Borough Council of
King's Lynn &
West Norfolk

2016 Air Quality Annual Status Report (ASR)

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

October 2016

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Executive Summary: Air Quality in Our Area

Air Quality in the Borough Council of King's Lynn & 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].

Since 2000, we have carried out a yearly review of air quality across the borough. We check levels of pollutants against levels set by the National Air Quality Strategy (they are shown in Appendix E). The air quality in the BCKLWN area is generally good; however, two pollutants have been identified for future monitoring and assessment. These are nitrogen dioxide (NO_2) and particulate matter (PM_{10}). The main source of NO_2 in the Borough is from road traffic emissions, notably at the Gaywood Clock junction (Lynn Road, Gayton Road, Wootton Road) and in King's Lynn town centre (London Road leading to the one way System of Railway Road, Blackfriars and Austin Street). Other pollution sources, including commercial, industrial and domestic sources, also make a contribution to background pollution concentrations. As such two Air Quality Management Areas (AQMA's) have been declared in King's Lynn, where exceedances of the annual mean objective for NO_2 were identified (details of the AQMA's area available on this webpage). Source apportionment work has shown that the main contribution of NO_2 is from road transport. This has led to the development of an Air Quality Action Plan that was adopted by the Council in 2015. Recent monitoring has shown there to be an overall reduction in measured NO_2 levels across the Borough.

The main source of PM_{10} levels have been identified as industrial processes, and we have carried out monitoring which remains ongoing in the North Lynn area of King's Lynn and the village of Stoke Ferry. A Detailed Assessment was undertaken of the

[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

North Lynn area which is close to a working dock operated by Associated British Ports and it was found that an AQMA does not need to be declared. The TEOM located in North Lynn is being relocated to Stoke Ferry in 2016.No new major sources of NO_2 or PM_{10} emissions have been identified.

An Air Quality Steering Group (AQSG) has been set up to allow departments within the BCKLWN, elected members and the County Council work together in implementing the measures identified in the AQAP.

Actions to Improve Air Quality

The actions taken to improve air quality have been driven by the measures in the Council's AQAP. The AQAP comprises Policy Actions, Road Traffic Actions and Emissions Actions. 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 in local policies; measures to manage parking within the King's Lynn town centre; implementation of urban traffic control systems and selective vehicle detection systems; promotion of public transport; electric vehicle charging and quality bus partnerships. A full list of measures in included in Table 2.2.

Local Priorities

The local priorities for BCKLWN in 2016 are listed in Chapter 4.

How to Get Involved

Further information on air quality in the BCKLWN area is available on the Council's website and on the website www.norfolkairquality.net which provides live data from the Council's continuous monitoring stations.

Everyone can try to reduce their impact of air pollution by making simple changes to their lifestyle, for example, walking to cycling instead of taking a car on a short journey or using public transport on a longer journey. Turning engines off where possible such as when dropping children at school can also help reduce harmful emissions from vehicle exhausts. If you are regularly making a single occupancy car journey to and from work you can you can obtain a Personal Travel Plan from Norfolk

County Council which will identify alternative ways of travel and possible car sharing opportunities.

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1 Local Air Quality Management

This report provides an overview of air quality in the Borough Council of King's Lynn & West Norfolk (BCKLWN) area during 2015. It fulfils the requirements of Local Air Quality Management (LAQM) as set out in Part IV of the Environment Act (1995) and the relevant Policy and Technical Guidance documents.

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

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

2 Actions to Improve Air Quality

2.1 Air Quality Management Areas

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

A summary of AQMAs declared by BCKLWN can be found in Table 2.1. Further information related to declared or revoked AQMAs, including maps of AQMA boundaries are available online.

Table 2.1 – Declared Air Quality Management Areas

AQMA Name	Pollutants and Air Quality Objectives	City / Town	One Line Description	Action Plan
Gaywood Clock	NO_2 annual mean	King's Lynn	An area encompassing a number of properties at the junction of the A148 (Lynn Road/Wootton Road) and A1076 (Gayton Road).	Borough Council of King's Lynn & West Norfolk Air Quality Action Plan 2015 Version 10
Town Centre	NO_2 annual mean	King's Lynn	A 'P' shaped area encompassing a number of properties comprising the main road to/from the town centre of King's Lynn (London Road and St James' Road) and the town centre one way system (Railway Road, Austin Street and Blackfriars Road).	Borough Council of King's Lynn & West Norfolk Air Quality Action Plan 2015 Version 10

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

In March 2015 an Air Quality Action Plan (AQAP) was adopted by the Council. The AQAP was produced by the BCKLWN in consultation with Norfolk County Council (NCC).

The BCKLWN has taken forward a number of measures during the current reporting year of 2015 in pursuit of improving local air quality. Details of all measures completed, in progress or planned are set out in Table 2.2. More detail on these measures can be found in the Council's Air Quality Action Plan. Key completed measures are:

- **1** Consideration of Air Quality Impacts when providing comments on planning applications within an AQMA or where an AQMA could be impacted or created
    - **Key outcome –** over 60 number of planning applications were commented upon for air quality issues in 2015, see Appendix F.
- **2** With regard to National Planning Policy Framework, include air quality considerations in the Local Plans and adopt an air quality Development Management Policy.
    - **Key outcome –** the emerging Site Allocations and Development Management Policies (SADMP) document includes policy DM15: Environment, design and amenity
- **3** With regard to National Planning Policy Framework, adopt Norfolk Technical Guidance on Air Quality and provide pre-application advice on planning applications
    - **Key Outcome –** the Institute of Air Quality Management's guidance Land-Use Planning & Development Control: Planning for Air Quality was adopted for use by BCKLWN
- **5** New access road from Wisbech Road through Friars to Boal Street.
    - **Key Outcome –** the access road has been completed
- **7** Implementation of Urban Traffic Control system (UTC) at principal junctions within AQMA and adjacent to AQMA
    - **Key Outcome –** SCOOT system implemented to manage and control traffic signals, reducing queues.

- **9** Decriminalisation of parking. Review of parking controls and enforcement in AQMAs and King's Lynn Town Centre
    - **Key Outcome –**parking has been decriminalised, an additional town centre controlled parked scheme has been introduced with some short term parking spaces
- **15** Traffic Management at London Road and Southgates
    - **Key Outcome -** traffic flow along London Road into the town centre has improved due to improvements to the Southgates roundabout and Hardwick Road and this is reflected in measured NO_2

Progress on the following measures has been slower than expected:

- **4** Develop Parking Management Plan
- **14** Changes to the Road Layout within the King's Lynn Gyratory

BCKLWN's priorities for the coming year are:

- **1** Consideration of Air Quality Impacts when providing comments on planning applications within an AQMA or where an AQMA could be impacted or created – this ongoing measure remains a priority as all development in King's Lynn will have an impact on air quality and there have been an number of small developments which with any further development will have a cumulative effect on air quality.
- **4** Develop Parking Management Plan - a parking management plan or strategy is still needed as it links to a number of other measures. The car parks in the town centre are generally full and therefore a plan is needed to consolidate the car parks and draw cars away from the town centre.
- **20** Quality Bus Partnerships and contracts – although a quality bus partnership is in place there is a possibility that current contracts could be utilised to promote the use of newer, less polluting, vehicles.

Table 2.2 – Progress on Measures to Improve Air Quality

Measure No.	Measure	EU Category	EU Classification	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
1	Consideration of Air Quality Impacts when providing comments on planning applications within an AQMA or where an AQMA could be impacted or created.	Policy Guidance and Development Control	Air Quality Planning and Policy Guidance	Borough Council (LPA & Env Quality Team)	ongoing	ongoing	Number of pre application discussions and planning applications responded to	Up to 1	In 2015 over 60 applications were commented upon which had 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 – an ongoing measure	This will always be an ongoing measure as long as relevant planning application are received

Measure No.	Measure	EU Category	EU Classification	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
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	Borough Council (LPA & Env Quality Team)	Completed	2014	Production of documents	Up to 1	Completed	Completed	Emerging Site Allocations and Development Management Policies document includes policy DM15: Environment, design and amenity
3	With regard to National Planning Policy Framework, adopt Norfolk Technical Guidance on Air Quality and provide pre-application advice on planning applications	Policy Guidance and Development Control	Air Quality Planning and Policy Guidance	Borough Council (LPA & Env Quality Team)	2014	2015	Production of documents	Up to 1	Completed	Completed	Institute of Air Quality Management Planning for Air Quality Guidance adopted for use instead of Norfolk Technical Guidance, this is the approach Norfolk wide

Measure No.	Measure	EU Category	EU Classification	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
4	Develop Parking Management Plan (linked to 9, 10, 11 & 12)	Transport Planning and Infrastructure	Other	County Council/ Borough Council	2014	ongoing	Publication of and implementation of plan	Up to 2	The implementation of this measure is still outstanding, although the Council uses the Norfolk County Council Parking Partnerships Parking Principles document no BCKLWN Parking Management Plan has been developed.	2017	This measure will be taken forward by the Air Quality Steering Group
5	New access road from Wisbech Road through Friars to Boal Street.	Traffic Management	Strategic highway improvements, Re-prioritising road space away from cars, including Access management, Selective vehicle priority, bus priority, high vehicle occupancy lane	County Council/ Borough Council	2010	December 2011	Continued air quality monitoring. Bus flow counts on London Road and new route	2-3	The new access road has been completed and is well used by Stagecoach buses.	Completed	This has removed some bus traffic from town centre.

Measure No.	Measure	EU Category	EU Classification	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
6	Incentivise the use of public transport.	Alternatives to private vehicle use	Other	County Council	2014	2015	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. The train fleet is due to be upgraded.	2017	None.
7	Implementation of Urban Traffic Control system (UTC) at principal junctions within AQMA and adjacent to AQMA	Traffic Management	UTC, Congestion management, traffic reduction	County Council	2010	December 2011	Continued air quality monitoring. Queue length at junctions at peak times	2-5	The SCOOT system has been implemented.	Completed	Queues on approach to town centre reduced and green wave through one way system. The system continues to be improved as conditions change over time.
8	Installation of selective vehicle detection (SVD) system	Traffic Management	UTC, Congestion management, traffic reduction	County Council	2011	2012	Number of vehicles fitted with SVD Annual average daily traffic numbers	Up to 1	The system has been installed on buses.	Completed	None.

Measure No.	Measure	EU Category	EU Classification	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
9	Decriminalisation of parking. Review of parking controls and enforcement in AQMAs and King's Lynn Town Centre (Linked to 4, 10, 11 & 12)	Transport Planning and Infrastructure	Other	Borough Council/ County Council	December 2010 Option validation Jan-March 2011	ongoing	Implementation of enforcement in AQMAs and Town Centre. Continued air quality monitoring.	Up to 1	Parking was decriminalised in November 2011. 30 minute bays have been introduced on King Street and have been a success. A controlled parking scheme has been introduced on South Quay.	Completed	None
10	Variable car parking rates (Linked to 4, 9, 11 & 12)	Transport Planning and Infrastructure	Other	Borough Council	2014	On going	Continued air quality monitoring Car park usage Queue lengths	Up to 1	This was trialled with free parking available on a Wednesday afternoon, however, this did not appear to have an impact. It may be because the charges in the first place are not that high.	Completed.	This measure will not be taken forward any further.

Measure No.	Measure	EU Category	EU Classification	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
11	Variable message signs (Linked to 4, 9, 10 & 12)	Traffic Management	Other	Borough Council/County Council	2014	2014	Peak hour parking usage Car park usage 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. There are some further signs that are going to be installed.	Completed.	None.

Measure No.	Measure	EU Category	EU Classification	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
12	Investigate potential for residents only parking in or close to AQMAs (Linked to 4, 9, 10 & 11)	Traffic Management	Workplace Parking Levy, Parking Enforcement on highway	Borough Council	2014	2015	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.	Completed.	None.
13	Support the use of West Lynn ferry	Promoting Travel Alternatives	Promote use of rail and inland waterways	Borough Council	2012	On going	Number of passengers using ferry	Up to 1	BCKLWN has provided funding for the West Lynn ferry.	Ongoing	The ferry service is well used, but is currently for sale. This measure may need reviewing in future depending on the outcome of the sale.

Measure No.	Measure	EU Category	EU Classification	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
14	Changes to the Road Layout within the King's Lynn Gyratory as proposed by KLATS	Traffic Management	UTC, Congestion management, traffic reduction	County Council	2011 Linked to measure 3	ongoing	Continued air quality monitoring. Daily traffic flow data and queue lengths	2-10	No work has been done on this as yet. The project needs rationalisation and microsimulation modelling.	2019	Devolution may provide new opportunities to take forward this measure.
15	Traffic Management at London Road and Southgates	Traffic Management	UTC, Congestion management, traffic reduction	County Council	2014	2015	Continued air quality monitoring. Queue length at junctions at peak times	1-5	Completed.	Completed.	Traffic flow along London Road has improved and this is reflected in measured NO_2.
16	Traffic Management at Gaywood clock	Traffic Management	UTC, Congestion management, traffic reduction	County Council	2014	2015	Continued air quality monitoring. Traffic que lengths	1-5	Partial completion.	2017	This measure will need further consideration and review after the Lynnsport access road is completed as this could impact on the Gaywood Clock junction.

Measure No.	Measure	EU Category	EU Classification	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
17	Promotion of travel plans, school travel plans and promotion of car sharing	Promoting Travel Alternatives	Personalised Travel Planning & School Travel Plans & Workplace Travel Planning	County Council/ Borough Council	2014	Ongoing	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 applications.	Ongoing.	Information on Travel Plans is available on the County Council website.
18	Improved cycling and walking provision	Promoting Travel Alternatives	Promotion of cycling & Promotion of walking	County Council/ Borough Council	2014	ongoing	Cycle usage and walking provision. Number of cycle/foot path improvements	Up to 1	The BCKLWN has increased provision for cycle parking. A County Council Walking and Cycling Action Plan being developed, BCKLWN provided comment.	Ongoing	None.

Measure No.	Measure	EU Category	EU Classification	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
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	Borough Council	2014	Ongoing	Number & use of EV charging points installed	Up to 1	Some charging points have been installed in King's Lynn town centre car park and Hunstanton. Charging points are requested on new development as a mitigation measure in line with IAQM guidance.	Ongoing	None.
20	Quality Bus Partnerships and contracts	Promoting Low Emission Transport	Public Vehicle Procurement - Prioritising uptake of low emission vehicles	County Council	2014	ongoing	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.	2017	This measure is to be taken further at future Air Quality Steering Group meetings.

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 measures already being taken in the Council's AQAP have been reviewed against the Toolbox in Annex II of TG(16) to determine which can have an effect on reducing $PM_{2.5}$ emissions. It was determined that in particular measures 6, 7, 8, 13, 15, 16, 17, 18 and 20 will also have an impact on reducing $PM_{2.5}$ emissions.

In addition to these measures that are other actions that BCKLWN is taking to address $PM_{2.5}$.

- Proving comments to Norfolk County Council's 'Silica sand review' which forms part of their Mineral Plan. The entire silica sand resource is within the BCKLWN area and comments were made on the appropriateness of each site and the likely impact on nearby residential receptors. The BCKLWN will continue to provide comments on any planning applications relating to search areas/sites to ensure that there are no adverse effects on air quality.
- Where the is potential for a construction site to impact on the local amenity by way of dust emissions a Construction Management Statement is requested as a pre-commencement planning condition. The statement has to include methods used and the measures taken to control the emission of dust and therefore minimise potential short term exposure to $PM_{2.5}$.

The BCKLWN is not required to monitor for $PM_{2.5}$ as there is no statutory requirement to do so. Instead the UK government has a network of air quality monitoring stations across the UK which monitors levels of $PM_{2.5.}$ The results show that the UK currently complies with the 25µg/m^3 limit value set by the EU air quality directive.

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

3.1 Summary of Monitoring Undertaken

3.1.1 Automatic Monitoring Sites

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

BCKLWN undertook automatic (continuous) monitoring at seven sites during 2015, two for NO_2 and five for PM_{10}. Table A.1 in Appendix A shows the details of the sites. National monitoring results are available at https://uk-air.defra.gov.uk/latest/.

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 58 sites during 2016.

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

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

3.2 Individual Pollutants

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

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 air quality objective of 40µg/m^3. For diffusion tubes, the full 2015 dataset of monthly mean values is provided in Appendix B. For 2015 there were three monitoring locations where the annual mean objective for NO_2 was exceeded. These sites are the automatic monitoring station at Gaywood (in the Gaywood Clock AQMA) and the diffusion tubes at site 2 (Railway Road 4, inside the Town Centre AQMA) and site 5 (Bus Station 2, not in an AQMA).

Both, Gaywood and Railway Road 4 have relevant exposure for the annual mean objective, whereas at Bus Station 2 the hourly objective is more relevant. At Bus Station 2 the annual mean did not exceed 60µg/m^3 which indicates that it would be unlikely that the NO_2 1-hour mean objective would be exceeded at this site. During 2015 the bus station was subject to King's Lynn Transport Interchange project and consequently monitoring had to be suspended for a number of months and therefore an annualised mean is reported. This project has since been completed and it is expected that a full year of monitoring will take place in 2016 and will give a more representative result.

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. There were no exceedances of the 1-hour mean objective reported at either of the conituous monitoring stations. There were no annual means greater than 60µg/m^3 at any diffusion tube sites indicating that it is unlikely that the 1-hour mean objective would be exceeded at any of these sites either. Bus Station 2 is the only site identfied where the 1 hour objective is likely to be exceeded.

Figures 1 – 3 present trends in the measured annual mean NO_2 concentrations over the past five years for diffusion tube sites and Figure 4 presents trends in the measured annual mean NO_2 concentrations at the continuous monitoring sites.

Generally there has been an overall decrease in the annual mean NO_2 concentrations measured, however, it is noted that a small number of sites (5 - Bus Station 2, 15 – Southgates, 20 – London Road 10 and 58 – NORR2) show an overall increase compared to 2014. At the continuous monitoring stations there has been an overall decrease in annual mean NO_2 at Southgates but an increase in annual mean NO_2 measured at Gaywood. This decrease at Southgates supports the possibility that the London Road part of the Town Centre AQMA could be revoked in future assuming no further exceedances are identified.

During 2015 two rounds of additional air quality monitoring were carried out at the new taxi rank in King's Lynn due to concerns being raised by the taxi trade. Dräger tubes were used to monitor Nitrogen Dioxide, Carbon Monoxide, Benzene and Sulphur Dioxide at two locations. The results indicated there is no impact on human health from the pollutants measured. The full report is available on the Council's website.

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 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.

PM_{10} is monitored by a TEOM and four Osiris dust screening units at five different sites. There were no exceedances of the annual mean objective at any of the monitoring sites, nor was PM_{10} 24-hour mean objective (50µg/m^3 not to be exceeded more than 35 times/year) exceeded.

In 2011 there were exceedances of both the annual mean and 24-hour mean at Page Stair Lane. This site is close to the King's Lynn Port which is a large industrial area, a Detailed Assessment of this area was undertaken in 2015 and has concluded that it will not be necessary to declare an AQMA in this area. Further information on the Detailed Assessment is available in Appendix C.

As this Detailed Assessment has now been completed it is planned that in 2016 the TEOM and an Osiris monitor will be relocated to Stoke Ferry to provide data for the outstanding Detailed Assessment.

4 Conclusions and Priorities for 2016

It was concluded:

- For 2015 there were three monitoring sites where the annual mean objective for NO_2 was exceeded. These sites are the automatic monitoring station at Gaywood (in the Gaywood Clock AQMA) and the diffusion tubes at site 2 (Railway Road 4, inside the Town Centre AQMA) and site 5 (Bus Station 2, not in an AQMA).
- Both AQMA's are still valid.
- No new AQMA's need to be declared at this time
- No AQMA needs revoking or amending this year.
- For the past 5 years generally there has been an overall decrease in the annual mean NO_2 concentrations measured. The exception to this is at the continuous monitoring station at Gaywood Clock where there has been an increase annual mean NO_2 concentrations measured.
- There were no exceedances of the annual mean objective for PM_{10} at any of the monitoring sites, nor was PM_{10} 24-hour mean objective (50µg/m^3 not to be exceeded more than 35 times/year) exceeded.
- No new sources of pollution were identified for NO_2 or PM_{10}.

The priorities for BCKLWN in 2016 are to:

- Continue to monitor NO_2 and PM_{10} levels at existing locations throughout the Borough
- Investigate the possibility of amending the extent of the current Town Centre AQMA should levels of NO_2 continue to decline
- Begin additional PM_{10} monitoring in Stoke Ferry to provide data for a Detailed Assessment to be undertaken
- Take the AQAP forward with the support of the AQSG to begin the implementation of outstanding measures
- Begin detailed data collection to provided evidence in support of AQAP measures to be reported the 2017 ASR

Appendix A: Monitoring Results

Table A.1 – Details of Automatic Monitoring Sites

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Monitoring Technique	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Inlet Height (m)
Southgates	Southgates Park, King's Lynn	Roadside	562225	319191	NO_2	Y	Chemiluminescent;	N/A	5	1.7
Gaywood	Gaywood, King's Lynn	Roadside	563437	320472	NO_2	Y	Chemiluminescent	5	1	1.7
North Lynn(3)	North Lynn, King's Lynn	Industrial	562086	321325	PM_{10}	N	TEOM	35	17	3.0
Page Stair Lane	Page Stair Lane, King's Lynn	Industrial	561527	320437	PM_{10}	N	Osiris	5	3.3	3.5
Stoke Ferry	Stoke Ferry	Industrial	570339	300083	PM_{10}	N	Osiris	5	1	3.5
St Michael's(3)	St Michael's (South Lynn Community Centre), King's Lynn	Urban Background	561826	318543	PM_{10}	N	Osiris	2	55	3.5

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Monitoring Technique	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Inlet Height (m)
Estuary Road	Estuary Road, King's Lynn	Industrial	561593	321466	PM_{10}	N	Osiris	2	1	3.5

(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.

(3) Monitors to be relocated to Stoke Ferry in 2016.

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

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube collocated with a Continuous Analyser?	Height (m)
1	Railway Road 1	Roadside	562073	320304	NO_2	Y – TC	2	2	N	2.5
2	Railway Road 4	Roadside	562100	320222	NO_2	Y – TC	0	2	N	2.4
3	Railway Road 5	Roadside	562117	320095	NO_2	Y – TC	0	1.5	N	2.4
5	Bus Station 2	Roadside	562003	320099	NO_2	N	N/A	N/A	N	2.2
6/7/8	Southgates AQMS co-located	Roadside	562226	319191	NO_2	Y- TC	No but property façade 4m from kerb further north	5	Y	3.2
9	Millfleet 1	Roadside	561912	319711	NO_2	N	No but property façade 4m from kerb in same street	4	N	2.5
10	London Rd 1	Roadside	562101	319679	NO_2	Y- TC	2.5	3	N	1.4

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube collocated with a Continuous Analyser?	Height (m)
11	London Rd 2	Roadside	562165	319575	NO_2	Y- TC	0	3	N	2.2
12	London Rd 3	Roadside	562243	319452	NO_2	Y- TC	1	3	N	2.1
13	London Rd 4	Roadside	562264	319375	NO_2	Y- TC	0	4.5	N	2.2
14	London Rd 5	Roadside	562227	319266	NO_2	Y- TC	0.5	4	N	2.2
15	Southgate s	Roadside	562190	319102	NO_2	Y- TC	1	0.5	N	2.4
18	Hardwick Rd	Roadside	562266	319043	NO_2	N	0	7	N	1.6
19	Vancouve r Avenue 1	Roadside	562277	319098	NO_2	N	0	6	N	1.5
20	London Rd 10	Roadside	562244	319261	NO_2	Y- TC	0	3.5	N	2.2
22	London Rd 6	Roadside	562285	319386	NO_2	Y- TC	0	5	N	1.3
23	London Rd 7	Roadside	562162	319614	NO_2	Y- TC	0	4.5	N	2.1
24	London Rd 8	Roadside	562136	319651	NO_2	Y- TC	0	5.5	N	2.2
25	The Walks	Urban Background	562191	319695	NO_2	N	0	75	N	1.7

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube collocated with a Continuous Analyser?	Height (m)
26	Railway Road 7	Roadside	562131	319996	NO_2	Y- TC	0	2	N	2.3
27	St John's Terrace	Roadside	562178	319999	NO_2	Y- TC	3	2	N	2.1
28	St John's Terrace/Blackfriars	Roadside	562253	320015	NO_2	Y- TC	0	1.5	N	2.6
29	Waterloo Street	Kerbside	562175	320055	NO_2	N	2.5	1	N	1.6
30	Portland Street	Kerbside	562204	320108	NO_2	N	2.5	1	N	2.4
31	Railway Rd 2	Roadside	562129	320132	NO_2	Y- TC	0	2	N	2.3
32	Railway Rd 3	Roadside	562119	320216	NO_2	Y- TC	0	2	N	2.4
33	Wellesley Street	Kerbside	562203	320159	NO_2	N	2.5	0.5	N	2.4
34	Blackfriars 2	Roadside	562244	320129	NO_2	Y- TC	0	2.5	N	2.4
35	Blackfriars 1	Roadside	562245	320238	NO_2	Y- TC	3	1.5	N	2.3
36	Norfolk Street	Roadside	562219	320319	NO_2	Y- TC	0	2	N	2.2
37	Blackfriars 3	Roadside	562254	320259	NO_2	Y- TC	N/A	2	N	2.5

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube collocated with a Continuous Analyser?	Height (m)
38	Littleport Street	Roadside	562257	320323	NO_2	Y- TC	0	2.5	N	2.4
39	Gaywood Road 2	Roadside	562822	320427	NO_2	N	0	7	N	5
40	Swan Gayton Rd	Roadside	563490	320469	NO_2	Y – GC	0	2	N	2.5
41	Wootton Road 2	Roadside	563478	320515	NO_2	Y – GC	0	2	N	3.4
42	Wootton Road 1	Roadside	563480	320582	NO_2	Y – GC	0	3	N	1.7
43	Lynn Road 1	Roadside	563412	320477	NO_2	Y – GC	0	5	N	3.4
44	Lynn Road 2	Roadside	563377	320484	NO_2	Y – GC	0	2	N	3.4
45	Gaywood Road 3	Roadside	563202	320488	NO_2	N	0	4.5	N	2.2
46	Gaywood Road 1	Roadside	562565	320509	NO_2	N	0	6.5	N	2.09
47	Austin Street 1	Roadside	562186	320376	NO_2	Y – TC	0.5	1	N	1.7
48	Austin Street 2	Roadside	562180	320365	NO_2	Y – TC	0	2	N	2.6
51	Wootton Road 3	Roadside	563521	320628	NO_2	N	6	1.5	N	1.8

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube collocated with a Continuous Analyser?	Height (m)
52	Lynn Road 3	Roadside	563289	320504	NO_2	N	5.5	1	N	1.6
58	NORR 2	Roadside	562171	319019	NO_2	N	18	2	N	2.5
66	Gaywood Road	Urban Background	562595	320527	NO_2	N	0	N/A	N	2.4
67	Greyfriars Road	Urban Background	562236	319579	NO_2	N	0	N/A	N	2.3
68	Nursery, London Road	Urban Background	562143	319838	NO_2	N	0	N/A	N	1.6
69	Whitefriar s Road 1	Urban Background	561994	319395	NO_2	N	0	N/A	N	2.2
70	Whitefriar s Road 2	Urban Background	561930	319355	NO_2	N	0	N/A	N	2.4
75	The Swan flats Gayton Road KL	Roadside	563469	320469	NO_2	Y – GC	0	2	N	2.8
76	Hardwick Park Homes	Roadside	562597	318740	NO_2	N	1	8	N	1.58

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube collocated with a Continuous Analyser?	Height (m)
79	Tennyson Ave	Roadside	562804	320423	NO_2	N	0	2	N	3.8
85	Southery	Suburban	562111	294806	NO_2	N	0	12	N	1.6
86	Taxi rank Bus station	Other	562019	320139	NO_2	N	0	N/A	N	2.2
87	Albion Street	Roadside	562103	320164	NO_2	N	0	2.6	N	2.1
88	Tennyson Ave	Roadside	562795	320290	NO_2	N	0	7.4	N	2.0
89	Whitefriars Terrace	Roadside	561888	319467	NO_2	N	0	1	N	2.4

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

(2) N/A if not applicable.

Table A.3 – Annual Mean NO_2 Monitoring Results

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) [1]	Valid Data Capture 2015 (%) [2]	NO_2 Annual Mean Concentration (µg/m^3) [3]				
					2011	2012	2013	2014	2015
Southgates	Roadside	Automatic	99.7	99.7	23	25	26	21	21
Gaywood	Roadside	Automatic	99.7	99.7	-	33	39	36	**42**
1	Roadside	Diffusion Tube	100	100	35.7	**40.3**	37.1	38.2	36.6
2	Roadside	Diffusion Tube	100	100	**50.3**	**45.1**	**47.1**	**47.0**	**46.6**
3	Roadside	Diffusion Tube	67	67	**45.4**	**40.6**	**42.2**	39.7	36.9
5	Roadside	Diffusion Tube	88	58	**42.5**	**43.6**	**43.9**	**46.0**	**53.0**
6/7/8	Roadside	Diffusion Tube	100	100	25.2	24.6	26.2	26.7	25.2
9	Roadside	Diffusion Tube	100	100	22.3	20.0	22.9	21.2	20.3
10	Roadside	Diffusion Tube	100	100	**42.1**	38.6	35.1	36.7	37.8
11	Roadside	Diffusion Tube	83	83	30.6	30.0	28.4	30.4	28.5
12	Roadside	Diffusion Tube	100	100	33.9	32.8	33.5	34.7	33.1
13	Roadside	Diffusion Tube	100	100	32.0	31.7	30.8	31.5	30.3
14	Roadside	Diffusion Tube	100	100	34.3	**50.4**	34.4	35.0	33.1

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) [1]	Valid Data Capture 2015 (%) [2]	NO_2 Annual Mean Concentration ($\mu g/m^3$) [3]				
					2011	2012	2013	2014	2015
15	Roadside	Diffusion Tube	100	100	36.7	37.4	36.7	38.4	37.2
18	Roadside	Diffusion Tube	100	100	28.2	26.4	26.4	26.5	25.8
19	Roadside	Diffusion Tube	100	100	25.3	25.0	24.8	23.6	23.7
20	Roadside	Diffusion Tube	100	100	30.6	29.5	33.5	33.1	30.8
22	Roadside	Diffusion Tube	100	100	34.7	32.1	33.3	34.2	31.4
23	Roadside	Diffusion Tube	100	100	34.3	32.7	36.2	35.3	31.6
24	Roadside	Diffusion Tube	100	100	31.8	31.4	32.5	32.0	28.7
25	Urban Background	Diffusion Tube	92	92	17.3	17.4	16.4	16.3	15.0
26	Roadside	Diffusion Tube	92	92	37.7	36.7	37.2	36.0	33.8
27	Roadside	Diffusion Tube	100	100	32.5	31.3	30.4	30.0	27.5
28	Roadside	Diffusion Tube	83	83	32.1	29.5	32.1	30.0	30.2
29	Kerbside	Diffusion Tube	100	100	23.1	21.6	21.8	19.1	18.6

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) [1]	Valid Data Capture 2015 (%) [2]	NO_2 Annual Mean Concentration ($\mu g/m^3$) [3]				
					2011	2012	2013	2014	2015
30	Kerbside	Diffusion Tube	100	100	26.5	22.9	22.8	21.3	21.4
31	Roadside	Diffusion Tube	75	75	35.4	36.0	32.7	30.9	30.4
32	Roadside	Diffusion Tube	100	100	33.4	30.7	30.6	30.9	27.7
33	Kerbside	Diffusion Tube	100	100	30.4	28.3	26.9	29.7	27.4
34	Roadside	Diffusion Tube	75	75	33.8	31.4	31.3	32.1	30.1
35	Roadside	Diffusion Tube	100	100	30.6	30.6	29.9	29.0	28.5
36	Roadside	Diffusion Tube	100	100	31.7	31.1	28.6	29.2	27.9
37	Roadside	Diffusion Tube	100	100	32.3	29.0	35.2	33.1	27.3
38	Roadside	Diffusion Tube	92	92	36.7	35.7	31.7	35.1	32.5
39	Roadside	Diffusion Tube	100	100	28.9	26.0	27.5	26.8	24.3
40	Roadside	Diffusion Tube	100	100	35.7	34.2	31.7	32.8	31.2
41	Roadside	Diffusion Tube	100	100	38.8	33.7	37.1	35.2	31.2
42	Roadside	Diffusion Tube	100	100	30.6	32.3	30.8	29.7	29.8

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) [1]	Valid Data Capture 2015 (%) [2]	NO_2 Annual Mean Concentration ($\mu g/m^3$) [3]				
					2011	2012	2013	2014	2015
43	Roadside	Diffusion Tube	100	100	29.4	30.6	30.6	30.9	28.7
44	Roadside	Diffusion Tube	58	58	35.5	34.3	35.5	36.6	31.8
45	Roadside	Diffusion Tube	83	83	31.5	29.9	31.5	26.8	26.0
46	Roadside	Diffusion Tube	100	100	27.3	24.4	26.3	26.2	23.8
47	Roadside	Diffusion Tube	100	100	38.3	35.5	33.9	34.9	29.6
48	Roadside	Diffusion Tube	75	75	33.7	30.6	30.2	32.1	28.4
51	Roadside	Diffusion Tube	100	100	20.7	19.7	19.6	19.0	17.3
52	Roadside	Diffusion Tube	100	100	29.6	30.0	29.4	28.7	27.2
58	Roadside	Diffusion Tube	100	100	26.2	24.8	30.1	28.9	26.7
66	Urban Background	Diffusion Tube	100	100	22.8	22.6	22.3	22.6	20.9
67	Urban Background	Diffusion Tube	100	100	18.7	18.2	18.2	16.8	16.4

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) [1]	Valid Data Capture 2015 (%) [2]	NO_2 Annual Mean Concentration ($\mu g/m^3$) [3]				
					2011	2012	2013	2014	2015
68	Urban Background	Diffusion Tube	75	75	24.9	22.9	21.0	19.4	18.8
69	Urban Background	Diffusion Tube	100	100	15.1	15.3	13.8	14.1	12.8
70	Urban Background	Diffusion Tube	100	100	15.1	12.4	12.5	13.9	12.4
75	Roadside	Diffusion Tube	92	92		34.1	34.8	35.1	33.0
76	Roadside	Diffusion Tube	100	100			20.1	20.8	18.8
79	Roadside	Diffusion Tube	100	100			35.2	34.7	34.0
85	Suburban	Diffusion Tube	100	42					19.7
86	Other	Diffusion Tube	100	100					27.6
87	Roadside	Diffusion Tube	100	100					28.7
88	Roadside	Diffusion Tube	100	100					18.9
89	Roadside	Diffusion Tube	100	100					13.3

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 Technical Guidance LAQM.TG16 if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

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

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2015 (%) (2)	NO_2 1-Hour Means > 200µg/m^3 (3)				
					2011	2012	2013	2014	2015
Southgates	Roadside	Automatic	99.7	99.7	0	0	0	0	0
Gaywood	Roadside	Automatic	99.7	99.7	-	0	0	0	0

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

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

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

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

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

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2015 (%) (2)	PM_{10} Annual Mean Concentration (µg/m^3) (3)				
				2011	2012	2013	2014	2015
North Lynn	Industrial	97.7	97.7			23	18	18
Page Stair Lane	Industrial	94.2	94.2	**42**	23	20	19	19
Stoke Ferry	Industrial	91.8	91.8	37	**70**	17	18	16
St Michael's	Urban Background	100	50.5			21	7	14
Estuary Road	Industrial	90.3	90.3			18	16	20

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

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

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

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

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2015 (%) (2)	PM_{10} 24-Hour Means > 50µg/m^3 (3)				
				2011	2012	2013	2014	2015
North Lynn	Industrial	97.7	97.7			1	4	3
Page Stair Lane	Industrial	94.2	94.2	**78**	16	6	7	4
Stoke Ferry	Industrial	91.8	91.8	22	**193**	20	3	9
St Michael's	Urban Background	100	50.5			13	1	0
Estuary Road	Industrial	90.3	90.3			1	2	8

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

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

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

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

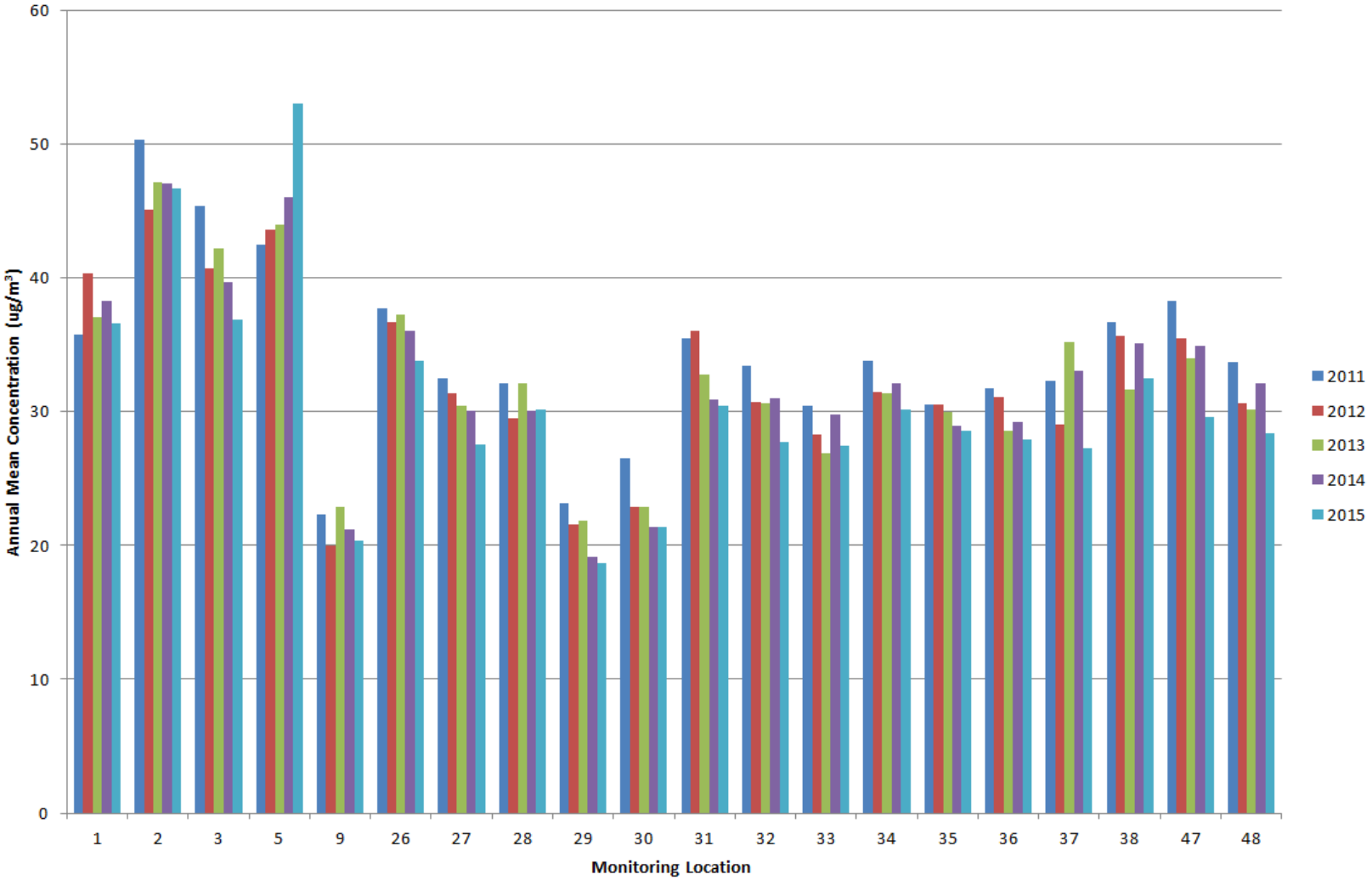


Figure 1 Trends in Annual Mean Nitrogen Dioxide Concentrations Measured at Diffusion Tube Monitoring Sites – Town Centre AQMA Northern Sites (the annual mean objective is 40ug/m^3)

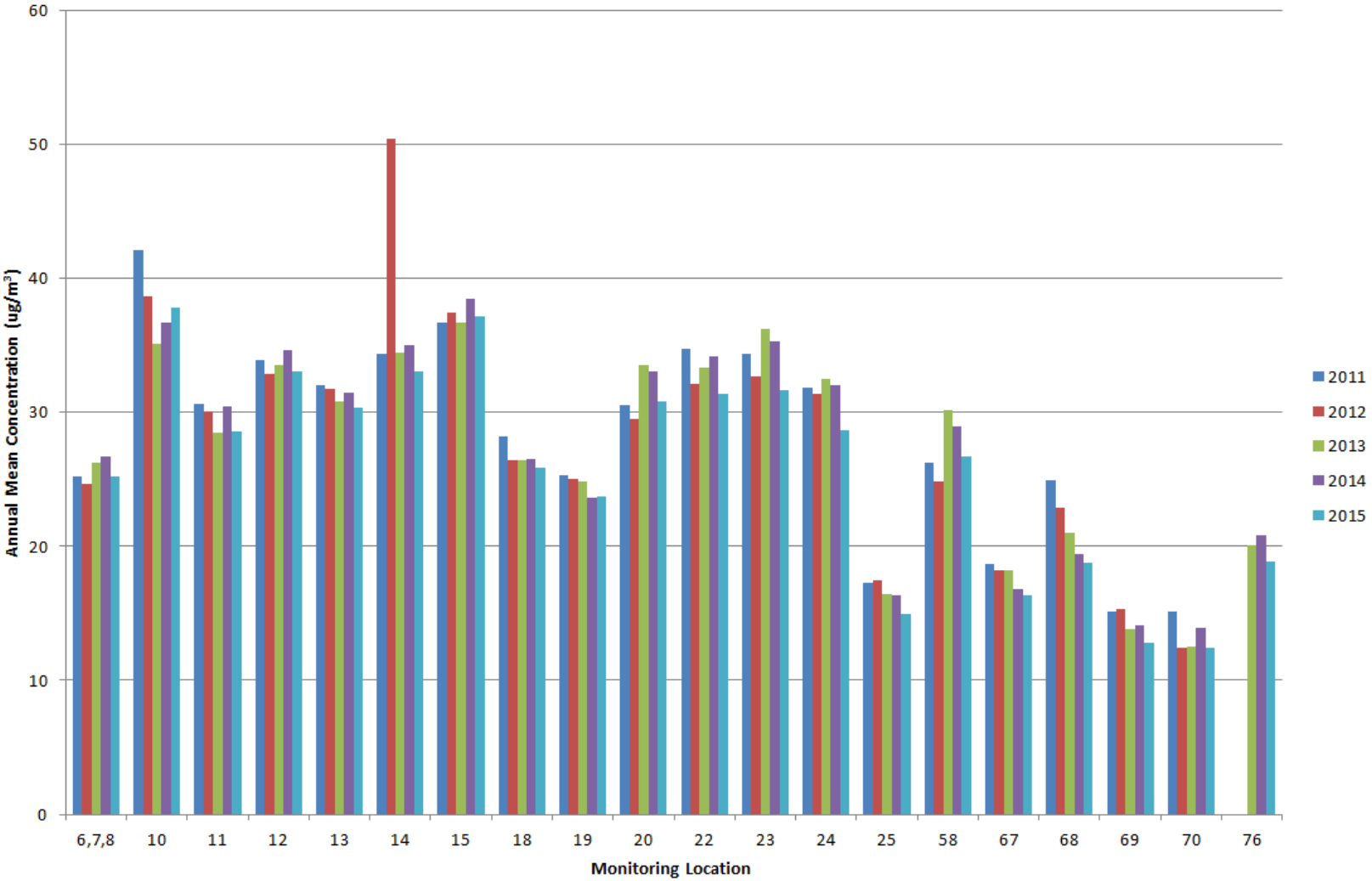


Figure 2 Trends in Annual Mean Nitrogen Dioxide Concentrations Measured at Diffusion Tube Monitoring Sites – Town Centre AQMA Sites (the annual mean objective is 40ug/m^3)

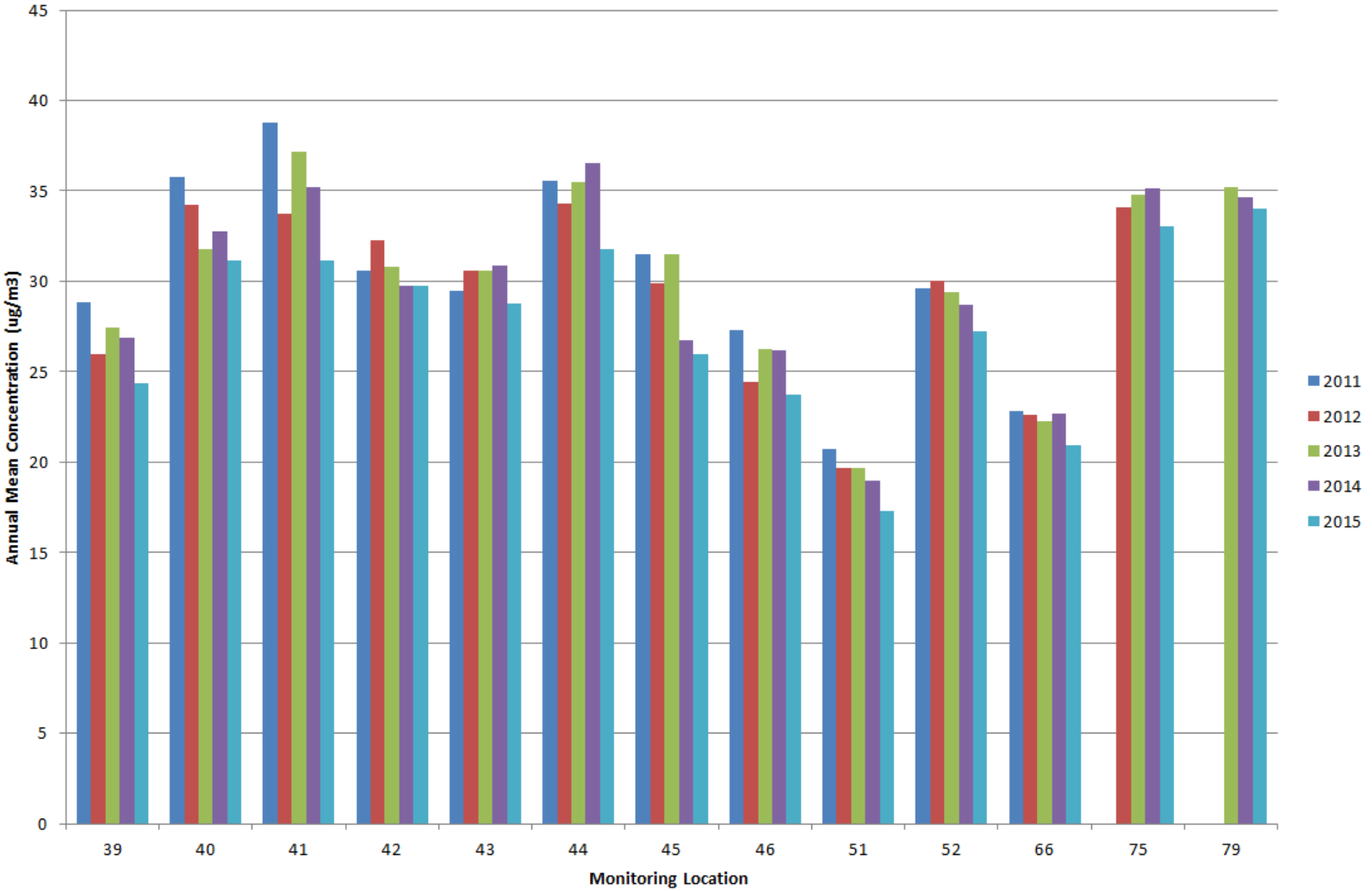


Figure 3 Trends in Annual Mean Nitrogen Dioxide Concentrations Measured at Diffusion Tube Monitoring Sites – Gaywood AQMA Sites (the annual mean objective is 40ug/m^3)

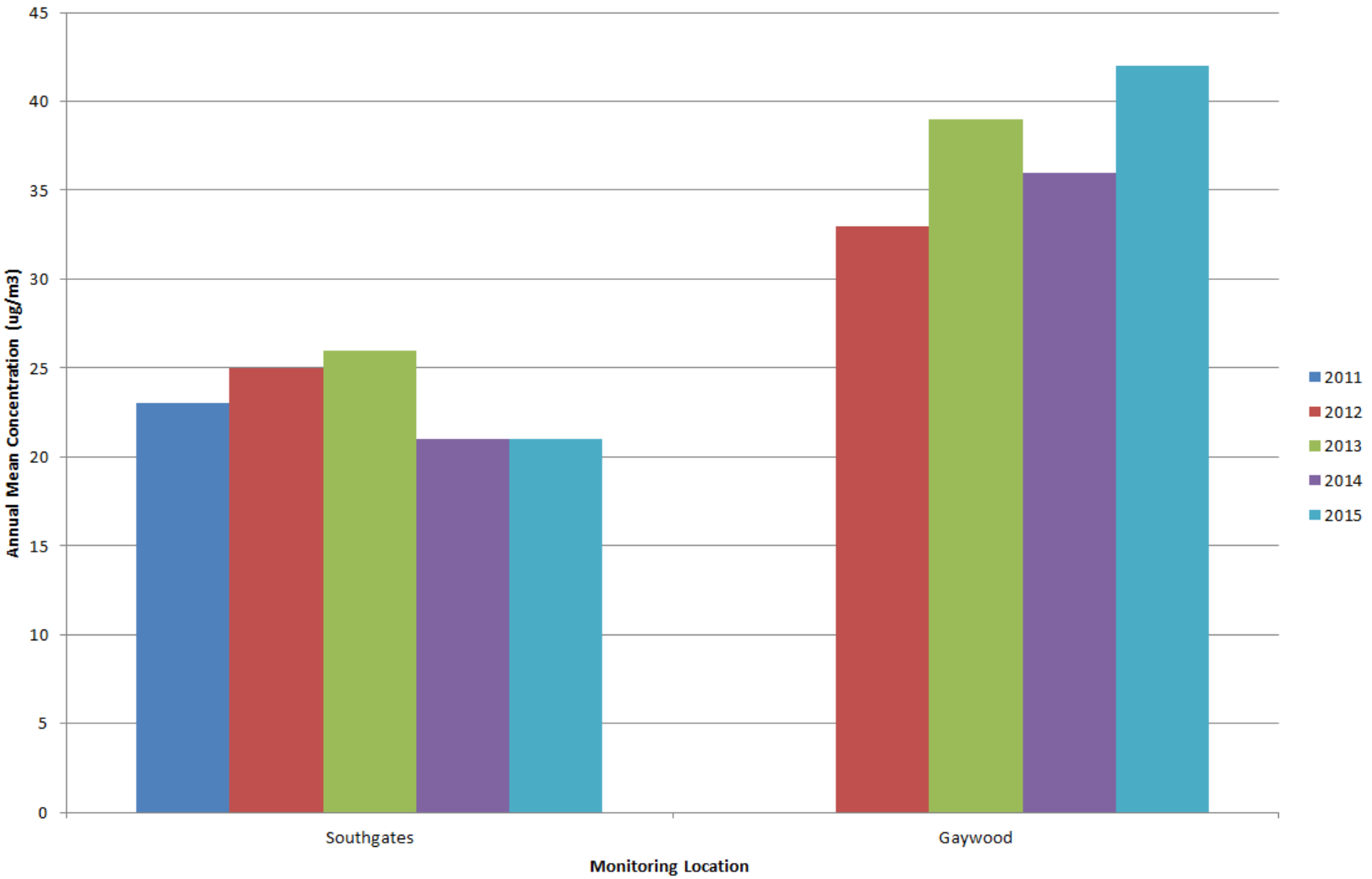
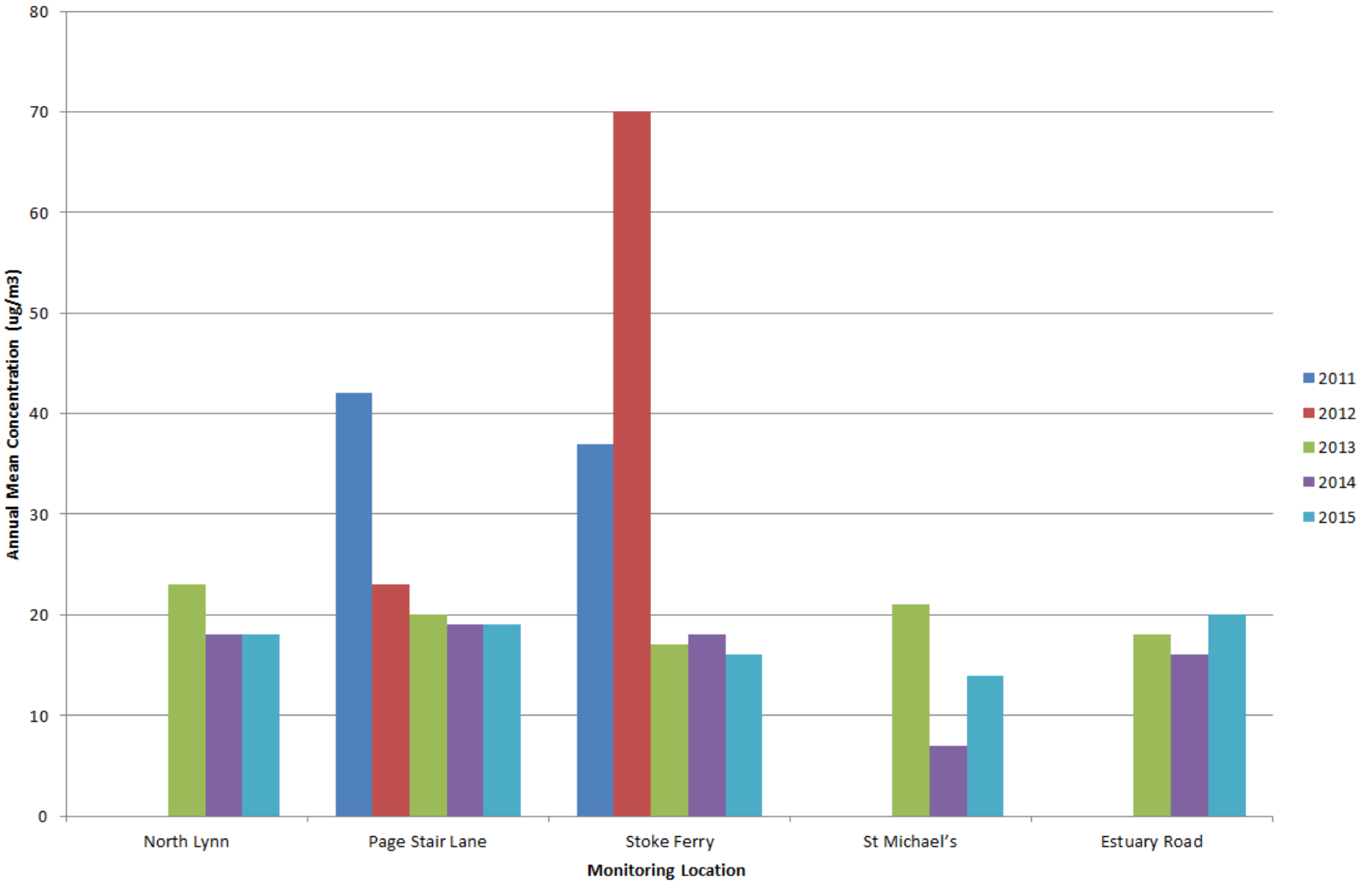


Figure 4 Trends in Annual Mean Nitrogen Dioxide Concentrations Measured at Continuous Monitoring Sites (the annual mean objective is 40ug/m^3)



The exceedances measured at Page Stair Lane in 2011 and Stoke Ferry in 2012 were what prompted the need for Detailed Assessments at both of these locations. The Detailed Assessment for the docks (Page Stair Lane) has been completed and data is being collected the Stoke Ferry Detailed Assessment.

Figure 5 Trends in Annual Mean PM_{10} Concentrations Measured at Continuous Monitoring Sites (the annual mean objective is 40ug/m^3)

Appendix B: Full Monthly Diffusion Tube Results for 2015

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

Site ID	NO_2 Mean Concentrations (µg/m^3)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean	
													Raw Data	Bias Adjusted (1)
1	48	49	35	35	38	38	35	42	39	48	44	48	42	37
2	48	59	59	44	53	63	55	51	44	52	53	55	53	47
3	47	44	47	44	-	-	40	-	42	47	-	51	42	37
5	56	50	-	-	-	-	35	-	36	42	36	36	60	53
6	36	40	26	26	23	23	26	25	27	34	31	28	29	25
7	35	38	28	26	26	26	26	26	27	30	29	29	29	25
8	33	36	29	19	25	26	25	26	26	31	30	30	28	25
6,7,8	35	38	27	24	25	25	25	26	27	32	30	29	29	25
9	25	29	24	23	17	18	19	19	25	31	23	24	23	20
10	46	48	38	48	38	34	40	43	41	49	43	47	43	38
11	30	36	30	28	-	31	29	31	34	37	M	38	32	29
12	41	43	36	33	37	38	38	36	35	36	40	38	38	33

Site ID	NO_2 Mean Concentrations (µg/m^3)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean	
													Raw Data	Bias Adjusted (1)
13	40	43	34	31	31	30	31	33	31	35	37	37	34	30
14	42	44	31	35	38	37	34	36	38	39	41	36	38	33
15	42	44	38	41	40	45	38	42	46	61	36	34	42	37
18	28	35	29	27	23	26	27	35	28	31	33	30	29	26
19	33	32	28	25	24	24	21	26	25	28	30	27	27	24
20	31	37	31	34	29	35	33	39	38	42	34	37	35	31
22	35	45	32	37	32	31	33	38	36	42	34	33	36	31
23	33	38	34	43	30	35	33	36	42	46	30	31	36	32
24	30	35	31	37	30	32	31	34	39	40	24	28	33	29
25	23	24	18	15	14	13	14	14	15	18	19	-	17	15
26	38	43	36	40	33	37	37	38	40	43	37	-	38	34
27	35	38	33	33	28	31	31	29	37	34	21	25	31	28
28	43	40	31	29	29	34	36	35	36	-	-	30	34	30
29	27	32	21	20	17	16	17	18	20	21	24	21	21	19
30	27	33	28	27	23	25	19	19	24	26	22	19	24	21

Site ID	NO_2 Mean Concentrations (µg/m^3)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean	
													Raw Data	Bias Adjusted (1)
31	38	39	35	37	29	-	-	-	31	38	33	31	35	30
32	33	38	28	33	27	28	30	32	34	34	31	30	32	28
33	35	39	31	29	29	26	28	29	28	33	33	34	31	27
34	41	40	30	-	32	32	33	29	-	-	37	34	34	30
35	38	41	30	30	31	31	29	30	33	33	34	29	32	29
36	35	39	28	30	27	31	28	31	32	35	34	31	32	28
37	33	39	32	33	26	28	25	30	35	36	30	25	31	27
38	39	42	32	34	34	33	34	37	38	-	40	43	37	32
39	32	35	27	26	23	24	26	27	29	29	27	27	28	24
40	43	38	35	36	34	34	35	33	33	30	41	33	35	31
41	41	41	36	39	32	32	33	34	35	41	29	32	35	31
42	38	40	33	32	32	30	33	30	31	34	36	37	34	30
43	39	41	34	33	28	30	32	28	38	35	32	22	33	29
44	38	49	-	39	-	-	-	35	41	45	M	31	36	32
45	29	36	31	33	25	-	-	23	33	36	27	22	30	26

Site ID	NO_2 Mean Concentrations (µg/m^3)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean	
													Raw Data	Bias Adjusted (1)
46	30	34	27	27	23	25	23	23	31	31	27	23	27	24
47	35	41	30	36	30	31	34	29	35	39	33	31	34	30
48	35	29	-	32	30	-	36	33	29	29	-	37	32	28
51	24	21	21	19	16	16	17	17	19	24	22	20	20	17
52	35	38	34	29	28	29	30	25	34	36	29	24	31	27
58	30	35	29	29	22	25	25	27	32	44	31	35	30	27
66	30	32	26	17	20	19	20	19	23	26	29	24	24	21
67	24	26	19	15	15	13	16	16	16	19	24	20	19	16
68	26	32	-	16	19	17	-	-	17	20	23	22	21	19
69	20	20	17	14	10	10	11	11	13	18	15	16	15	13
70	19	21	15	13	9	8	10	11	12	18	15	18	14	12
75	46	50	33	-	34	32	37	36	42	30	36	37	38	33
76	27	25	21	18	18	17	20	21	19	22	24	25	21	19
79	45	52	35	38	33	37	38	29	43	42	42	30	39	34
85	18	19	15	11	10	-	-	-	-	-	-	-	22	20

Site ID	NO_2 Mean Concentrations (µg/m^3)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean	
													Raw Data	Bias Adjusted (1)
86	39	35	31	29	26	29	33	31	30	30	34	30	31	28
87	31	28	28	38	28	29	32	31	43	44	31	28	33	29
88	31	25	23	21	17	17	18	19	20	20	24	23	22	19
89	21	21	16	14	11	10	11	11	13	19	18	17	15	13

(1) See Appendix C for details on bias adjustment

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

Significant Changes to Sources of Pollution

During 2015 the BCKLWN did not issue any substantial variations for Part B or Part A2 Local Authority Pollution Prevention Control permits. During 2015 three new Part B permits were issued by the Council; one di-isocyanate process (Envirofoam Chemicals Ltd, Station Road, Roydon, King's Lynn, PE32 1AW), one manufacturing of timber and wood-based products process (A1 Timber Engineering, "1-8 Nelson Business Park", Bergen Way, North Lynn Industrial Estate, King's Lynn, Norfolk) and one waste wood incineration process (PS & JE Ward Ltd, Belmont Nursery, Long Road, Terrington St Clement, King's Lynn, Norfolk, PE34 4JL). There were also two new Part A2 timber treatment Part A2 permits issued; Metsa Wood UK Ltd, Cross Bank Road, King's Lynn, Norfolk, PE30 2HA ,previously a Part B permit, and Pattrick & Thompsons Ltd, Page Stair Lane, King's Lynn, Norfolk, PE30 1NQ. All of these were assessed for potential emissions as part of the application process and none were determined to have a detrimental effect on air quality and no further assessment was found to be necessary. The BCKLWN will inspect and monitor each process as part of its regulatory duties.

Information obtained from the Environment Agency shows that although a number of permits issued in the BCKLWN area were varied during 2015 these were mainly normal or administrative variations and did not represent a significant change to any source of pollution. One new A1 application was granted for an intensive farming permit of more than 750 sows.

Detailed Dispersion Modelling

During 2015 a Detailed Assessment of the King's Lynn docks area was carried out by Bureau Veritas on behalf of the Council. The docks are a source of particulate matter and in order to assess how far particulates are likely to travel unitary emissions modelling was undertaken using ADMS 5. To account for different meteorological conditions the model was ran assuming data equivalent to the seven Pasquill-Gifford atmospheric stability classes. As expected the percentage of the particulate concentration was shown to decrease more rapidly for meteorological data representing the more unstable conditions, than conditions with increased

stability. The percentage of the concentration decreased rapidly with distance; at 50m distance from the source only 1.5% of the concentration at the source would be present. A large number of residential receptors are located within 50m of the docks boundary, however, the modelling showed the residential receptors are sufficiently far enough away from the particulate emitting activities that they are not significantly affected by them. It was concluded that it is not necessary to declare an AQMA relating to emissions of PM_{10} from the docks area. However, it is likely that in some areas of the docks exceedances of the PM_{10} air quality objective will occur and if relevant exposure were to be introduced (e.g. a new residential development), this may necessitate the declaration of an AQMA.

Evidence to Support Action Plan

As the new AQAP was only adopted in 2015, the gathering of data to support measures is in its initial stages. To support measures 1, 2 and 3, records are kept of when planning applications are considered which may have air quality impacts. However, there are a number of areas where data will be collected going into 2016.

This will include bus numbers on the new access road (supporting measure 6), bus usage figures (supporting measure 6), short term parking tickets issued (supporting measure 9) and numbers of ferry users (supporting measure 13).

QA/QC on Monitoring Data

Automatic

Data from the automatic monitoring stations is collected by Air Quality Data Management (AQDM) on behalf of the Council. The TEOM data has VCM for Indicative Gravimetric Equivalent applied. The Osiris data has a gravimetric factor of 1.3 for Indicative Gravimetric Equivalent applied. Both the TEOM and the NOx analysers are serviced biannually by Air Monitors. Calibration data is collected fortnightly from NOx analysers by council officers and passed to AQDM who carry out any adjustment of data. The Osiris instruments are serviced and calibrated annually by Turnkey Instruments.

Non-Automatic

The diffusion tube were supplied and analysed by Gradko. 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 laboratory follows the procedures as outlined within its Harmonisation Practical Guidance.

In the 2015 WASP/AIR PT results, rounds AIR PT AR006 (January – February 2015), AIR PT AR007 (April – May 2015), AIR PT AR009 (July – August 2015) and AIR PT AR010 (October – November 2015) Gradko scored 100%. This is the percentage of results submitted which were subsequently determined to be satisfactory based upon a z-score of ≤±2.

Annualisation of Diffusion Tube Data

Where there was fewer than 9 months' of data available for a site annualisation was performed. Details of this are shown in the table below.

Table C.1 – Annualisation of Data

Diffusion Tube Site	Leicester Uni A	Norwich AF	Northampton AF	Average AF	Bias Unadjusted Annual Mean Concentration	Bias Adjusted Annual Mean Concentration	Bias Adjusted and Annualised Annual Mean Concentration
3	0.94	0.93	0.91	0.93	45.25	39.82	36.9
5	1.50	2.06	0.79	1.44	41.57	36.58	53.0
44	0.92	0.91	0.90	0.91	39.7	34.94	31.8
85	1.40	2.27	0.92	1.53	14.6	12.85	19.7

Diffusion Tube Bias Adjustment Factor and Precision

The national bias adjustment factor 0.88 from the national bias adjustment spreadsheet (version 06_16, based on 27 studies) was used to correct the diffusion tube data. The BCKLWN have triple co-located tubes with the continuous NOx analyser at Southgates and the local bias adjustment factor of 0.75 was calculated using the Local Bias Adjustment Factor spreadsheet (v_04) available from the Defra LAQM website. Although the local co-location bias adjustment had good precision (the coefficient of variation (CV) of triplicate diffusion tubes for eight or more periods during the year was less than 20%, and the average CV of all monitoring periods was less than 10%) and data capture the use of the local bias adjustment figure would

have meant a large reduction in the bias adjusted measurements therefore it was felt the national bias adjustment factor would give more representative and realistic results.

Appendix D: Maps of Monitoring Locations

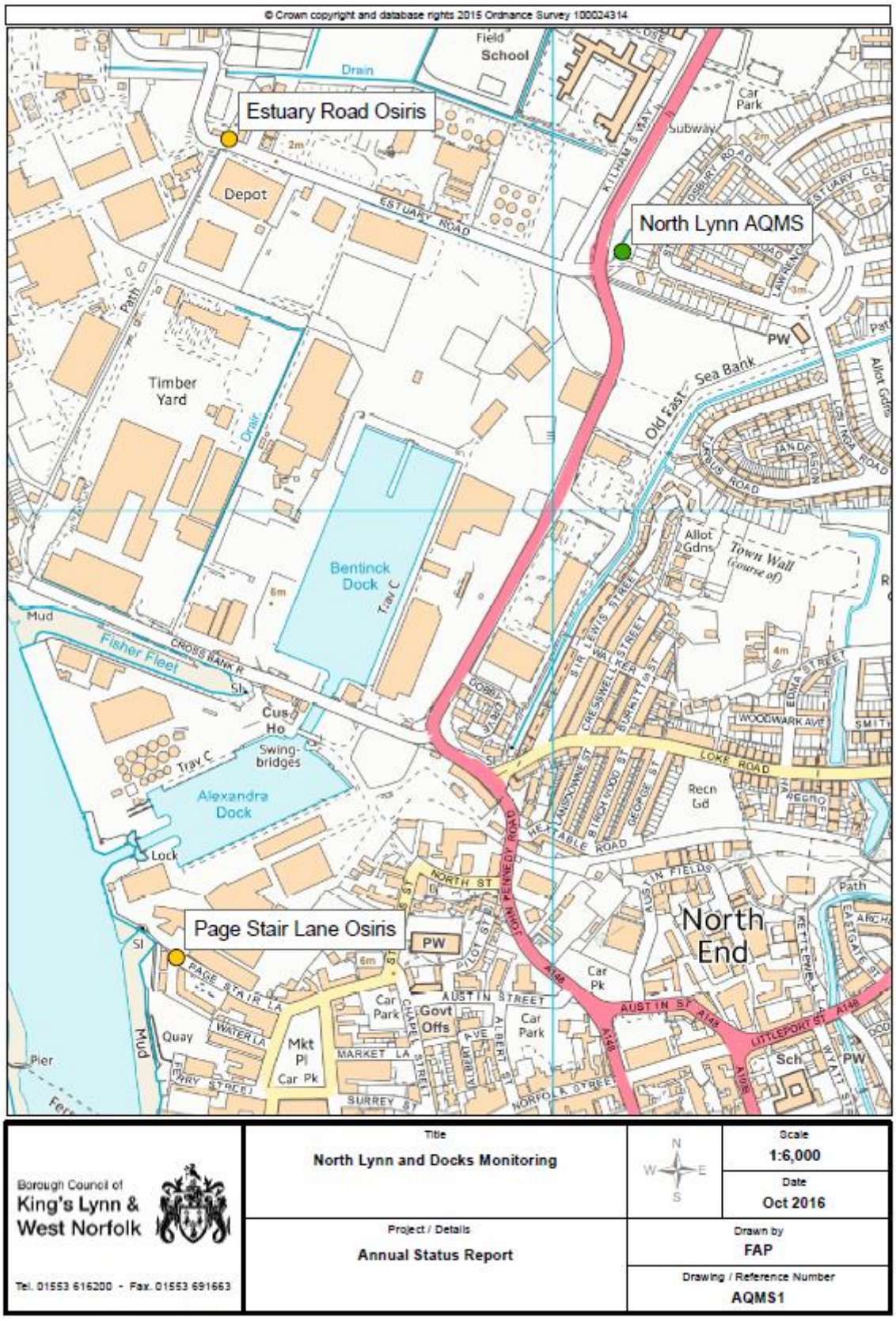


Figure 6 North Lynn and Docks Monitoring Stations

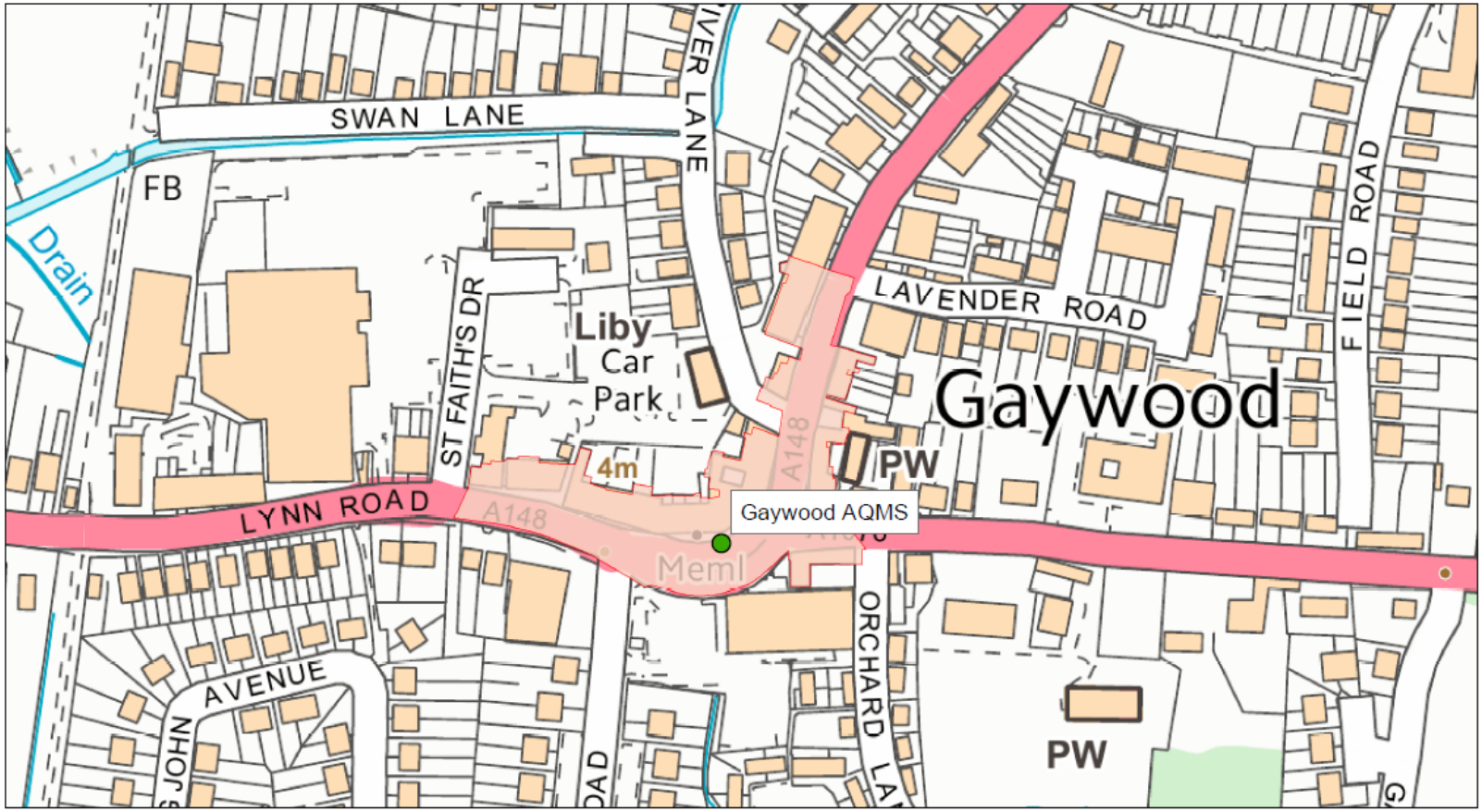


Figure 7 Gaywood Monitoring Station

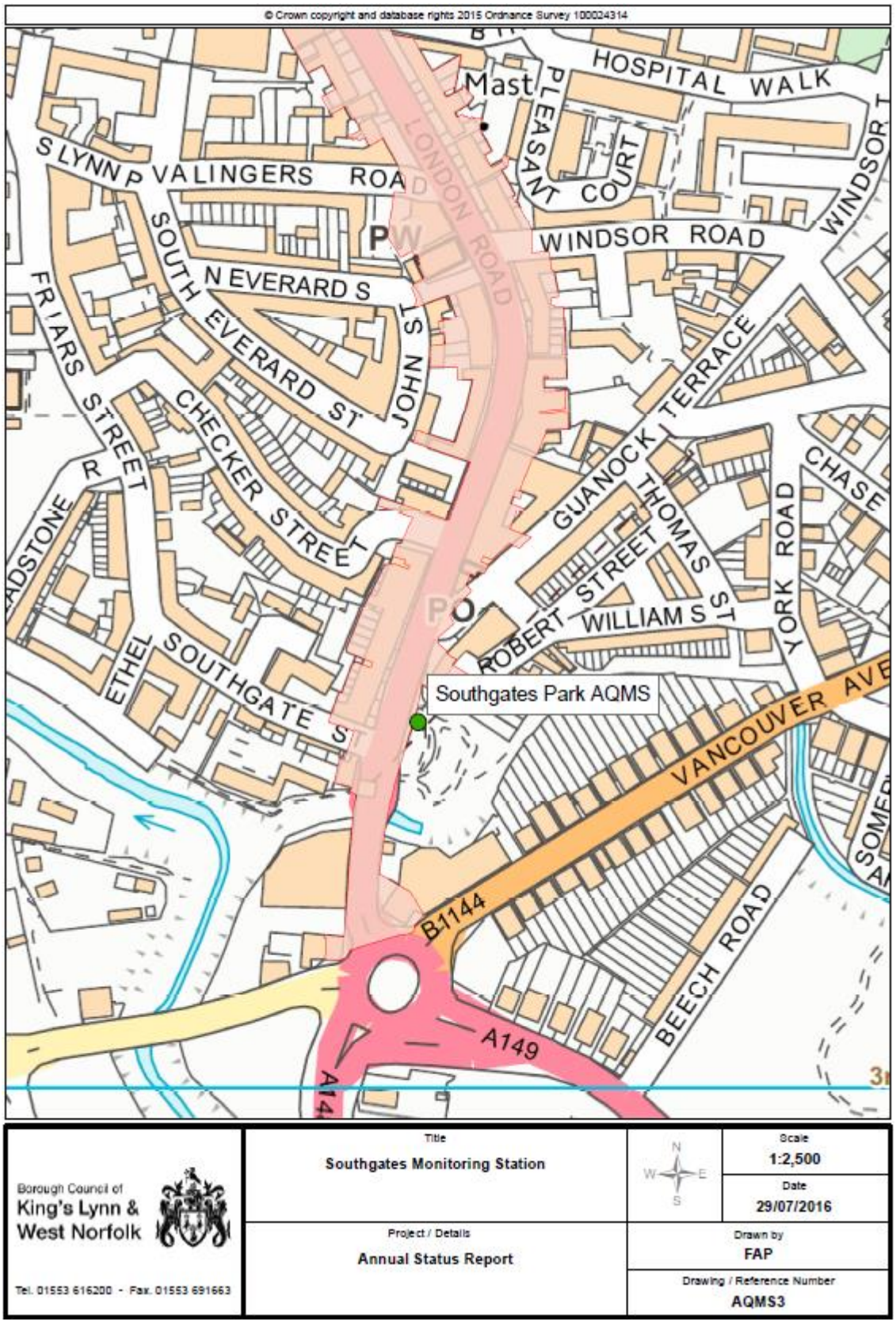


Figure 8 Southgates Monitoring Station

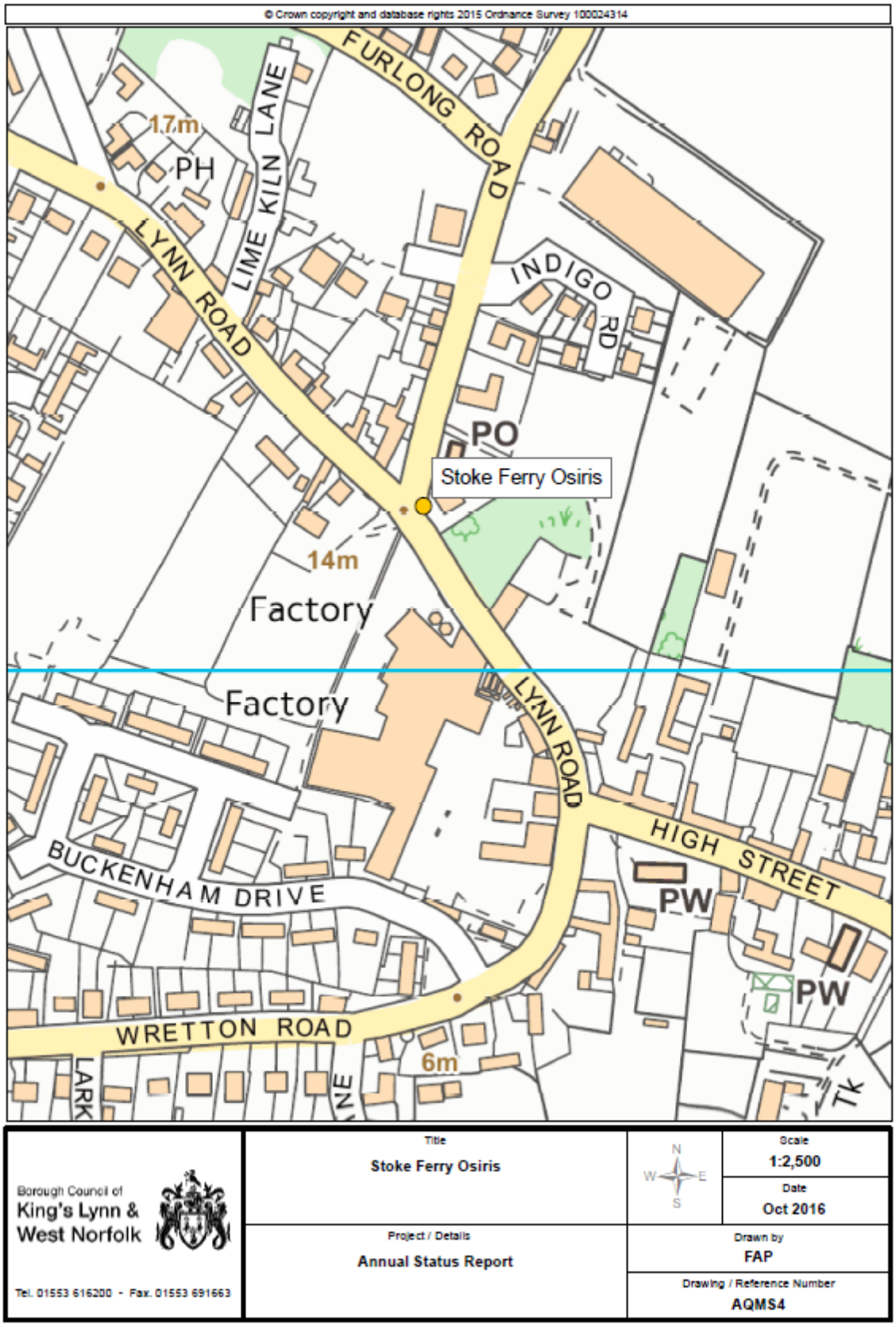


Figure 9 Stoke Ferry Osiris

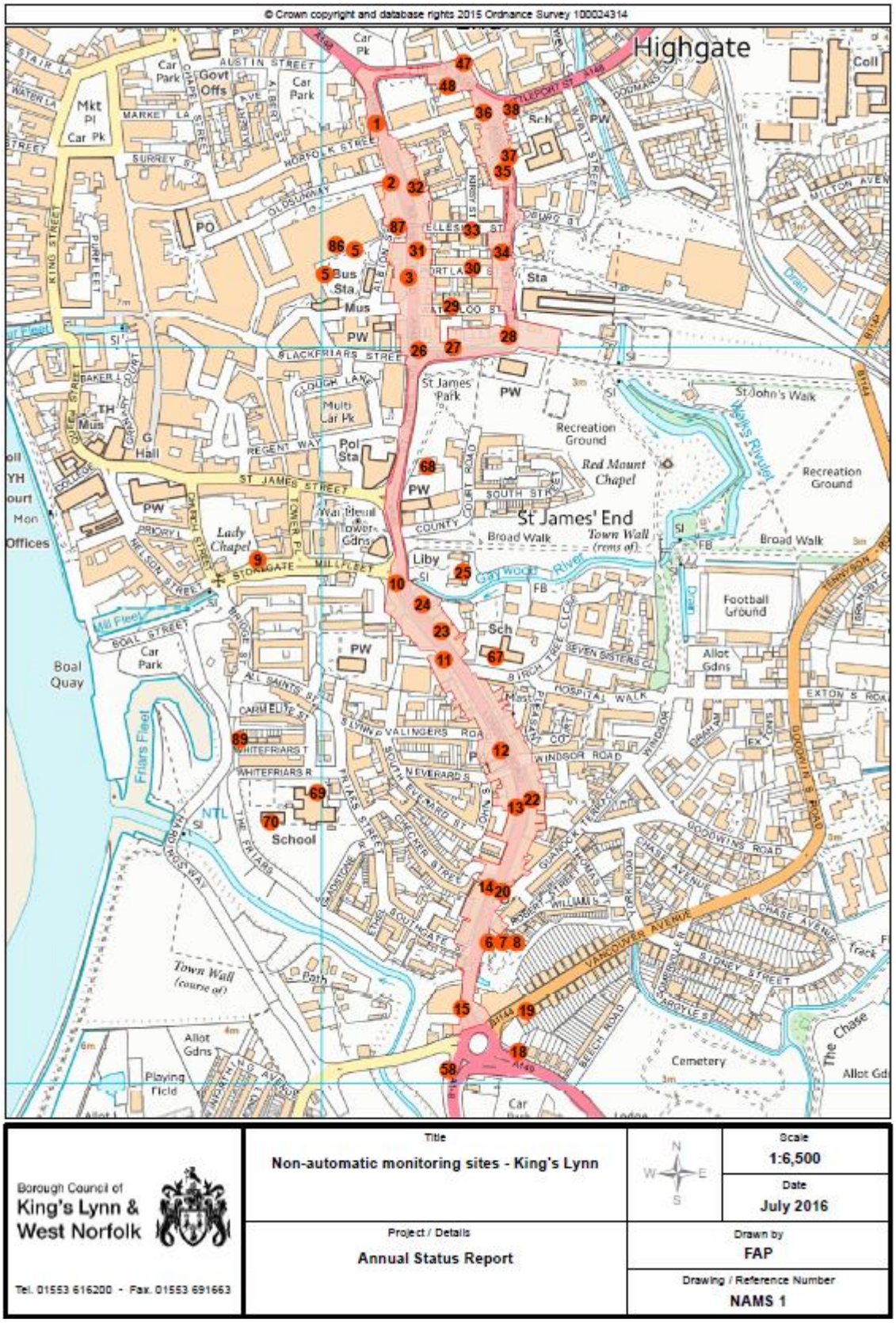


Figure 10 Non-automatic monitoring sites King's Lynn

Figure 11 Non-automatic monitoring sites Highgate & Gaywood

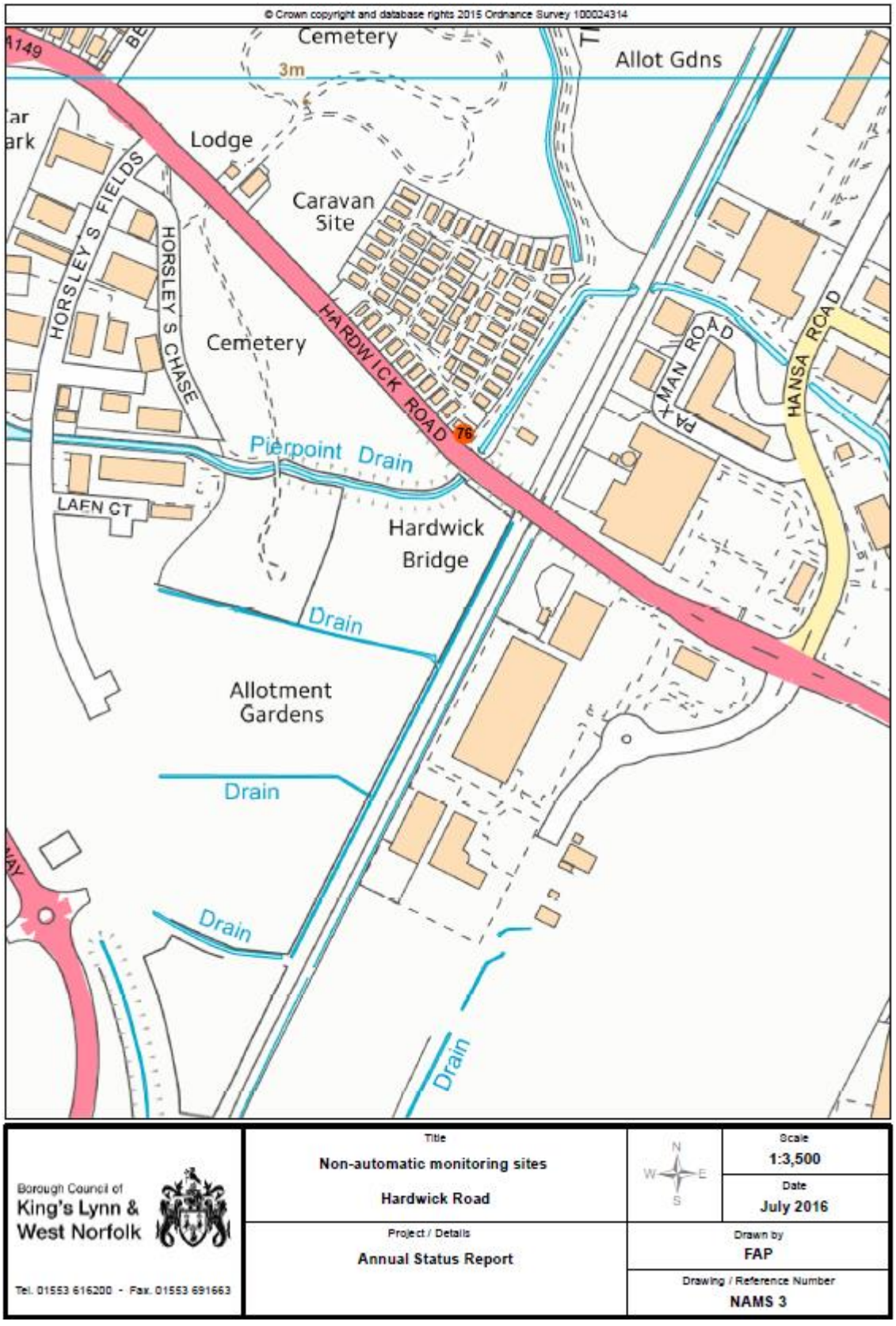


Figure 12 Non-automatic monitoring sites Hardwick Road

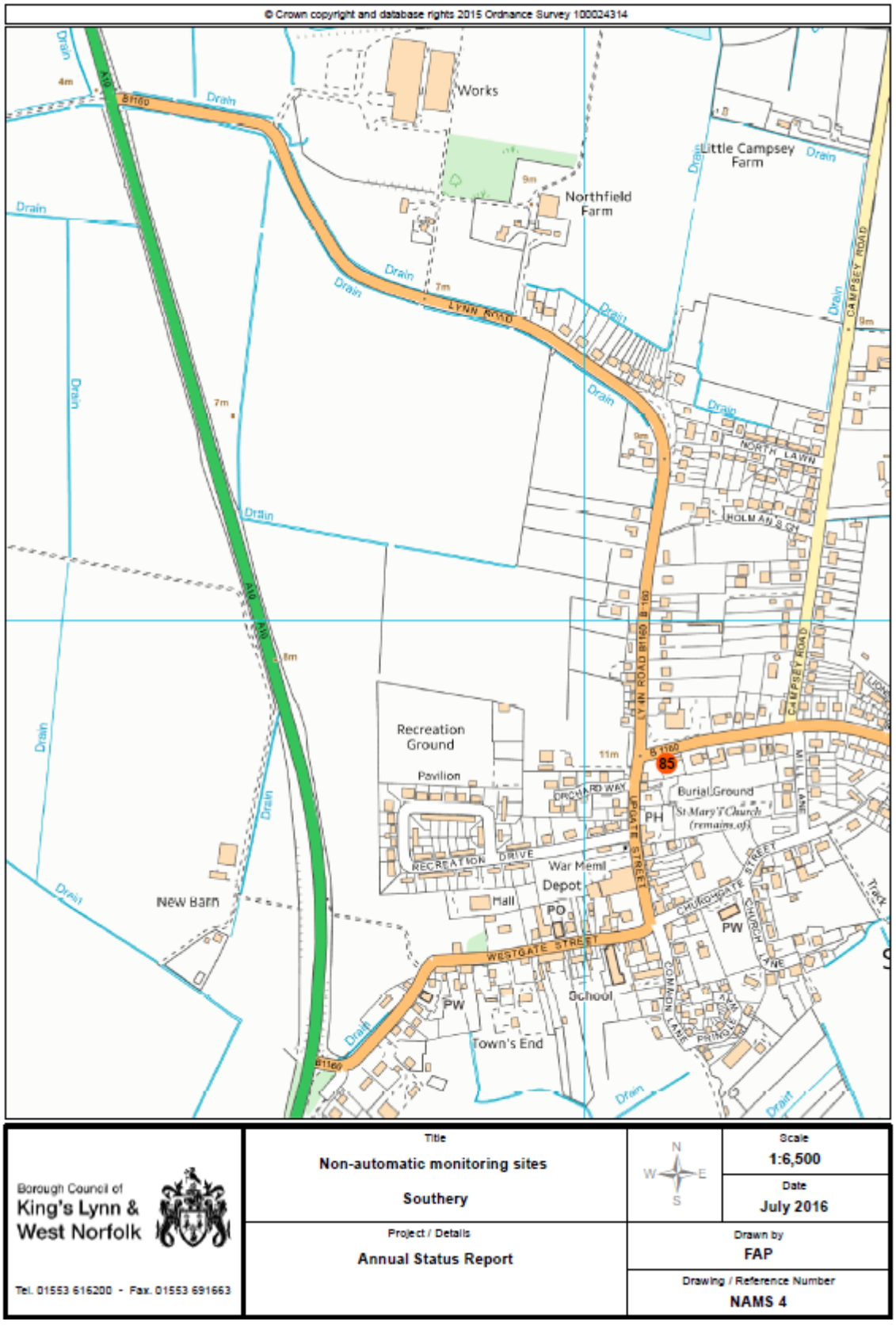


Figure 13 Non-automatic monitoring sites Southery

Appendix E: Summary of Air Quality Objectives in England

Table E.1 – Air Quality Objectives in England

Pollutant	Air Quality Objective[4]	
	Concentration	Measured as
Nitrogen Dioxide (NO_2)	200 µg/m^3 not to be exceeded more than 18 times a year	1-hour mean
	40 µg/m^3	Annual mean
Particulate Matter (PM_{10})	50 µg/m^3, not to be exceeded more than 35 times a year	24-hour mean
	40 µg/m^3	Annual mean
Sulphur Dioxide (SO_2)	350 µg/m^3, not to be exceeded more than 24 times a year	1-hour mean
	125 µg/m^3, not to be exceeded more than 3 times a year	24-hour mean
	266 µg/m^3, not to be exceeded more than 35 times a year	15-minute mean

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

Appendix F: Summary of Planning Applications Commented Upon in 2015

In 2015 the Environmental Quality Team commented on over 60 applications which had air quality issues. They were screened according to EPUK & IAQM guidance and air quality assessments required where appropriate. Best practice measures were also recommended.

Table F.1 – Summary of Planning Applications

Industrial	Note on potential impact
New CHP (2 x 500kW units), QE Hospital, King's Lynn	Stack height and NO2 emissions from CHP
Replacement waste baler at a recycling site, Glazewing, West Dereham	PM_{10} from waste operations
Additional plant at existing bio-ethanol plant, British Sugar, Wissington	No change to emissions
Enlargement of Minerals storage area, Frimstone, Snettisham	Fugitive PM_{10} from minerals site
Ground conveyor for minerals, Watlington Quarry	Fugitive PM_{10} from minerals site
Installation of 10 No. 2 tonne bunkered LPG vessels, Quorn Foods, Methwold	Air quality implications were considered and it was decided there were none
Change in phasing plan for mineral extraction, Coxford Abbey Quarry, Syderstone	Fugitive PM_{10} from minerals site
Increased depth of extraction and revisions to the restoration phasing, Snettisham Quarry	Fugitive PM_{10} from minerals site
Installation of modular pyrolysis plant for treatment of plastics, Hockwold Cum Wilton	Emissions from CHP or pyrolysis of plastics Referred to LAPPC
Variation of condition 1 (time limit) to extend operations of the coated roadstone plant, Tarmac, Pentney	The BCKLWN issue the environmental permit for this process. No history of complaints. The application was an extension of time and no change to the existing process or location so no objection was made as there would not be any change in fugitive PM_{10} emissions.
Extension of time for operations and aggregate sales, inert recycling, site office, Crimplesham Quarry, Crimplesham	Fugitive PM_{10} from minerals site
Continue use of plant site, Watlington Quarry	Emission of fugitive PM_{10}

Erection of anaerobic digestion facility (to process cereal crops/food waste/slurry), Cross Bank Rd, King's Lynn	NO_2 from CHP and P from vehicle movements, storage. AQA reviewed. Referred to EA PPC
Agricultural	
New biomass boiler, flue and fuel store, Roydon Hall Farm, Roydon	Stack height and PM_{10} emissions from boiler
New large Poultry Unit, Sedgeford	PM_{10} from animal feed/bedding Referred to EA for Environmental Permit
Wood chip and oil fired boiler house, Tuxhill Farm, Terrington St Clement	Stack height and PM_{10} emissions from boiler
Residential	
Outline application for 40 dwellings, Ferry Road, Clenchwarton	NO_2 from traffic
Outline application for 170 dwellings, south east of Downham Market	NO_2 from traffic
Outline application for 250 dwellings, North East of Downham Market	NO_2 from traffic
50 dwellings, Howdale Rise, Downham Market	NO_2 from traffic
10 dwellings, Gayton Rd, East Winch	NO_2 from traffic
Outline residential , Lynn Road, Gayton	NO_2 from traffic
Outline 40 dwellings, Manor Farm, Back St Gayton	NO_2 from traffic
Outline residential, Lynn Rd, Gayton	NO_2 from traffic
Refurbishment of 2 and construction of 8 new dwellings, Church Lane Heacham	NO_2 from traffic
Shop to residential in AQMA, Railway Rd, King's Lynn	NO_2 from traffic
Garage block to residential in AQMA, Railway Road, King's Lynn	NO_2 from traffic
Commercial to 8 residential units in AQMA, Norfolk Street, King's Lynn	NO_2 from traffic
8 dwellings and 2 commercial in AQMA, Railway Road, King's Lynn	NO_2 from traffic
17 flats, Purfleet St, King's Lynn	NO_2 from traffic
5 dwellings, 97 Norfolk St, King's Lynn	NO_2 from traffic
30 dwellings, Crown Street, Methwold	NO_2 from traffic
Outline 24 dwellings, Hythe Road, Methwold	NO_2 from traffic
Outline 65 dwellings Grimston Road, S Wootton	NO_2 from traffic
Outline 9 dwellings, Teal Close, Snettisham	NO_2 from traffic
18 dwellings, Churchgate Way, Terrington St Clement	NO_2 from traffic

40 dwellings, Mill Road, Watlington	NO_2 from traffic
Community/Commercial	
Demolition of existing buildings and construction of Class A1 (Retail), former garage, Lynn Rd, Heacham	NO_2 from traffic
Biomass Energy Centre, Iceni Academy, Methwold	Stack height and PM_{10} emissions from boiler
New Build Special Educational Needs (SEN) education facility, North Lynn Industrial Estate	NO_2 from traffic
Demolition of existing buildings and construction of Class A1 (Retail), former Nursery, Marsh Rd, Walpole St Andrew	NO_2 from traffic

Glossary of Terms

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

References

Local Air Quality Management Technical Guidance (TG16), April 2016, published by Defra.

Local Air Quality Management Policy Guidance (PG16), April 2016, published by Defra.

National Diffusion Tube Bias Adjustment Spreadsheet, version 06_16

Borough Council of King's Lynn & West Norfolk Updating and Screening Assessment 2015

Borough Council of King's Lynn & West Norfolk Air Quality Action Plan 2015 version 10