips.phe.org.uk/profile/public-health-outcomes-framework

In addition to these measures, the Council continues to take the following measures to address $PM_{2.5}$:

- During 2019, the Borough Council responded to the Norfolk Minerals and Waste Local Plan - Preferred Options document. Individual comments were provided on all waste and mineral sites proposed, in conjunction with the BCKLWN's Community Safety and Neighbourhood Nuisance Team. The potential dust emissions (PM_{10} and $PM_{2.5}$) from each site were considered, with site specific mitigation measures recommended to protect both human health and amenity.
- Where there is potential for a construction site to impact on the local amenity by way of dust emissions, a Construction Environmental Management Plan is requested as a pre-commencement planning condition. The statement must include methods used and the measures taken to control the emission of dust and therefore minimise potential short-term exposure to PM_{10} and $PM_{2.5}$.
- The Single Issue Silica Sand Review was published in December 2017 and details the appropriateness of each site. The Council will continue to provide comments on any planning applications relating to the search areas/sites to ensure that there are no adverse effects on air quality.

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

3.1 Summary of Monitoring Undertaken

This section sets out what monitoring has taken place and how it compares with objectives. The BCKLWN have also undertaken an Air Quality Screening Assessment in line with the screening tools and methodology outlined within Chapter 7 of Defra TG(16) Guidance. More detail is provided in Section 3.3.

3.1.1 Automatic Monitoring Sites

The BCKLWN's 2019 monitoring network comprises two NO_2 chemiluminescent analysers, one PM_{10} TEOM monitor, and four indicative Osiris dust monitors recording both $PM_{2.5}$ and PM_{10} concentrations. In February 2018, the Council relocated the TEOM monitor from North Lynn, King's Lynn (Site CM3) to Lynn Road, Stoke Ferry (Site CM4), in response to a number of complaints made by the public in regard to dust potentially being emitted from a neighbouring animal feed plant – and to help validate the indicative readings reported by the Osiris located within the village. Over a year's worth of monitoring has now been undertaken at CM4; the result of which are detailed within a Technical Note in Appendix E. Table A.1 in Appendix A shows the details of all the automatic monitoring sites. National monitoring results are available at https://uk-air.defra.gov.uk/.

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

3.1.2 Non-Automatic Monitoring Sites

BCKLWN undertook non- automatic (passive) monitoring of NO_2 at 69 sites during 2019, including the provision of a triplicate co-location study. During 2019 no diffusion tubes were relocated or decommissioned from operation. However, the non-automatic monitoring network has been reviewed based off 2019 results and permitted planning applications within the borough. Based off this review, changes will be made in 2020 with the addition of new monitoring sites at key junctions and roads of interest. Table A.2 in Appendix A shows the details of the current sites, with

maps showing the location of the monitoring sites provided in Appendix D: Maps of Monitoring Locations and AQMAs.

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), can be found within Appendix C.

3.2 Individual Pollutants

The air quality monitoring results presented in this section are, where relevant, adjusted for bias[8], "annualisation" (where the data capture falls below 75%), and distance correction[9]. Further details on adjustments are provided in Appendix C.

3.2.1 Nitrogen Dioxide (NO_2)

Table A.3 in Appendix A compares the ratified and adjusted monitored NO_2 annual mean concentrations for the past 5 years with the AQS objective of 40µg/m^3. For diffusion tubes, the full 2019 dataset of monthly mean values is provided in Appendix B.

2019 data capture for all monitoring was greater than or equal to 75%. As a result, in accordance with TG16, annualisation was not required at any site.

Results for 2019 have been bias adjusted using a nationally derived bias adjustment factor of 0.93. Full details of the bias adjustment and QA/QC procedure are provided in Appendix C.

Table A.3 provides a summary of measured annual mean concentrations (bias adjusted) for 2019. During 2019, one site (Site 2) reported an exceedance of the NO_2 annual mean AQS objective limit, and four other sites reported concentrations to be within 10% of the AQS objective limit (Table 3.1). Three of the four monitoring locations (Sites 1, 2, and 3) were found to be located within the boundary of the Town Centre AQMA, one within the Gaywood Clock AQMA (Site CM2), with Site 15 located adjacent to the Town Centre AQMA. Sites 1, 2, 3, and CM2 were considered to represent relevant exposure and therefore were directly comparable with the AQS objective limit. Site 15 however is located on the kerbside to monitor background

[8] https://laqm.defra.gov.uk/bias-adjustment-factors/bias-adjustment.html
[9] Fall-off with distance correction criteria is provided in paragraph 7.77, LAQM.TG(16)

concentrations from changes in traffic emissions. The site therefore does not represent relevant exposure.

Table 3.1 – Summary of Measured Annual Mean NO_2 Exceedances and Near Exceedances

Site ID	Within AQMA Y/N	2019 Annual Mean Concentration (µg/m^3)
1	Y- Town Centre AQMA	36.3
2	Y- Town Centre AQMA	42.4
3	Y- Town Centre AQMA	37.5
CM2	Y – Gaywood Clock AQMA	37.0
15*	N	36.7

* Site does not represent relevant exposure and is used to monitor changes in traffic flow only.
All values presented above have been bias adjusted

Site 2 has reported the highest annual mean NO_2 concentration within the Borough four times (inclusive) since 2015. Site 2 is located along a stretch of Railway Road – an arterial one-way route passing through the Town Centre where congestion is considered to be prevalent.

Looking at the past five years, exceedances of the annual mean AQS objective have been recorded at only two sites within the Borough, Site CM2 (last exceedance recorded in 2016) and Site 2. The number of sites recording concentrations within 10% of the AQS objective have also remained steady over the last five years. Overall, annual mean NO_2 concentrations have remained stable, with decreases recorded at many sites; most importantly Site 2.

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. No exceedances of the hourly mean objective were recorded at either automatic monitoring site.

The annual mean NO_2 concentration was not greater than 60µg/m^3 at any non-automatic monitoring site. In particular, the diffusion tube located at Site 5 (King's Lynn Transport Interchange) reported concentrations well below 60µg/m^3, which is where short term exposure is most relevant. Therefore exceedance of the 1-hour mean objective during 2019 at any monitoring location within King's Lynn is unlikely. Furthermore, both continuous NO_2 monitors installed within King's Lynn reported no exceedance of the short term NO_2 1-hour objective throughout 2019, or since 2015.

Town Centre AQMA

The annual mean concentration results for the NO_2 diffusion tubes located within Town Centre AQMA are presented in Figure A.1. NO_2 monitoring within the Town Centre AQMA was undertaken at 25 sites during 2019, comprising of 27 diffusion tubes and one continuous monitor (CM1), including the provision of a triplicate co-location site. One site (Site 2) reported an exceedance of the NO_2 annual mean AQS objective limit, with two additional sites reported concentrations to be within 10% (Site 1 and 3). All three sites are deemed to represent relevant exposure and therefore no distance correction calculations were performed. The three sites are located along differing stretches of the A148- Railway Road- an arterial route through the Town Centre.

Site 2 reported the highest concentration in 2019. Over the previous five years however, NO_2 concentrations recorded at Site 2 have displayed a downwards trend, decreasing from 46.6µg/m^3 in 2015 to 42.4µg/m^3 in 2019. Moreover, Site 2 is the only site to record an exceedance of the annual mean AQS objective within the Town Centre AQMA over the last five years.

As ilustrated within Figure A.1, concentrations of NO_2 have remained steady over the last five years within the AQMA, with some sites experiencing a decrease in annual mean concentrations; most importanly Site 2 which has recorded a drop of 4.2µg/m^3 since 2015.

CM1 has reported NO_2 annual mean concentrations below or equal to 25.0µg/m^3 since 2015; 37.5% below the AQS objective limit. Similarly, CM1 has reported no exceedance of the short term 1-hour AQS objective limit, or concentrations exceeding 200µg/m^3 on any occasion since 2015.

Based on historical and 2019 monitoring data, it is recommended that the AQMA remain in force. However, it is suggested that the BCKLWN continue to review the effectiveness of the current monitoring network within the AQMA, with the view to relocate monitoring locations reporting concentrations to be well below the AQS annual mean objective, to further improve confidence in air quality reporting.

Gaywood Clock AQMA

The annual mean concentration results for the NO_2 diffusion tubes located within the Gaywood Clock AQMA are presented in Figure A.2. NO_2 monitoring within the

Gaywood Clock AQMA was undertaken at seven sites during 2019, comprising of 6 diffusion tubes and one continuous monitor (CM2). No sites reported an exceedance of the NO_2 annual mean AQS objective limit, with Site CM2 reporting the highest recorded concentration in the AQMA during 2019 (37.0µg/m^3); within 10% of the AQS objective.

Site CM2 is an automatic monitor located on Lynn Road, an arterial route through the Gaywood Clock junction. Annual mean concentrations recorded at Site CM2 have exhibited a downwards trend over the last five years, decreasing from 42.0µg/m^3 in 2015 to 37.0µg/m^3 in 2019. Furthermore, Site CM2 is the only site within the Gaywood Clock AQMA to record an exceedance of the AQS objective over the last five years, the last being in 2016.

All sites reported NO_2 annual mean concentrations to be between 29.7µg/m^3 and 37.0µg/m^3 for 2019, with NO_2 concentrations remaining steady overall within the AQMA over the last 5 years. CM2 reported concentrations to be within 10% of the AQS objective limit for the fourth time since 2015- the only divergence being last year when an annual mean NO_2 concentration of 34.50µg/m^3 was recorded. CM2 reported no exceedance of the short-term 1-hour AQS objective limit, or concentrations exceeding 200µg/m^3 on any one occasion since 2015.

Based on historical and 2019 monitoring data, it is recommended that the AQMA remain in force, with the view of revocation if NO_2 annual mean concentrations stabilise below the AQS objective limit.

Outside of Declared AQMAs

The annual mean concentration results for the NO_2 diffusion tubes located outside of the declared AQMA boundaries are presented in Figure A.3. NO_2 monitoring was undertaken at 38 sites outside of an AQMA boundary during 2019; and although yearly variations are visible within Figure A.3, NO_2 concentrations have remained overall stable below the AQS objective limit over the last five years.

Site 15 recorded an annual mean concentration within 10% of the AQS objective (36.7µg/m^3) as shown in Table 3.1. This is the highest annual mean concentration recorded outside of an AQMA, and the second time the site has recorded a concentration with 10% of the AQS objective since 2015. However, Site 15 is located on A148- London Road (adjacent to the Town Centre AQMA boundary), and is

situated on the kerbside to monitor background concentrations from changes in traffic flow only. The site therefore does not represent relevant exposure. None of the other 37 sites outside of an AQMA have recorded exceedances, or concentrations within 10% of the AQS objective, since 2015.

Sites 90, 91, 92 and 93 were commissioned to monitor potential emissions from the new road; Lynnsport Way. The road is now open with results showing minimal impact.

Site 76 was commissioned in 2013 to monitor emissions from the addition of Sainsbury's and Tesco superstores to the Hardwick retail park. Concentrations recorded at Site 76 continue to remain well below the AQS NO_2 annual mean objective limit.

Eight new sites (Sites 61, 62, 63, 64, 72, 73, 74, and 83) were commissioned in 2016 (funded by Palm Paper Ltd), to monitor NO_2 concentrations surrounding the Palm Paper facility, located off the Saddlebow Industrial Estate. Annual mean NO_2 concentrations recorded at the eight sites have remained well below the annual mean AQS objective limit since commission, with Site 73 reporting the highest concentration of 22.1µg/m^3 in 2019 and is located on Main Road, West Winch.

Based on historical and 2019 monitoring data, the AQMA boundaries are considered to be of relevance, due to the absence of any reported exceedances at monitoring sites located outside of a declared AQMA boundary since 2015.

3.2.2 Particulate Matter (PM_{10})

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 (24-hour) 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.

No exceedances of either the annual mean or short term (24-hour mean) AQS objective were reported at any site throughout King's Lynn during 2019, a trend prevalent since 2015.

Figure A.4 presents trends in annual mean PM_{10} concentrations measured at the five automatic monitoring sites over the past 5 years. It can be seen that the annual mean

PM_{10} concentration has remained steady at a couple of sites between 2015 and 2019, with an overall decrease largely observed. The highest recorded concentration over the past five years was reported at Sites OS1 and OS2 (21µg/m^3) for 2016. OS1 is located along Page Stair Lane, King's Lynn, whilst OS2 was located along Furlong Road, Stoke Ferry. OS2 was decommissioned in 2018 and relocated to Buckenham Drive, Stoke Ferry as a new site; OS5.

Table A.6 – 24-Hour Mean PM_{10} Monitoring Results in Appendix A shows the number of exceedances of the PM_{10} daily mean air quality objective of 50µg/m^3 at the five automatic monitoring sites. It can be seen that the number of exceedances have been well below the limit of 35 exceedances a year for the past five years, with the maximum number of daily exceedances recorded by CM4 in 2019 (5 days).

Within Stoke Ferry, due to previous recorded levels of PM_{10} and local concerns, particulate monitoring is being undertaken at three locations within the village using two Osiris dust monitors and a TEOM (OS4, OS5 and CM4). As detailed within the Technical Note located in Appendix E, no exceedances of the PM_{10} annual mean or 24-hour mean AQS objective limit have been recorded within 2019 or since the three sites were commissioned. Therefore the declaration of an AQMA within the village is not required.

Following the completion of the Technical Note, the monitoring locations within Stoke Ferry will be reviewed during 2020, with equipment relocated if concentrations remain well below AQS objectives.

3.2.3 Particulate Matter ($PM_{2.5}$)

$PM_{2.5}$ is regulated by standards in the UK which presently places no statutory duty on Local Authorities to report against the annual mean objective limit. These standards are scheduled to be legally enforced in 2020. Nonetheless, the BCKLWN undertake monitoring of $PM_{2.5}$ within the borough indirectly via four Osiris dust monitors. The MCERTs accreditation for the Osiris instrument is only for the indicative measurement of PM_{10} and not $PM_{2.5}$, therefore the $PM_{2.5}$ concentrations should not be taken as absolute.

Table A.7 in Appendix A presents the ratified and adjusted monitored $PM_{2.5}$ annual mean concentrations for the past 4 years since monitoring began. There were no

exceedances of the obligatory annual mean standard of 25µg/m^3 at any of the monitoring sites.

Figure A.5 presents trends in annual mean $PM_{2.5}$ concentrations visually, measured at the four automatic monitoring sites for the past 4 years since monitoring began. Annual mean $PM_{2.5}$ concentrations have been below the obligatory annual mean standard of 25µg/m^3 for the previous four years (2016-2019). $PM_{2.5}$ concentrations have remained largely constant across all four sites, however OS4 has experienced the largest shift, a 3.0µg/m^3 reduction since 2016.

3.3 Air Quality Screening Update

To accompany this ASR, a review of the screening methodology, detailed within Chapter 7 of the LAQM TG16 guidance, has been undertaken. The full screening update can be found within Appendix F. No new sources of air pollution were identified during the review; and no additional air quality monitoring is required within the borough.

4. Conclusions and Priorities

During the 2019 reporting year, the BCKLWN demonstrated proactive steps to stabilising and improving air quality across the Borough. These measures include the development of the King's Lynn Transport Study and the planned update of the existing AQAP, in-line with the completed source appointment modelling exercise and soon to be completed baseline modelling study.

During 2019 there was only one reported exceedance of the annual mean NO_2 AQS objective limit in-line with relevant exposure (Site 2), located within the Town Centre AQMA. Four additional sites reported NO_2 annual mean concentrations to be within 10% of the AQS objective. Two of the four sites were located within the Town Centre AQMA, one within the Gaywood Clock AQMA, with the other adjacent to the Town Centre AQMA (but not located at a relevant receptor).

Based on 2019 monitoring, no changes to the existing AQMA boundaries are required and no revocations should be carried out.

It can be concluded from the monitoring results within the Stoke Ferry Technical Note that the declaration of a new AQMA within the village is not required, as no exceedances of the short term or annual mean PM_{10} AQS objective were recorded within 2019.

Additionally, no new sources of air pollution were identified through the completion of the air quality screening update, with no additional monitoring required within the borough.

The main priorities for the BCKLWN in 2020 are to:

- Continue to monitor both NO_2 and PM_{10} concentrations throughout the Borough, notably within both AQMAs;
- Regularly review the site locations within the monitoring network to ensure that any hotspots are identified;
- Complete the King's Lynn Transport Study and the supporting dispersion modelling exercise; and
- Update the existing AQAP with the outcomes from the King's Lynn Transport Study.

Appendix A: Monitoring Results

Table A.1 - Details of Automatic Monitoring Sites

Site ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA?	Monitoring Technique	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Inlet Height (m)
CM1	Southgates Park, King's Lynn	Roadside	562225	319191	NO_2	YES	Chemiluminescent	N/A	5	1.7
CM2	Gaywood, King's Lynn	Roadside	563437	320472	NO_2	YES	Chemiluminescent	5	1	1.7
CM3	North Lynn, King's Lynn	Roadside	562086	321325	PM_{10}	NO	TEOM	35	17	3
CM4	Lynn Road, Stoke Ferry	Roadside	570339	300083	PM_{10}	NO	TEOM	5	1	3
OS1	Page Stair Lane, King's Lynn	Roadside	561527	320437	PM10 / $PM_{2.5}$	NO	Osiris	5	3.3	3.5
OS2	Lynn Road, Stoke Ferry	Roadside	570339	300083	PM_{10} / $PM_{2.5}$	NO	Osiris	5	1	3.5
OS3	Estuary Road, King's Lynn	Roadside	561593	321466	PM_{10} / $PM_{2.5}$	NO	Osiris	2	1	3.5
OS4	Wretton Road, Stoke Ferry	Roadside	570438	299905	PM_{10} / $PM_{2.5}$	NO	Osiris	24	19	3.5
OS5	Buckenham Drive, King's Lynn	Roadside	570264	299943	PM_{10} / $PM_{2.5}$	NO	Osiris	12	1	3.2

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 (Easting)	Y OS Grid Ref (Northing)	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	Railway Road 1	Roadside	562073	320304	NO_2	TC	2	2	NO	2.5
2	Railway Road 4	Roadside	562100	320222	NO_2	TC	0	2	NO	2.4
3	Railway Road 5	Roadside	562117	320095	NO_2	TC	0	1.5	NO	2.4
5	Bus Station - Shelters, Bay D	Roadside	562003	320099	NO_2	N	N/A	N/A	NO	2.2
6,7,8	Southgates Monitoring Station	Roadside	562226	319191	NO_2	TC	No but property façade 4m from kerb further north	5	YES	3.2
9	Mill Fleet	Roadside	561912	319711	NO_2	N	0	4	NO	2.5
10	London Road 1	Roadside	562101	319679	NO_2	TC	0	3	NO	1.4
11	London Road 2	Roadside	562165	319575	NO_2	TC	0	3	NO	2.2
12	London Road 3	Roadside	562243	319452	NO_2	TC	1	3	NO	2.1
13	London Road 4	Roadside	562264	319375	NO_2	TC	0	4.5	NO	2.2
14	London Road 5	Roadside	562227	319266	NO_2	TC	0.5	4	NO	2.2
15	Southgates	Roadside	562190	319102	NO_2	N	1	0.5	NO	2.4

18	Hardwick Rd	Roadside	562266	319043	NO_2	N	0	7	NO	1.6
19	Vancover Avenue	Roadside	562277	319098	NO_2	N	0	6	NO	1.5
20	London Road 10	Roadside	562244	319261	NO_2	TC	0	3.5	NO	2.2
22	London Road 6	Roadside	562285	319386	NO_2	TC	0	5	NO	1.3
23	London Road 7	Roadside	562162	319614	NO_2	TC	0	4.5	NO	2.1
24	London Road 8	Roadside	562136	319651	NO_2	TC	0	5.5	NO	2.2
25	The Walks	Roadside	562191	319695	NO_2	N	0	75	NO	1.7
26	Railway Road 7	Roadside	562131	319996	NO_2	TC	0	2	NO	2.3
27	St John's Terrace	Roadside	562178	319999	NO_2	TC	3	2	NO	2.1
28	St John's Terrace/ Blackfriar's	Roadside	562253	320015	NO_2	TC	0	1.5	NO	2.6
29	Waterloo Street	Kerbside	562175	320055	NO_2	N	2.5	1	NO	1.6
30	Portland Street	Kerbside	562204	320108	NO_2	N	2.5	1	NO	2.4
31	Railway Road 2	Roadside	562129	320132	NO_2	TC	0	2	NO	2.3
32	Railway Road 3	Roadside	562119	320216	NO_2	TC	0	2	NO	2.4
33	Wellesley Street	Roadside	562203	320159	NO_2	N	2.5	0.5	NO	2.4
34	Blackfriars 2	Roadside	562244	320129	NO_2	TC	0	2.5	NO	2.4

35	Blackfriars 1	Roadside	562245	320238	NO_2	TC	3	1.5	NO	2.3
36	Norfolk Street	Roadside	562219	320319	NO_2	N	0	2	NO	2.2
37	Blackfriars 3	Roadside	562254	320259	NO_2	TC	N/A	2	NO	2.5
38	Littleport Street	Roadside	562257	320323	NO_2	TC	0	2.5	NO	2.4
39	Gaywood Road 2	Roadside	562822	320427	NO_2	N	0	7	NO	5
40	The Swan (1) Gayton Road	Roadside	563490	320469	NO_2	GC	0	2	NO	2.5
41	Wootton Road 2	Roadside	563478	320515	NO_2	GC	0	2	NO	3.4
42	Wootton Road 1	Roadside	563480	320582	NO_2	GC	0	3	NO	1.7
43	Lynn Road 1	Roadside	563412	320477	NO_2	GC	0	5	NO	3.4
44	Lynn Road 2	Roadside	563377	320484	NO_2	GC	0	2	NO	3.4
45	Gaywood Road 3	Roadside	563202	320488	NO_2	N	0	4.5	NO	2.2
46	Gaywood Road 1	Roadside	562565	320509	NO_2	N	0	6.5	NO	2.09
47	Austin Street 1	Roadside	562186	320376	NO_2	TC	0.5	1	NO	1.7
48	Austin Street 2	Roadside	562180	320365	NO_2	TC	0	2	NO	2.6
51	Wootton Road 3	Roadside	563521	320628	NO_2	N	6	1.5	NO	1.8
52	Lynn Road 3	Roadside	563289	320504	NO_2	N	5.5	1	NO	1.6

58	NORR	Roadside	562171	319019	NO_2	N	18	2	NO	2.5
61	Sydney Terrace	Roadside	561854	318272	NO_2	N	0	3.5	NO	1.55
62	Burney Road	Roadside	561604	318601	NO_2	N	0	7	NO	1.55
63	High Road, Saddlebrow 1	Roadside	560593	315712	NO_2	N	0	15	NO	1.7
64	High Road, Saddlebrow 2	Roadside	560917	316766	NO_2	N	0	22	NO	1.7
66	Gaywood Road	Urban Background	562595	320527	NO_2	N	0	N/A	NO	2.4
67	Greyfriars, London Road	Urban Background	562236	319579	NO_2	N	0	N/A	NO	2.3
68	Nursery, London Road	Urban Background	562143	319838	NO_2	N	0	N/A	NO	1.6
69	Whitefriars 1, Whitefriars Road	Urban Background	561994	319395	NO_2	N	0	N/A	NO	2.2
70	Whitefriars 2, Whitefriars Road	Urban Background	561930	319355	NO_2	N	0	N/A	NO	2.4
72	Ferry Square, West Lynn	Roadside	561223	320295	NO_2	N	0.5	1.5	NO	2.2
73	Main Road, West Winch	Roadside	563161	315848	NO_2	N	10	11	NO	1.7
74	Saddlebow Caravan Park	Roadside	561754	317910	NO_2	N	0	1	NO	2.2
75	The Swan (2) Gayton Road	Roadside	563469	320469	NO_2	GC	0	2	NO	2.8
76	Hardwick Road	Roadside	562597	318740	NO_2	N	1	8	NO	1.58
79	Tennyson Ave	Roadside	562804	320423	NO_2	N	0	2	NO	3.8

83	The Elms	Suburban	560779	318509	NO_2	N	0	115	NO	1.7
86	Bus Station - Taxi Rank	Other	562019	320139	NO_2	N	0	N/A	NO	2.2
87	Albion Street	Roadside	562103	320164	NO_2	TC	0	2.6	NO	2.1
88	Tennyson Avenue (2)	Roadside	562795	320290	NO_2	N	0	7.4	NO	2
89	Whitefriars Terrace	Roadside	561888	319467	NO_2	N	0	1	NO	2.4
90	Spenser Road	Roadside	563366	322065	NO_2	N	0	8	NO	1.8
91	Reid Way	Roadside	563255	321613	NO_2	N	0	8	NO	2.5
92	Garden Court	Roadside	563256	321589	NO_2	N	0	16	NO	2
93	Front Way	Roadside	563213	321283	NO_2	N	0	9.7	NO	2

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.3 – Annual Mean NO_2 Monitoring Results

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2019 (%) (2)	NO_2 Annual Mean Concentration (µg/m^3) (3) (4)				
							2015	2016	2017	2018	2019
CM1	562225	319191	Roadside	Automatic	89.7	89.7	21.0	25.0	25.0	23.9	21.0
CM2	563437	320472	Roadside	Automatic	95.1	95.1	**42.0**	**45.0**	38.0	34.5	37.0
1	562073	320304	Roadside	Diffusion Tube	100.0	100.0	36.6	35.5	35.9	33.8	36.3
2	562100	320222	Roadside	Diffusion Tube	100.0	83.3	**46.6**	**44.6**	**45.5**	**43.2**	**42.4**
3	562117	320095	Roadside	Diffusion Tube	100.0	75.0	36.9	38.6	38.5	37.4	37.5
5	562003	320099	Roadside	Diffusion Tube	100.0	91.7	-	32.4	30.4	28.8	28.8
6,7,8	562226	319191	Roadside	Diffusion Tube	100.0	97.2	25.2	24.6	24.6	23.9	24.3
9	561912	319711	Roadside	Diffusion Tube	100.0	100.0	20.3	20.8	19.5	19.9	20.5
10	562101	319679	Roadside	Diffusion Tube	100.0	100.0	37.8	36.3	37.2	36.2	35.5
11	562165	319575	Roadside	Diffusion Tube	100.0	100.0	28.5	27.9	27.7	28.1	28.4
12	562243	319452	Roadside	Diffusion Tube	100.0	100.0	33.1	32	33.5	29.8	31.4
13	562264	319375	Roadside	Diffusion Tube	100.0	100.0	30.3	31	29.9	28.8	29.0
14	562227	319266	Roadside	Diffusion Tube	100.0	100.0	33.1	33.1	33.6	33.6	33.2
15	562190	319102	Roadside	Diffusion Tube	100.0	100.0	37.2	35.4	34.9	35.3	36.7
18	562266	319043	Roadside	Diffusion Tube	100.0	100.0	25.8	24.5	25.9	24.1	25.1
19	562277	319098	Roadside	Diffusion Tube	100.0	100.0	23.7	23	24	21.9	23.9

20	562244	319261	Roadside	Diffusion Tube	100.0	91.7	30.8	30.6	28.2	30	28.2
22	562285	319386	Roadside	Diffusion Tube	100.0	100.0	31.4	32.6	30.1	34	31.0
23	562162	319614	Roadside	Diffusion Tube	100.0	100.0	31.6	32.5	29.6	32.6	31.2
24	562136	319651	Roadside	Diffusion Tube	100.0	100.0	28.7	28.9	26.4	30.5	29.7
25	562191	319695	Roadside	Diffusion Tube	100.0	100.0	15.0	14.4	15.3	15.9	15.3
26	562131	319996	Roadside	Diffusion Tube	100.0	100.0	33.8	31.5	31.4	32.9	31.5
27	562178	319999	Roadside	Diffusion Tube	100.0	100.0	27.5	28.5	27.8	28.5	27.6
28	562253	320015	Roadside	Diffusion Tube	100.0	100.0	30.2	30	30.5	28.9	29.8
29	562175	320055	Kerbside	Diffusion Tube	100.0	75.0	18.6	18.3	18.7	19	18.9
30	562204	320108	Kerbside	Diffusion Tube	100.0	100.0	21.4	20.4	19.7	19.4	20.5
31	562129	320132	Roadside	Diffusion Tube	100.0	100.0	30.4	28.2	28.3	30.2	29.1
32	562119	320216	Roadside	Diffusion Tube	100.0	100.0	27.7	29	28.3	28.8	27.8
33	562203	320159	Roadside	Diffusion Tube	100.0	100.0	27.4	26.1	27.8	27.4	28.5
34	562244	320129	Roadside	Diffusion Tube	100.0	100.0	30.1	28.7	28.9	31.1	28.8
35	562245	320238	Roadside	Diffusion Tube	100.0	100.0	28.5	27.2	28.2	27.7	27.6
36	562219	320319	Roadside	Diffusion Tube	100.0	100.0	27.9	27.3	27.6	27.4	27.7
37	562254	320259	Roadside	Diffusion Tube	100.0	75.0	27.3	26.5	26.5	30.6	29.7
38	562257	320323	Roadside	Diffusion Tube	100.0	100.0	32.5	31.5	33.2	34	34.2
39	562822	320427	Roadside	Diffusion Tube	100.0	100.0	24.3	24.1	24.3	24.5	24.5

40	563490	320469	Roadside	Diffusion Tube	100.0	100.0	31.2	30.2	31.2	31.3	32.0
41	563478	320515	Roadside	Diffusion Tube	100.0	100.0	31.2	32.2	32.1	36.7	34.9
42	563480	320582	Roadside	Diffusion Tube	100.0	100.0	29.8	29.3	30.5	30	29.7
43	563412	320477	Roadside	Diffusion Tube	100.0	100.0	28.7	30	29.2	30.9	29.4
44	563377	320484	Roadside	Diffusion Tube	100.0	100.0	31.8	32.8	32.4	36	34.6
45	563202	320488	Roadside	Diffusion Tube	100.0	100.0	26	27	25.2	28.8	26.8
46	562565	320509	Roadside	Diffusion Tube	100.0	100.0	23.8	24	22.5	24.6	24.1
47	562186	320376	Roadside	Diffusion Tube	100.0	100.0	29.6	30.3	29.3	30.6	29.7
48	562180	320365	Roadside	Diffusion Tube	100.0	91.7	28.4	26.8	27.8	27.7	27.2
51	563521	320628	Roadside	Diffusion Tube	100.0	100.0	17.3	18.3	19	18.8	18.6
52	563289	320504	Roadside	Diffusion Tube	100.0	100.0	27.2	27.3	28.7	30.1	28.4
58	562171	319019	Roadside	Diffusion Tube	100.0	100.0	26.7	28.2	24.7	28.2	27.4
61	561854	318272	Roadside	Diffusion Tube	100.0	100.0	-	-	16.9	16.7	17.1
62	561604	318601	Roadside	Diffusion Tube	100.0	83.3	-	-	14.9	13.9	14.1
63	560593	315712	Roadside	Diffusion Tube	100.0	100.0	-	-	9.7	10.2	9.7
64	560917	316766	Roadside	Diffusion Tube	100.0	100.0	-	-	10.4	10.5	10.3
66	562595	320527	Urban Background	Diffusion Tube	100.0	83.3	20.9	20.4	18.5	20.6	22.1
67	562236	319579	Urban Background	Diffusion Tube	100.0	100.0	16.4	15.7	17.2	16.4	16.8
68	562143	319838	Urban Background	Diffusion Tube	100.0	100.0	18.8	19	19.5	20.5	19.1

69	561994	319395	Urban Background	Diffusion Tube	100.0	100.0	12.8	12.7	12.5	13.7	13.3
70	561930	319355	Urban Background	Diffusion Tube	100.0	75.0	12.4	12.3	12.7	12.7	13.5
72	561223	320295	Roadside	Diffusion Tube	100.0	91.7	-	-	12.3	12.3	11.6
73	563161	315848	Roadside	Diffusion Tube	100.0	100.0	-	-	19.6	24.3	22.1
74	561754	317910	Roadside	Diffusion Tube	100.0	100.0	-	-	14.2	14.2	13.4
75	563469	320469	Roadside	Diffusion Tube	100.0	100.0	33	32.2	31.6	34.1	35.8
76	562597	318740	Roadside	Diffusion Tube	100.0	100.0	18.8	18.2	19.6	18.8	19.8
79	562804	320423	Roadside	Diffusion Tube	100.0	100.0	34	34.6	32.8	32.7	33.2
83	560779	318509	Suburban	Diffusion Tube	100.0	100.0	-	-	11.8	12.9	13.0
86	562019	320139	Other	Diffusion Tube	100.0	100.0	27.6	27.7	27.6	27.1	27.7
87	562103	320164	Roadside	Diffusion Tube	100.0	91.7	28.7	30.5	29.3	32	30.0
88	562795	320290	Roadside	Diffusion Tube	100.0	100.0	18.9	18.3	17.8	18.2	18.9
89	561888	319467	Roadside	Diffusion Tube	100.0	100.0	13.3	13	13.2	13.2	13.5
90	563366	322065	Roadside	Diffusion Tube	100.0	100.0	-	14	15	15.9	16.1
91	563255	321613	Roadside	Diffusion Tube	100.0	100.0	-	13.6	13.7	14.4	14.5
92	563256	321589	Roadside	Diffusion Tube	100.0	100.0	-	12.9	12.6	12.9	13.0
93	563213	321283	Roadside	Diffusion Tube	100.0	100.0	-	13.1	11.9	13.3	12.7

☒ **Diffusion tube data has been bias corrected**

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

☒ **Reported concentrations are those at the location of the monitoring site (bias adjusted and annualised, as required), i.e. prior to any fall-off with distance adjustment**

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.

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

Figure A.1 – Trends in Annual Mean NO_2 Concentrations Measured at Monitoring Sites: Town Centre AQMA

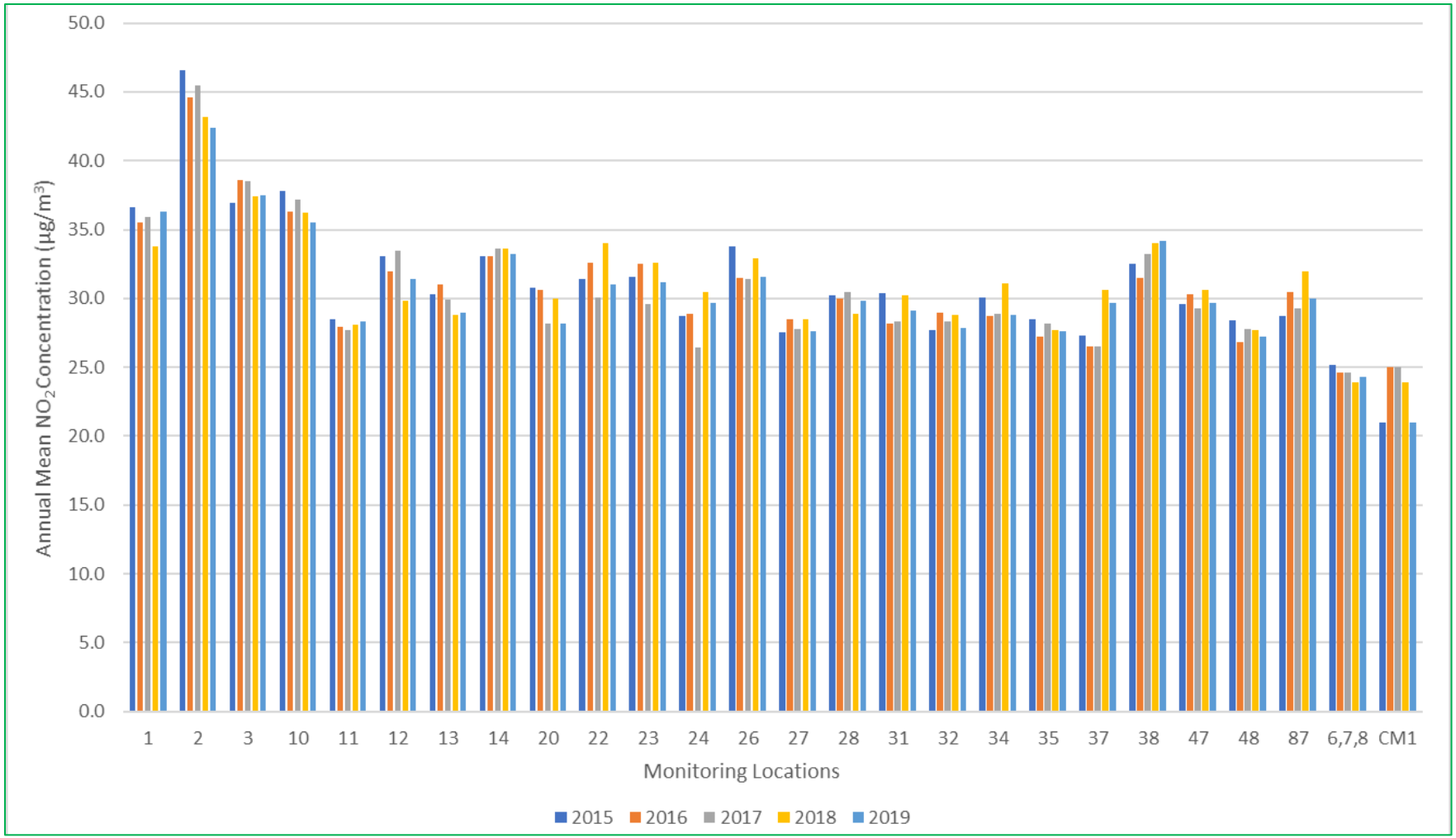


Figure A.2 – Trends in Annual Mean NO_2 Concentrations Measured at Monitoring Sites: Gaywood AQMA

Figure A.3 – Trends in Annual Mean NO_2 Concentrations Measured at Monitoring Sites: Outside of AQMAs

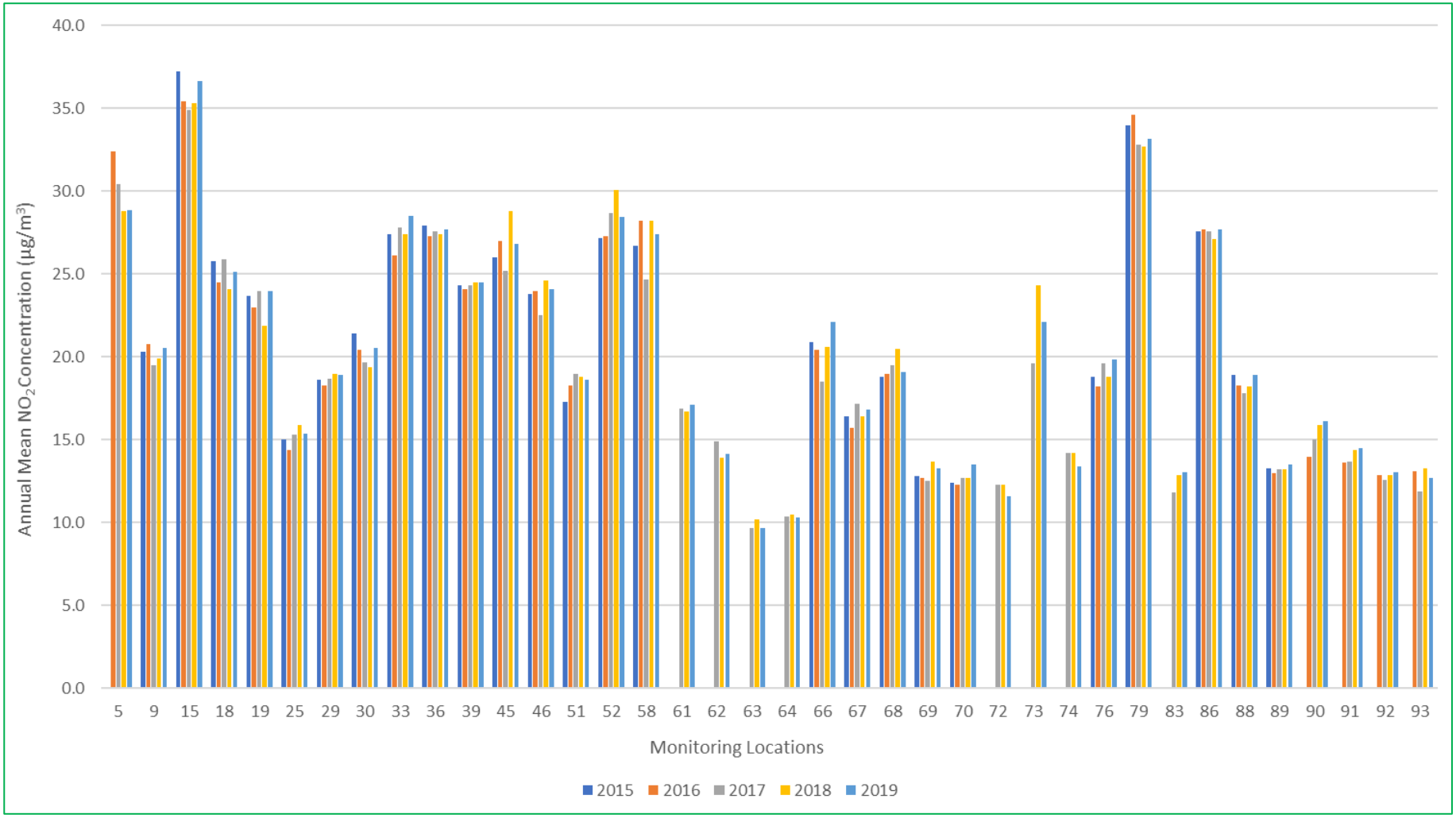


Table A.4 – 1-Hour Mean NO_2 Monitoring Results

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2019 (%) (2)	NO_2 1-Hour Means > 200µg/m³ (3)				
							2015	2016	2017	2018	2019
CM1	562225	319191	Roadside	Automatic	89.7%	89.7%	0	0	0	0	0
CM2	563437	320472	Roadside	Automatic	95.1%	95.1%	0	0	0	0	0

Notes:

Exceedances of the NO_2 1-hour mean objective (200µg/m³ not to be exceeded more than 18 times/year) are shown in **bold.**

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

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

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

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

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2019 (%) (2)	PM_{10} Annual Mean Concentration (µg/m³) (3)				
						2015	2016	2017	2018	2019
CM3	562086	321325	Roadside	N/A	N/A	18.0	18.0	19.0	-	-
CM4	570339	300083	Roadside	96.8%	96.8%	-	-	-	18.4	16.0
OS1	561527	320437	Roadside	95.7%	95.7%	19.0	21.0	18.0	16.4	11.0
OS2	570339	300083	Roadside	N/A	N/A	16.0	21.0	17.0	10.3	-
OS3	561593	321466	Roadside	89.8%	89.8%	20.0	15.0	13.0	14.6	13.0
OS4	570438	299905	Roadside	97.5%	97.5%	-	16.0	12.0	13.2	11.0
OS5	570264	299943	Roadside	95.3%	95.3%	-	-	-	12.7	10.0

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

Notes:

Exceedances of the PM_{10} annual mean objective of 40µg/m³ 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.

Figure A.4 – Trends in Annual Mean PM_{10} Concentrations

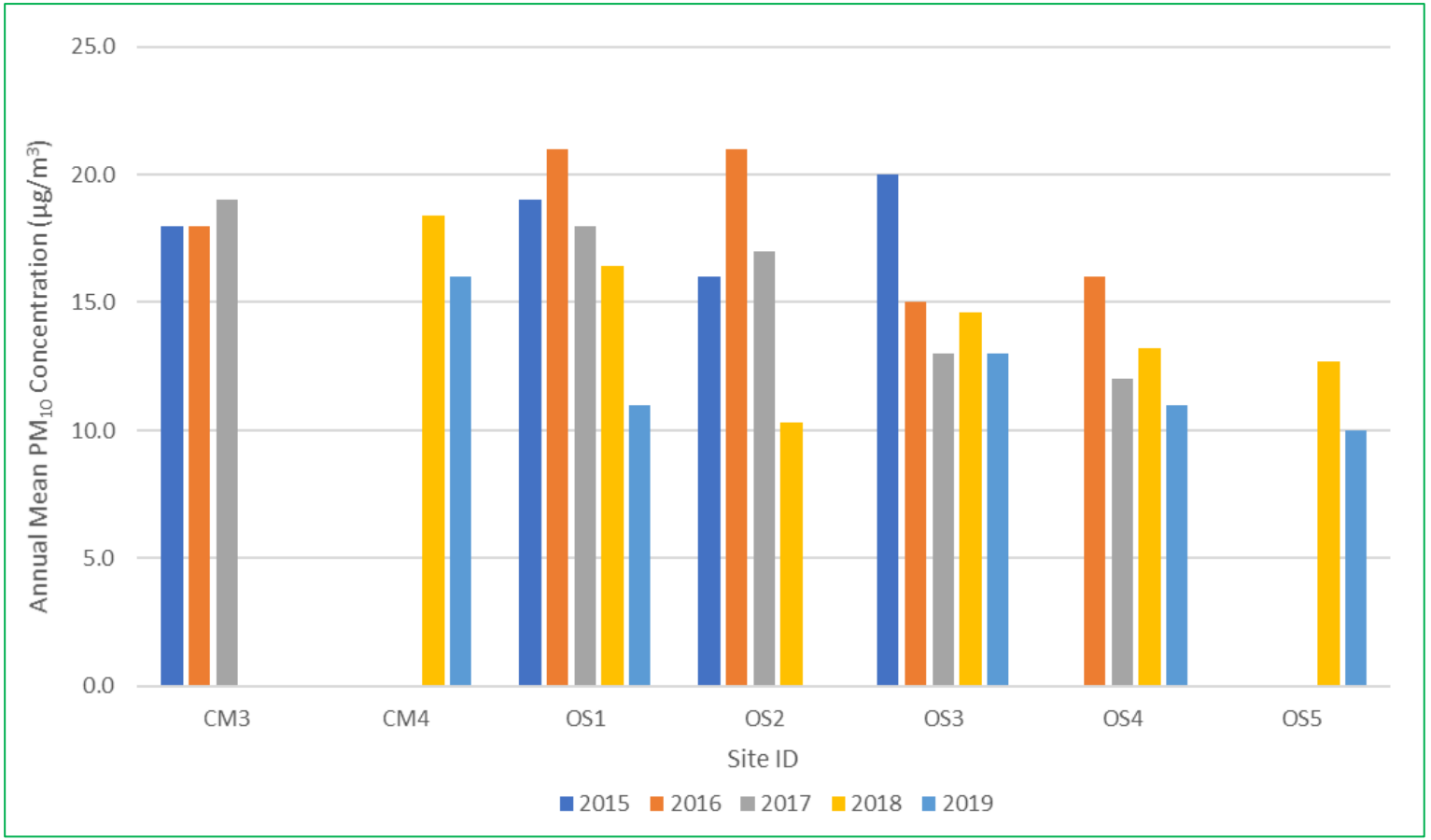


Table A.6 – 24-Hour Mean PM_{10} Monitoring Results

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2019 (%) (2)	PM_{10} 24-Hour Means > 50µg/m^3 (3)				
						2015	2016	2017	2018	2019
CM3	562086	321325	Roadside	N/A	N/A	3	5	3	0	-
CM4	570339	300083	Roadside	96.8%	96.8%	**-**	**-**	**-**	0	5
OS1	561527	320437	Roadside	95.7%	95.7%	4	9	3	4	0
OS2	570339	300083	Roadside	N/A	N/A	9	3	2		-
OS3	561593	321466	Roadside	89.8%	89.8%	8	2	0	0	0
OS4	570438	299905	Roadside	97.5%	97.5%	**-**	0	0	0	0
OS5	570264	299943	Roadside	95.3%	95.3%	**-**	**-**	**-**	0	0

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	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2019 (%) (2)	$PM_{2.5}$ Annual Mean Concentration (µg/m^3) (3)				
						2015	2016	2017	2018	2019
OS1	561527	320437	Roadside	95.7%	95.7%	-	6.0	6.0	7.0	5.0
OS2	570339	300083	Roadside	N/A	N/A	-	6.0	7.0	4.9	-
OS3	561593	321466	Roadside	89.8%	89.8%	-	4.0	6.0	6.9	7.0
OS4	570438	299905	Roadside	97.5%	97.5%	-	10.0	5.0	6.2	7.0
OS5	570264	299943	Roadside	95.3%	95.3%	-	-	-	5.9	5.0

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

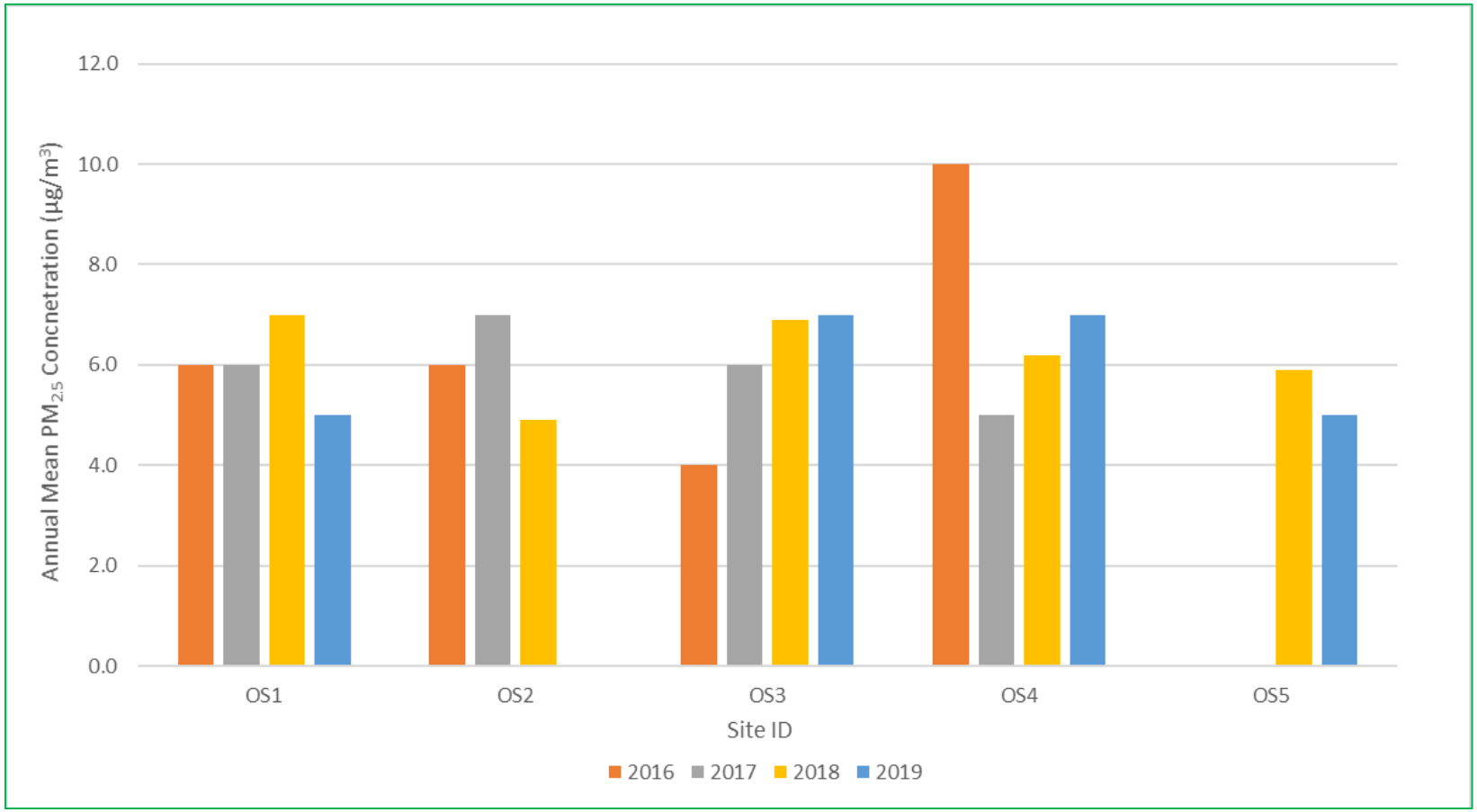
Notes:

(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.

Figure A.5 – Trends in Annual Mean $PM_{2.5}$ Concentrations



Appendix B: Full Monthly Diffusion Tube Results for 2019

Table B.1 - NO_2 Monthly Diffusion Tube Results - 2019

Site ID	NO_2 Mean Concentrations ($\mu g/m^3$)														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean		
													Raw Data	Bias Adjusted (0.93) and Annualised (1)	Distance Corrected to Nearest Exposure (2)
1	43.0	44.0	36.0	34.0	33.0	36.0	30.0	41.0	40.0	42.0	47.0	42.0	39.0	36.3	-
2	Missing	Missing	48.0	34.0	47.0	42.0	41.0	52.0	46.0	47.0	52.0	47.0	46.0	42.4	-
3	47	43	40	30	42	33	Missing	45	39	44	Missing	Missing	40.0	37.5	-
5	31	36	30	31	Missing	26	25	30	28	36	37	31	31.0	28.8	-
6	33	34	27	23	21	21	22	22	24	29	33	Missing	26.0	24.4	-
7	36	31	28	23	21	22	22	23	24	28	31	30	27.0	24.7	-
8	30	32	26	21	23	22	21	19	23	30	31	31	26.0	23.9	-
9	27	29	18	25	18	17	16	16	20	25	30	24	22.0	20.5	-
10	38	48	34	36	31	35	32	39	39	42	44	40	38.0	35.5	-
11	31	37	31	22	23	27	28	32	31	34	35	35	31.0	28.4	-
12	39	45	35	22	22	29	31	39	34	35	37	37	34.0	31.4	-
13	36	40	35	23	26	24	27	31	31	30	35	36	31.0	29.0	-
14	40	44	34	26	30	30	32	39	35	39	39	41	36.0	33.2	-
15	43	39	38	40	39	35	38	43	40	41	42	35	39.0	36.7	-
18	31	35	26	23	23	21	25	25	27	26	32	30	27.0	25.1	-
19	30	30	25	24	21	23	22	26	24	27	30	27	26.0	23.9	-

20	32	31	27	36	29	30	26	29	31	33	Missing	29	30.0	28.2	-
22	32	41	32	36	29	31	28	29	32	33	42	35	33.0	31.0	-
23	30	35	31	44	33	30	31	28	33	34	42	31	34.0	31.2	-
24	31	32	28	45	32	34	29	28	32	34	32	26	32.0	29.7	-
25	23	25	18	11	11	11	12	12	14	17	22	22	17.0	15.3	-
26	33	39	33	29	34	31	28	35	36	36	40	33	34.0	31.5	-
27	34	33	31	28	28	26	26	30	29	28	36	27	30.0	27.6	-
28	39	35	33	28	30	28	29	37	31	33	38	24	32.0	29.8	-
29	28	28	Missing	Missing	Missing	14	14	16	18	19	25	21	20.0	18.9	-
30	31	27	21	20	18	18	16	18	20	24	29	23	22.0	20.5	-
31	38	40	27	33	22	29	27	30	29	32	39	30	31.0	29.1	-
32	34	39	26	29	23	25	25	28	30	31	39	30	30.0	27.8	-
33	39	38	31	28	22	26	23	30	28	30	38	35	31.0	28.5	-
34	37	38	35	23	23	24	28	31	31	33	36	33	31.0	28.8	-
35	34	35	33	24	24	26	27	29	30	30	34	30	30.0	27.6	-
36	37	37	30	26	22	25	23	28	29	31	37	32	30.0	27.7	-
37	36	31	30	35	32	Missing	26	Missing	28	Missing	39	30	32.0	29.7	-
38	36	50	35	34	26	33	32	40	35	38	43	39	37.0	34.2	-
39	30	34	26	24	20	21	25	24	23	26	37	26	26.0	24.5	-
40	42	39	36	30	27	30	29	36	31	34	41	38	34.0	32.0	-
41	34	40	38	44	31	37	31	36	37	39	49	34	38.0	34.9	-
42	39	42	35	22	25	27	27	32	31	33	38	32	32.0	29.7	-
43	40	34	34	27	29	28	31	28	32	30	38	28	32.0	29.4	-
44	44	42	37	43	34	35	34	18	38	37	50	34	37.0	34.6	-
45	32	34	29	31	27	26	24	22	27	30	39	25	29.0	26.8	-
46	29	30	27	28	22	22	19	20	25	27	36	26	26.0	24.1	-
47	37	40	33	32	23	29	26	31	27	32	40	33	32.0	29.7	-

48	37	42	34	13	14	23	25	32	30	36	36	Missing	29.0	27.2	-
51	25	29	22	18	14	13	14	17	18	22	26	22	20.0	18.6	-
52	38	33	32	30	28	25	27	27	30	30	40	27	31.0	28.4	-
58	34	35	26	39	22	25	16	24	26	36	41	29	29.0	27.4	-
61	22	27	21	15	13	12	13	16	17	20	24	21	18.4	17.1	-
62	23	Missing	16	Missing	10	10	10	11	14	17	22	19	15.2	14.1	-
63	14	17	10	9	6	6	6	7	9	11	16	14	10.4	9.7	-
64	16	12	10	13	8	7	7	7	10	13	17	13	11.1	10.3	-
66	30	32	Missing	20	17	17	Missing	18	21	25	33	25	24.0	22.1	-
67	25	27	18	12	10	13	13	15	17	20	23	24	18.0	16.8	-
68	28	28	21	15	16	15	16	17	19	22	26	23	21.0	19.1	-
69	21	21	13	12	10	8	9	9	12	17	22	17	14.0	13.3	-
70	20	25	Missing	9	7	8	Missing	Missing	12	15	22	13	15.0	13.5	-
72	18	Missing	11	11	10	7	8	9	11	14	21	17	12.0	11.6	-
73	28	25	19	36	21	19	19	14	22	26	35	21	24.0	22.1	-
74	15	19	16	16	11	10	10	10	13	15	24	14	14.0	13.4	-
75	41	46	39	35	28	32	38	34	37	41	52	39	39.0	35.8	-
76	27	30	21	15	14	16	18	23	19	23	25	25	21.0	19.8	-
79	44	42	38	31	26	28	34	32	35	37	48	33	36.0	33.2	-
83	19	18	12	17	11	10	10	9	12	15	21	14	14.0	13.0	-
86	34	36	30	29	22	23	27	30	26	30	38	32	30.0	27.7	-
87	33	37	32	39	27	26	28	Missing	30	32	41	30	32.0	30.0	-
88	26	31	21	18	13	14	14	16	18	22	29	22	20.0	18.9	-
89	20	21	13	13	9	8	8	10	13	18	22	19	15.0	13.5	-
90	23	26	15	15	11	12	12	13	16	20	26	19	17.0	16.1	-
91	23	22	17	12	10	10	11	12	14	18	23	15	16.0	14.5	-
92	19	22	14	11	9	9	9	10	12	15	22	16	14.0	13.0	-

93	21	23	13	11	1	9	9	10	13	17	21	16	14.0	12.7	-

☐ **Local bias adjustment factor used**

☒ **National bias adjustment factor used**

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

☒ **Where applicable, data has been distance corrected for relevant exposure in the final column**

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

(2) Distance corrected to nearest relevant public exposure.

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

Diffusion Tube Local Bias Adjustment Factor

King's Lynn Council operate one continuous NO_2 analyser (Southgates- CM1) that has a triplicate site of diffusion tubes co-located at the monitoring site. A local bias adjustment factor has been calculated for the location using the Precision and Bias adjustment spreadsheet (v04); the output is presented below in Figure C.1. The calculated local bias adjustment factor was 0.78.

Figure C.1- Local Bias Adjustment Output: Southgates (Tubes 6/7/8)

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	09/01/2019	2/6/2019	33.0	36.0	30.0	33	3.0	9	7.5
2	2/6/2019	3/6/2019	34.0	31.0	32.0	32	1.5	5	3.8
3	3/6/2019	4/3/2019	27.0	28.0	26.0	27	1.0	4	2.5
4	4/3/2019	5/1/2019	23.0	23.0	21.0	22	1.2	5	2.9
5	5/1/2019	6/5/2019	21.0	21.0	23.0	22	1.2	5	2.9
6	6/5/2019	7/3/2019	21.0	22.0	22.0	22	0.6	3	1.4
7	7/3/2019	8/14/2019	22.0	22.0	21.0	22	0.6	3	1.4
8	8/14/2019	9/4/2019	22.0	23.0	19.0	21	2.1	10	5.2
9	9/4/2019	10/3/2019	24.0	24.0	23.0	24	0.6	2	1.4
10	10/3/2019	11/6/2019	29.0	28.0	30.0	29	1.0	3	2.5
11	11/6/2019	12/4/2019	33.0	31.0	31.0	32	1.2	4	2.9
12	12/4/2019	1/8/2020		30.0	31.0	31	0.7	2	6.4
13									

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

Automatic Method	
Period Mean	Data Capture (% DC)
30.1	99.6
27.5	99.4
20.3	68.2
15.2	53
15.4	56.2
15.5	99.9
15.4	99.7
16.6	99.8
15.9	99.9
20.7	99.9
26.6	99.9
22.4	99.9

Data Quality Check	
Tubes Precision Check	Automatic Monitor Data
Good	Good
Good	Good
Good	or Data Capture
Good	or Data Capture
Good	or Data Capture
Good	Good
Good	Good
Good	Good
Good	Good
Good	Good
Good	Good
Good	Good

<-- Overall survey: Good precision | Poor Overall DC

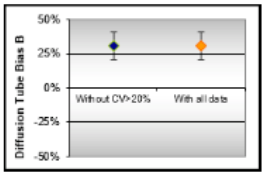
(Check average CV & DC from Accuracy calculations)

Site Name/ ID:	Southgates

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 9 periods of data
Bias factor A 0.78 (0.72 - 0.84)
Bias B 28% (18% - 38%)
:Diffusion Tubes Mean 27 µgm^{-3}
:(Mean CV (Precision 5
:Automatic Mean 21 µgm^{-3}
:Data Capture for periods used 100%
:Adjusted Tubes Mean 21 (20 - 23) µgm^{-3}

Accuracy (with 95% confidence interval)
WITH ALL DATA
Bias calculated using 9 periods of data
Bias factor A 0.78 (0.72 - 0.84)
Bias B 28% (18% - 38%)
:Diffusion Tubes Mean -3
:(Mean CV (Precision
:Automatic Mean 21 -3
:Data Capture for periods used 100%
:Adjusted Tubes Mean 21 (20 - 23) µgm^{-3}



Jaume Targa, for AEA
Version 04 - February 2011

Diffusion Tube National Bias Adjustment Factor

The diffusion tubes used by King's Lynn Council are supplied and analysed by Gradko International, the tubes were prepared using the 20% TEA in acetone preparation method. The 2019 national bias adjustment factor for Gradko 20% TEA in water is 0.93, based on 27 studies, as derived from the national bias adjustment factor spread sheet (Round 1 of 3)[10]

[10] https://laqm.defra.gov.uk/bias-adjustment-factors/national-bias.html

Discussion of Choice of Bias Adjustment Factor Used

The diffusion tube data has been corrected using a bias adjustment factor, which is an estimate of the difference between diffusion tube concentration and continuous monitoring, the latter assumed to be a more accurate method of monitoring. The Defra LAQM.TG(16) provides guidance with regard to the application of a bias adjustment factor to correct diffusion tube monitoring.

Triplicate co-location studies can be used to determine a local bias factor based on the comparison of diffusion tube results with data taken from NOx/NO_2 continuous analysers. Alternatively, the national database of diffusion tube co-location surveys provides bias factors for the relevant laboratory and preparation method.

The national bias adjustment factor (0.93) has been used to adjust the 2019 diffusion tube data. As illustrated in Figure C.1, the automatic analyser (CM1) had poor data capture for three of the twelve monitoring periods (3, 4, & 5), with the valid data capture for 2019 being 89.7%. As stated within LAQM.TG(16) Box 7.11, where data capture from the automatic analyser is less than 90%, the national bias adjustment factor may be more representative. Additionally, the local bias adjustment factor calculated is very different to the national one, also informing the overall decision.

The poor data capture within monitoring periods 3, 4, & 5 is the result of a series of faults at the automatic monitoring site. Firstly, during the installation of a web-logger at CM1 on the 25th of March 2019, a fault occurred which resulted in the analyser sampling internally. This was fixed on the 16th of April. Secondly, during an engineer visit to site, the NO/NO_2 valve was broken; resulting in another data gap from 20th May to 4th June. These faults, and other smaller issues at CM1, resulted in the reduced data capture.

QA/QC of Automatic Monitoring

Data from the automatic monitoring stations is collected by Air Quality Data Management (AQDM) on behalf of the BCKLWN. The TEOM data has the Volatile Correction Model (VCM) for Indicative Gravimetric Equivalence applied, and the Osiris data has a gravimetric factor of 1.3 for Indicative Gravimetric Equivalence applied. Both the TEOM and NOx analysers are serviced biannually by Air Monitors,

and calibration data is collected fortnightly from the NOx analysers by council officers and passed to AQDM who carry out any adjustment of the data. The Osiris instruments are serviced and calibrated annually by Turnkey Instruments.

QA/QC of Diffusion Tube Monitoring

Gradko International Ltd (Gradko) is a UKAS accredited laboratory and participates in the AIR-PT Scheme (a continuation of the Workplace Analysis Scheme for Proficiency (WASP) for NO_2 tube analysis and the Annual Field Inter-Comparison Exercise. These provide strict performance criteria for participating laboratories to meet, thereby ensuring NO_2 concentrations are reported to a high level of accuracy. The lab follows the procedures set out in the Harmonisation Practical Guidance.
In the 2019 AIR-PT results, AIR-PT AR030 (January to February 2019), AIR PT AR031 (April to May 2019), AIR-PT AR033 (July to August 2019) and AIR-PT AR034 (September to November 2019), Gradko scored 75% for the first and 100% for the latter three. The percentage score reflects the results deemed to be satisfactory based upon the z-score of $\leq \pm 2$.

Short-term to Long-term Data Adjustment

Monitoring data capture for 2018 was greater than 75% at all the monitoring locations, therefore annualisation was not required.

Fall-off With Distance Correction

In accordance with the conditions stated in Section 7.78 of Defra's TG(16), distance correction calculations, using the NO_2 fall-off with distance calculator, was not required to be undertaken at any site in operation in 2019**.**

Appendix D: Maps of Monitoring Locations and AQMAs

Figure D.1 – Monitoring Sites Within and Adjacent to Gaywood Clock AQMA

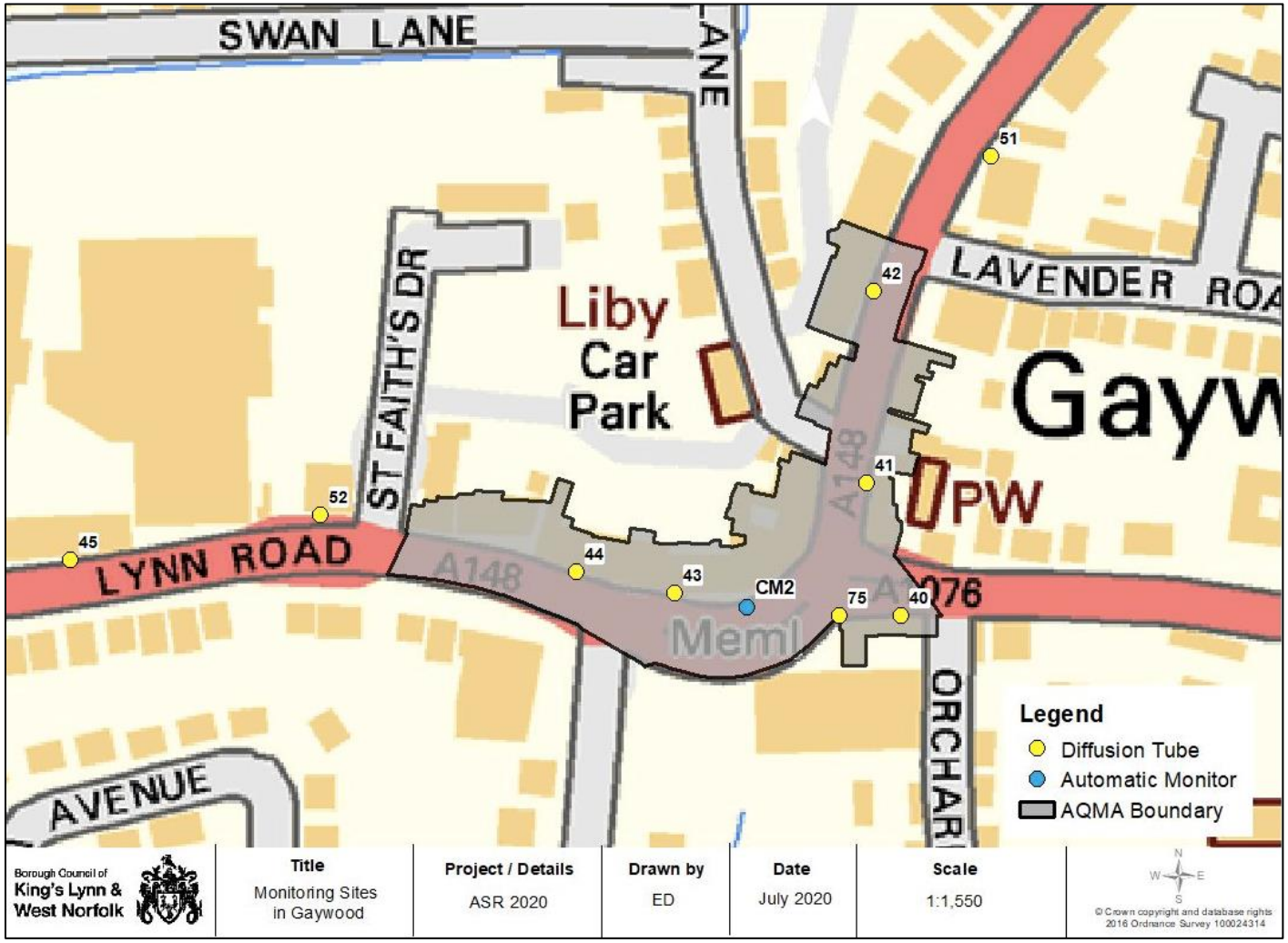


Figure D.2 – Monitoring Sites Within and Adjacent to Town Centre AQMA

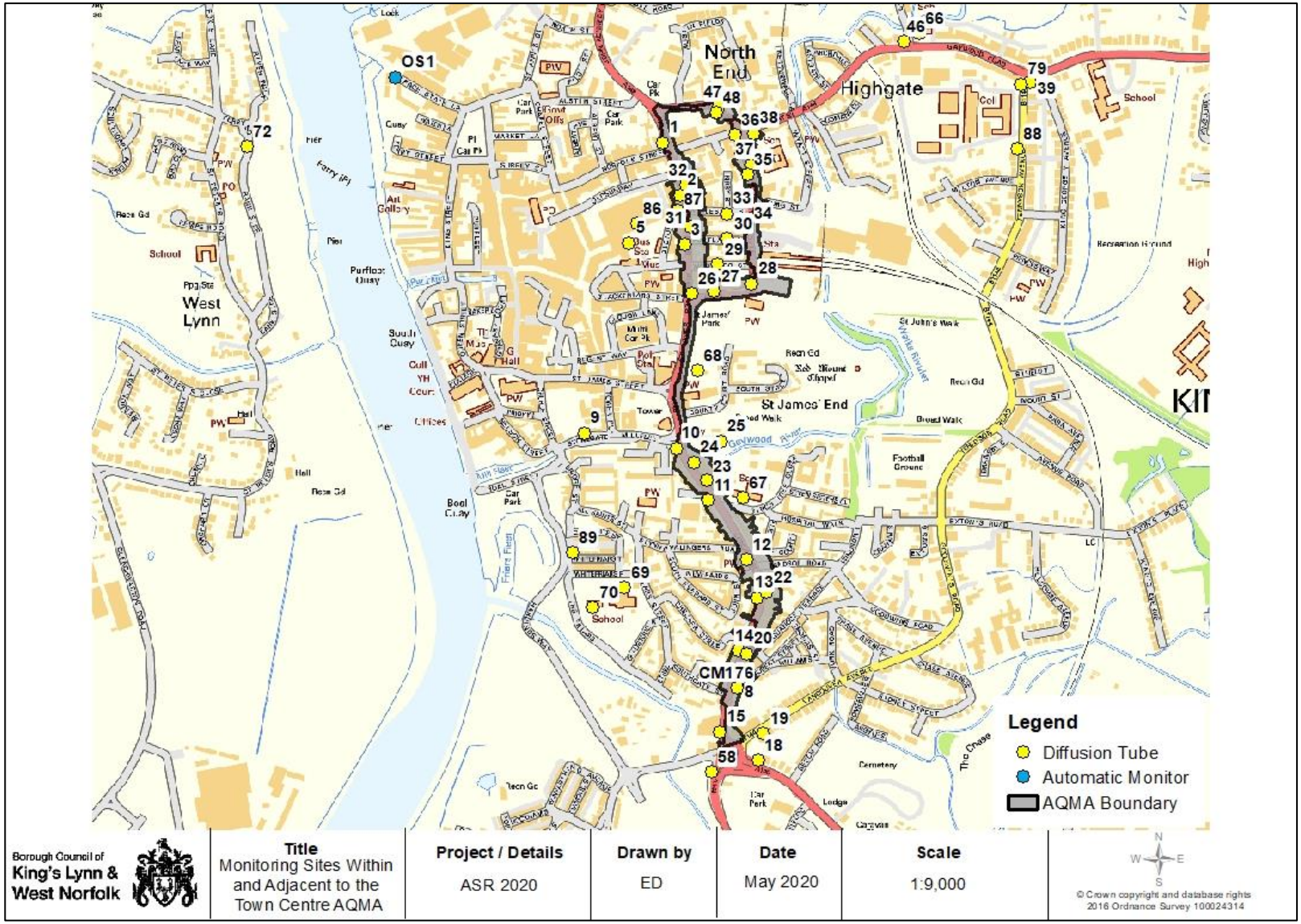


Figure D.3 – Monitoring Sites: South of King's Lynn

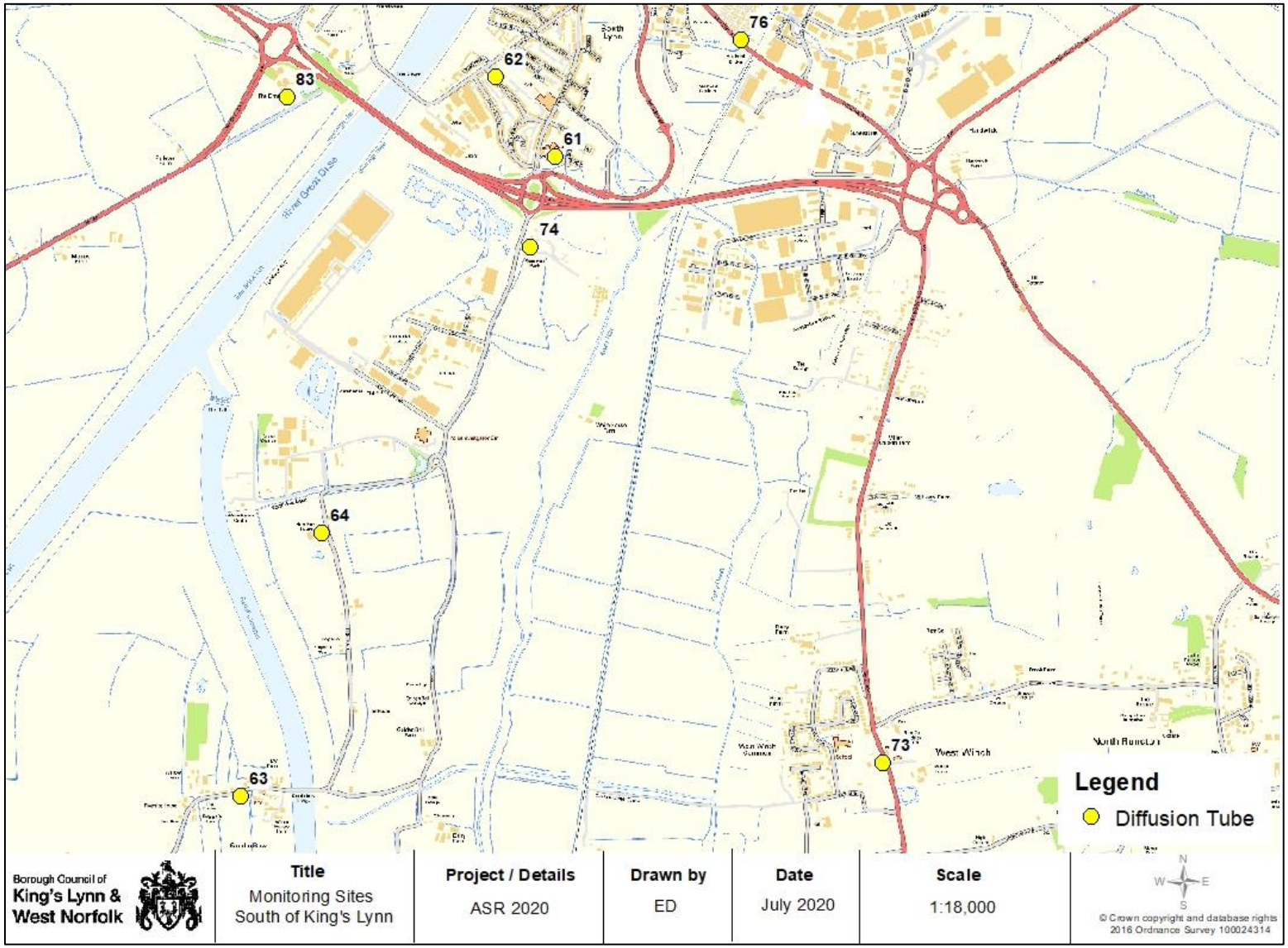


Figure D.4 – Monitoring Sites: North Lynn

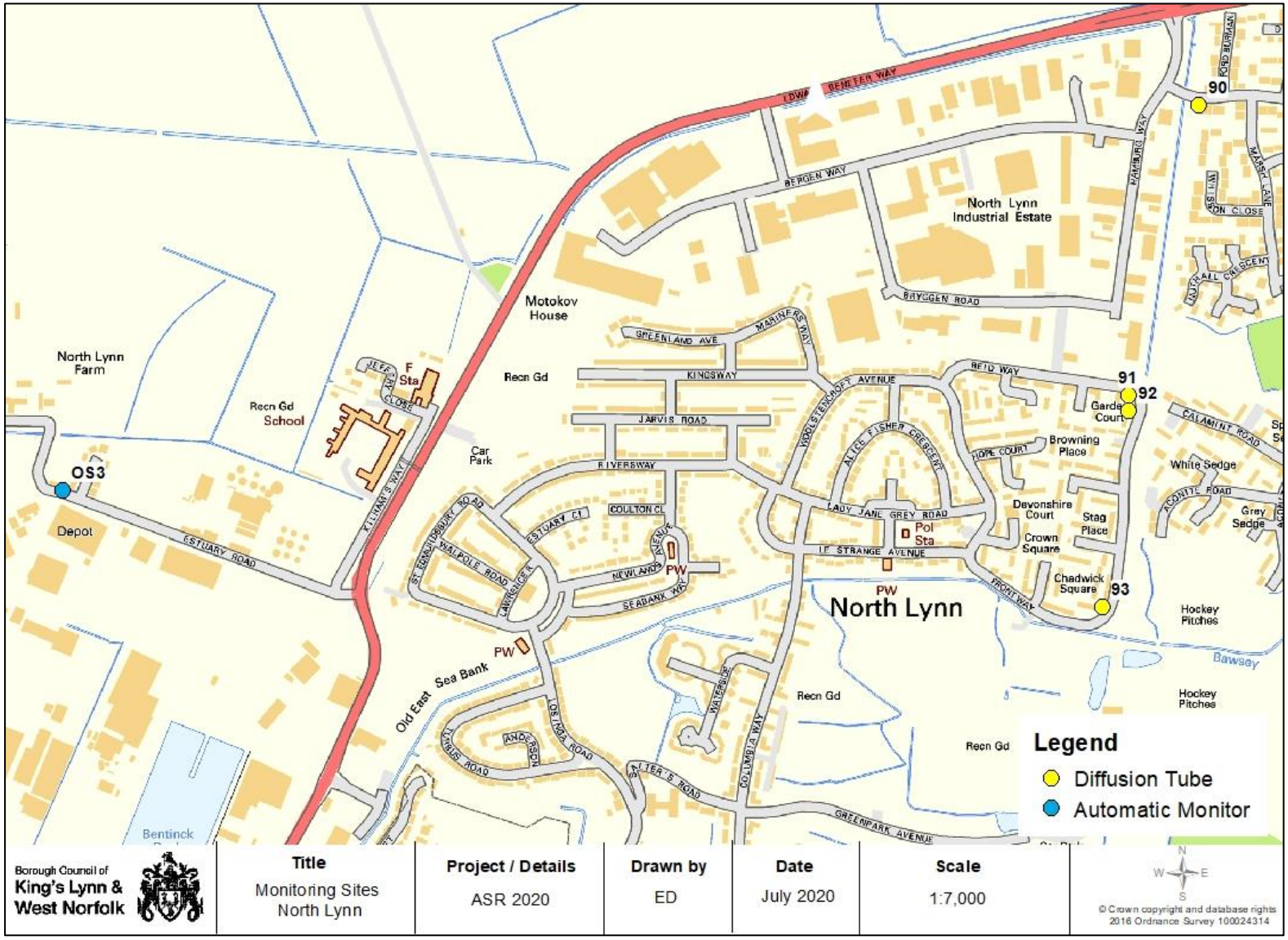
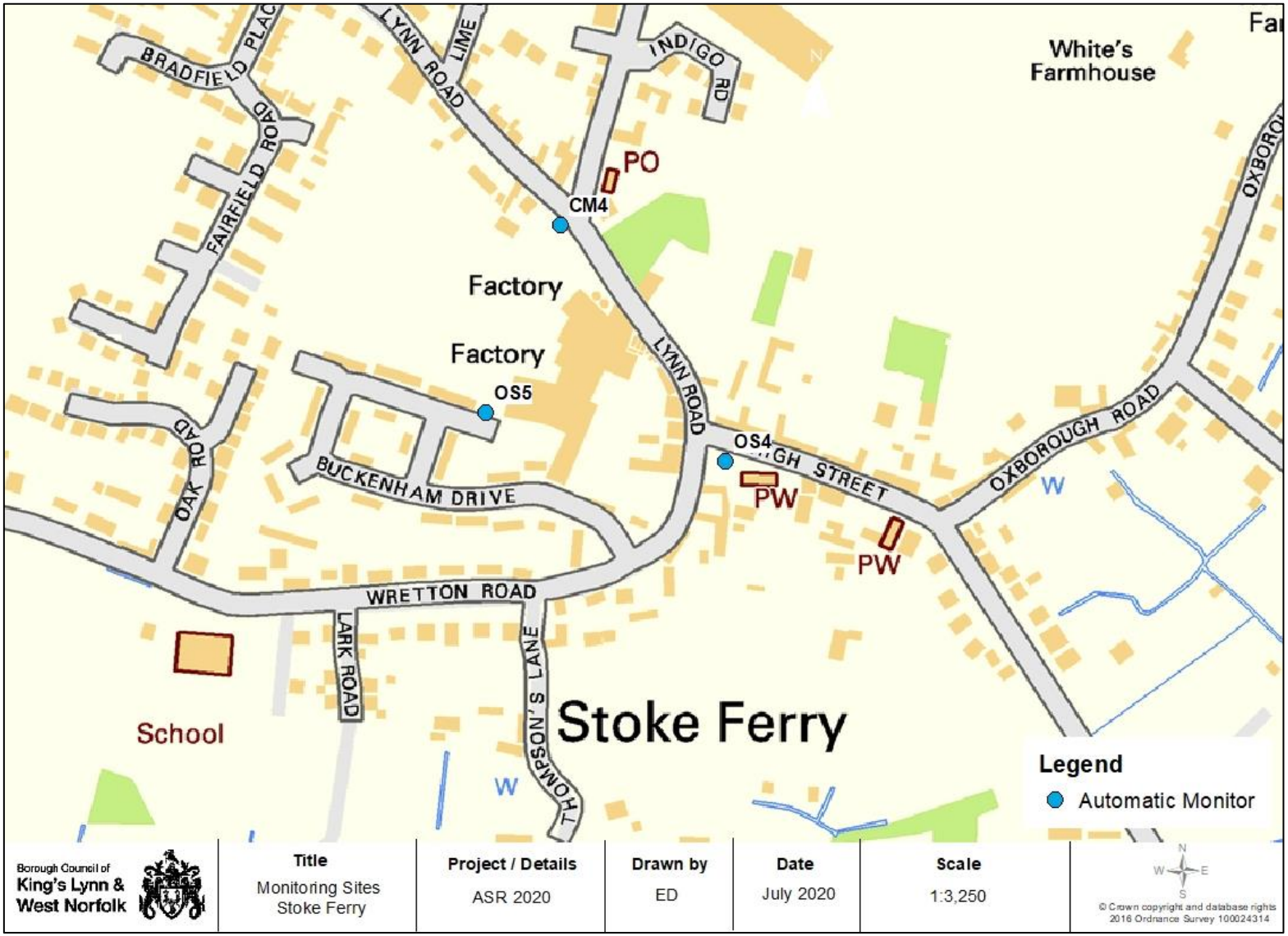


Figure D.5 – Monitoring Sites: Stoke Ferry



Appendix E: PM_{10} Monitoring in Stoke Ferry - A Technical Note

Executive Summary

Due to previous high concentrations of PM_{10} (particulate matter with an aerodynamic diameter of 10 µg m^{-3} or less) recorded by an OSIRIS dust monitor and public complaints received, additional particulate monitoring has been undertaken by the Borough Council of King's Lynn's Environmental Quality Team within the village of Stoke Ferry, King's Lynn. A TEOM was utilised to conduct the monitoring, with the main pollutant assessed being PM_{10}.

Monitoring was undertaken for a 12-month period, with the concentrations recorded processed through the King's College's Volatile Correction Model (VCM) as per Defra Technical Guidance. Based upon a review of the monitoring data, the following conclusions can be made:

- Neither the 24-hour daily mean, nor annual mean PM_{10} objectives were exceeded over the 12-month period at the site; and
- Based upon the monitored concentrations of PM_{10} an Air Quality Monitoring Area (AQMA) will not be declared within Stoke Ferry for PM_{10}.

Background

The village of Stoke Ferry is located in the Borough of King's Lynn and West Norfolk, and due to the close proximity of residential properties to an industrial animal feed mill, particulate monitoring has previously been completed by utilising two OSIRIS dust monitors. OSIRIS dust monitors possess an MCERTS accreditation for PM_{10} (0-100 µgm^{-3}), however can only provide indicative results. The two monitors were installed either side of the mill on Furlong Road and Wretton Road, commissioned in 2009 and 2016 respectfully. Exceedances of the both the annual and 24-hour daily mean PM_{10} objective were recorded at Furlong Road in 2012; with an annual mean concentration of 70 µgm^{-3} recorded. The daily 24-hour mean objective was exceeded for 193 days. The decision was made to increase the monitoring of PM_{10} in the village, however this was delayed due to practical considerations.

In February 2018, the Borough Council of King's Lynn & West Norfolk relocated the TEOM monitor from North Lynn, King's Lynn to Lynn Road, Stoke Ferry. The new site in Self's Field only became operational in October 2018 however due to a power supply issue. In response to this, one of the OSIRIS dust monitors was relocated from Furlong Road to Buckenham Drive.

A TEOM (Tapered Element Oscillating Microbalance) is a gravimetric particulate monitor, which measures particulate matter mass continuously. PM_{10} is one of three core pollutants monitored through Local Air Quality Management (LAQM). Emissions can result in negative health impacts such as respiratory and cardiovascular illnesses. Following application of the Volatile Correction Model (VCM), the PM_{10} concentrations recorded from a TEOM are converted to be reference equivalent and therefore deemed acceptable for the assessment of EU limit values.

The TEOM was relocated to validate the indicative PM_{10} readings reported by an OSIRIS monitor previously at the same site, and in response to a number of complaints made by the public in regard to dust potentially being emitted from the animal feed mill. Figure E.1 displays the location of the TEOM and current Osiris dust monitors in Stoke Ferry.

Figure E.1 - Map of Stoke Ferry village illustrating the locations of particulate monitoring equipment and animal feed mill.

Meteorological Data

Meteorological data collected at the weather station at RAF Marham has been examined in relation to the local area. The prevailing wind is shown to be from the south-west, with an average wind speed of below 15 m/s (metres per second). Wind speed and directional data was also collected at the TEOM and the Wretton Road Osiris. The data from the TEOM shows prevailing south-westerly wind (Figure E.2). The prevailing wind directions are expected to result in the transportation of particulate emissions from the mill towards the north east of the village; although the wind direction is variable across the year.

Figure E.3 illustrates the source direction of PM_{10} recorded at the TEOM in 15-minute means. This illustrates the majority of particulate matter detected originated from either the north-east or south-east of the TEOM site.

Figure E.2 - Wind rose illustrating wind direction recorded at Stoke Ferry TEOM over the study period

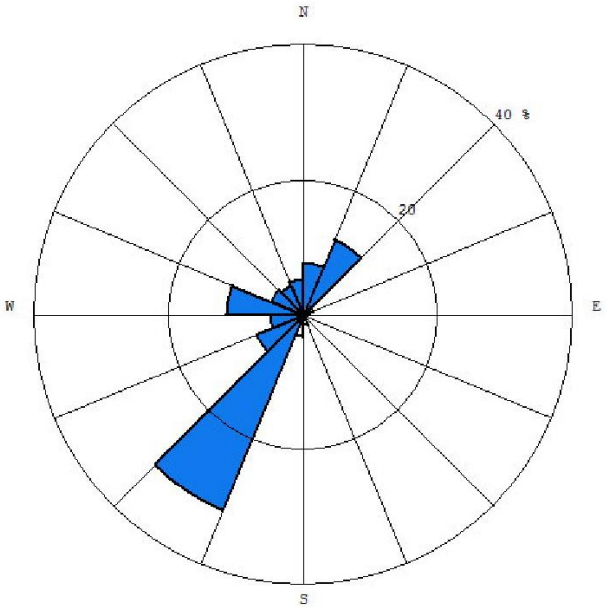
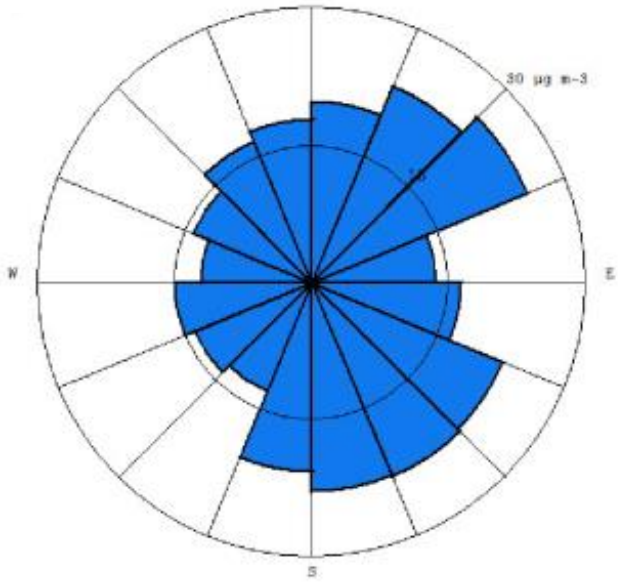


Figure E.3 - Pollution rose illustrating source direction of PM_{10} recorded in 15-minute means over the study period



Results

The results span a one year period from the TEOM's commissioning on the 23rd October 2018 to 22nd October 2019. The Volatile Correction Model (VCM) has been applied to the data to calculate the EU Reference Equivalent (gravimetric) PM_{10} results required for the Local Air Quality Management (LAQM) reports. The annual

data capture for the monitoring period was 97.2%, which is above the 85% target for reporting against the PM_{10} objectives as per Defra Technical Guidance.

The results of the 12-month monitoring period are displayed below. As shown in Table E-1, the maximum daily mean PM_{10} value recorded was 61 µg m^{-3}. This is above the 24-hour daily mean limit value of 50 µg m^{-3}, which was exceeded over 5 days (26th, 27th, 28th February, 30th March, and 18th April 2019). The annual allowance for the 24-hour daily mean objective however is 35 days, therefore the objective was not exceeded (Table E-1). These results are also illustrated visually in Figure E-4. By assessing the daily mean concentrations recorded against Defra's Daily Air Quality Index (DAQI); we can determine that on 5 occasions air quality was classed as 'moderate', with 355 days classed as 'low'. There were no 'very high' or 'high' occasions over the monitoring period within the area.

The annual mean PM_{10} concentration recorded over the 12 months was 17 µg m^{-3}, which is well below the 40 µg m^{-3} objective (Table E-1). Therefore, no exceedances of the national objectives for PM_{10} (either the 24-hour daily mean or the annual mean objective) have been recorded by the TEOM in Stoke Ferry. The monthly mean concentrations are displayed in Table E-2.

Table E.1 - PM_{10} Air Quality Objectives and Results Recorded over the Monitoring Period

Pollutant	Air Quality Objective	Maximum Concentration Recorded	Number of Exceedances	Number of Exceedances Allowed	Objective Exceeded?
PM_{10} (Gravimetric)	Daily Mean >50 µg m^{-3}	61 µg m^{-3} (daily mean)	5	35 Days	No
PM_{10} (Gravimetric)	Annual Mean >40 µg m^{-3}	17 µg m^{-3} (annual mean)	0	-	No

Table E.2 – Monthly Mean PM_{10} Concentrations

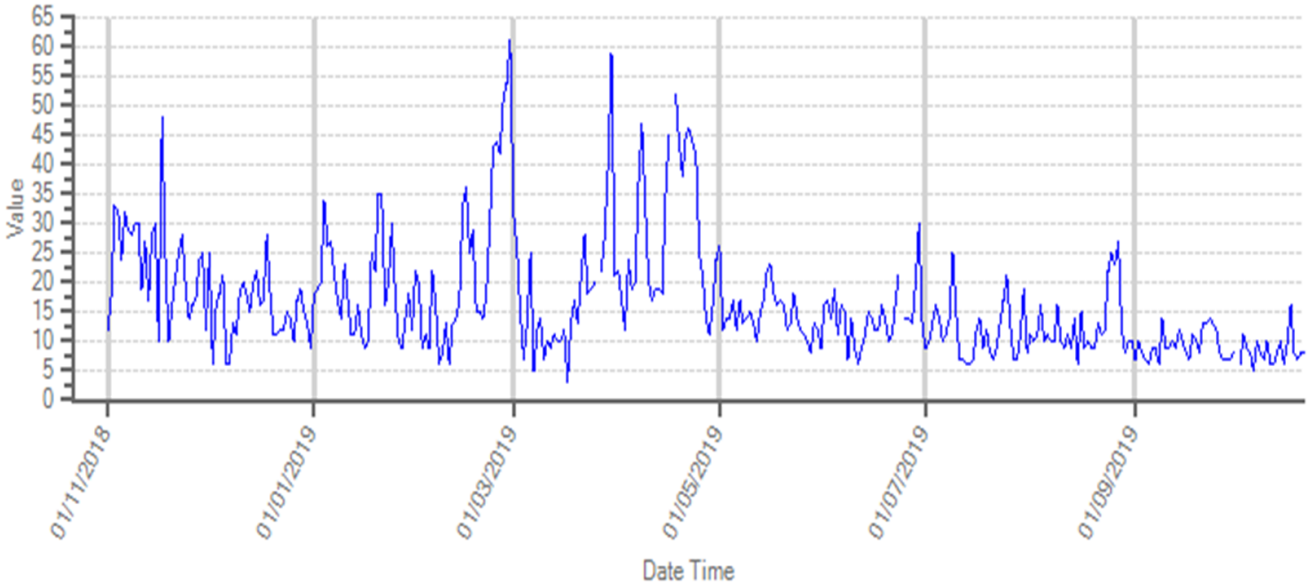
Pollutant	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual Mean
PM_{10} (µg m^{-3})	20	17	19	18	22	30	19	13	14	12	12	9	17

Outcomes of the Monitoring

Based on a review of the monitoring data collected, we can conclude that neither the daily mean nor annual mean PM_{10} objectives were exceeded over the 12-month period where monitoring was completed at the site. Based upon these results an Air Quality Monitoring Area (AQMA) will not be declared within Stoke Ferry for PM_{10}, as concentrations have not been shown to be excess of the air quality objectives.

In the near future, the monitoring of PM_{10} within Stoke Ferry will continue at the locations of the TEOM and both OSIRIS dust monitors. However, the possible relocation of some of the monitoring equipment will be explored, in response to the submission of an outline planning application for residential development on the current animal feed mill site.

Figure E.4 - 24-Hour Mean Concentrations of PM_{10} over the Monitoring Period (µg m^{-3})



Appendix F: Air Quality Screening Update

Road Traffic Sources

Narrow Congested Streets with Residential Properties Close to the Kerb

Defra Technical Guidance TG(16) defines narrow congested streets to have the following:

- Daily traffic flow (AADT) of approximately 5,000 vehicles per day;
- Slow moving traffic that is frequently stopping and starting through the day; and
- Residential properties that are within 2m of the kerb and there are buildings on both sides of the road.

No new roads have been identified within the Borough Council of King's Lynn and West Norfolk as meeting the requirements.

The Borough Council of King's Lynn and West Norfolk confirms that there are no new/newly identified congested streets with a flow above 5,000 vehicles per day and residential properties close to the kerb, which have not been adequately considered in previous rounds of Review and Assessment.

Busy Streets Where People May Spend 1-hour or More Close to Traffic

There will be some street locations where individuals may regularly spend 1-hour or more, for example streets with many shops and streets with outdoor cafes and bars with the following criteria:

- Daily traffic flow (AADT) of approximately 10,000 vehicles per day; and
- Individuals that are within 5m of the kerb for 1-hour or more.

People occupationally exposed in such locations should not be included, as they are not covered by the regulations. The Borough Council currently monitors NO_2 concentrations using a diffusion tube at Bay D of the King's Lynn Transport Interchange to meet this category.

The Borough Council of King's Lynn and West Norfolk confirms that there are no new/newly identified busy streets where people may spend 1 hour or more close to

traffic. The Council currently monitors NO_2 concentrations at the King's Lynn Transport Interchange using a diffusion tube- no exceedances have been recorded.

Roads with a High Flow of HGVs

Roads with unusually high proportion of HGVs:

- Daily traffic flow (AADT) of approximately 2,500 HDVs per day; and
- There is relevant exposure receptors within 10m from kerb

The Borough Council of King's Lynn and West Norfolk confirms that there are no new/newly identified roads with high flows of buses/HGVs.

Junctions

Defra Technical Guidance TG(16) states that for a junction to require assessment the following criteria must be met:

- Daily traffic flow (AADT) of approximately 10,000 vehicles per day; and
- There is relevant exposure within 10m from the kerb

Whilst no new junctions meeting the above criteria have been identified within the borough, the BCKLWN are planning to extend the NO_2 monitoring network by placing a diffusion tube at the Low Road (A1076)/ Castle Rising Road junction to explore the current concentrations of NO_2 at the junction, prior to the commencement of the proposed/permitted developments at Hall Lane and Knight's Hill. Additionally, DMRB screening assessments were undertaken at the Low Road (A1076)/ Castle Rising Road and Queen Mary Road/ Lynn Road junctions. No exceedances of either the NO_2 annual or short term mean objective were identified.

The Borough Council of King's Lynn and West Norfolk confirms that there are no new/newly identified busy junctions/busy roads.

New Roads Constructed or Proposed Since the Last Round of Review and Assessment

The following planning applications, which could result in changes to air quality emissions from road traffic, have been submitted to the Council in the last 12 months:

- West Winch Housing Access Road - The Council advised on the scoping opinion for the Environmental Impact Assessment for the road and recommended that a Travel Plan and Transport Assessment be carried out

including sustainable transport methods in line with the BCKLWN's Air Quality Action Plan. It was also advised that the impact of the road on both AQMAs during both the construction and operation phases be scoped into the Air Quality Assessment. No information regarding expected traffic movements along the new road is available yet.

- Portland Street, King's Lynn **-** Conversion of offices to 3 flats and basements to offices. The development was located adjacent to the Town Centre AQMA boundary, with NO_2 concentrations monitored at several diffusion tubes around the site due to traffic emissions, with elevated concentrations recorded near building facades. The highest concentration and only exceedance of the AQS objective was recorded over 25m from the site. While the application was not likely to introduce significant additional traffic movements, there was the potential for residents of the proposed flats to be exposed to unacceptable risks from existing pollution. The BCKLWN therefore recommended good practice measures and a condition that no development shall take place on site until a scheme to protect the dwellings from road traffic air pollution has been submitted to and approved in writing by the LPA.
- West Hall Farm, Gayton **-** Erection of a 210 pupil primary school and 56 place nursery. The application included a transport statement which detailed 37 new parking spaces at the site. The estimated AADT from the development was not deemed significant in line with EPUK and IAQM Planning for Air Quality Guidance and therefore an AQA was not required. Additionally, the site location and sustainable travel plan were identified as encouraging active transport. The BCKLWN therefore did not require mitigation, however stated they would welcome the addition of EV charging points within the development.
- Land South of 47 Lynn Road, Heacham **-** Proposed roadside services including construction of 3 single story building, associated car parking (89 spaces) and drive thru lanes and extension to existing Lidl carpark (38 spaces) (pre-app). As detailed by NPPF para. 111, all developments that will generate significant amounts of movement should be required to provide a travel plan and should be supported by a transport statement/ assessment.

Therefore, the BCKLWN stated they would expect a full application to include a traffic assessment and would welcome a travel plan.

- 11 Portland Street, King's Lynn **-** Proposed change of use from office to two flats. The development site was approximately 30m away from the boundary of the Town Centre AQMA, previously declared due to exceedances of NO_2 ASQ objectives from road traffic sources. As the development did not include any parking provision it was deemed not likely to introduce significant additional traffic movements. Additionally, NO_2 concentrations are currently monitored using a diffusion tube approximately 20m from the development site. The nitrogen dioxide concentrations recorded over the last five years were way below the national objective. Therefore, air quality was not deemed a risk to the development and mitigation was not recommended.
- 28 Railway Road, King's Lynn **-** Change of use from vacant offices to Orthodontics Practice (Pre-App Enquiry). Proposed development was located on within Town Centre AQMA, which has been declared due to NO_2 emissions from traffic A diffusion tube is located approximately 20m from the development site. the site has recorded concentrations of nitrogen dioxide which are within 10% of the AQS objective limit. While the application was not likely to introduce significant additional traffic movements, the BCKLWN advised that the applicants should seek advice concerning the AQMA if submitting a full application.
- 131 Austin Street, King's Lynn **-** New Build Dwelling. The site was located within the Town Centre AQMA. The site was adjacent to two locations where ongoing monitoring had indicated elevated levels of NO_2 near residential façades and exceedances of the health based AQS objective have been recorded. As a single dwelling, the proposal was only likely to generate a small number of additional traffic movements not deemed significant in the EPUK and IAQM Planning for Air Quality guidance criteria. Whilst the BCKLWN had no objection in principle regarding the impact on air quality from additional traffic movements in the operational phase, the potential health impact of traffic emissions on occupants of the development required mitigation via the condition that no development above foundation level shall take place on site until a scheme to protect the dwellings from road traffic

noise and road traffic air pollution has been submitted to and approved in writing by the LPA.

- Wellesley Street, King's Lynn **-** Proposed residential development (6 dwellings) following demolition of former vehicle service centre. Wellesley Street is adjacent to the Town Centre AQMA, with the primary source of pollution being traffic emissions. Ongoing monitoring by diffusion tubes in the vicinity had indicated elevated levels of NO_2 near residential façades. However, an exceedance of the AQS objective had not been recorded adjacent to the site. Potential traffic movements from the site were not deemed a significant change in the AQMA based on criteria in the EPUK and IAQM Planning for Air Quality guidance. To reduce the potential for adverse effects of poor air quality on residents of the proposed dwellings, the BCKLWN recommended an informative detailing good practice measures.
- Lynn Road, Stoke Ferry **-** Construction of up to 70 residential dwellings. The application was considered in conjunction with application 19/00272/OM for 30 houses at the Furlong Store site. The BCKLWN were included in pre-application discussions and agreed the methodology for the air quality screening report which was submitted with the application. The review of the trip generation figures and likely AADT indicated that a full air quality assessment was not required. The predicted 399 AADT was not a significant change in an area where background pollution is low, based on criteria in the EPUK/IAQM guidance. However, the cumulative impact of the two developments exceeds the EPUK/IAQM screening value by 70 trips. In the interest of better air quality management and to further reduce the potential impact on air quality, the BCKLWN recommended that good practice measures be included as part of any full application for planning permission. Additionally, the BCKLWN recommended the adoption of travel plan measures including submission of a monitoring report be required by condition.
- Old Market Street, King's Lynn **-** Conversion of building to form dwelling (pre-app advice). The site is adjacent to the Town Centre AQMA. The BCKLWN monitors NO_2 concentrations from road traffic sources nearby to the site, and elevated levels have been recorded. The BCKLWN therefore advised that the

applicant should therefore carry out a screen assessment to determine if mitigation was required.

- 25 Old Sunway, King's Lynn **-** Construction of 9 apartments. The site was 65m from the Town Centre AQMA, however the monitoring network indicated that NO_2 concentrations near the site are regularly below the AQS objective. The development itself did not include parking spaces and therefore was unlikely to be a source of additional traffic emissions. Therefore, the BCKLWN did not require mitigation.
- Dragonfly Hotels, Hardwick Narrows, King's Lynn **-** Extension of existing hotel to provide 36 bedrooms. The application included a brief transport statement in which the estimated AADT were detailed; these were not considered significant based on EPUK and IAQM Planning for Air Quality Guidance criteria. The proposal was on land at rear of hotel and within 100m of the A47 where concentrations of NO_2 from traffic emissions were likely to be higher. As occupation of the new rooms is temporary, it was unlikely that occupants would be exposed to levels of NO_2 above the air quality standard. In the absence of an air quality screening assessment and to reduce any potential adverse effects of poor air quality, the BCKLWN recommended an informative detailing good practice measures.
- Cheney Hill, Heacham **-** Phase 2- Residential development for 64 dwellings. This pre-applicated detailed the second phase of development (an addition of 64 dwellings), resulting in a total development of 133 dwellings. It was expected that the completed site would not result in a significant change in AADT on the road network based on criteria within EPUK and IAQM Planning for Air Quality Guidance. The BCKLWN however recommended that an air quality screening assessment be undertaken taking account of the phase one development.

The Borough Council of King's Lynn and West Norfolk has assessed new/proposed roads meeting the criteria in Table 7.1 in TG(16) and concluded that it will not be necessary to proceed to dispersion modelling.

Roads with Significantly Changed Traffic Flows

The Borough Council of King's Lynn and West Norfolk confirms that there have been no roads with a traffic flow greater than 10,000 vehicles per day that have experienced an increase in traffic flow of more than 25%.

In response to the work done within King's Lynn Transport Study (KLTS) regarding potential road changes modelled along London Road, Southgate's Roundabout and Harding's Way, and the location of new residential receptors along Wisbech Road and Sandpiper Way, the BCKLWN have increased NO_2 monitoring upon Wisbech Road. These results, along with the Air Quality Baseline study being completed by Bureau Veritas, will aid in informing decisions concerning changes to the road network and traffic flows.

The Borough Council of King's Lynn and West Norfolk confirms that there are no new/newly identified roads with significantly changed traffic flows.

Bus and Coach Stations

The assessment considers bus and coach stations meeting the following criteria:

- Daily traffic flow (AADT) of approximately 2,500 bus/coach movements per day; and
- There is relevant exposure within 10m from the kerb.

The Borough Council of King's Lynn and West Norfolk confirms that there are no relevant bus stations in the Local Authority area as the King's Lynn Transport Interchange does not meet the above criteria of 2,500 bus movements per day.

Other Transport Sources

Airports

The Borough Council of King's Lynn and West Norfolk confirms that there are no airports in the Local Authority area.

Railways (Diesel and Coal Fired Locomotives)

Diesel or coal fired stationary locomotives can give rise to high short-term NO_2 and SO_2 concentrations near railway stations or depots. Additionally, moving locomotives can contribute to elevated short-term NO_2 and SO_2 concentrations close to the track.

Stationary Trains

The BCKLWN conducted screening of stationary diesel locomotives in line with LAQM TG16 Guidance:

- Identify locations where diesel or steam locomotives are regularly (at least 3 times a day) stationary for periods of 15 minutes or more; and
- Determine relevant exposure within 15 m of the locomotives.

The diesel trains screened are only stationary for one period of thirty minutes per day; this does not require monitoring for NO_2 or SO_2, in line with the guidance above.

The Borough Council of King's Lynn and West Norfolk confirms that there are no locations where diesel or steam trains are regularly stationary for periods of 15 minutes or more, with potential for relevant exposure within 15m.

Moving Trains

Railway lines with a heavy traffic of diesel passenger trains are listed within the Defra Technical Guidance TG(16).

The Borough Council of King's Lynn and West Norfolk confirms that there are no locations with a large number of movements of diesel locomotives, and potential long-term relevant exposure within 30m.

Ports

Defra Technical Guidance TG(16) states that ports should be assessed where there are:

- More than 5,000 movements per year taking place and there is exposure within 250m: or
- Where there are over 15,000 movements per year and exposure within 1km.

The number of annual movements within the port does not meet the above criteria to monitor for SO_2 emissions, with the fisher fleet using low sulphur diesel fuel.

The Borough Council of King's Lynn and West Norfolk confirms that there are no ports or shipping that meet the specified criteria within the Local Authority area.

Non-Road Mobile Machinery

Non-Road Mobile Machinery (NRMM) refers to mobile machines, transportable industrial equipment or vehicles which are fitted with an internal combustion engine and not intended for transporting goods or passengers on roads. Typically, NRMM is associated with construction sites.

Where emissions from NRMM and construction machinery have the potential to cause exceedances of the AQS objectives, the BCKLWN has requested the following measures be included in Construction Environmental Management Plans (CEMP) and site mitigation, where relevant, in line with Defra Technical Guidance TG(16):

- Ensure all equipment complies with the appropriate NRMM standards;
- Where feasible, ensure further abatement plant is installed on NRMM equipment, e.g. Diesel Particulate Filters (DPFs);
- Ensure all vehicles switch off engines when stationary – no idling vehicles;
- Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where possible; and
- Impose and signpost a maximum-speed-limit of 15 mph on surfaced and 10 mph on unsurfaced haul roads and work areas.

The Borough Council of King's Lynn and West Norfolk confirms there have not been exceedances of the AQS objectives or concerns due to NRMM activities within the borough. Emissions from NRMM are considered during the planning process and CEMP are requested if necessary.

Industrial Sources

Industrial Installations

Industrial Installations

Local authorities should screen industrial installations by using the Industrial Emissions Screening Tool. If no air quality assessment is submitted with the planning application, the criteria for screening is as follows:

- New source or existing source with significant increase (30%) in emissions - with population exposure nearby

The BCKLWN continue to monitor NO_2 concentrations through a network of diffusion tubes located around industrial installation in the borough e.g. Centrica A Power Station, Saddlebow and Palm Paper Ltd, Saddlebow Industrial Estate. No exceedances of either the annual or 24-hour mean objective have been recorded.

In November 2019, the BCKLWN received a query from a borough councillor regarding the stack height of the Centrica A power station and should it have been increased during turbine upgrade work. Centrica A had previously been offline from 2012 to November 2019. The BCKLWN therefore re-examined the original planning application and environmental quality comments. The planning matter was determined under section 36 by the Secretary of State. As part of that planning process an air quality report considered the plant and aggregate impacts with surrounding point sources. The stack height is controlled through the Environment Agency Environmental Permit for the site. The Environment Agency confirmed that the King's Lynn A single stack is 60m, from the original permit decision document. The upgrade work resulted in an improvement in emissions from the new turbine with 59% efficiency compared to the previous 54%. Therefore, no increase in stack height was required.

The Borough Council of King's Lynn and West Norfolk confirms that there are no new or proposed industrial installations for which planning approval has been granted within its area or nearby in a neighbouring authority.

Major Petrol Storage Deposits

Major petrol fuel depots and petrol stations were identified in previous Technical Guidance as potential sources of concern, due to potential elevated emissions of C_6H_6 (benzene), especially if combined with higher levels from nearby busy roads. However, all sources of concern have been assessed and monitoring undertaken in previous screening assessments.

The Borough Council of King's Lynn and West Norfolk confirms that there are no major fuel (petrol) storage depots within the Local Authority area.

Petrol Stations

The specific criteria for petrol stations that require assessment as stated within Defra Technical Guidance TG(16) is a petrol station with the following:

- An annual throughput of more than 2,000m^3 of petrol;
- A busy road nearby, one with more than 30,000 vehicles per day; and
- There is relevant exposure within 10m from the pumps

The Borough Council of King's Lynn and West Norfolk confirms that there are no petrol stations meeting the specified criteria.

Poultry Farms

In previous rounds of Review and Assessment, local authorities have identified potential exceedances of the PM_{10} objectives due to particulate matter emissions from poultry farms (defined as chickens (laying hens and broilers), ducks and guinea fowl, and turkeys).

Poultry farms meeting the below criteria should be identified and then screened using the methodology provided within Defra Technical Guidance TG(16) Box 7.2:

- Farms housing in excess of:
    - 400,000 birds if mechanically ventilated;
    - 200,000 birds if naturally ventilated;
    - 100,000 birds if turkey unit; and
- There is relevant exposure within 100m of the poultry units.

Over the last year, one planning application for a poultry farm has been received by the Borough Council of King's Lynn and West Norfolk:

- Whin Close Farm, Docking Road **-** Erection of 4 poultry sheds and associated development. Although the proposal was for 320,000 birds and the nearest receptor was 730m away from the site, screening was still undertaken using the methodology provided within Defra Technical Guidance TG(16) Box 7.2. The BCKLWN advised that there was no risk of exceeding the 24-hour mean PM_{10} objective due to emissions from the poultry farm.

The Borough Council of King's Lynn and West Norfolk confirms that there are no poultry farms meeting the specified criteria.

Commercial and Domestic Sources

Commercial and Domestic Gas-Fired CHP Combustion (Individual Installations)

Gas-fired CHP combustion can lead to an increase in NO_2 emissions, and as Defra Technical Guidance TG(16) dictates, screening should be undertaken using the CHP Screening Calculator. The CHP tool considers emissions from natural gas and biogas firing CHP, from internal combustion engines and gas turbines.

- Southery Road Farm, Ploughmans Drive, Feltwell **-** Proposed Anaerobic Digestion Plant with CHP generator. Emissions data was reviewed using the CHP Screening Calculator. The BCKLWN advised that the CHP unit would not result in an exceedance of the national air quality standard at relevant receptors based off the results of the screening tool.

The Borough Council of King's Lynn and West Norfolk has assessed commercial and domestic gas-fired CHP combustion individual installations and concluded it will not be necessary to carry out monitoring and/or dispersion modelling.

Commercial and Domestic Biomass Combustion (Individual Installations)

Biomass burning can lead to an increase in PM_{10} emissions and, compared to conventional gas-burning, can also result in an increase in the overall NOx emissions. Therefore, local authorities should screen individual biomass combustion installations by using the Biomass Calculator as detailed within Defra Technical Guidance TG(16).

The Borough Council of King's Lynn and West Norfolk has assessed commercial and domestic biomass combustion individual installations and concluded it will not be necessary to carry out monitoring and/or dispersion modelling.

Commercial and Domestic Biomass Combustion (Combined Installations)

There is the potential that many small biomass combustion installations (including domestic solid fuel burning), whilst individually acceptable, could in combination lead to unacceptably high PM_{10} concentrations, particularly in areas where concentrations are close to or above the objectives.

The Borough Council of King's Lynn and West Norfolk has assessed commercial and domestic biomass combustion combined installations and concluded it will not be necessary to carry out monitoring and/or dispersion modelling.

Domestic Other Solid-Fuel Combustion

The assessment considers 'significant' domestic solid fuel burning meeting the following criteria:

- The density of coal burning premises = 100 per 500m x 500m area

The Borough Council of King's Lynn and West Norfolk do not currently have concerns regarding SO_2 emissions from coal burning. The BCKLWN currently imposes eight Smoke Control Areas within King's Lynn which place restrictions on both the solid fuels household can burn and the appliances which can be used. Additionally, all planning applications received that contain a solid fuel burner receive the below comment:

"*The proposed dwelling floor plans includes a solid fuel burner. If this is included within the development, the applicant should be aware of our advice on burning wood and coal at www.west-norfolk.gov.uk/solid-fuel in order to minimise potential pollution or nuisance from the solid fuel appliances."*

Additionally, the BCKLWN's webpages detailing solid fuel burning are updated regularly with up to date guidance, especially in the winter months. The Environmental Quality Team also work alongside the Community Safety and Neighbourhood Nuisance team to investigate complaints made regarding domestic burning.

The Borough Council of King's Lynn and West Norfolk confirms that there are no areas of significant domestic fuel use in the Local Authority area.

Fugitive or Uncontrolled Sources

Dust emissions from a range of fugitive and uncontrolled sources can give rise to elevated PM_{10} concentrations. Screening criteria is included within Defra Technical Guidance TG(16):

- There is relevant exposure within 200m of the source of emissions (up to 1km if background PM_{10}> 28µg/m^3)

The following planning applications have the potential to result in emissions of fugitive or uncontrolled sources of PM_{10} and have been commissioned in the last 12 months:

- Watlington Quarry, Watlington Road, Tottenhill, King's Lynn **-** Construction of additional slit lagoon(s) and subsequent removal of sand and gravel and clay. The nearest receptor to the site was located over 300m away and it was agreed by the BCKLWN that, as illustrated in the AQA, the proposal should not cause an unacceptable impact at the nearby receptors. It was however recommended that a dust management plan be required by condition, in order to provide an additional safeguard.
- Middleton Aggregates Ltd, Mill Drove, King's Lynn **-** Variation of Conditions to allow extraction of carstone with restoration. The application was also reviewed using a screening method within the IAQM guidance on the Assessment of Mineral Dust Impacts for Planning. The BCKLWN advised that, based on the presence of a buffer and buffer planting, low background PM_{10} concentrations, and prevailing wind direction, there was unlikely to be an exceedance of the air quality standard. It was recommended that good practice mitigation measures and a dust management plan be required by condition.
- Warren Energy Ltd, Brandon Road, Methwold **-** Retrospective application to retain bund, post and wire fence, and use of existing hard standing track for use of access. A Dust Assessment was submitted with the application, which assessed the potential impact from fugitive dust emissions from vehicle movements along the existing track, in accordance with the Environmental Protection UK/Institute of Air Quality Management methodology. Due to the track surfacing material, low background concentrations of particulates and location of sensitive receptors, the predicted risk of impact was reported to be negligible and the potential air quality impacts are classified as not significant. The BCKLWN therefore advised no objection regarding the impact of air quality on human health and recommended that the submitted complaints recording procedure be utilised to record any dust complaints.
- Warren Energy Ltd, Brandon Road, Methwold **-** Retrospective application to vary conditions to allow the offsite importation and onsite processing of 49,000

tonnes of diversified feedstock. The applicant submitted a Dust Assessment. Fugitive dust emissions from vehicle track out were identified as a potential source of airborne particulates and assessed in accordance with the Environmental Protection UK/Institute of Air Quality Management methodology. The significance of potential air quality impacts was classified as not significant. Therefore, the BCKLWN advised no objection regarding the impact of air quality on human health.

- King's Lynn Port **-** Osiris dust monitors are used to monitor PM_{10} emissions from the port of King's Lynn at two locations; Estuary Road and Page Stair Lane. The BCKLWN have not recorded any exceedances of the PM_{10} AQS objective, and we have not been notified of any changes in operation which would require monitoring to change.
- Lynn Road, Stoke Ferry, King's Lynn **-** In February 2018, the BCKLWN took the decision to relocate the TEOM monitor from North Lynn, King's Lynn to Lynn Road, Stoke Ferry. This move was in response to a number of complaints made by the public regarding fugitive dust emissions potentially being emitted from a neighbouring animal feed plant – and to help validate the indicative readings reported by the Osiris located at the same site. In response to the relocation of the TEOM, the existing Osiris (OS2) was then relocated to a new site within Stoke Ferry, located at Buckenham Drive in August 2018 (renamed OS5) to help improve air quality reporting within the area. Monitoring of PM_{10} was then undertaken for a year at three sites within Stoke Ferry. No exceedances either the long or short term PM_{10} national objective were recorded. A Technical Note detailing the full results was produced and can be found in Appendix E.

The Borough Council of King's Lynn and West Norfolk confirms that a potential source of fugitive particulate matter emissions was identified within the Local Authority area (Stoke Ferry). No exceedances of either the long or short term national PM_{10} objective were recorded.

Appendix G: Summary of Air Quality Objectives in England

Table G.1 – Air Quality Objectives in England

Pollutant	Air Quality Objective[11]	
	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

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

Glossary of Terms

Abbreviation	Description
AQAP	Air Quality Action Plan - A detailed description of measures, outcomes, achievement dates and implementation methods, showing how the local authority intends to achieve air quality limit values'
AQMA	Air Quality Management Area – An area where air pollutant concentrations exceed / are likely to exceed the relevant air quality objectives. AQMAs are declared for specific pollutants and objectives
ASR	Air Quality Annual Status Report
BCKLWN	Borough Council of King's Lynn & West Norfolk
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
KLTS	King's Lynn Transport Study
LAQM	Local Air Quality Management
NCC	Norfolk County Council
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides
PM_{10}	Airborne particulate matter with an aerodynamic diameter of 10µm (micrometres or microns) or less
$PM_{2.5}$	Airborne particulate matter with an aerodynamic diameter of 2.5µm or less
QA/QC	Quality Assurance and Quality Control
SO_2	Sulphur Dioxide

References

- Borough Council of King's Lynn and West Norfolk Annual Status Report 2019.
- Borough Council of King's Lynn and West Norfolk, Local Plan - Site Allocations and Development Management Policies Plan.
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