



***King's Lynn and Norfolk Borough Council  
LAQM Progress Report 2014***

*Bureau Veritas Air Quality*




*October 2014*



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## Document Control Sheet

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## Executive Summary

Part IV of the Environment Act 1995 places a statutory duty on local authorities to review and assess the air quality within their area and take account of Government Guidance when undertaking such work. This Annual Progress Report is a requirement of the Fifth Round of Review and Assessment and is a requirement for all local authorities. The Report has been prepared in accordance with Technical Guidance LAQM.TG (09) and associated tools (2010 based).

This Annual Progress Report considers all new monitoring data and assesses the data against the Air Quality Strategy (AQS) objectives. It also considers any changes that may have an impact on air quality.

Updated monitoring showed that there were no exceedences of the NO<sub>2</sub> objectives outside of existing AQMAs or where relevant exposure was present. At Southgates Park, the concentrations showed an increasing trend in 2012 and 2013. The 2013 results from Gaywood also showed an increase from 2012 and were very close to the annual mean objective. Majority of diffusion tube sites in 2013 showed an increase from 2012 concentrations, however the 2013 concentrations were still lower than those in 2011.

Continuous monitoring for Particulate Matter less than 10µg in aerodynamic diameter (PM<sub>10</sub>) has shown that the objectives continued to be met at the TEOM monitoring stations. OSIRIS monitoring at four locations through the year also showed compliance with the annual mean and 24-hour mean objectives in 2013.

The Council has identified one biomass installation – in Wisbech - which may impact on air quality in the Local Authority area. This will be taken into consideration in the next Updating and Screening Assessment when full emissions data is available.

Proposed actions arising from the 2014 Annual Progress Report are as follows:

- Continue NO<sub>2</sub> diffusion tube and continuous monitoring in the Borough to identify future changes in pollutant concentrations;
- Undertake further monitoring at relevant receptors in the areas of Stoke Ferry and Page Stair Lane, King's Lynn, using a Defra approved method to confirm existing concentrations; proceed to a monitoring based Detailed Assessment in these areas;

- Continue to gather emission and stack information for the identified biomass installations to determine their potential impact upon air quality; and
- Proceed to the 2015 Updating and Screening Assessment.

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# 1 Introduction

## 1.1 Description of Local Authority Area

The Borough of King's Lynn & West Norfolk covers approximately 550 square miles (142,877 hectares) and is essentially rural in nature. The Borough includes the two market towns of King's Lynn and Downham Market, the Victorian coastal town of Hunstanton, and more than one hundred villages of varying sizes. The Borough is located about 100 miles north of London and stretches from the north Norfolk coast, along the eastern side of The Wash, through the Marshland, Fens and Brecks to the borders of Lincolnshire, Cambridgeshire and Suffolk. The Borough is the tenth largest district council area in England and Wales. In 2010, the population of King's Lynn & West Norfolk was estimated at approximately 143,631 (source: ONS).

King's Lynn is an important nodal point, where major transport routes converge, including a trunk road (A47) and three principal roads (A10, A17 and A134); a direct, electrified rail service to London and Cambridge; an extensive system of inland navigable waterways; and sea links to northern and eastern Europe. The town lies some forty miles from the other regional centres of Cambridge, Norwich and Peterborough.

The main source of air pollution in the Borough is road traffic emissions, notably along the A148 (London Road / Gaywood Road / Wootton Road) going through King's Lynn town centre. Other pollution sources, including commercial, industrial and domestic sources, also make a contribution to background pollution concentrations.

Two Air Quality Management Areas (AQMA) have been declared in King's Lynn where exceedences of the annual mean Air Quality Strategy (AQS) objective for nitrogen dioxide (NO<sub>2</sub>) were identified, mainly due to traffic congestion.

Another AQMA had previously been declared in 2002 in South Quay, King's Lynn, where the loading of grain onto vessels, highlighted as a potential source of fugitive PM<sub>10</sub> emissions, contributed to the exceedence of the PM<sub>10</sub> daily mean AQS objective. However, the South Quay AQMA was revoked in 2006 following the implementation of an Air Quality Action Plan (AQAP) and evidence that PM<sub>10</sub> levels met the objective.

## 1.2 Purpose of Progress Report

This report fulfils the requirements of the Local Air Quality Management (LAQM) process as set out in Part IV of the Environment Act (1995), the AQS for England, Scotland, Wales and Northern Ireland 2007 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 exceedences are considered likely, the local authority must then declare an AQMA and prepare an AQAP setting out the measures it intends to put in place in pursuit of the objectives.

Progress Reports are required in the intervening years between the three-yearly Updating and Screening Assessment reports. Their purpose is to maintain continuity in the LAQM process.

They are not intended to be as detailed as Updating and Screening Assessment Reports, or to require as much effort. However, if the Progress Report identifies the risk of exceedence of an AQS Objective, the Local Authority (LA) should undertake a Detailed Assessment immediately, and not wait until the next round of Review and Assessment.

## 1.3 Air Quality Objectives

The air quality objectives applicable to LAQM in **England** are set out in the Air Quality (England) Regulations 2000 (SI 928), The Air Quality (England) (Amendment) Regulations 2002 (SI 3043), and are shown in Table 1.1. This table shows the objectives in units of micrograms per cubic metre  $\mu\text{g}/\text{m}^3$  (milligrams per cubic metre,  $\text{mg}/\text{m}^3$  for carbon monoxide) with the number of exceedences in each year that are permitted (where applicable).

**Table 1-1 Air Quality Objective included in Regulations for the purpose of LAQM in England**

Pollutant	Air Quality Objective		Date to be achieved by
	Concentration	Measured as	
Benzene	16.25 $\mu\text{g}/\text{m}^3$	Running annual mean	31.12.2003
	5.00 $\mu\text{g}/\text{m}^3$	Annual mean	31.12.2010
1,3-Butadiene	2.25 $\mu\text{g}/\text{m}^3$	Running annual mean	31.12.2003
Carbon monoxide	10 $\text{mg}/\text{m}^3$	Running 8-hour mean	31.12.2003
Lead	0.50 $\mu\text{g}/\text{m}^3$	Annual mean	31.12.2004
	0.25 $\mu\text{g}/\text{m}^3$	Annual mean	31.12.2008

Pollutant	Air Quality Objective		Date to be achieved by
	Concentration	Measured as	
Nitrogen dioxide	200 µg/m <sup>3</sup> not to be exceeded more than 18 times a year	1-hour mean	31.12.2005
	40 µg/m <sup>3</sup>	Annual mean	31.12.2005
Particulate Matter (PM <sub>10</sub> ) (gravimetric)	50 µg/m <sup>3</sup> , not to be exceeded more than 35 times a year	24-hour mean	31.12.2004
	40 µg/m <sup>3</sup>	Annual mean	31.12.2004
Sulphur dioxide	350 µg/m <sup>3</sup> , not to be exceeded more than 24 times a year	1-hour mean	31.12.2004
	125 µg/m <sup>3</sup> , not to be exceeded more than 3 times a year	24-hour mean	31.12.2004
	266 µg/m <sup>3</sup> , not to be exceeded more than 35 times a year	15-minute mean	31.12.2005

## 1.4 Summary of Previous Review and Assessments

Between 1999 and 2003, the Borough Council of King's Lynn & West Norfolk undertook its First Round of Review and Assessment of air quality, which concluded that PM<sub>10</sub> and NO<sub>2</sub> concentrations were likely to exceed the AQS objectives at a number of locations in King's Lynn. As a result, the Council declared two AQMAs, one in South Quay (for PM<sub>10</sub>) in April 2002, and another one in Railway Road (for NO<sub>2</sub>) in November 2003. The South Quay AQMA was revoked in June 2006 following the effective implementation of an AQAP for the area.

The Second Round of Review and Assessment began with an Updating and Screening Assessment (USA), completed in 2003. The report concluded that there had been no significant changes since the First Round and that it was not necessary to carry out a Detailed Assessment at that time. However, the subsequent Progress Report (2004) recommended proceeding to a Detailed Assessment for NO<sub>2</sub>, following new monitored exceedences of the annual mean objective outside the AQMA in King's Lynn. The Detailed Assessment (2005) confirmed that exceedences were likely to occur at several sites outside the AQMA, and as a result, made the recommendation to extend the AQMA to encompass properties along Railway Road, Blackfriars Road and London Road.

The Third Round of Review and Assessment began with the USA, completed in 2006. The report provided an update with respect to air quality issues within the Borough since the

previous round. A number of changes made to the technical guidance for the Review and Assessment process since the Second Round (Technical Guidance LAQM.TG(03)) were taken into account for this assessment. Having considered each pollutant, the USA concluded that the AQS objectives for benzene, 1,3-butadiene, carbon monoxide, lead, PM<sub>10</sub> and sulphur dioxide were still being met and that no further assessment was required for these pollutants. The report also recommended (following the conclusions of the Detailed Assessment 2005) that monitoring of NO<sub>2</sub> be continued in the Borough to validate the proposal to extend the Railway Road AQMA in King's Lynn.

The Council approved a variation order (February 2007) to extend the AQMA, which now includes all of Railway Road, Austin Street, Blackfriars Road, St James Road and London Road.

Modelling undertaken by a neighbouring Local Authority, Fenland District Council, also predicted potential exceedences of the NO<sub>2</sub> annual mean AQS objective along Elm High Road in Wisbech. The area lies on the border of the Borough of King's Lynn & West Norfolk; therefore, both local authorities deployed additional diffusion tubes in the area to confirm the modelling results. Subsequent monitoring for Elm High Road, Wisbech, showed compliance with the annual mean objective for NO<sub>2</sub> and demonstrated that there is no requirement to declare an AQMA.

The Progress Report carried out in 2007 confirmed that NO<sub>2</sub> concentrations were still exceeding the objective at the majority of the monitoring sites in the AQMA; justifying its extension. It also concluded that a Detailed Assessment for NO<sub>2</sub> in Wisbech was not required, as new monitoring results were below the AQS objective. However, new available NO<sub>2</sub> monitoring results showed an exceedence of the objective at the 'Wootton Road 2' diffusion tube in the Gaywood Clock area of King's Lynn. This site is located about 1km east of the extended AQMA in the town centre; therefore, it was recommended that a Detailed Assessment be carried out in this area.

The Detailed Assessment, which also included the Further Assessment of the Railway Road AQMA, was completed in 2008. The report concluded that a new AQMA in the Gaywood Clock area was required, as both updated monitoring data and predicted NO<sub>2</sub> concentrations confirmed that the AQS annual mean objective was likely to be exceeded. The new AQMA was declared in April 2009, for an area encompassing properties at the junction of Wootton Road, Gayton Road and Lynn Road.

The Further Assessment confirmed that the extended Railway Road AQMA in King's Lynn Town Centre was still valid and should remain, as both monitoring and modelling confirmed

exceedences of the AQS objective. The source apportionment results showed that cars are the main contributors with respect to high levels of NO<sub>2</sub> in the AQMA, followed by buses, HGVs and LGVs, while background pollution levels also contribute significantly.

The 2009 USA took into consideration changes to the Technical Guidance LAQM.TG(09) and concluded that although exceedences of NO<sub>2</sub> were still recorded in the Borough, these were confined to the existing AQMAs. Pollutant concentrations outside the AQMAs met the objectives and no Detailed Assessment was required.

The Further Assessment of the Gaywood Clock AQMA was completed in July 2010. The report confirmed the need for the AQMA as both monitoring and modelled concentrations still exceeded the NO<sub>2</sub> annual mean objective.

The 2010 and 2011 Annual Progress Reports concluded that no new Detailed Assessment were required as there were no new exceedences recorded outside the existing AQMAs.

The 2012 Updating and Screening Assessment found that a Detailed Assessment was required in the Page Stair Lane area due to potential exceedences of the annual mean and 24-hour mean with regards to PM<sub>10</sub>. During 2011 particulate monitoring was completed in this area using an Osiris instrument, an indicative method of monitoring only.

The 2012 USA also identified two new developments on Hardwick Road, a new Tesco Superstore and Sainsbury Superstore, which modelling had predicted to increase NO<sub>2</sub> concentrations on Hardwick Road. Both applications had highway improvements as part of the application and developments. It was advised that King's Lynn and West Norfolk Borough Council continue to monitor at this location in order to assess the impact of the development.

The 2013 Progress Report found no exceedences of the NO<sub>2</sub> objectives outside of existing AQMAs. The monitoring site at Hardwick Road showed that the annual mean NO<sub>2</sub> concentrations were generally reducing (based on the 2012 and 2013 diffusion tube results, both of which were below 2011 levels). From this data it would appear that the Tesco and Sainsbury developments have not lead to increases in NO<sub>2</sub> concentrations as predicted. With regards to PM<sub>10</sub>, the 2012 results from an Osiris monitoring site in Stoke Ferry showed an exceedence of both the annual mean and 24-hour mean objectives. Therefore a Detailed Assessment with regards to PM<sub>10</sub> in this area was recommended.

Figure 1.1 Map of King’s Lynn AQMA 1 – Railway Road (Town Centre)

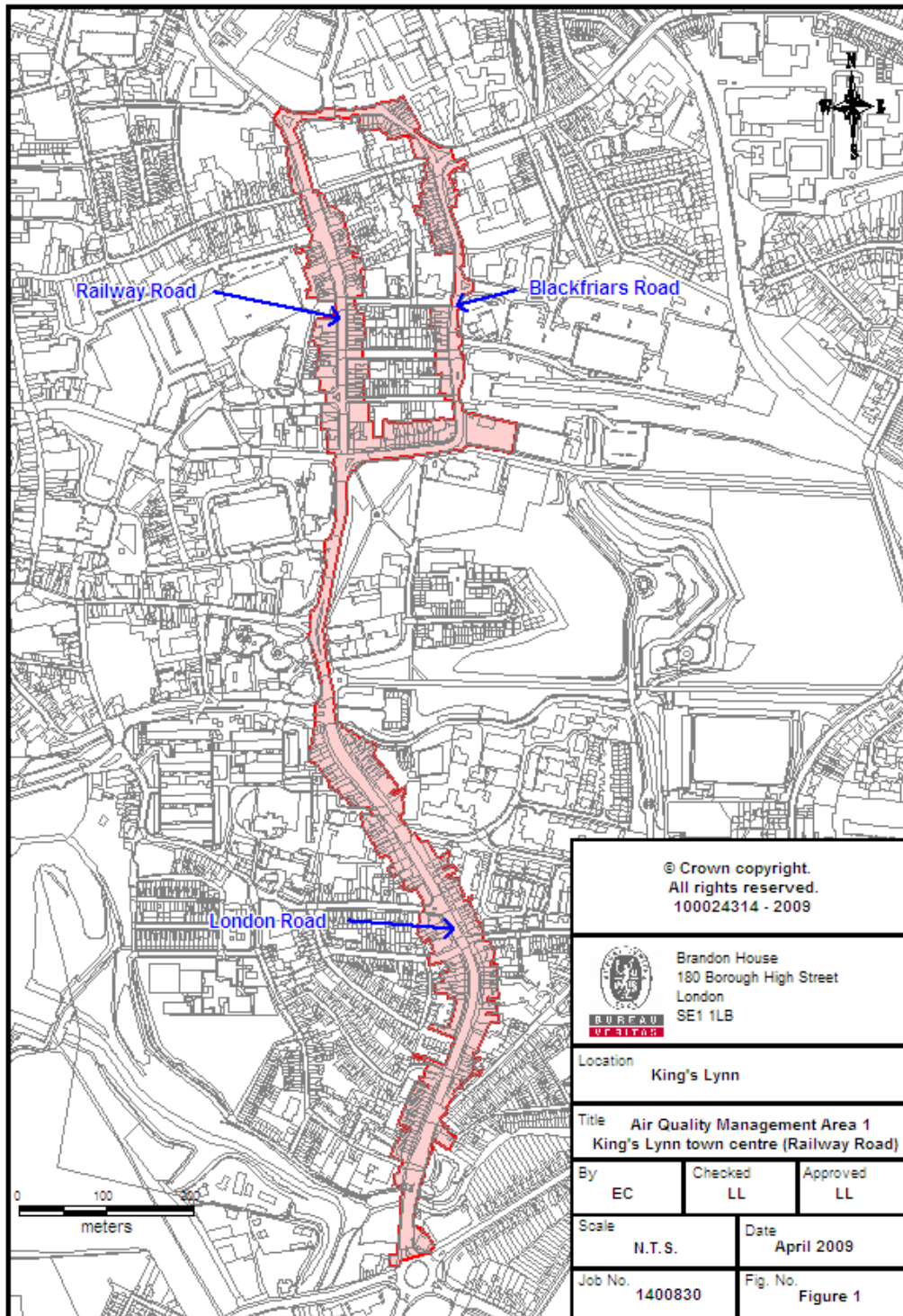
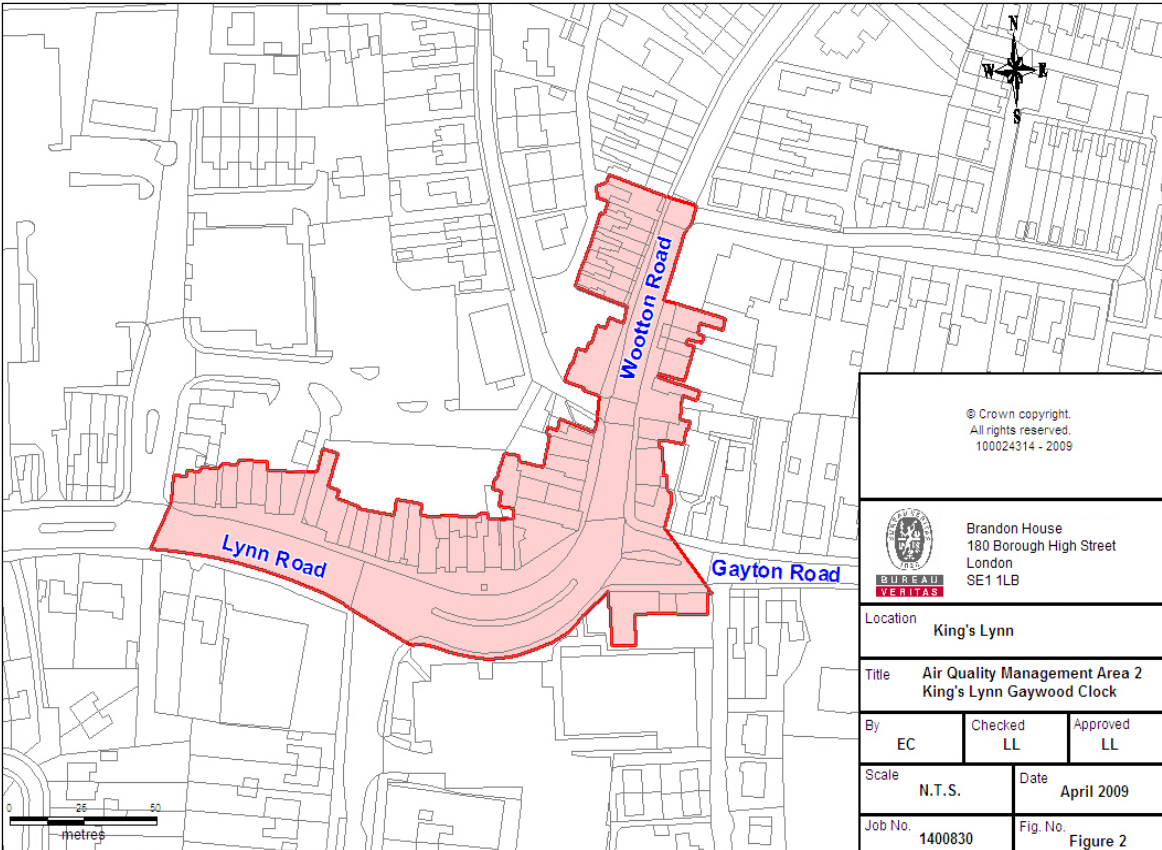


Figure 1.2 Map of King's Lynn AQMA 2 – Gaywood Clock



## 2 New Monitoring Data

### 2.1 Summary of Monitoring Undertaken

#### 2.1.1 Automatic Monitoring Sites

King's Lynn and West Norfolk Borough Council undertook continuous monitoring of pollutants using reference methods at four locations during 2013: in Southgates Park, King's Lynn, in Gaywood, King's Lynn, in the village of Leziate near a sand quarry site (monitoring ceased in April 2013) and at the North Lynn site at Edward Benefer Way, King's Lynn (site added in August 2013). These sites are shown in Figure 2.1.

The Southgates Park station, which monitors nitrogen dioxide (NO<sub>2</sub>) and particulates (PM<sub>10</sub>) in King's Lynn town centre AQMA comprises a chemiluminescence NO<sub>x</sub> / NO<sub>2</sub> analyser and a Tapered Element Oscillating Microbalance (TEOM) PM<sub>10</sub> analyser. Both analysers have been operational since 2006, however the TEOM analyser developed a fault and was removed in March 2013.

The Gaywood monitoring station was installed in 2011; full data capture began in January 2012. The site monitors NO<sub>x</sub> / NO<sub>2</sub> using a chemiluminescence analyser.

The Leziate monitoring station was established in July 2009 off Station Road near the sand quarry site entrance due to queries about background PM<sub>10</sub> and dust emissions from the mineral plant. From July 2011 the chemiluminescence NO<sub>x</sub> / NO<sub>2</sub> analyser was removed. As results indicated compliance with PM<sub>10</sub> objectives, the TEOM analyser was also removed; this took place in May 2013.

The TEOM analyser from Leziate was relocated to Edward Benefer Way, King's Lynn (North Lynn monitoring site) where monitoring commenced in August 2013 to provide data as part of the Detailed Assessment in this area.

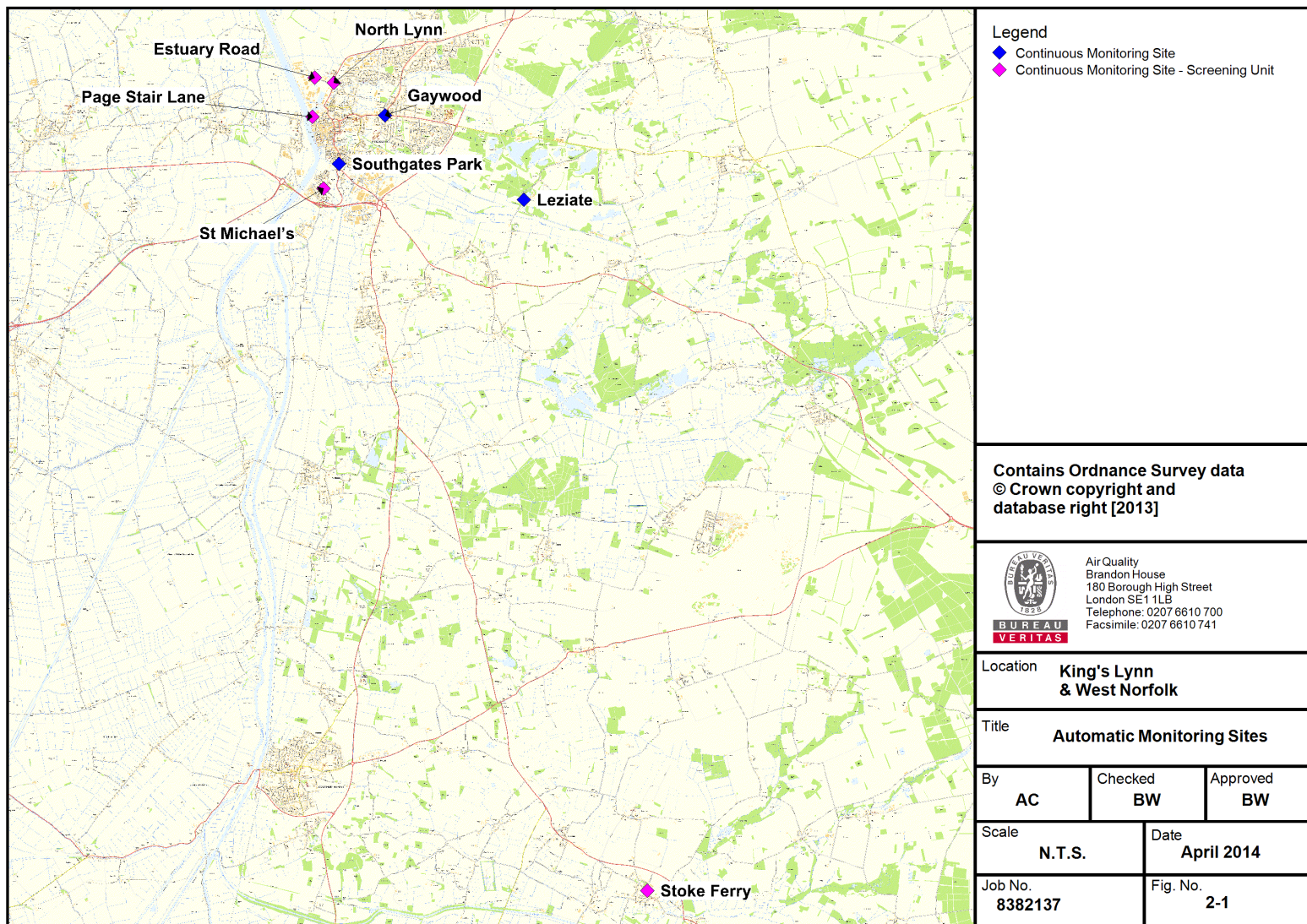
In 2013 the Council also monitored particulate levels based on indicative method of Osiris dust and particle analysers across the Borough. Instruments were installed in the following locations:

- the village of Stoke Ferry near an industrial site,
- Page Stair Lane to monitor dust from King's Lynn Docks,
- St Michaels Primary School, Saddlebow Road, King's Lynn to monitor background concentrations near Saddlebow Road and industrial sites,
- Estuary Road, King's Lynn near an industrial site/dock.

Further details of these monitoring stations are provided in Table 2-1.



Figure 2.1 Map of Continuous Monitoring Sites



Bureau Veritas Air Quality King's Lynn and West Norfolk Borough Council

Table 2-1 Details of Automatic Monitoring Sites

Site ID	Site Location	Site Type	X OS Grid Reference	Y OS Grid Reference	Inlet Height (m)	Pollutants Monitored	In AQMA?	Monitoring Technique	Relevant Exposure?	Distance to Kerb of Nearest Road (m)	Does this Location Represent Worst-Case Exposure?
Southgates Park, King's Lynn	London Road, King's Lynn	Roadside	562225	319191	1.70	NO <sub>2</sub> , PM <sub>10</sub> **	Y	Chemiluminescence, TEOM	N	5m	No
Gaywood, King's Lynn	Lynn Road, Gaywood, King's Lynn	Roadside	563437	320472	1.70	NO <sub>2</sub>	Y	Chemiluminescence	Y – 5m	1m	Yes
Leziate*	Station Road, Leziate	Industrial	567090	318257	3.50	PM <sub>10</sub>	N	TEOM	Y – 25m	41m	No
North Lynn, King's Lynn	Edward Benefer Way, off St Edmundsbury Road, King's Lynn	Near-Road	562086	321325	3.00	PM <sub>10</sub>	N	TEOM	Y – 35m	17m	Yes
Page Stair Lane, King's Lynn	Page Stair Lane, King's Lynn	Industrial	561527	320437	3.50	TSP, PM <sub>10</sub> , PM <sub>2.5</sub> , PM <sub>1</sub>	N	Osiris	Yes – 5m	3.3m	Yes
Stoke Ferry	Lynn Road/Furlong Road, Stoke Ferry	Industrial	570339	300083	3.50	TSP, PM <sub>10</sub> , PM <sub>2.5</sub> , PM <sub>1</sub>	N	Osiris	Yes – 5m	1m	Yes
St Michael's, King's Lynn	St Michaels Cof E Primary School, Saddlebow Road, King's Lynn.	Urban background	561826	318543		TSP, PM <sub>10</sub> , PM <sub>2.5</sub> , PM <sub>1</sub>	N	Osiris	Yes – 2m	55m	No
Estuary Road, King's Lynn	Estuary Road, King's Lynn	Industrial	561593	321466		TSP, PM <sub>10</sub> , PM <sub>2.5</sub> , PM <sub>1</sub>	N	Osiris	Yes-2m	1m	Yes

Site ID	Site Location	Site Type	X OS Grid Reference	Y OS Grid Reference	Inlet Height (m)	Pollutants Monitored	In AQMA?	Monitoring Technique	Relevant Exposure?	Distance to Kerb of Nearest Road (m)	Does this Location Represent Worst-Case Exposure?
Heights are estimates * Monitoring at Leziate ceased in April 2013. ** TEOM at Southgates Park was removed in March 2013.											

### 2.1.2 Non-Automatic Monitoring Sites

In 2013 the Council monitored NO<sub>2</sub> at 65 sites in the Borough using passive diffusion tubes. The vast majority of the monitoring sites are located in King's Lynn town centre, including a set of triplicate tubes co-located with the continuous monitoring analyser in Southgates.

King's Lynn and West Norfolk Borough Council continue to monitor at the below locations in response to a waste incinerator application at the Willows, Saddlebow Industrial Area.

- Site 61- Sydney Terrace;
- Site 62 - Burnley Road;
- Site 63 - Mayfield House Lynn Road, Saddlebow; and
- Site 64 - New Farm House, High Road, Saddlebow
- Site 72 - Ferry Square, West Lynn;
- Site 73 - Main Road, West Winch; and
- Site 74 - Saddlebow Caravan Park, King's Lynn.

One monitoring site was relocated in July 2013; this was:

- Site 14 - London Road 5 - moved from 75 London Road to 76 London Road.

In 2013 six new sites were added to the survey:

- Site 76 - Hardwick Road (27 Hardwick Bridge Park) – opened in January 2013;
- Site 77 - Hillen Road (102 Hillen Road) – opened in January 2013;
- Site 78 - King John Bank (1 Crown Cottages, King John Bank) - opened in February 2013;
- Site 79 - Tennyson Ave (The Woolpack, Tennyson Avenue) - opened in March 2013;
- Site 80 - Roydon 1 (Roydon Common) – opened in April 2013 and moved in October 2013 to Roydon Common top;
- Site 81- Roydon 2 (Roydon Common) – opened in April 2013 and moved in October 2013 to Roydon Common bottom.

Five monitoring sites were discontinued; these were:

- Site 4 - Railway Road 6 (Jct of Railway Road/Blackfriars Street) – closed in December 2012;

- Site 17 - Nora 1 (Kellard House) – closed in July 2012;
- Site 53 - Elm Road Wisbech 3 (Elm Road, Wisbech) – closed in December 2012;
- Site 54 - Elm Road Wisbech 4 (Elm Road, Wisbech) – closed in December 2012; and
- Site 55 - Elm Road Wisbech 5 (Elm Road, Wisbech) – closed in December 2012.

The monitoring sites 53, 54 and 55 along Elm High Road, Wisbech, were removed as the monitoring results over the last few years has consistently shown that NO<sub>2</sub> concentrations are below the annual mean objective.

There are 27 diffusion tube sites located in the town centre AQMA, and 6 other sites within the Gaywood Clock AQMA.

Diffusion tubes in 2013 were prepared and analysed by Gradko International Limited using 20% triethanolamine (TEA) in water. Quality control procedures, including bias adjustment, are discussed in Appendix A.

The details of the NO<sub>2</sub> monitoring network are shown in Table 2-2 and Figure 2.2 through to Figure 2.5.

Figure 2.2 Map of Non-Automatic Monitoring Sites. King's Lynn

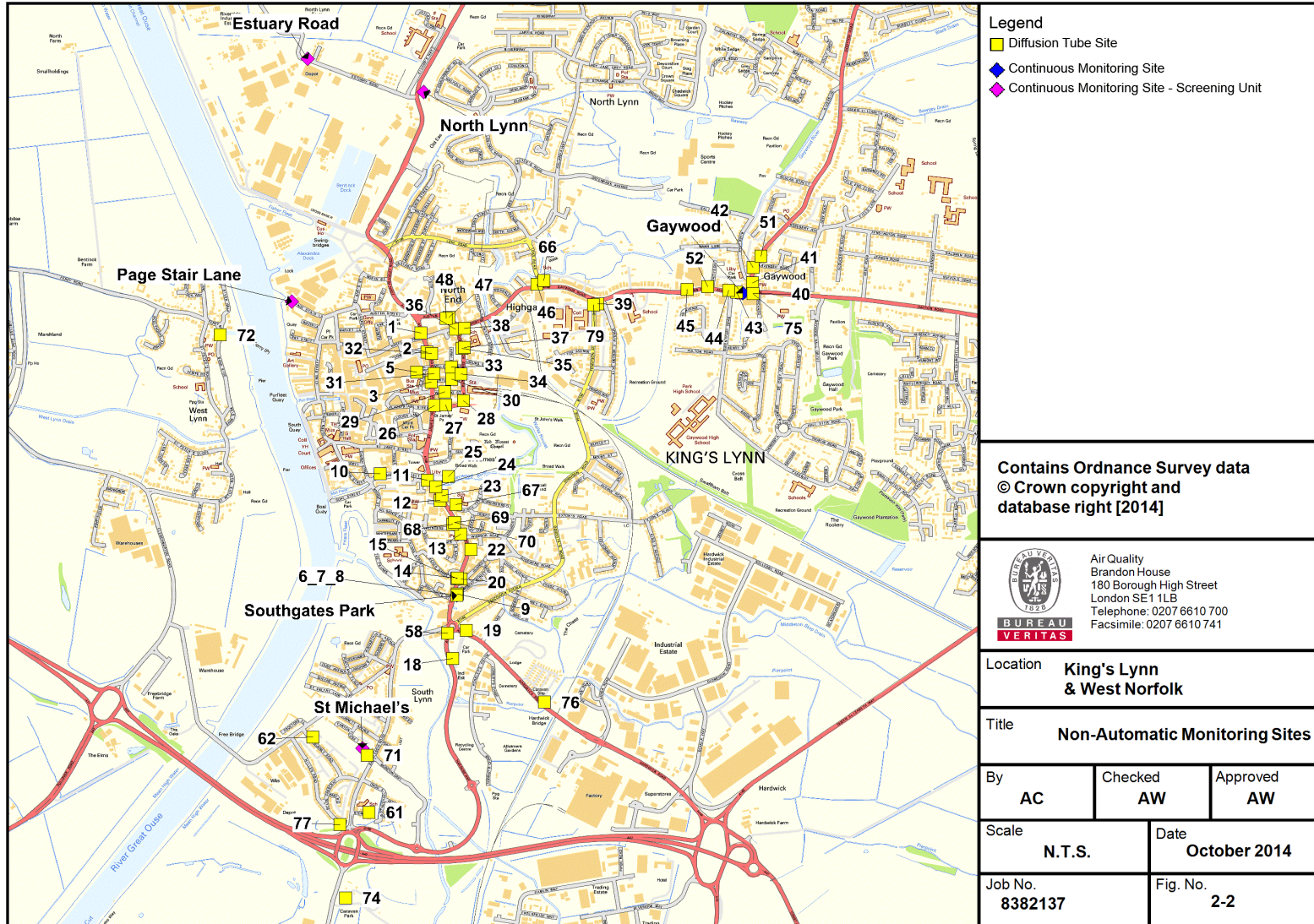


Figure 2.3 Map of Non-Automatic Monitoring Sites. Roydon

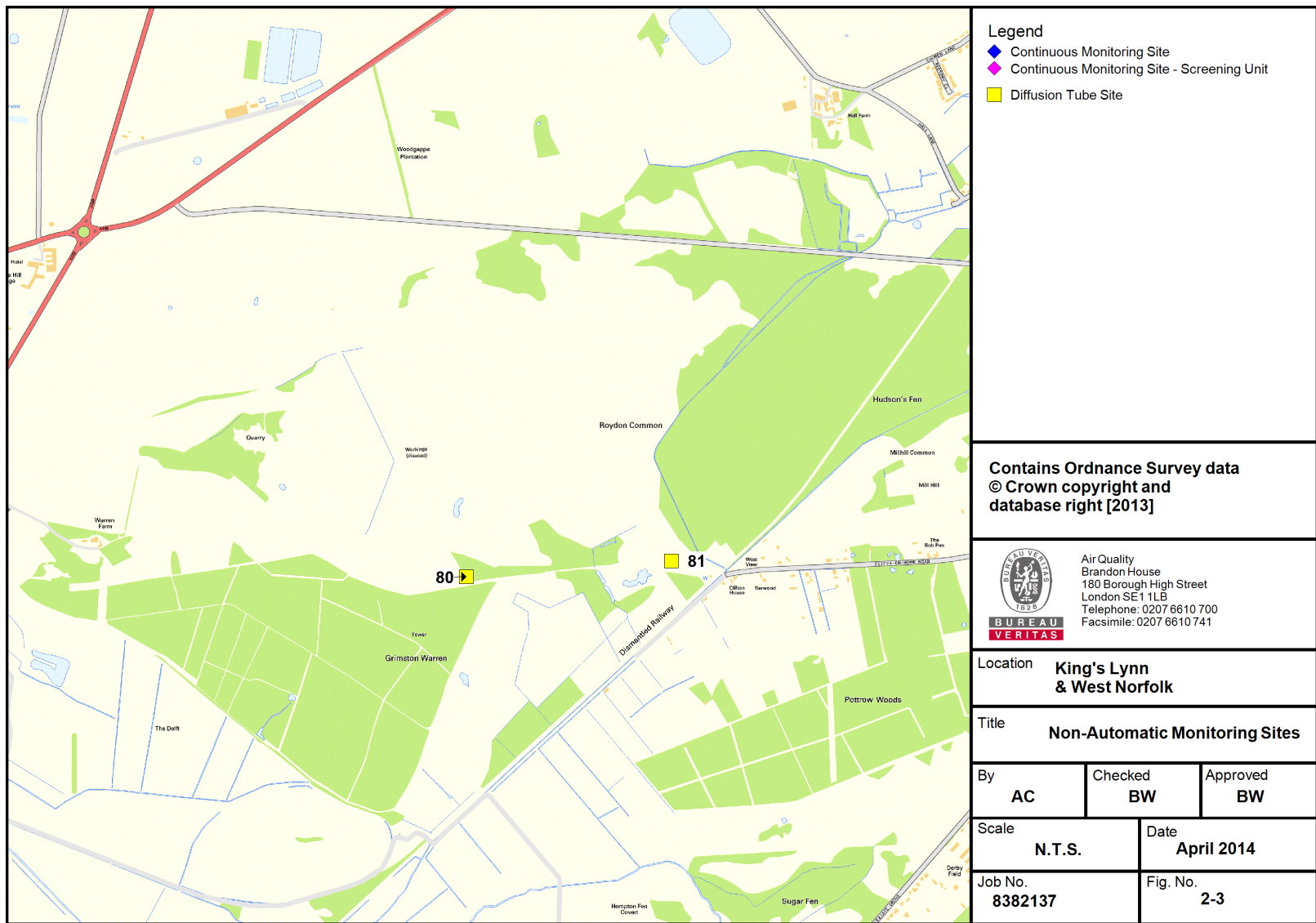


Figure 2.4 Map of Non-Automatic Monitoring Site. Walpole Cross Keys

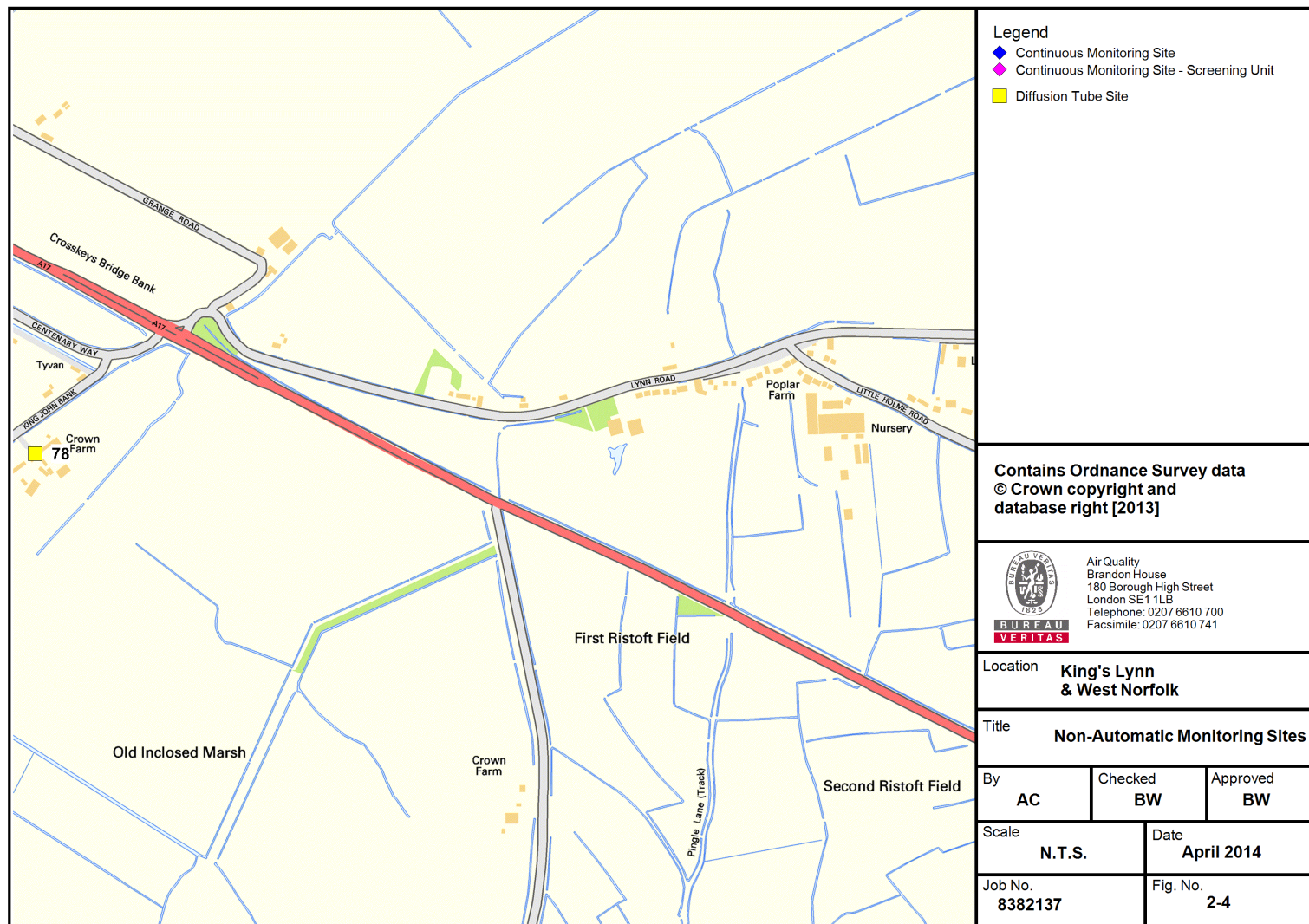




Figure 2.5 Map of Non-Automatic Monitoring Site. Saddlebow and West Winch

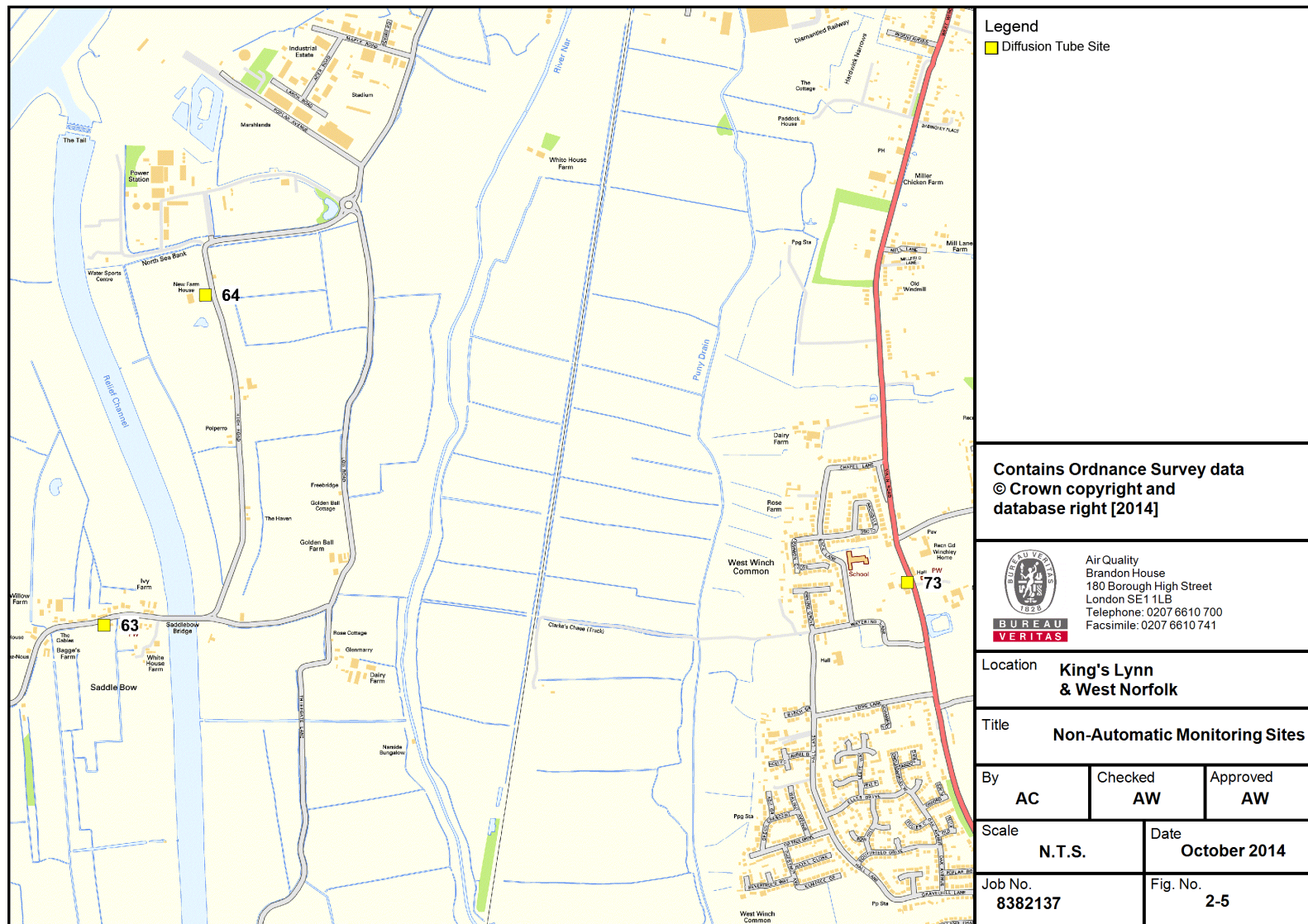


Table 2-2 Details of Non- Automatic Monitoring Sites – Nitrogen dioxide

Site ID	Site Name	Site Type	X OS Grid Reference	Y OS Grid Reference	Site Height (m)	In AQMA?	Is Monitoring Co-located with a Continuous Analyser (Y/N)	Relevant Exposure?	Distance to Kerb of Nearest Road (m)	Does this Location Represent Worst-Case Exposure?
1	Railway Road 1	Kerbside	562073	320304	2.50	Y – Town Centre	N	Y - 3m	2m	Y
2	Railway Road 4	Roadside	562100	320222	2.40	Y – Town Centre	N	Y - 0m	2m	Y
3	Railway Road 5	Roadside	562117	320095	2.40	Y – Town Centre	N	Y - 0m	1.5m	Y
5	Bus Station	Roadside (Bus Station)	562055	320137	2.20	N	N	N	N/A	Y
6,7,8	Southgates Monitoring Station	Roadside	562225	319191	3.20	Y – Town Centre	Y	No but property façade 4m from kerb further north	5m	Y
9	Mill Fleet	Roadside	562227	319198	2.50	N	N	No but property façade 4m from kerb in same street	4m	Y
10	London Road 1	Roadside	561900	319707	1.40	Y - Town Centre	N	Y - 2.5m	3m	Y
11	London Road 2	Roadside	562101	319679	2.20	Y – Town Centre	N	Y - 0m	3m	Y
12	London Road 3	Roadside	562154	319594	2.10	Y – Town Centre	N	Y - 1m	3m	Y

Site ID	Site Name	Site Type	X OS Grid Reference	Y OS Grid Reference	Site Height (m)	In AQMA?	Is Monitoring Co-located with a Continuous Analyser (Y/N)	Relevant Exposure?	Distance to Kerb of Nearest Road (m)	Does this Location Represent Worst-Case Exposure?
13	London Road 4	Roadside	562242	319452	2.20	Y – Town Centre	N	Y - 0m	4.5m	Y
14	London Road 5	Roadside	562227	319266	2.20	Y – Town Centre	N	Y – 0.5m	4m	Y
15	Southgates	Roadside	562226	319263	2.40	Y – Town Centre	N	Y – 1m	0.5m	Y
18	Hardwick Rd	Roadside	562209	318924	1.60	N	N	Y – 0m	7m	Y
19	Vancouver Avenue 1	Roadside	562266	319043	1.50	N	N	Y – 0m	6m	Y
20	London Road 10	Kerbside	562244	319261	2.20	Y – Town Centre	N	Y – 0m	3.5m	Y
22	London Road 6	Roadside	562285	319386	1.30	Y – Town Centre	N	Y – 0m	5m	Y
23	London Road 7	Roadside	562162	319614	2.10	Y – Town Centre	N	Y – 0m	4.5m	Y
24	London Road 8	Roadside	562136	319651	2.20	Y – Town Centre	N	Y – 0m	5.5m	Y
25	The Walks	Urban Background	562191	319695	1.70	N	N	Y – 0m	75m	Y
26	Railway Road 7	Roadside	562131	319996	2.30	Y – Town Centre	N	Y – 0m	2m	Y
27	St John's Terrace	Roadside	562178	319999	2.10	Y – Town Centre	N	Y – 3m	2m	Y
28	St John's Terrace/Blackfriar's	Roadside	562253	320016	2.60	Y – Town Centre	N	Y – 0m	1.5m	Y

Site ID	Site Name	Site Type	X OS Grid Reference	Y OS Grid Reference	Site Height (m)	In AQMA?	Is Monitoring Co-located with a Continuous Analyser (Y/N)	Relevant Exposure?	Distance to Kerb of Nearest Road (m)	Does this Location Represent Worst-Case Exposure?
29	Waterloo Street	Kerbside	562175	320055	1.60	N	N	Y – 2.5m	1m	Y
30	Portland Street	Kerbside	562204	320108	2.40	N	N	Y – 2.5m	1m	Y
31	Railway Road 2	Kerbside	562129	320132	2.30	Y – Town Centre	N	Y – 0m	2m	Y
32	Railway Road 3	Roadside	562119	320216	2.40	Y – Town Centre	N	Y – 0m	2m	Y
33	Wellsley Street	Kerbside	562203	320159	2.40	N	N	Y – 2.5m	0.5m	Y
34	Blackfriars 2	Roadside	562244	320129	2.40	Y – Town Centre	N	Y – 0m	2.5m	Y
35	Blackfriars 1	Roadside	562248	320239	2.30	Y – Town Centre	N	Y – 3m	1.5m	Y
36	Norfolk Street	Roadside	562219	320319	2.20	Y – Town Centre	N	Y – 0m	2m	Y
37	Blackfriars 3	Roadside	562257	320243	2.50	Y – Town Centre	N	No	2m	Y
38	Littleport Street	Roadside	562257	320323	2.40	Y – Town Centre	N	Y – 0m	2.5m	Y
39	Gaywood Road 2	Roadside	562822	320427	5.00	N	N	Y – 0m	7m	Y
40	The Swan (1) Gayton Road	Roadside	563480	320470	2.50	Y – Gaywood Clock	N	Y – 0m	2m	Y
41	Wootton Road 2	Roadside	563478	320515	3.40	Y – Gaywood Clock	N	Y – 0m	2m	Y

Site ID	Site Name	Site Type	X OS Grid Reference	Y OS Grid Reference	Site Height (m)	In AQMA?	Is Monitoring Co-located with a Continuous Analyser (Y/N)	Relevant Exposure?	Distance to Kerb of Nearest Road (m)	Does this Location Represent Worst-Case Exposure?
42	Wootton Road 1	Roadside	563480	320582	1.70	Y – Gaywood Clock	N	Y – 0m	3m	Y
43	Lynn Road 1	Roadside	563412	320477	3.40	Y – Gaywood Clock	N	Y – 0m	5m	Y
44	Lynn Road 2	Roadside	563377	320484	3.40	Y – Gaywood Clock	N	Y – 0m	2m	Y
45	Gaywood Road 3	Roadside	563202	320488	2.20	N	N	Y – 0m	4.5m	Y
46	Gaywood Road 1	Roadside	562565	320509	2.09	N	N	Y – 0m	6.5m	Y
47	Austin Street 1	Roadside	562193	320369	1.70	Y – Town Centre	N	Y – 0.5m	1m	Y
48	Austin Street 2	Roadside	562180	320365	2.60	Y – Town Centre	N	Y – 0m	2m	Y
51	Wootton Road 3	Roadside	563515	320628	1.80	N	N	Y – 6m	1.5m	Y
52	Lynn Road 3	Roadside	563288	320499	1.60	N	N	Y – 5.5m	1m	Y
58	NORR	Roadside	562186	319031	2.50	N	N	Y – 18m	2m	Y
61	Sydney Terrace	Roadside	561854	318272	1.55	N	N	Y – 0m	3.5m	Y
62	Burney Road	Roadside	561615	318591	1.55	N	N	Y – 0m	7m	Y
63	Lynn Road, Saddlebow	Roadside	560593	315712	1.70	N	N	Y – 0m	15m	N
64	High Road, Saddlebow	Roadside	560917	316766	1.70	N	N	Y – 0m	22m	N

Site ID	Site Name	Site Type	X OS Grid Reference	Y OS Grid Reference	Site Height (m)	In AQMA?	Is Monitoring Co-located with a Continuous Analyser (Y/N)	Relevant Exposure?	Distance to Kerb of Nearest Road (m)	Does this Location Represent Worst-Case Exposure?
66	Gaywood Road	Urban Background	563699	319679	2.40	N	N	Y – 0m	N/A	Y
67	Greyfriars , London Road	Urban Background	562222	319576	2.30	N	N	Y – 0m	N/A	Y
68	Nursery, London Road	Urban Background	562208	319493	1.60	N	N	Y – 0m	N/A	Y
69	Whitefriars 1, Whitefriars Road	Urban Background	562215	319502	2.20	N	N	Y – 0m	N/A	Y
70	Whitefriars 2, Whitefriars Road	Urban Background	562215	319502	2.40	N	N	Y – 0m	N/A	Y
71	St Michael's, Saddlebow Road	Urban Background	561846	318514	2.20	N	N	Y – 0m	N/A	Y
72	Ferry Square West Lynn	Roadside	561223	320295	2.20	N	N	Y – 0.5m	1.5m	Y
73	Main Road, West Winch	Urban Background	563161	315848	1.70	N	N	Y – 10m	11m	Y
74	Saddlebow Caravan Park, King's Lynn	Roadside	561754	317910	2.20	N	N	Y – 5m	1m	Y
75	The Swan (2) Gayton Road	Roadside	563480	320470	2.80	Y – Gaywood Clock	N	Y – 0m	2m	Y
76	Hardwick Road	Roadside	562597	318739		N	N	Y – 1m	8m	N
77	Hillen Road	Near-Road	561730	318220		N	N	Y-0m	13m	Y

Site ID	Site Name	Site Type	X OS Grid Reference	Y OS Grid Reference	Site Height (m)	In AQMA?	Is Monitoring Co-located with a Continuous Analyser (Y/N)	Relevant Exposure?	Distance to Kerb of Nearest Road (m)	Does this Location Represent Worst-Case Exposure?
78	King John Bank	Urban background	550039	319757		N	N	Y – 0m	45m	Y
79	Tennyson Ave	Roadside	562804	320422		N	N	Y – 0m	2m	Y
80	Roydon Common top	Suburban	568100	321789		N	N		934m	N
81	Roydon Common bottom	Suburban	568809	321844		N	N		200m	N

Heights are estimates

## 2.2 Comparison of Monitoring Results with Air Quality Objectives

### 2.2.1 Nitrogen Dioxide

There are two Air Quality Objectives for NO<sub>2</sub>, namely:

- the annual mean of 40µg/m<sup>3</sup>, and
- the 1-hour mean of 200µg/m<sup>3</sup> not to be exceeded more than 18 times a year.

### Automatic Monitoring Data

The Council monitored NO<sub>2</sub> at two locations during 2013: the roadside Southgates Park monitoring station in King's Lynn and the Gaywood monitoring station. Data capture was good during 2013 at both sites and as such no annualisation has been required.

The monitoring data can be seen in Table 2-3 and Table 2-4 below.

Results for 2013 indicate that both the annual mean objective and the 1-hour objective were met at both monitoring locations.

Figure 2.6 shows the trend in NO<sub>2</sub> concentration from 2008 through to 2013 at the Southgates Park and Gaywood monitoring locations. At Southgates Park, the concentrations peaked in 2009, following this, the annual mean decreased in 2010 and 2011, before increasing again in 2012 and 2013. The 2013 results from Gaywood in 2013 showed an increase from 2012 and were very close to the annual mean objective.



**Table 2-3 Results of Automatic Monitoring for NO<sub>2</sub>: Comparison with Annual Mean Objective**

Site ID	Site Type	Within AQMA?	Valid Data Capture for Monitoring Period %	Valid Data Capture 2013 %	Annual Mean Concentration (µg/m <sup>3</sup> )					
					2008	2009	2010	2011	2012	2013
Southgates Park, King’s Lynn	Roadside	Y	98.3	98.3	27	30	27	23	25	26
Gaywood, King’s Lynn	Roadside	Y	98.7	98.7	-	-	-	-	33	39

**Figure 2.6 Trends in Annual Mean NO<sub>2</sub> Concentrations Measured at Automatic Monitoring Sites**

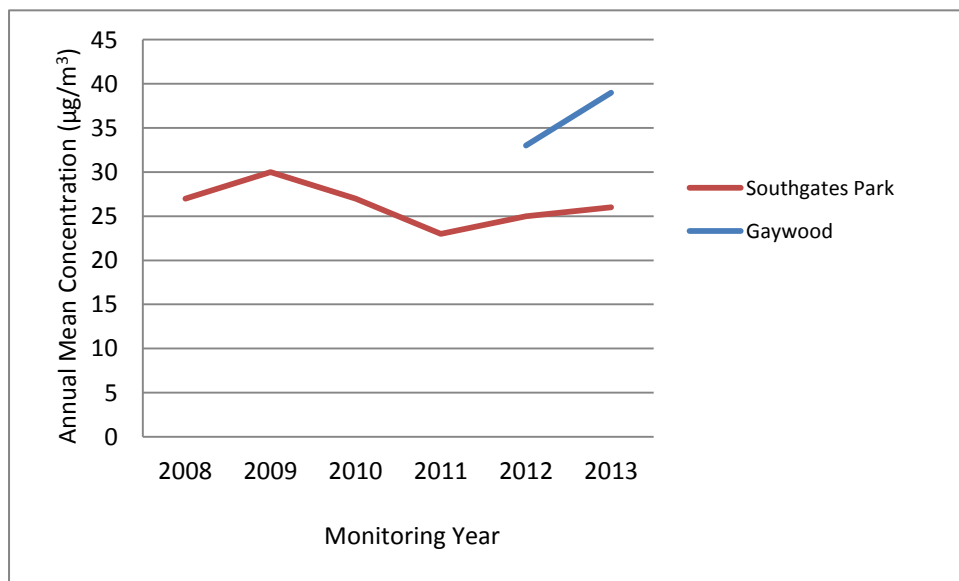


Figure 2.6 shows the trend in annual mean concentration at the Southgates Park and Gaywood monitoring locations. This shows that NO<sub>2</sub> concentrations at Southgates Park peaked in 2009, before decreasing in 2010 and 2011. The concentrations increased again in 2012 and 2013 at this location. The 2013 results from Gaywood show that the concentrations increased in 2013 from 2012 and were very close to the annual mean objective.

Table 2-4 Results of Automatic Monitoring for NO<sub>2</sub>: Comparison with 1-hour Mean Objective

Site ID	Site Type	Within AQMA?	Valid Data Capture for Monitoring Period %	Valid Data Capture 2013 %	Number of Hourly Means > 200µg/m <sup>3</sup>					
					2008	2009	2010	2011	2012	2013
King's Lynn Southgates	Roadside	Y	98.3	98.3	0	0	0	0	0	0
Gaywood, King's Lynn	Roadside	Y	98.7	98.7	-	-	-	-	0	0

### Diffusion Tube Monitoring Data

The NO<sub>2</sub> diffusion tube data are summarised in Table 2-5. The full dataset (monthly mean values) are included in Appendix A.

Due to a lab error, results for all sites from May 2013 were deemed not valid; nonetheless data capture for 2013 was generally very good. Annualisation was required for six sites only: Site 29 had missing results mainly due to lab errors; there were missing tubes at Site 71 and Site 73; and the new sites 79, 80 and 81 were installed later in the year. Full details regarding the annualisation can be found in Appendix A.

For the 2013 data set there were three sites where the annual mean NO<sub>2</sub> objective was exceeded as shown in the table below.

Site ID	Site Name	Within AQMA?	2013 Annual Mean Concentration (µg/m <sup>3</sup> ) – Local Bias Adjustment factor = 0.9	Comments
2	Railway Road 4	Y – Town Centre	47.1	Exceedences in five previous years including 2012.
3	Railway Road 5	Y – Town Centre	42.2	No exceedence in 2012, however was exceeding in the previous years.
5	Bus Station	N	43.9	Exceedences in 2012 and previous years (except 2010).

Two of the sites showing to be exceeding were located within the existing Town Centre AQMA:

- Railway Road 4 and Railway Road 5.

These sites had shown exceedences in previous years - with the concentrations reducing until 2012. The 2013 results showed an increase from 2012.

Most of the sites which were close to the annual mean are all located within the existing Town Centre AQMA:

- Railway Road 1; London Road 1; Southgates; London Road 7 and Railway Road 7.

Site 41 (Wootton Road 2) was the only site within the Gaywood Clock AQMA where 2013 results were close to the annual mean objective.

Site 5 (Bus Station) was the only site to exceed the annual mean objective outside of existing AQMAs. This site is positioned to give an indication of the hourly objective at this location, as there is relevant exposure with regards to this objective as people may spend up to one hour at the bus station. There is no relevant exposure with regards to the annual mean. With respect to the hourly NO<sub>2</sub> objective, there could be a potential risk of exceedence where the annual mean concentration is greater than 60 µg/m<sup>3</sup>. As the concentrations in 2012 and 2013 slightly exceeded 40 µg/m<sup>3</sup> it is unlikely that the hourly mean objective will be exceeded at this site.

The 2012 Updating and Screening Assessment identified that there was the potential for increases in NO<sub>2</sub> emissions as per ADMS Roads modelling in relation to the Tesco Store and Sainsbury developments on Hardwick Road. King's Lynn and West Norfolk Borough Council have undertaken monitoring on Hardwick Road (Site 18) at this location, both before and following the development of the store. The diffusion tube has shown a continual decrease in annual mean concentrations between 2010 and 2012 (with concentrations showing a slight increase in 2013 (to 26 µg/m<sup>3</sup>)).

Table 2-5 Results of NO<sub>2</sub> Diffusion Tubes 2013

Site ID	Location	Site Type	Within AQMA?	Triplicate or Co-located Tube	Full Calendar Year Data Capture 2013 (Number of Months)	2013 Annual Mean Concentration ( $\mu\text{g}/\text{m}^3$ ) - Bias Adjustment factor = 0.90
1	Railway Road 1	Kerbside	Y – Town Centre	N	10	37.1
2	Railway Road 4	Roadside	Y – Town Centre	N	11	<b>47.1</b>
3	Railway Road 5	Roadside	Y – Town Centre	N	10	<b>42.2</b>
5	Bus Station 1	Roadside (Bus Station)	N	N	10	<b>43.9</b>
6,7,8	Southgates Monitoring Station	Roadside	Y – Town Centre	Y	11	25.9
9	Mill Fleet 1	Roadside	N	N	11	22.9
10	London Road 1	Roadside	Y – Town Centre	N	10	38.5
11	London Road 2	Roadside	Y – Town Centre	N	10	28.4
12	London Road 3	Roadside	Y – Town Centre	N	11	33.5
13	London Road 4	Roadside	Y – Town Centre	N	11	30.8
14	London Road 5	Roadside	Y – Town Centre	N	11	34.4
15	Southgates	Roadside	Y – Town Centre	N	11	36.7
18	Hardwick Rd	Roadside	N	N	11	26.4

Site ID	Location	Site Type	Within AQMA?	Triplicate or Co-located Tube	Full Calendar Year Data Capture 2013 (Number of Months)	2013 Annual Mean Concentration ( $\mu\text{g}/\text{m}^3$ ) - Bias Adjustment factor = 0.90
19	Vancouver Avenue 1	Roadside	N	N	11	24.8
20	London Road 10	Kerbside	Y – Town Centre	N	11	33.5
22	London Road 6	Roadside	Y – Town Centre	N	11	33.3
23	London Road 7	Roadside	Y – Town Centre	N	11	36.2
24	London Road 8	Roadside	Y – Town Centre	N	11	32.5
25	The Walks	Urban Background	N	N	11	16.4
26	Railway Road 7	Roadside	Y – Town Centre	N	11	37.2
27	St John's Terrace	Roadside	Y – Town Centre	N	10	30.4
28	St John's Terrace/Blackfriar's	Roadside	Y – Town Centre	N	10	32.1
29	Waterloo Street	Kerbside	N	N	8	18.5*
30	Portland Street	Kerbside	N	N	11	22.8
31	Railway Road 2	Kerbside	Y – Town Centre	N	11	32.7
32	Railway Road 3	Roadside	Y – Town Centre	N	11	30.6
33	Wellsley Street	Kerbside	N	N	11	26.9
34	Blackfriars 2	Roadside	Y – Town Centre	N	10	31.3

Site ID	Location	Site Type	Within AQMA?	Triplicate or Co-located Tube	Full Calendar Year Data Capture 2013 (Number of Months)	2013 Annual Mean Concentration ( $\mu\text{g}/\text{m}^3$ ) - Bias Adjustment factor = 0.90
35	Blackfriars 1	Roadside	Y – Town Centre	N	11	29.9
36	Norfolk Street	Roadside	Y – Town Centre	N	11	28.6
37	Blackfriars 3	Roadside	Y – Town Centre	N	11	35.2
38	Littleport Street	Roadside	Y – Town Centre	N	11	31.7
39	Gaywood Road 2	Roadside	N	N	10	27.5
40	The Swan Gayton Road	Roadside	Y – Gaywood Clock	Y – Duplicate Tube	11	31.7
41	Wootton Road 2	Roadside	Y – Gaywood Clock	N	11	37.1
42	Wootton Road 1	Roadside	Y – Gaywood Clock	N	11	30.8
43	Lynn Road 1	Roadside	Y – Gaywood Clock	N	11	30.6
44	Lynn Road 2	Roadside	Y – Gaywood Clock	N	11	35.5
45	Gaywood Road 3	Roadside	N	N	10	31.5
46	Gaywood Road 1	Roadside	N	N	11	26.3
47	Austin Street 1	Roadside	Y – Town Centre	N	10	33.9

Site ID	Location	Site Type	Within AQMA?	Triplicate or Co-located Tube	Full Calendar Year Data Capture 2013 (Number of Months)	2013 Annual Mean Concentration ( $\mu\text{g}/\text{m}^3$ ) - Bias Adjustment factor = 0.90
48	Austin Street 2	Roadside	Y – Town Centre	N	11	30.2
51	Wootton Road 3	Roadside	N	N	11	19.6
52	Lynn Road 3	Roadside	N	N	11	29.4
58	NORR 2	Roadside	N	N	11	30.1
61	9 Sydney Terrace	Roadside	N	N	11	16.9
62	5 Burnley Road	Roadside	N	N	11	17.7
63	Mayfield House, Lynn Road	Roadside	N	N	11	11.5
64	New Farm House, High Road, Saddlebow	Roadside	N	N	10	11.3
66	Highgate Primary School	Urban Background	N	N	11	22.3
67	Greyfriars 2 Primary School	Urban Background	N	N	11	18.2
68	Nursery School	Urban Background	N	N	11	21.0
69	Whitefriars 1 Primary School	Urban Background	N	N	11	13.8
70	Whitefriars 2 Primary School	Urban Background	N	N	11	12.5
71	St Michael's Primary School	Urban Background	N	N	6	16.4*
72	Ferry Square West Lynn	Roadside	N	N	11	12.8



Site ID	Location	Site Type	Within AQMA?	Triplicate or Co-located Tube	Full Calendar Year Data Capture 2013 (Number of Months)	2013 Annual Mean Concentration ( $\mu\text{g}/\text{m}^3$ ) - Bias Adjustment factor = 0.90
73	Main Road, West Winch	Urban Background	N	N	7	28.0*
74	Saddlebow Caravan Park, King's Lynn	Roadside	N	N	10	14.5
75	The Swan (2) Gayton Road	Roadside	Y	Y – Duplicate Tube	11	34.8
76	Hardwick Road	Roadside	N	N	9	20.1
77	Hillen Road	Near-Road	N	N	10	16.0
78	King John Bank	Urban background	N	N	10	11.2
79	Tennyson Ave	Roadside	N	N	8	34.6*
80	Roydon Common top	Suburban	N	N	8	9.7*
81	Roydon Common bottom	Suburban	N	N	8	9.8*

\* Results were annualised

Table 2-6 Results of NO<sub>2</sub> Diffusion Tubes (2008 to 2013)

Site ID	Site Type	Within AQMA?	Annual Mean Concentration ( $\mu\text{g}/\text{m}^3$ ) - Adjusted for Bias					2012 (Bias Adjustment Factor = 0.84)	2013 (Bias Adjustment Factor = 0.90)
			2008 (Bias Adjustment Factor = 0.76)	2009 (Bias Adjustment Factor = 0.83)	2010 (Bias Adjustment Factor = 0.89)	2011 (Bias Adjustment Factor = 0.70)	2012 (Bias Adjustment Factor = 0.84)		
1	Kerbside	Y – Town Centre	44.4	46.7	37.4	35.7	38.2	37.1	
2	Roadside	Y – Town Centre	51.5	56.6	46.8	50.3	42.6	47.1	
3	Roadside	Y – Town Centre	46.8	53.1	45.6	45.4	38.3	42.2	
5	Roadside (Bus Station)	N	40.0	41.6	38.1	42.5	40.9	43.9	
6,7,8	Roadside	Y – Town Centre	28.9	29.5	27.1	25.2	24.2	25.9	
9	Roadside	N	23.4	24.4	24.6	22.3	19.9	22.9	
10	Roadside	Y	41.1	45.8	40.0	42.1	36.5	38.5	
11	Roadside	Y – Town Centre	31.6	34.6	31.9	30.6	28.4	28.4	
12	Roadside	Y – Town Centre	38.5	39.6	33.5	33.9	31.3	33.5	
13	Roadside	Y – Town Centre	36.0	38.5	32.7	32.0	30.1	30.8	
14	Roadside	Y – Town Centre	39.1	37.5	37.5	34.3	34.9	34.4	
15	Roadside	Y – Town Centre	42.1	44.3	43.8	36.7	35.4	36.7	

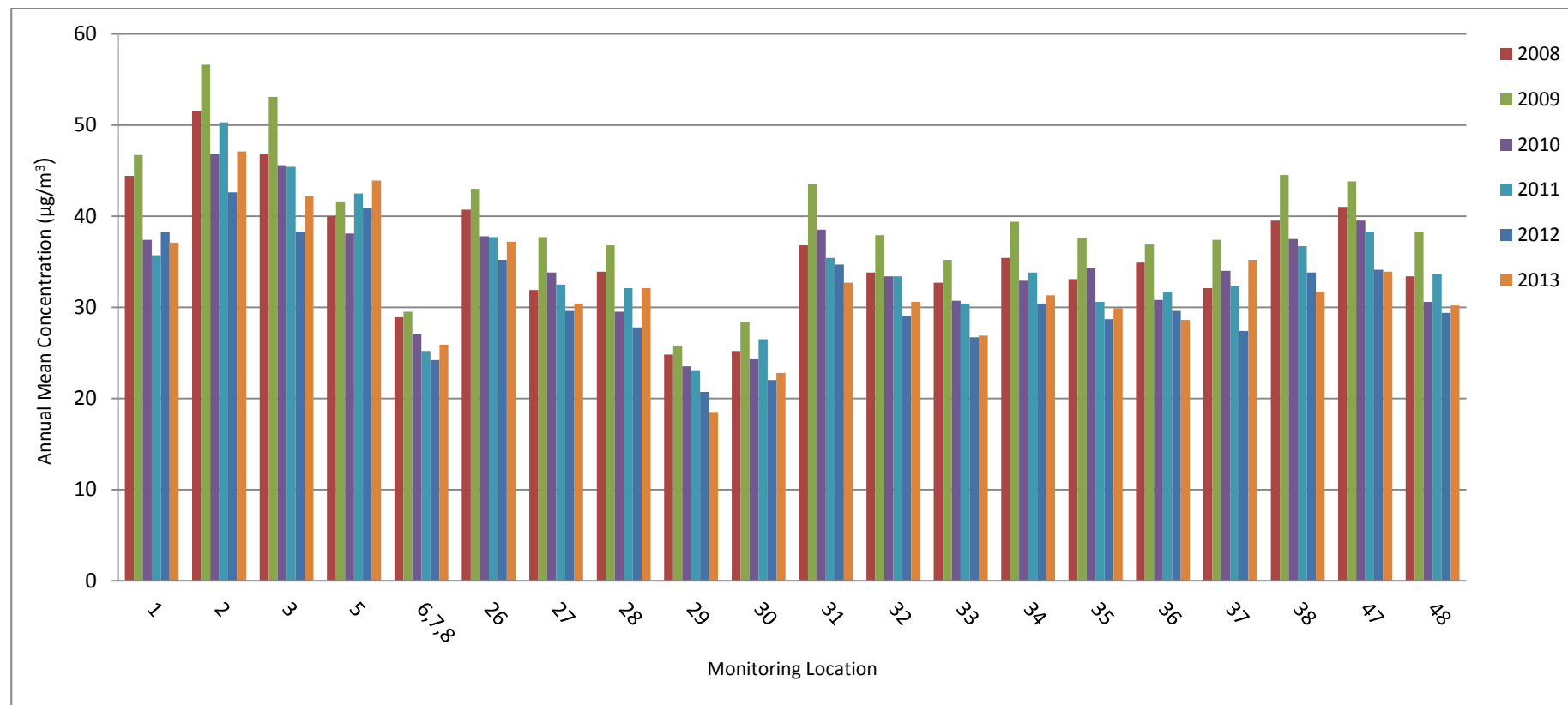
Site ID	Site Type	Within AQMA?	Annual Mean Concentration ( $\mu\text{g}/\text{m}^3$ ) - Adjusted for Bias					2012 (Bias Adjustment Factor = 0.84)	2013 (Bias Adjustment Factor = 0.90)
			2008 (Bias Adjustment Factor = 0.76)	2009 (Bias Adjustment Factor = 0.83)	2010 (Bias Adjustment Factor = 0.89)	2011 (Bias Adjustment Factor = 0.70)	2012 (Bias Adjustment Factor = 0.84)		
18	Roadside	N	30.0	31.5	28.4	28.2	25.4	26.4	
19	Roadside	N	24.6	29.0	26.3	25.3	24.0	24.8	
20	Kerbside	Y – Town Centre	32.2	36.2	33.7	30.6	27.8	33.5	
22	Roadside	Y – Town Centre	37.2	38.8	38.6	34.7	30.6	33.3	
23	Roadside	Y – Town Centre	35.5	35.9	39.0	34.3	31.9	36.2	
24	Roadside	Y – Town Centre	32.2	36.6	34.1	31.8	30.2	32.5	
25	Urban Background	N	18.8	20.1	17.9	17.3	17.0	16.4	
26	Roadside	Y – Town Centre	<b>40.7</b>	<b>43.0</b>	37.8	37.7	35.2	37.2	
27	Roadside	Y – Town Centre	31.9	37.7	33.8	32.5	29.6	30.4	
28	Roadside	Y – Town Centre	33.9	36.8	29.5	32.1	27.8	32.1	
29	Kerbside	N	24.8	25.8	23.5	23.1	20.7	18.5	
30	Kerbside	N	25.2	28.4	24.4	26.5	22.0	22.8	
31	Kerbside	Y – Town Centre	36.8	<b>43.5</b>	38.5	35.4	34.7	32.7	
32	Roadside	Y – Town Centre	33.8	37.9	33.4	33.4	29.1	30.6	
33	Kerbside	N	32.7	35.2	30.7	30.4	26.7	26.9	
34	Roadside	Y – Town Centre	35.4	39.4	32.9	33.8	30.4	31.3	

Site ID	Site Type	Within AQMA?	Annual Mean Concentration ( $\mu\text{g}/\text{m}^3$ ) - Adjusted for Bias					2012 (Bias Adjustment Factor = 0.84)	2013 (Bias Adjustment Factor = 0.90)
			2008 (Bias Adjustment Factor = 0.76)	2009 (Bias Adjustment Factor = 0.83)	2010 (Bias Adjustment Factor = 0.89)	2011 (Bias Adjustment Factor = 0.70)	2012 (Bias Adjustment Factor = 0.84)		
35	Roadside	Y – Town Centre	33.1	37.6	34.3	30.6	28.7	29.9	
36	Roadside	Y – Town Centre	34.9	36.9	30.8	31.7	29.6	28.6	
37	Roadside	Y – Town Centre	32.1	37.4	34.0	32.3	27.4	35.2	
38	Roadside	Y – Town Centre	39.5	<b>44.5</b>	37.5	36.7	33.8	31.7	
39	Roadside	N	27.8	31.5	29.0	28.9	24.6	27.5	
40	Roadside	Y – Gaywood Clock	36.6	39.0	33.7	35.7	32.2	31.7	
41	Roadside	Y – Gaywood Clock	<b>40.4</b>	<b>45.1</b>	<b>42.4</b>	38.8	31.8	37.1	
42	Roadside	Y – Gaywood Clock	31.6	35.4	31.2	30.6	30.6	30.8	
43	Roadside	Y – Gaywood Clock	30.0	32.7	32.0	29.4	29.2	30.6	
44	Roadside	Y – Gaywood Clock	34.1	38.6	35.8	35.5	32.5	35.5	
45	Roadside	N	30.8	33.3	34.4	31.5	28.4	31.5	
46	Roadside	N	28.2	30.4	28.7	27.3	24.1	26.3	
47	Roadside	Y – Town Centre	<b>41.0</b>	<b>43.8</b>	39.5	38.3	34.1	33.9	

Site ID	Site Type	Within AQMA?	Annual Mean Concentration ( $\mu\text{g}/\text{m}^3$ ) - Adjusted for Bias					2012 (Bias Adjustment Factor = 0.84)	2013 (Bias Adjustment Factor = 0.90)
			2008 (Bias Adjustment Factor = 0.76)	2009 (Bias Adjustment Factor = 0.83)	2010 (Bias Adjustment Factor = 0.89)	2011 (Bias Adjustment Factor = 0.70)	2012 (Bias Adjustment Factor = 0.84)		
48	Roadside	Y – Town Centre	33.4	38.3	30.6	33.7	29.4	30.2	
51	Roadside	N	21.4	23.6	20.5	20.7	19.0	19.6	
52	Roadside	N	30.7	37.0	32.1	29.6	28.6	29.4	
58	Roadside	N	30.8	34.3	29.1	26.2	23.9	30.1	
61	Roadside	N	-	-	17.2	18.2	15.8	16.9	
62	Roadside	N	-	-	18.8	17.8	18.1	17.7	
63	Roadside	N	-	-	13.7	11.2	10.6	11.5	
64	Roadside	N	-	-	12.2	11.6	10.8	11.3	
66	Urban Background	N	26.2	26.0	24.0	22.8	21.9	22.3	
67	Urban Background	N	21.5	21.9	18.8	18.7	17.5	18.2	
68	Urban Background	N	23.8	25.3	22.8	25.0	24.4	21.0	
69	Urban Background	N	17.5	18.5	16.1	15.2	15.0	13.8	
70	Urban Background	N	16.5	17.0	17.3	15.0	12.1	12.5	
71	Urban Background	N	-	-	17.2	18.3	17.5	16.4	
72	Roadside	N	-	-	-	13.9	12.3	12.8	
73	Urban Background	N	-	-	-	21.2	22.8	28.0	
74	Roadside	N	-	-	-	15.5	15.0	14.5	
75	Roadside	Y	-	-	-	-	30.1	34.8	

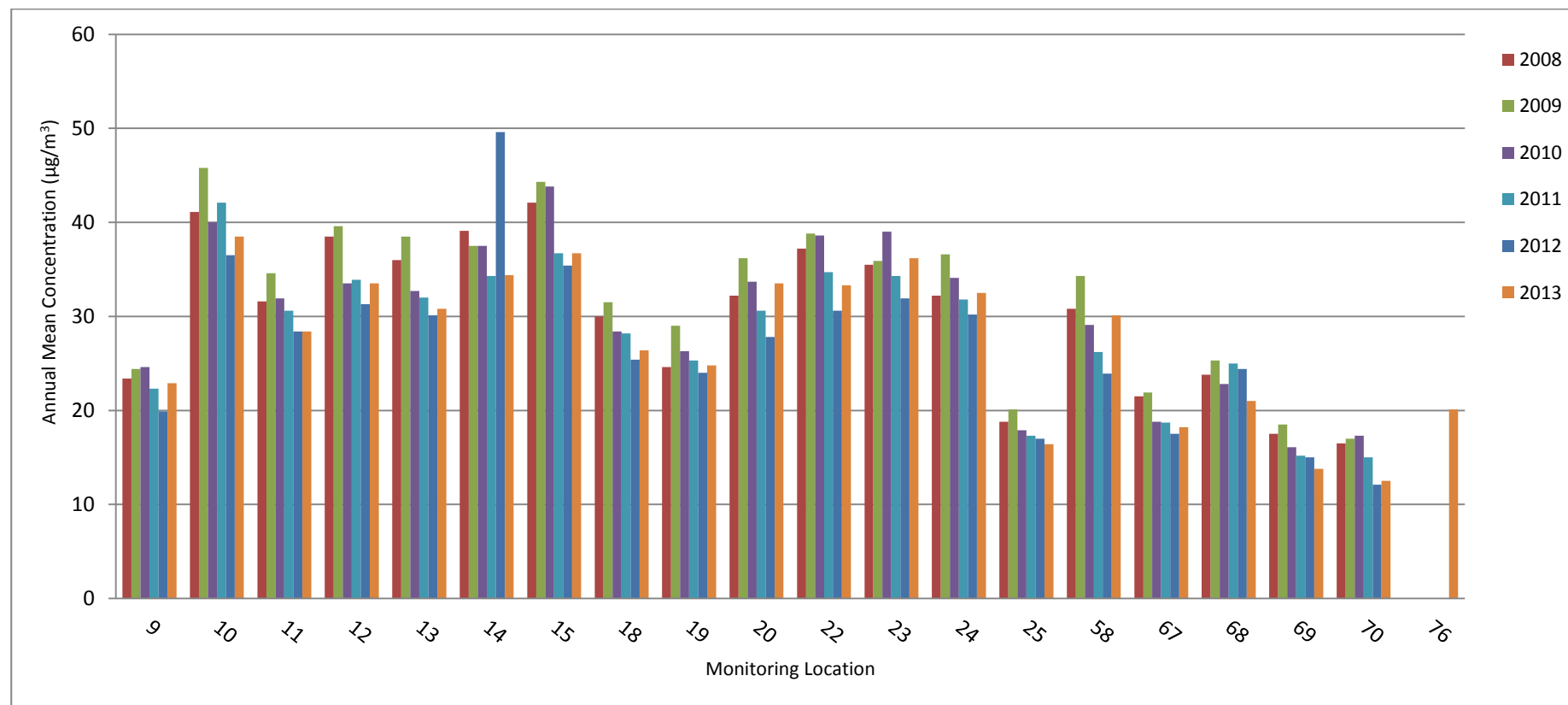
Site ID	Site Type	Within AQMA?	Annual Mean Concentration ( $\mu\text{g}/\text{m}^3$ ) - Adjusted for Bias					2012 (Bias Adjustment Factor = 0.84)	2013 (Bias Adjustment Factor = 0.90)
			2008 (Bias Adjustment Factor = 0.76)	2009 (Bias Adjustment Factor = 0.83)	2010 (Bias Adjustment Factor = 0.89)	2011 (Bias Adjustment Factor = 0.70)	2012 (Bias Adjustment Factor = 0.84)		
76	Roadside	N	-	-	-	-	-	20.1	
77	Near-Road	N	-	-	-	-	-	16.0	
78	Urban background	N	-	-	-	-	-	11.2	
79	Roadside	N	-	-	-	-	-	34.6	
80	Suburban	N	-	-	-	-	-	9.7	
81	Suburban	N	-	-	-	-	-	9.8	

Figure 2.7 Trends in Annual Mean Nitrogen Dioxide Concentrations Measured at Diffusion Tube Monitoring Sites – King’s Lynn AQMA 1 - North



The above figure shows the trend in NO<sub>2</sub> concentration for those sites located in the North of the Town Centre and AQMA. Majority of sites showed an increase from 2012 concentrations, however the 2013 concentrations were still lower than those in 2011. The graph shows that in the North of the town there were three locations (Sites 2, 3 and 5) where the concentration exceeded the annual mean of 40 µg/m<sup>3</sup>.

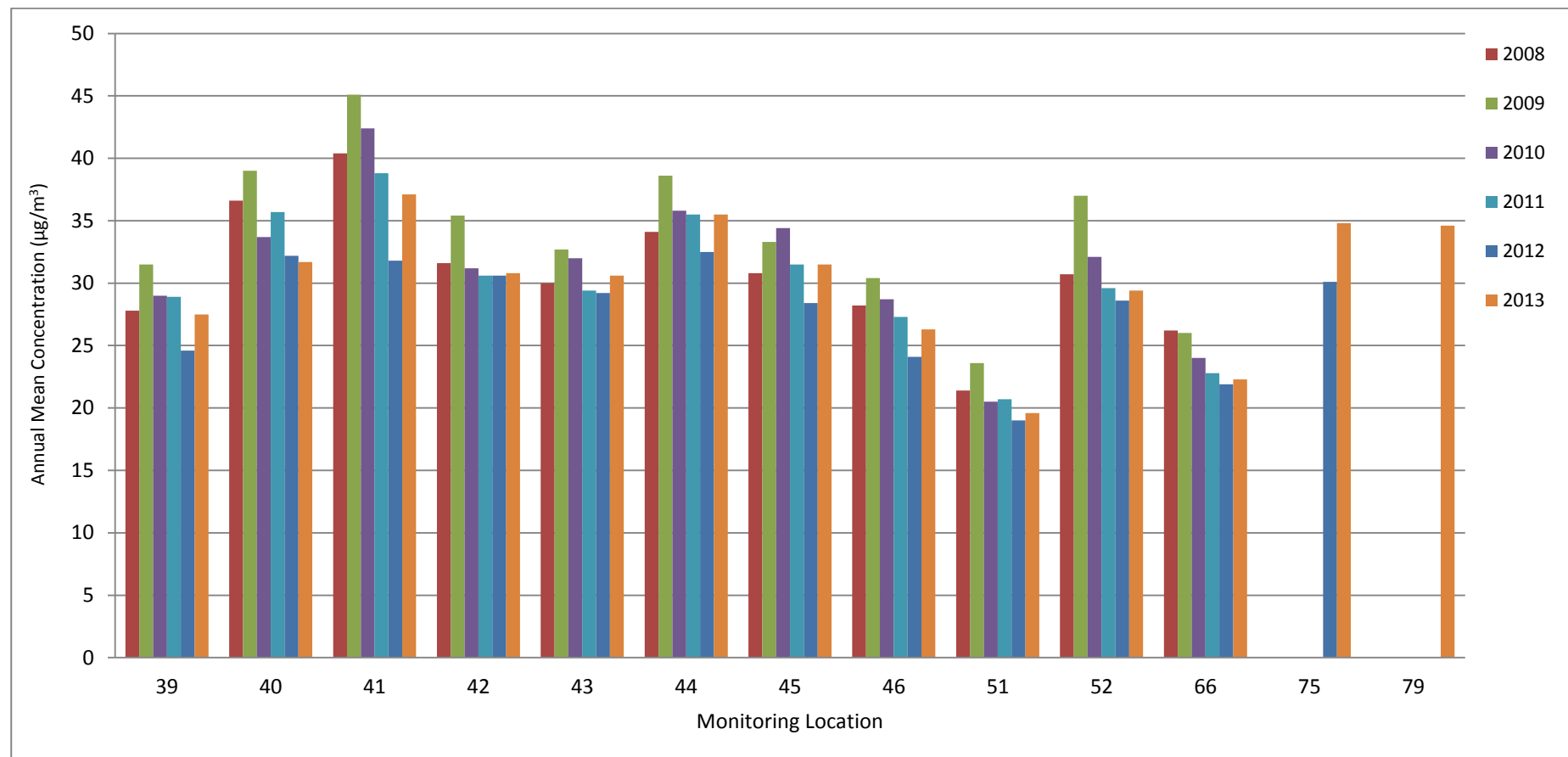
Figure 2.8 Trends in Annual Mean Nitrogen Dioxide Concentrations Measured at Diffusion Tube Monitoring Sites – King's Lynn AQMA 1 – South



The above figure shows the trend in NO<sub>2</sub> concentration for those sites located in the South of the Town Centre and AQMA. Majority of sites showed an increase from 2012 concentrations, however the 2013 concentrations were still lower than those in 2011. The graph shows that in the South area of the King's Lynn AQMA there were no monitoring locations where the concentration exceeded the annual mean of 40 µg/m<sup>3</sup>.

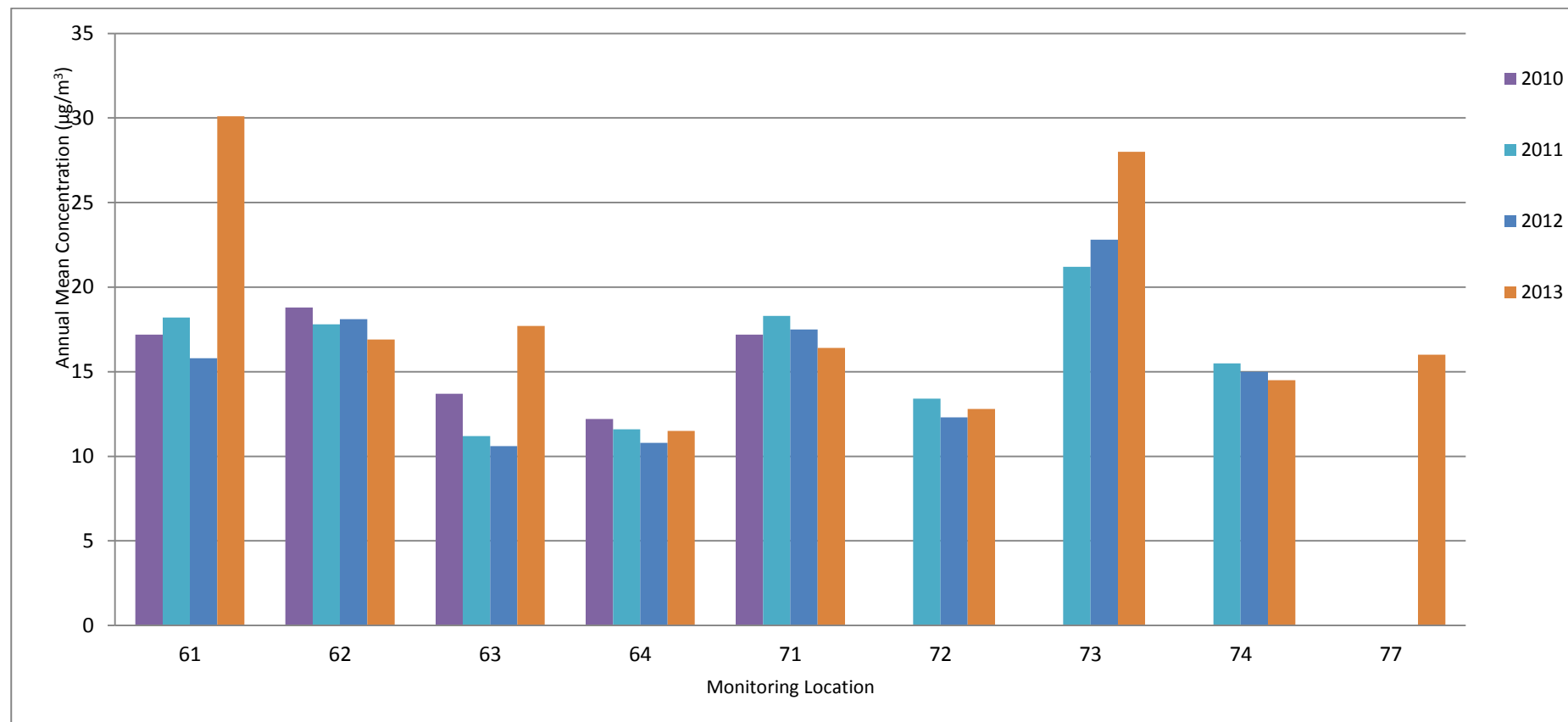


**Figure 2.9 Trends in Annual Mean Nitrogen Dioxide Concentrations Measured at Diffusion Tube Monitoring Sites – Gaywood Clock**



The above figure shows the trend in NO<sub>2</sub> concentration for those sites located in the Gaywood Clock AQMA and surrounding area. Majority of sites showed an increase from 2012 concentrations, however the 2013 concentrations were still lower than those in 2011. The graph shows that in the Gaywood Clock area there were no monitoring locations where the concentration exceeded the annual mean of 40 µg/m<sup>3</sup>.

Figure 2.10 Trends in Annual Mean Nitrogen Dioxide Concentrations Measured at Diffusion Tube Monitoring Sites – South King's Lynn & The Willows EfW Application



The above figure shows the trend in NO<sub>2</sub> concentration in the south of King's Lynn as well as for those sites monitored as background sites as part of the planning application submitted for an Energy from Waste incinerator at The Willows Industrial Estate. Majority of sites showed an increase from 2012 concentrations, with Sites 64 and 72 still remaining below 2011 concentrations and Sites 61, 63 and 73 showing a large increase in concentrations, which exceeded 2010 results. For all sites the concentration remained below the annual mean objective of 40 µg/m<sup>3</sup>.

## 2.2.2 Particulate Matter (PM<sub>10</sub>)

There are two Air Quality Objectives for PM<sub>10</sub>, namely:

- the annual mean of 40µg/m<sup>3</sup>; and
- the 24-hour mean of 50µg/m<sup>3</sup> not to be exceeded more than 35 times a year.

The Council undertook monitoring of PM<sub>10</sub> using TEOM analysers at two locations during 2013: Southgates Park and North Lynn.

Monitoring at Southgates Park ceased in March 2013 due to equipment failure.

The Leziate monitoring station continued to operate until the beginning of May 2013. The TEOM analyser from Leziate was then installed at the North Lynn monitoring site in August 2013.

Osiris dust and particles analysers were also installed at four locations in 2013.

Results for the TEOMs have been VCM<sup>1</sup> corrected and the Osiris data has also been corrected using a gravimetric factor of 1.3 by AQDM who conduct the data management for the Council.

Data capture was below 90% at both TEOM monitoring sites, and as such the results were annualised and the 90<sup>th</sup> percentile of PM<sub>10</sub> 24-hour means is also reported.

The 2013 results show that the annual mean and the 24-hour mean continue to be met at both monitoring locations within the Borough. The 2013 pollutant levels still show a decrease in concentration at Southgates Park.

There is a greater uncertainty in Osiris monitoring results as they are an indicative monitoring method only. All those sites showed compliance with the annual mean and 24-hour mean PM<sub>10</sub> objectives in 2013. However, the Stoke Ferry site showed large exceedences of the annual mean and the 24-hour mean objectives in 2012 and a Detailed Assessment in this area was recommended in the 2013 Progress Report. A Detailed Assessment was also recommended in the Page Stair Lane area due to exceedences of the annual mean and the 24-hour mean objectives in 2011. Therefore, it is recommended that further monitoring in these areas at a relevant receptor is carried out using a Defra approved method to confirm existing concentrations.

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<sup>1</sup> Volatile Model – Used to correct TEOM measurements for the loss of volatile components of particulate matter that occur due to the high sampling temperatures employed by this instrument

Table 2-7 Results of Automatic Monitoring for PM<sub>10</sub>: Comparison with Annual Mean Objective

Site ID	Site Type	Within AQMA?	Valid Data Capture for Monitoring Period %	Valid Data Capture 2013 %	Confirm Gravimetric Equivalent (Y or N/A)	Annual Mean Concentration (µg/m <sup>3</sup> )					
						2008	2009	2010	2011	2012	2013
Southgates King's Lynn	Roadside	Y	18.5	18.5	Y	19	20	21	22	20	18.9*
Leziate	Industrial	N	33.7	33.7	Y	-	27	21	20*	17	20
North Lynn, King's Lynn	Near-Road	N	39.0	39.0	Y	-	-	-	-	-	23.2*
Stoke Ferry	Industrial	N	92.4	92.4	N	-	16.5	19.5	37	<b>70</b>	17
Page Stair Lane, King's Lynn	Industrial	N	84.9	84.9	N	-	-	-	<b>42</b>	23	20
St Michael's, King's Lynn	Urban background	N	47.0	47.0	N	-	-	-	-	-	21
Estuary Road, King's Lynn	Industrial	N	63.1	63.1	N	-	-	-	-	-	18

\* Results were annualised as in Box 3.2 of TG(09)

Figure 2.11 Trends in Annual Mean PM<sub>10</sub> Concentrations

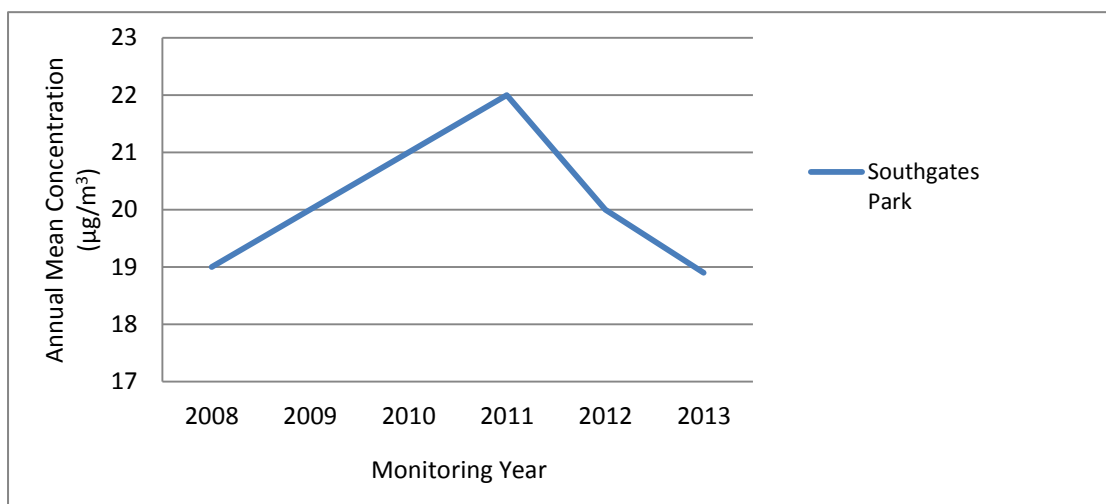


Figure 2.10 shows the trend in PM<sub>10</sub> concentrations at the Southgates Park monitoring location. The graph shows for the Southgates site annual mean concentrations have remained relatively stable, with a slight increasing trend observed between 2008 and 2011. The site is currently showing a decrease in annual mean concentrations when compared to the 2011 results.

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Table 2-8 Results of Automatic Monitoring for PM<sub>10</sub>: Comparison with 24-hour Mean Objective

Site ID	Site Type	Within AQMA?	Valid Data Capture for Monitoring Period %	Valid Data Capture 2013 %	Confirm Gravimetric Equivalent (Y or N/A)	Number of Daily Means > 50µg/m <sup>3</sup>					
						2008	2009	2010	2011	2012	2013
Southgates King's Lynn**	Roadside	Y	18.5	18.5	Y	1	3	1 (31.7)	3	4	4 (42.6)
Leziate	Industrial	N	33.7	33.7	Y	-	1	2 (31.9)	6 (41) <sup>a</sup>	1	3
North Lynn, King's Lynn	Near-Road	N	39.0	39.0	Y	-	-	-	-	-	1 (29.8)
Stoke Ferry King's Lynn	Industrial	N	92.4	92.4	N	-	-	-	22	<b>193</b>	20
Page Stair Lane, King's Lynn	Industrial	N	84.9	84.9	N	-	-	-	<b>78</b>	16	6
St Michael's, King's Lynn	Urban background	N	47.0	47.0	N	-	-	-	-	-	13
Estuary Road, King's Lynn	Industrial	N	63.1	63.1	N	-	-	-	-	-	1

If data capture is less than 90%, include the 90<sup>th</sup> percentile of 24-hour means in brackets

\*\* TEOM at Southgates Park was removed in March 2013.

### 2.2.3 Sulphur Dioxide (SO<sub>2</sub>)

King's Lynn and West Norfolk Borough Council does not currently monitor sulphur dioxide as there are no new sources requiring monitoring.

### 2.2.4 Benzene

King's Lynn and West Norfolk Borough Council does not currently monitor benzene as previous monitoring indicated compliance with the objectives.

### 2.2.5 Other Pollutants Monitored: PM<sub>2.5</sub>

The target for PM<sub>2.5</sub> is an annual mean of 25µg/m<sup>3</sup> by 2020. PM<sub>2.5</sub> objectives have been set out in the UK Air Quality Regulations. There is no obligation upon local authorities to carry out monitoring of PM<sub>2.5</sub>. The UK's monitoring requirements with respect to PM<sub>2.5</sub> are fulfilled by data from national monitoring networks.

The latest AEA-Ricardo Air Pollution Report for 2012 shows that the annual mean concentrations of PM<sub>2.5</sub> were within the limit value across the UK (25 µg/m<sup>3</sup> to be achieved by 1st Jan 2010); met was also the Stage 1 limit value, which comes into force in 2015 (25 µg/m<sup>3</sup> to be achieved by 1st Jan 2015). Stage 2 limit value (20 µg/m<sup>3</sup> to be achieved by 1st Jan 2020) was exceeded at one location only – London Marylebone Road, annual mean: 21 µg/m<sup>3</sup>.

As part of the Air Quality Directive the UK is required to achieve a National Exposure Reduction Target (NERT) for PM<sub>2.5</sub>, between 2010 and 2020. The Average Exposure Indicator (AEI) statistic for the UK is 13µg/m<sup>3</sup>. This AEI determines the NERT to be achieved by 2020. An AEI of 13µg/m<sup>3</sup> sets a reduction target of 15%.

### 2.2.6 Summary of Compliance with AQS Objectives

There were three NO<sub>2</sub> diffusion tube locations where the annual mean NO<sub>2</sub> objective was exceeded in 2013, two of which were inside the existing Town Centre AQMA. The remaining site was located at the Bus Station monitoring location. This site is not relevant of public exposure with regards to the annual mean NO<sub>2</sub> objective. From the 2012-2013 data it is unlikely that the hourly NO<sub>2</sub> objective would be exceeded at this location as the annual mean is less than 60µg/m<sup>3</sup>.

With regards to PM<sub>10</sub>, the 2013 results show that the annual mean and the 24-hour mean continued to be met at both TEOM monitoring locations within the Borough. All four OSIRIS sites also showed compliance with the annual mean and 24-hour mean objectives in 2013.

King's Lynn and West Norfolk Borough Council has examined the results from monitoring in the Borough.

Concentrations within the AQMAs still exceed the annual mean objective for NO<sub>2</sub> at several locations and the AQMA should remain.

## **3 New Local Developments**

### **3.1 Road Traffic Sources**

LAQM requires local authorities to consider the following:

- Narrow congested streets with residential properties close to the kerb;
- Busy streets where people may spend one hour or more close to traffic;
- Roads with a high flow of buses and/or HGVs;
- Junctions;
- New roads constructed since the last Updating and Screening Assessment;
- Roads with significantly changed traffic flows; and
- Bus or coach stations.

King's Lynn and West Norfolk Borough Council confirms that of the above categories there have been no new or newly identified which have not previously been considered in previous rounds of review and assessment.

### **3.2 Other Transport Sources**

LAQM requires local authorities to consider the following:

- Airports;
- Locations where diesel or steam trains are regularly stationary for periods of 15 minutes or more, with relevant exposure within 15m;
- Locations with a large number of movements of diesel locomotives and long term relevant exposure within 30m; and
- Shipping ports.

King's Lynn and West Norfolk Borough Council confirms that of the above categories there have been no new or newly identified sources which have not been considered in previous rounds of review and assessment.



### 3.3 Industrial Sources

LAQM requires local authorities to consider the following:

- Industrial Installations: new or proposed;
- Industrial installations: existing where emissions have increased substantially or relevant exposure introduced;
- Major fuel storage depots;
- Petrol stations; and
- Poultry farms.

King's Lynn and West Norfolk Borough Council identified three applications that could impact local air quality, two of which were refused and the other will require an air quality assessment. The details of these applications are provided below.

***Planning application ref. 13/00856/CM - Two incinerators, replacement of previously approved incinerator cremator and application to increase throughput, Anglia Fallen Stock, Cliffe En Howe Road, Pott Row, King's Lynn, Norfolk***

The Council raised concerns over the information provided and the ability to carry out any screening assessment or chimney height assessment. The site has a history of complaints regarding air quality and odour and has the potential to cause an exceedence of the AQS for PM<sub>10</sub> at local receptors.

The application was refused in August 2013. The applicant had failed to demonstrate that the emission from the incinerators would not impact significantly or breach air quality standards. The applicant has appealed and the case will be heard during 2014.

***Planning application ref. 13/00705/F - Replace CHP plant with 2 x 500kw CHP configuration and size models, Queen Elizabeth Hospital, Gayton Road, King's Lynn, Norfolk***

In June 2013 the Council received a planning application to replace a CHP installation with a different model. Additional information was requested regarding this application, such as the specification of the replacement engines, emissions data and stack height calculations.

This information has not been supplied so the Council could not assess the impacts of this development on the local air quality or amenity of the receptors. Therefore, the Council objected due to lack of information and the application was refused.

***Scoping opinion - Poultry Unit, Wethered Manor, Docking Road, Sedgeford, Hunstanton***

Received in December 2013, this proposal exceeds the 40,000 Environmental Permitting threshold, as such it will need to obtain an environmental permit from the Environment Agency. This will control some emissions from the installation and may set emission limits. The Council will also require that the impacts on air quality are covered in the Environmental Statement including a view on what will be controlled by the permit.

Data search of the Environment Agency air pollution records have confirmed that there were no increases of air emissions of more than 30% since April 2012 from permitted industrial installations<sup>2</sup>.

### **3.4 Commercial and Domestic Sources**

LAQM requires local authorities to consider the following:

- Biomass combustion plant – individual installations;
- Areas where the combined impact of several biomass combustion sources may be relevant; and
- Areas where domestic solid fuel burning may be relevant.

Kings' Lynn and West Norfolk Council have identified the following biomass installations which have not been previously assessed and are over 50KW in output.

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<sup>2</sup>[http://maps.environment-agency.gov.uk/wiyby/dataSearchController?topic=airpollution&layerGroup=4&lang=\\_e](http://maps.environment-agency.gov.uk/wiyby/dataSearchController?topic=airpollution&layerGroup=4&lang=_e)

***Planning application ref. 13/00292/F - Proposed lean-to extension to existing biomass boiler building, plus 3 x additional biomass boilers. (Part retrospective), 52 Baptist Road, Upwell, Wisbech***

This application was submitted in March 2013 and the Council had previously commented on the original biomass boiler at this site (application ref. 12/00356/F), already installed. This proposal adds two additional straw-burning boilers and a back-up oil-fired boiler. The cumulative capacity of all four units is 3.98MW (4 x 0.995MW)

The data supplied so far by the applicant was not sufficient to complete a screening assessment for this installation. This will be assessed further in the next Updating and Screening Assessment.

***Planning application ref. 13/01442/F - Installation of biomass boiler within new purpose built steel framed building, Rokewood, Walton Road, Walsoken***

The data supplied by the applicant was not sufficient to complete a screening assessment for this installation (model shown on the plans did not agree with the provided specification; unknown chimney height and exit gas velocity). The application, submitted in October 2013, was later withdrawn.

### **3.5 New Developments with Fugitive or Uncontrolled Sources**

LAQM requires local authorities to consider the following:

- Landfill sites;
- Quarries;
- Unmade haulage roads on industrial sites;
- Waste transfer stations; and
- Any other potential sources of fugitive particulate emissions.

King's Lynn and West Norfolk Borough Council confirms that of the above categories there have been no new or newly identified sources which have not been considered in previous rounds of review and assessment.

King's Lynn and West Norfolk Borough Council has identified the following local developments which may impact on air quality in the Local Authority area.

**Biomass Installation:**

- 52 Baptist Road, Upwell, Wisbech

This will be taken into consideration in the next Updating and Screening Assessment when full emissions data is available.

## **4 Local / Regional Air Quality Strategy**

King's Lynn and West Norfolk Borough Council does not have an Air Quality Strategy, however the Air Quality Action Plan considers the AQMAs and includes wider measures across the borough.

## 5 Planning Applications

King's Lynn and West Norfolk Borough Council has identified the following six planning applications, which may impact upon air quality.

### ***Willows Waste to Energy***

The Borough Council were a consultee to the Planning application by Cory Wheelabrator for a municipal waste incinerator to be located on land off Saddlebow Road, King's Lynn. The Borough Council has thoroughly assessed the air quality impact of this proposal and instructed Air Quality Consultants Ltd to independently review the planning application. The review considered the impact of the Willows PRC and also the aggregate impact with adjacent industrial development such as Centrica A&B, Palm Paper Mill & Sludge Combuster. The findings were reported in the 2012 Progress Report and incorporated into the Borough Council's response to Norfolk County Council.

During 2013 additional information was received and reviewed by the Borough Council.

The application was 'called in' for a decision by the Secretary of State. A Public Enquiry was held commencing in February 2013 for which the Borough Council provided evidence. The decision is currently pending. However it should be noted that on 7 April 2014, NCC's Cabinet voted to terminate its contract with Cory Wheelabrator on the grounds of failure to secure satisfactory planning permission.

### ***Planning application ref. C/2/2013/2003, Construction of a Sludge Transfer Scheme - AW Sewage Treatment Works, Clockcase Road, Clenchwarton***

The application was received in June 2013 and further information regarding any potential air quality impacts from this development was requested.

There was also the potential for an exceedence of the PM<sub>10</sub> objective due to dust from construction activities. The Planning Statement refers to a Construction Environmental Management Plan which could include measures for control of mud and dust. The Council recommended that provision and approval of a Construction Environmental Management Plan (CEMP) be required by condition and that the construction of the development be required to be in accordance with the approved CEMP.

Information was provided on likely emissions and control mechanisms. Processing is limited to screening and pumping within the proposed development. Fugitive emissions will be minimised by providing an extraction system in tanks. Dispersion of treated off-gasses is

reported to be aided by the vent stack height and an accelerated emission at the point of discharge. It is unlikely that the concentrations of pollutants dispersed to the atmosphere would have a significant impact on air quality.

***Planning application ref. C/2/2013/2006 - Continued extraction of sand and gravel from existing quarry (part retrospective) and restoration to agriculture and mixed woodland, Coxford Abbey Quarry, Docking Road, Syderstone***

The Dust Assessment submitted with the application (July 2013) concludes that mitigation measures are required to reduce the risk of impact to an acceptable level. Section 5 of the Dust Assessment sets out Environmental Design Measures such as topsoil screening bunds and screening by vegetation. Tree belts are proposed on the easterly perimeter and screening bunds are proposed around the perimeter of each operational area. Section 7 of the Dust Assessment sets out recommended mitigation techniques. The Council recommended that adoption of the recommended environmental design measures and mitigation measures be required by condition. This could be provided by the requirement to submit a Site Environmental Management Plan (SEMP) for approval and for operations to be carried out in accordance with the approved SEMP.

***Planning application ref. 13/01358/FM - Construction of two new production/packaging facility buildings, Bepak Europe Ltd, Bergen Way, North Lynn Industrial Estate***

Planning permission was given for the construction of new production/packaging facility buildings at North Lynn (application submitted in September 2013). The application has the potential for air quality impacts. The development will include an additional 234 car parking spaces. The development will also require the delivery and storage of raw materials which could potentially have an impact on local air quality. The company operate a travel plan and calculate that only 70 arrivals and 70 departures would occur at each shift change. However, the applicant did not submit an air quality assessment in support of this application. Therefore any potential impact on the AQMA and surrounding area has not been predicted.

***Planning application ref. 13/01675/OM - Construction of up to 95 dwellings, with access road, South of Russett Close, Wootton Road. King's Lynn***

This development will introduce new traffic movements onto the busy Wootton Road which feeds into the Gaywood Air Quality Management Area (AQMA) to the south. An air quality assessment was provided for the development to the south of this proposal. However this did

not take into account this additional development. A screening assessment was agreed with the applicant to determine the potential for air quality impacts.

The construction phase of the development has the potential to cause dust which could have an impact on nearby residential properties. The Council will therefore recommend that a construction environmental management plan be required by condition which sets out how dust will be mitigated.

***Planning application ref. 13/01105/FM Kings Lynn Power Station, Centrica A – New gas turbine***

Air quality dispersion study correctly identified the two air quality management areas in King's Lynn and assessed impact on them. Combined impact considered with existing consented activities namely, Centrica B Power Station and Palm Paper Mill and the proposed Willows Power & Recycling Centre.

The air quality dispersion study (submitted with the application in August 2013) shows that the new gas turbine will have less air quality impact than the current Centrica A gas turbine and make a minor beneficial impact on air quality surrounding the power station. The new gas turbine, will be more efficient and have a lower operating limit value, will reduce the environmental impact of the development. The new plant emissions of NO<sub>2</sub> will be below the 1% annual mean screening threshold and are therefore deemed insignificant. The NO<sub>2</sub> emissions will not significantly impact on the existing AQMA.

However, the Council are aware that this proposal has the potential to create many additional traffic movements and may therefore have adverse air quality impacts. Regarding the dust emissions, the Council will recommend the use of a condition to require submission and approval of a scheme to demonstrate how the emissions of construction dust will be minimised.

***Planning application ref. 13/01615/OM - Outline Application: development of up to 1,110 residential units (Class C3); primary school (Class D1); local centre (Class A1, B1, D1), Land West of Constitution Hill, Constitution Hill, North Runcton***

The application, received in November 2013 was supported with a Transport Statement and Environmental Statement (ES), which included the assessment of air quality impacts.

The traffic assessment predicts a significant increase in traffic on the A10 and to a lesser extent on the A47 and A149. During the operational phase of the development the air quality assessment in the ES concludes that a negligible impact on NO<sub>2</sub> concentrations (0.5µg/m<sup>3</sup>)



will result from traffic at the development. An imperceptible impact ( $0.1\mu\text{g}/\text{m}^3$ ) is predicted for  $\text{PM}_{10}$ .

The Council will require a monitoring survey to validate the assessment and support the measures in the Air Quality Action Plan, which will be developed if necessary. This could be achieved by provision of funding for  $\text{NO}_2$  diffusion tubes at locations to be agreed with the planning authority. During the construction phase potential impacts are predicted from earthworks, construction and dust trackout.

The ES makes recommendations to mitigate likely air quality effects of the proposed development on air quality. These are: construction environmental management plan and the design of roads to be free-flowing. The Council will recommend that provision of a construction environmental management plan be required by condition. It will also be recommended that funding for diffusion tube monitoring be required by condition or via a section 106 agreement. This should allow for six tubes to be located at sites agreed with the planning authority for a period of five years from commencement of development.

### ***Palm Paper 3 CCGT Power station Kings Lynn***

Pre-application discussions have taken place regarding a natural gas fired combined cycle gas turbine plant, with a thermal capacity of 162MW to provide electricity and steam entirely for internal use within the Palm Paper mill. The application is part of National Infrastructure Planning, decided by the Planning Inspectorate. The application is expected to be submitted to the Planning Inspectorate Q2 2014.

## 6 Air Quality Planning Policies

The Council adopted the Local Development Framework (LDF) Core Strategy on the 28<sup>th</sup> July 2011. The Core Strategy is the main document which sets out the long term strategy for the borough and policies which will shape new development. It will guide development and the use of land up to 2025. The Core Strategy is linked to the Sustainable Community Strategy produced in association with the West Norfolk Partnership.

Contained in the Core Strategy are four key vision points, including Environment as stated below;

*'We want to safeguard our justifiably famous natural and historic environment, at the same time making sustainability a central principle to our vision. We want to build connections with other local and regional economies, reduce reliance on the car, and prepare ourselves for the challenges of climate change'.*

From the vision are Core Strategy Objectives, those relating to Environment are listed below;

- West Norfolk has undergone regeneration and growth that is well planned and complements its high quality historical and natural inheritance.
- Communities benefit from quality public spaces and parks with access to the coast and countryside that make the area special.
- West Norfolk is meeting the challenges of climate change and reducing or mitigating carbon emissions.
- Public transport has improved and people are less reliant on the motor car to access places and services.
- West Norfolk is still considered to be somewhere unique retaining its own local distinctiveness.

The following policies have reference to air quality within them:

### ***Policy CS08 Sustainably Development***

- All new development in the borough should promote and encourage opportunities to achieve high standards of sustainability and energy efficiency, with measures including:
  - Design and construction techniques to improve efficiency
  - Reduction of on-site emissions by generation of cleaner energy

- Good access links for walking and cycling
- Support of renewable energy generation

***Policy CS11 Transport***

- Improving strategic networks serving passenger and freight movements to reduce congestion and improve reliability and safety
- Bypasses for Middleton and East Winch and West Winch and junction improvements
- Improvements to rail infrastructure and services on the King's Lynn to Cambridge/King's Cross Line
- Implementation of the KLATS schemes including improvements in King's Lynn – balance ease of access and car parking with flows, highway safety and alternatives such as park and ride and a second parkway station
- Achieving improvements within the towns of King's Lynn, Downham Market and Hunstanton, particularly where there are air quality issues.
- Achieving a balanced package of highway, traffic management (including car parking) and public transport improvements.
- Maximising the use of alternative modes of freight movement via rail and the port
- New Developments should demonstrate that they have been designed to:
  - Reduce the need to travel.
  - Promote sustainable forms of transport appropriate for their location, including walking, cycling, public transport
  - Private car (development proposals which are likely to have significant transport implications will need to be accompanied by a transport assessment and travel plan to show how car based travel can be minimised)

In addition to the above document, King's Lynn and West Norfolk Borough Council Environmental Quality Team have been in discussion with the Borough planners regarding the inclusion of air quality policy in the Local Plan. Air quality will be included as part of POAW4: Environment, Design and Amenity. This document is currently in draft form and is likely to go to the consultation stage in 2013:

***Sustainable Development - Policy CS08 - Draft Area Wide Policy POAW 4 – Environment, Design and Amenity***

Development will be expected to protect or enhance the amenity of the wider environment, neighbouring uses and existing occupants as well as any new occupiers of the proposed development. Proposals will be considered in relation to amenity issues including

- Noise;
- Odour;

- Air quality;
- Light pollution;
- Contamination, and;
- Visual impact.

The scale, height, massing, materials and layout of development should respond to the local setting and pattern of the adjacent streets including spaces between buildings.

Development proposals should demonstrate that safe access is obtainable and adequate parking facilities will be provided.

## 7 Local Transport Plans and Strategies

The 3<sup>rd</sup> Local Transport Plan for Norfolk, *Connecting Norfolk*, covering 2011 to 2026 was adopted in March 2011. The six key priorities identified for transport are:

- Maintaining and managing the highway network;
- Delivering sustainable growth;
- Enhancing strategic connections;
- Reducing emissions;
- Improving road safety; and
- Improving accessibility.

In October 2012 the first Strategic Environmental Assessment / Sustainability Appraisal (SEASA) monitoring report was completed, establishing the current state of the environment and changes to indicators that have occurred between 2010/11 and 2011/12. The indicators were developed to measure the effects that the LTP3 strategy and implementation plan might have.

The following SEASA objectives have links to Air Quality

### ENV 1

- CO<sub>2</sub> tonnes from road transport – improving

### ENV 2

- Number of AQMAs due to transport – remains the same
- Concentrations of NO<sub>2</sub> Gaywood King's Lynn –air quality improving
- Concentrations of NO<sub>2</sub> Railway Road King's Lynn –air quality declining

The King's Lynn Area Transport Strategy (KLATS) will set of the way in which transport issues are addressed in the King's Lynn area over the 2011 – 2015 period. The Stage 1 final report recommended that the Borough Council sets up an Air Quality Steering Group (AQSG) to finalise options and implement the AQMA Action Plan. The Stage 1 report developed transport models to aid the development of strategy and potential interventions

and the impacts of the LDF. The report considered public transport, cycling infrastructure, car parking and additional rail facilities. The report contained a list of possible interventions for consideration by the Growth Point Board and further actions, including the following

- Highway Schemes – including Bypass linking North Lynn and West Lynn, Gaywood Link Road, A149 Queen Elizabeth Way dualling
- Traffic Management Schemes – including inbound high occupancy vehicle lane at Gaywood Clock junction and Wotton Road, improvements to the A47 Pullover Roundabout, town centre 20mph zone
- Public Transport Schemes – including inbound contraflow bus lane on Railway Road, park and ride at Saddlebow East/ South Lynn
- Dedicated bus and cycle routes between Wisbech Road and Millfleet, cycle links to the National Cycle Network

## 8 Climate Change Strategies

The Sustainability Appraisal completed as part of the Core strategy lists the following issues to be considered when determining future development within the borough:

- Impending climate change and issues associated with it;
- There is a potential lack of water resources due to over abstraction, and climate change leading to decreased water availability; and
- Greenhouse gas emissions from the borough are contributing to climate change, and are higher than the national average.

The following policies provide guidance as to how the Council are planning to deal with the issue of climate change:

- Policy CS07 - Development in Coastal Areas
- Policy CS08 – Sustainably Development
- Policy CS12 – Environmental Assets

## 9 Implementation of Action Plans

King's Lynn and West Norfolk Borough Council have developed a draft AQAP in 2013. An Air Quality Steering Group has been set to finalise the draft AQAP.

The Steering Group is chaired by the Portfolio Holder for the Environment and includes Environment and Planning officers (Exec Director, Environmental Quality, LDF, and Development Control), Car Parks, Regeneration & NCC Highways departments.

The report will need to be presented for consultation to statutory consultees including DEFRA and the community of King's Lynn and West Norfolk. The report will be made available for consultation for an 8 week period via the borough council's website.

Once approved by the Borough Council of King's Lynn and West Norfolk Cabinet and the Secretary of State the plan will be fully adopted. Once adopted and fully integrated into the Norfolk Local Transport Plan the borough and county councils will collaborate to implement the measures in the AQAP and in monitoring progress. The timescale for the AQAP implementation is shown in Table 9-1. Some actions proposed by the draft Plan have already been completed as detailed in Table 9-2.

**Table 9-1 King's Lynn and West Norfolk Air Quality Action Plan Implementation Timescale**

Action	Date
Finalise AQAP	April – May 2014
Cabinet/ Member consultation on draft AQAP	June – July 2014
Public consultation on draft AQAP	August - September 2014
Review of public consultation comments	October 2014
Amend and revise AQAP as necessary	October 2014
Submit Final AQAP for DEFRA Approval	November 2014
Adoption of AQAP	December 2014/ January 2015
Implementation	January 2015 ongoing



Table 9-2 King's Lynn and West Norfolk Air Quality Action Plan (2013, draft)

	Measure	Focus	Lead	Planning phase	Implementation phase	Indicator	Target NO <sub>2</sub> reduction impact (µg/m <sup>3</sup> )
1	New access road from Wisbech Road through Friars to Boal Street.	Removal of some traffic from London Road/ Railway Road. Removal of buses, and potential reduction in car movements.  Consider use of route by Taxi's & PHV.	County Council/ Borough Council	2010	Completed 01/12/2011	Continued air quality monitoring.  Bus flow counts on London Road and new route.	2-3
2	Incentivise the use of public transport.	Removal of some traffic from London Road, Railway Road and Gaywood Clock area.  Potential reduction in car movements.	County Council	2013	2014	Continued air quality monitoring.  Bus usage figures.	Up to 1
3	Implementation of Urban Traffic Control system (UTC) at principal junctions within AQMA and adjacent to AQMA.	Reduction of emissions within the AQMA from stop/start driving.  Improve traffic flow and reduce congestion	County Council	2010	Completed 01/12/2011	Continued air quality monitoring.  Queue length at junctions at peak times	2-5
4	Decriminalisation of parking. Review of parking controls and enforcement in AQMAs and	Improve traffic flow through AQMA and reduce congestion.  Smooth out traffic flow over the course of the day.	Borough Council/ County Council	Dec-10 Option validation Jan-March 2011	Ongoing	Implementation of enforcement in AQMAs and Town Centre. Continued air quality monitoring.	Up to 1

	Measure	Focus	Lead	Planning phase	Implementation phase	Indicator	Target NO <sub>2</sub> reduction impact (µg/m <sup>3</sup> )
	King's Lynn Town Centre.  Linked to 7,8,9 & 21.						
5	Investigate feasibility and if viable, provide Electric vehicle charging points in car parks and in new developments.	Encourage the use of electric vehicles within the town centre	Borough Council	2014	Ongoing	Number & use of EV charging points installed.	Up to 1
6	Support the use of West Lynn ferry.	Encourage use of the ferry from West Lynn to the town centre	Borough Council	2012	Ongoing	Number of passengers using ferry.	Up to 1
7	Variable car parking rates.  Linked to 4,8,9 & 21	Vary rate for long and short term parking. Even out peak flows but encourage short term trips. Improve traffic flow through AQMA and reduce congestion. Smooth out traffic flow over the course of the day.	Borough Council	2013	Ongoing	Continued air quality monitoring.  Car park usage.  Queue lengths.	Up to 1
8	Variable message signs.  Linked to 4,7,9 & 21	Provide signage to direct drivers to available parking spaces.  Improve traffic flow through AQMA and reduce congestion.	Borough Council/County Council	2013	2014	Peak hour parking usage.  Car park usage.	Up to 1

	Measure	Focus	Lead	Planning phase	Implementation phase	Indicator	Target NO <sub>2</sub> reduction impact (µg/m <sup>3</sup> )
9	Investigate potential for residents only parking in or close to AQMAs.  Linked to 4,7,8, 9 & 21.	Develop residents only parking zones.  Improve traffic flow through AQMA and reduce congestion.  Smooth out traffic flow over the course of the day.  Increase car park usage within Town.	Borough Council	2013	2014	Peak hour parking usage.  Car park usage.  Continued air quality monitoring.	Up to 1
10	Changes to the Road Layout within the King's Lynn Gyratory as proposed by KLATS.	Smooth out traffic flow over the course of the day.  Increase car park usage within Town.  Improve traffic flow and reduce congestion in AQMAs.	County Council	2011  Linked to measure 3.	Ongoing	Continued air quality monitoring. Daily traffic flow data and queue lengths	2-10
11	Traffic Management at Gaywood clock.	Investigate measures to displace queuing traffic.	County Council	2012	2014	Continued air quality monitoring.  Traffic que lengths.	1-5
12	Traffic Management at London Road and Southgates.	Investigate measures to displace queuing traffic.	County Council	2012	2014	Continued air quality monitoring.  Queue length at junctions at peak times.	1-5

	Measure	Focus	Lead	Planning phase	Implementation phase	Indicator	Target NO <sub>2</sub> reduction impact (µg/m <sup>3</sup> )
13	Quality Bus Partnerships and contracts.	Contract between the Council and bus operators that include type of bus, level of service and vehicle emissions.	County Council	2011	Ongoing	Continued air quality monitoring. % buses Euro 3 or better. Installation of SVD.	Up to 1
14	Installation of selective vehicle detection (SVD) system.	Reduction of emissions within the AQMA from stop/start driving. Improve flow of public transport vehicles.	County Council	2011	Completed 2012	Number of vehicles fitted with SVD. Annual average daily traffic numbers.	Up to 1
15	Promotion of travel plans, school travel plans and promotion of car sharing.	Encourage alternatives to car use and to single car occupancy and reduce need to travel for work. Particularly at large employers.	County Council/ Borough Council	2014	Ongoing	Continued air quality monitoring. Number of travel plans.	Up to 1
16	Improved cycling and walking provision.	Improvement of space for walking and cycling such as cycle lanes and pavements. Promotion of Sustrans maps and bicycle user groups.	County Council/ Borough Council	2014	Ongoing	Cycle usage and walking provision. Number of cycle/foot path improvements.	Up to 1
17	With regard to National Planning Policy Framework,	Give appropriate weight to air quality in the decision making process.	Borough Council (LPA & Env. Quality Team)	Completed	2013	Production of documents.	Up to 1

	Measure	Focus	Lead	Planning phase	Implementation phase	Indicator	Target NO <sub>2</sub> reduction impact (µg/m <sup>3</sup> )
	include air quality considerations in the Local Plans and adopt an air quality Development Management Policy.						
18	With regard to National Planning Policy Framework, adopt Norfolk Technical Guidance on Air Quality and provide pre-application advice on planning applications.	Raise air quality concerns early in the decision making process and provide a technical framework.	Borough Council (LPA & Env. Quality Team)	2013	2013	Production of documents.	Up to 1
19	Consideration of Air Quality Impacts when providing comments on planning applications within an AQMA or where an AQMA could	Comment on pre-application discussions, advise planners on significance of impacts, agree conditions and S106 agreements.	Borough Council (LPA & Env. Quality Team)	Ongoing	Ongoing	Number of pre application discussions and planning applications responded to.	Up to 1

	Measure	Focus	Lead	Planning phase	Implementation phase	Indicator	Target NO <sub>2</sub> reduction impact (µg/m <sup>3</sup> )
	be impacted or created.						
20	Develop Parking Management Plan.	Smooth out traffic flow over the course of the day. Increase car park usage within Town Review car parking provision within King's Lynn layout, type and location Improve traffic flow through AQMA and reduce congestion	County Council/ Borough Council	2013	Ongoing	Publication of and implementation of plan.	Up to 2

## 10 Conclusions and Proposed Actions

### 10.1 Conclusions from New Monitoring Data

The review of 2013 monitoring data found that there were three NO<sub>2</sub> diffusion tube locations where the annual mean NO<sub>2</sub> objective was exceeded in 2013, two of which were inside the existing Town Centre AQMA. The remaining site was located at the Bus Station monitoring location. This site is not relevant of public exposure with regards to the annual mean NO<sub>2</sub> objective. From the 2012 – 2013 data it is unlikely that the hourly NO<sub>2</sub> objective would be exceeded at this location as the annual mean is less than 60µg/m<sup>3</sup>.

With regards to PM<sub>10</sub>, the 2013 results show that the annual mean and the 24-hour mean continued to be met at both TEOM monitoring locations within the Borough. All four Osiris sites showed compliance with the annual mean and 24-hour mean objectives in 2013.

### 10.2 Conclusions relating to New Local Developments

The Council has identified one biomass installation, at 52 Baptist Road, Upwell, Wisbech, which may impact on air quality in the Local Authority area. This will be taken into consideration in the next Updating and Screening Assessment when full emissions data is available.

There are three biomass installations identified in the 2012 Progress report for which full emissions and stack information were unavailable at that time. All three are located a considerable distance from the AQMAs and in rural locations, as such it is considered unlikely that they will lead to an exceedence of the air quality objectives for either PM<sub>10</sub> or NO<sub>2</sub>. King's Lynn and West Norfolk Borough Council will continue to liaise with relevant stakeholders to obtain the necessary information. These installations will also be assessed in the next Updating and Screening Assessment.

### 10.3 Proposed Actions

Proposed actions arising from the 2014 Annual Progress Report are as follows:

- Continue NO<sub>2</sub> diffusion tube and continuous monitoring in the Borough to identify future changes in pollutant concentrations;

- Undertake further monitoring at relevant receptors in the areas of Stoke Ferry and Page Stair Lane, King's Lynn, using a Defra approved method to confirm existing concentrations; proceed to a monitoring based Detailed Assessment in these areas;
- Continue to gather emission and stack information for the identified biomass installations to determine their potential impact upon air quality; and
- Proceed to the 2015 Updating and Screening Assessment.



## 11 References

- Local Air Quality Management Technical Guidance LAQM.TG(09). February 2009. Published by Defra in partnership with the Scottish Government, Welsh Assembly Government and Department of the Environment Northern Ireland
- King's Lynn and West Norfolk Borough Council 2012 Updating and Screening Assessment
- King's Lynn and West Norfolk Borough Council 2013 Annual Progress Report
- Air Quality Action Plan for the King's Lynn Town Centre and Gaywood Clock Air Quality Management Areas, 2013
- King's Lynn and West Norfolk Borough Council Local Development Framework – Core Strategy 2011
- King's Lynn Area Transportation and Land Use Study Stage 1 Final Report, March 2009
- Norfolk County Council's 3<sup>rd</sup> Local Transport Plan Strategic Environmental Assessment, First Monitoring Report 2011/12
- Environment Agency Information © Environment Agency and database right
- Air Pollution in the UK 2011 – Compliance Assessment Summary, AEA September 2012

## **12 Appendices**

Appendix A: Quality Assurance / Quality Control (QA/QC) Data

## Appendix A: QA:QC Data

### Diffusion Tube Bias Adjustment Factors

The diffusion tubes are supplied and analysed by Gradko utilising the 20% Triethanolamine (TEA) in water preparation method. A bias adjustment of 0.95 for the year 2013 (based on 24 studies) has been derived from the national bias adjustment calculator<sup>3</sup>.

### Factor from Local Co-location Studies

King's Lynn and West Norfolk Borough Council operate a continuous analyser and have a triplicate co-located tubes. The Local Bias Adjustment Factor is 0.9.

The survey had good precision and good data capture for the 11 periods of data used. May results were considered not valid due to a lab error.

Therefore the bias adjustment factor was calculated using 11 periods of data.

Location	Diffusion Tube Data capture	Continuous Monitor Data Capture	Diffusion Tube Annual Mean ( $\mu\text{g}/\text{m}^3$ )	Continuous Monitor Annual Mean ( $\mu\text{g}/\text{m}^3$ )	Ratio
Southgates Park, King's Lynn	97%	99%	29	26	0.9

### Discussion of Choice of Factor to Use

Data have been corrected using a bias adjustment factor, which is an estimate of the difference between diffusion tube concentrations and continuous monitoring, the latter assumed to be a more accurate method of monitoring. The technical guidance LAQM.TG (09) provides guidance with regard to the application of a bias adjustment factor to correct diffusion tubes. Triplicate co-location studies can be used to determine a local bias factor based on the comparison of diffusion tube results with data from  $\text{NO}_x$  /  $\text{NO}_2$  continuous analysers. Alternatively, the national database of diffusion tube co-location surveys provides bias factors for the relevant laboratory and preparation method.

<sup>3</sup> National Diffusion Tube Bias Adjustment Factor Spreadsheet, version 03/14 published in March 2014.

The May tube results have been removed from the dataset based on advice from the laboratory and National Physical Laboratory (NPL). All tube dispatched for the May exposure period are suspect and therefore should not be used in any assessments.

There are triplicate co-located tubes in the King’s Lynn and West Norfolk Borough Council area. Data capture for the continuous monitor located at Southgates Park was 98% for the year and 99% for the 11 periods of data used. Diffusion tube precision and data capture were good for the 11 periods. Therefore, the local bias adjustment factor of 0.9, based on 11 periods of data, has been used in the main body of the report. The National Bias Adjustment factor of 0.95, based on 24 studies, has been presented in the appendix for comparison.

For previous data, years 2008 to 2012, the bias adjustment factors have been taken from the Council’s previous LAQM annual reports. The factors used were 0.88 (2008), 0.97 (2009), 0.88 (2010), 0.89 (2011) and 0.84 (2012).

**PM Monitoring Adjustment**

Particulate monitoring adjustment is completed by Air Quality Data Management (AQDM).

**Short to Long Term Adjustment**

***Continuous Monitoring Sites***

Annualisation was required for the Southgates Park and North Lynn sites where data capture was below 90% during 2013 (the Southgates Park site was removed in March 2013 and the North Lynn site was added in August 2013). Therefore, the results for these sites were annualised for 2013 and the details are provided in the table below.

Continuous Monitoring Site	Norwich Lakenfields Annualisation Factor	Leamington Spa Annualisation Factor	Chesterfield Annualisation Factor	Average Annualisation Factor
Southgates King’s Lynn	0.65	0.74	0.71	0.70
North Lynn, King’s Lynn	1.23	1.28	1.17	1.22

**Diffusion Tubes**

Annualisation was required at six sites as detailed in the below table.

Site	Wicken Fen Annualisation Factor	Norwich Lakenfields Annualisation Factor	St Osyth Annualisation Factor	Average Annualisation Factor
Site 29 - Waterloo Street	0.827	0.851	0.869	0.849
Site 71 St Michael's, Saddlebow Road	0.997	0.953	0.980	0.977
Site 73 Main Road, West Winch	1.249	1.020	1.129	1.133
Site 79 Tennyson Ave	0.997	1.007	0.940	0.981
Site 80 Roydon 1	1.033	1.092	0.996	1.040
Site 81 Roydon 2	1.033	1.092	0.996	1.040

**QA/QC of Automatic Monitoring**

The sites are part of the National Automatic Monitoring Calibration Club, where data are managed to the same QA procedures and standards as the UK Automatic Urban and Rural Network (AURN) sites.

**QA/QC of Diffusion Tube Monitoring**

Gradko International Ltd is a UKAS accredited laboratory and participates in the Workplace Analysis Scheme for Proficiency (WASP) for NO<sub>2</sub> diffusion tube analysis and the Annual Field Inter-Comparison Exercise. These provide strict performance criteria for participating laboratories to meet, thereby ensuring NO<sub>2</sub> concentrations reported are of a high calibre. The lab follows the procedures set out in the Harmonisation Practical Guidance. In the latest available WASP results, rounds 120 through to 123 (January to December 2013) Gradko International have scored 100%. The percentage score reflects the results deemed to be satisfactory based upon the z-score of  $< \pm 2$ . Based on 24 studies, 96% of all local Authority co-location studies in 2013 were rated as 'good' (tubes are considered to have "good" precision where the coefficient of variation of duplicate or triplicate diffusion tubes for eight or more periods during the year is less than 20%).

Bureau Veritas Air Quality King's Lynn and West Norfolk Borough Council

Monthly Diffusion Tube Results 2013

Site Ref	NO <sub>2</sub> Concentrations µg/m <sup>3</sup>												COUNT	% CAPTURE	AVERAGE
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
1		43.0	39.0	37.0		34.0	39.0	38.0	39.0	49.0	45.0	49.0	10	83.3	41.2
2	58.0	45.0	44.0	41.0		48.0	51.0	56.0	52.0	54.0	77.0	50.0	11	91.7	52.4
3	55.0	54.0	40.0	40.0		43.0	47.0	45.0	43.0		51.0	51.0	10	83.3	46.9
5	59.0	48.0	38.0			43.0	43.0	51.0	45.0	45.0	62.0	54.0	10	83.3	48.8
6	32.6	31.8	31.2	27.4		23.4	24.1	23.5	26	30.9	37.3	37.4	11	91.7	29.6
7	33	29.8	30.3	25.9		23.4	16.7	24.4	25.5	27.5	40.6	35.5	11	91.7	28.4
8	36.9	33.5	29.3	24.8		21.9	22.4	24.2	25.6	29.1	35.2		10	83.3	28.3
9	38.0	27.0	30.0	21.0		19.0	22.0	18.0	21.0	24.0	32.0	28.0	11	91.7	25.5
10	43.0	40.0	47.0	40.0		39.0	47.0	41.0	42.0	41.0		48.0	10	83.3	42.8
11	42.0	32.0	28.0	26.0		26.0	30.0	31.0	30.0	34.0	37.0		10	83.3	31.6
12	42.0	35.0	32.0	31.0		32.0	32.0	38.0	37.0	38.0	49.0	44.0	11	91.7	37.3
13	44.0	36.0	33.0	28.0		27.0	29.0	31.0	32.0	34.0	44.0	38.0	11	91.7	34.2
14	45.0	32.0	34.0	35.0		31.0	34.0	38.0	37.0	41.0	52.0	42.0	11	91.7	38.3
15	47.0	42.0	41.0	40.0		21.0	44.0	42.0	42.0	41.0	49.0	39.0	11	91.7	40.7
18	38.0	29.0	29.0	24.0		23.0	26.0	29.0	26.0	29.0	37.0	33.0	11	91.7	29.4
19	33.0	29.0	28.0	23.0		20.0	22.0	26.0	25.0	29.0	36.0	32.0	11	91.7	27.5
20	42	39	43	32		34	38	33	35	39	39	36	11	91.7	37.3
22	45	41	44	33		27	41	34	34	36	46	26	11	91.7	37.0
23	40	41	54	41		43	44	34	32	35	44	35	11	91.7	40.3
24	28	42	51	36		38	40	30	33	34	36	29	11	91.7	36.1
25	26	20	18	13		11	13	8	18	20	28	26	11	91.7	18.3
26	41	40	45	39		43	41	42	39	38	48	39	11	91.7	41.4
27	35	31	30	30		36	35		34	30	43	34	10	83.3	33.8
28	41	33	30	28		31	36	38	35		45	40	10	83.3	35.7
29	28	24	22	18					22	20	32	28	8	66.7	24.3
30	29	28	26	21		21	21	23	24	24	35	27	11	91.7	25.4
31	44	39	38	34		32	34	33	27	37	41	41	11	91.7	36.4
32	40	34	35	31		30	31	32	32	33	40	36	11	91.7	34.0
33	38	37	9	26		27	27	29	31	33	37	35	11	91.7	29.9
34	42	32	33	22		31	30	38	37	34	49		10	83.3	34.8
35	37	33	30	27		30	24	35	35	33	44	38	11	91.7	33.3
36	33	37	34	23		28	30	30	27	32	38	37	11	91.7	31.7

Bureau Veritas Air Quality

King's Lynn and West Norfolk Borough Council

37	39	39	42	29		30	35	39	39	46	46	46	11	91.7	39.1
38	49	39	35	32		33	34	30	32	30	42	31	11	91.7	35.2
39	32	32	28	26		23	30	30	30		37	37	10	83.3	30.5
40	34	36	32	33		27	32	35	34	37	44	44	11	91.7	35.3
41	44	42	43	41		36	44	36	38	39	49	42	11	91.7	41.3
42	38	35	31	30		30	31	33	27	36	46	39	11	91.7	34.2
43	34	37	31	28		30	34	33	34	32	47	34	11	91.7	34.0
44	40	40	42	36		38	45	37	37	36	45	38	11	91.7	39.5
45	36	39	42	31		33	33	28	32	31	45		10	83.3	35.0
46	35	32	34	24		26	26	24	27	25	40	28	11	91.7	29.2
47	42		45	31		34	38	33	35	36	45	38	10	83.3	37.7
48	33	32	30	24		26	29	32	34	40	44	45	11	91.7	33.5
51	30	25	21	16		15	18	16	20	24	28	27	11	91.7	21.8
52	36	35	35	28		31	24	30	32	32	42	34	11	91.7	32.6
58	40	37	40	28		28	31	25	31	35	40	33	11	91.7	33.5
61	26	21	17	15		11	13	15	18	19	28	23	11	91.7	18.7
62	26	21	17	15		12	14	16	19	22	28	26	11	91.7	19.6
63	18	15	13	10		7	8	8	12	13	20	16	11	91.7	12.7
64	18	15	14	9		7		8	12	12	15	16	10	83.3	12.6
65	0	0	0	0		0	0	0	0	0	0	0	11	91.7	0.0
66	31	27	23	19		19	19	21	23	25	35	30	11	91.7	24.7
67	27	21	16	14		12	13	17	20	22	29	31	11	91.7	20.2
68	25	24	24	17		18	18	20	23	24	34	30	11	91.7	23.4
69	19	19	21	13		10	11	7	15	16	20	18	11	91.7	15.4
70	7	18	16	12		8	11	10	13	21	18	19	11	91.7	13.9
71		22	18			13	9			24	26		6	50.0	18.7
72	23	19	16	11		8	9	10	14	15	22	10	11	91.7	14.3
73	31	34	32	20		25	28	22					7	58.3	27.4
74	21	20	19	14		13	12	13	16	16		17	10	83.3	16.1
75	41	42	43	31		33	34	36	41	36	43	45	11	91.7	38.6
76	28	21	18	16		14			22	27	27	28	9	75.0	22.3
77	27	22	13	15		11	14		23	19	11	23	10	83.3	17.8
78		14	11	11		7	8	8	11	16	21	17	10	83.3	12.4
79			38	27			36	39	44	41	48	40	8	66.7	39.1
80				7		8	5	9	11	14	14	15	8	66.7	10.4
81				6		4	5	7	6	15	23	18	8	66.7	10.5

## 2013 Diffusion Tube Results – National Bias Adjustment Factor

Site ID	Site Type	Within AQMA?	Annual Mean Concentration ( $\mu\text{g}/\text{m}^3$ ) - Adjusted for Bias	
			2013 (National Bias Adjustment Factor = 0.95)	2013 (Local Bias Adjustment Factor = 0.90)
1	Kerbside	Y – Town Centre	39.1	37.1
2	Roadside	Y – Town Centre	49.7	47.1
3	Roadside	Y – Town Centre	44.6	42.2
5	Roadside (Bus Station)	N	46.4	43.9
6,7,8	Roadside	Y – Town Centre	27.3	25.9
9	Roadside	N	24.2	22.9
10	Roadside	Y	40.7	38.5
11	Roadside	Y – Town Centre	30.0	28.4
12	Roadside	Y – Town Centre	35.4	33.5
13	Roadside	Y – Town Centre	32.5	30.8
14	Roadside	Y – Town Centre	36.4	34.4
15	Roadside	Y – Town Centre	38.7	36.7
18	Roadside	N	27.9	26.4
19	Roadside	N	26.2	24.8



Site ID	Site Type	Within AQMA?	Annual Mean Concentration ( $\mu\text{g}/\text{m}^3$ ) - Adjusted for Bias	
			2013 (National Bias Adjustment Factor = 0.95)	2013 (Local Bias Adjustment Factor = 0.90)
20	Kerbside	Y – Town Centre	35.4	33.5
22	Roadside	Y – Town Centre	35.2	33.3
23	Roadside	Y – Town Centre	38.3	36.2
24	Roadside	Y – Town Centre	34.3	32.5
25	Urban Background	N	17.4	16.4
26	Roadside	Y – Town Centre	39.3	37.2
27	Roadside	Y – Town Centre	32.1	30.4
28	Roadside	Y – Town Centre	33.9	32.1
29	Kerbside	N	19.6*	18.5*
30	Kerbside	N	24.1	22.8
31	Kerbside	Y – Town Centre	34.5	32.7
32	Roadside	Y – Town Centre	32.3	30.6
33	Kerbside	N	28.4	26.9
34	Roadside	Y – Town Centre	33.1	31.3
35	Roadside	Y – Town Centre	31.6	29.9

Site ID	Site Type	Within AQMA?	Annual Mean Concentration ( $\mu\text{g}/\text{m}^3$ ) - Adjusted for Bias	
			2013 (National Bias Adjustment Factor = 0.95)	2013 (Local Bias Adjustment Factor = 0.90)
36	Roadside	Y – Town Centre	30.1	28.6
37	Roadside	Y – Town Centre	37.1	35.2
38	Roadside	Y – Town Centre	33.4	31.7
39	Roadside	N	29.0	27.5
40	Roadside	Y – Gaywood Clock	33.5	31.7
41	Roadside	Y – Gaywood Clock	39.2	37.1
42	Roadside	Y – Gaywood Clock	32.5	30.8
43	Roadside	Y – Gaywood Clock	32.3	30.6
44	Roadside	Y – Gaywood Clock	37.5	35.5
45	Roadside	N	33.3	31.5
46	Roadside	N	27.7	26.3
47	Roadside	Y – Town Centre	35.8	33.9
48	Roadside	Y – Town Centre	31.9	30.2
51	Roadside	N	20.7	19.6

Site ID	Site Type	Within AQMA?	Annual Mean Concentration ( $\mu\text{g}/\text{m}^3$ ) - Adjusted for Bias	
			2013 (National Bias Adjustment Factor = 0.95)	2013 (Local Bias Adjustment Factor = 0.90)
52	Roadside	N	31.0	29.4
58	Roadside	N	31.8	30.1
61	Roadside	N	17.8	16.9
62	Roadside	N	18.7	17.7
63	Roadside	N	12.1	11.5
64	Roadside	N	12.0	11.3
66	Urban Background	N	23.5	22.3
67	Urban Background	N	19.2	18.2
68	Urban Background	N	22.2	21.0
69	Urban Background	N	14.6	13.8
70	Urban Background	N	13.2	12.5
71	Urban Background	N	17.3*	16.4*
72	Roadside	N	13.6	12.8
73	Urban Background	N	29.5*	28.0*
74	Roadside	N	15.3	14.5
75	Roadside	Y	36.7	34.8
76	Roadside	N	21.2	20.1
77	Near-Road	N	16.9	16.0

Site ID	Site Type	Within AQMA?	Annual Mean Concentration ( $\mu\text{g}/\text{m}^3$ ) - Adjusted for Bias	
			2013 (National Bias Adjustment Factor = 0.95)	2013 (Local Bias Adjustment Factor = 0.90)
78	Urban background	N	11.8	11.2
79	Roadside	N	36.5*	34.6*
80	Suburban	N	10.3*	9.7*
81	Suburban	N	10.4*	9.8*

\* Results were annualised.