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## 2012 Air Quality Updating and Screening Assessment for *Waveney District Council*

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

October 2012

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## Executive Summary

This Updating and Screening report has been produced as part of Waveney District Council's requirement to assess present and predicted future air quality against the objectives prescribed by the Air Quality Regulations 2000 (as amended). If an exceedence of any objective is considered likely, there is a requirement to proceed to a detailed assessment of that pollutant and to declare an Air Quality Management Area (AQMA), if the exceedence is confirmed. The Local Air Quality Management process set out in the Part IV of the Environment Act (1995), the Air Quality Strategy for England, Scotland, Wales and Northern Ireland (2007) and the relevant Policy and Technical Guidance documents have all been followed.

In order to assess air quality in Waveney District, this report considers new monitoring data as well as assessing the impact of new development on air quality in the district.

Air quality data is available in Lowestoft from a continuous analyser located in Belvedere Road, which measures oxides of nitrogen and a network of 8 passive diffusion tube sites measuring NO<sub>2</sub> at relevant roadside locations on the A146, A1117 and A12, the major A-roads which pass through Lowestoft. One diffusion tube has been used to measure urban background concentrations of NO<sub>2</sub> at a central location in Lowestoft. Further diffusion tubes have been used in a triplicate co-location study with the continuous analyser.

A new diffusion tube air quality monitoring site has been established at Ingate in the Market Town of Beccles.

The annual mean concentrations of NO<sub>2</sub> obtained from the diffusion tube survey at the monitoring sites indicate that the national air quality objectives are unlikely to be exceeded anywhere in the district in 2012..Monitoring of NO<sub>2</sub> will continue in the Port area because of the elevated annual mean concentration measured at the Pier Terrace site. An additional diffusion tube will be located at the Pier Terrace location in 2012.

Monitoring will also be continued in Ingate, at the new diffusion tube monitoring site because of the relatively high levels of NO<sub>2</sub> measured at the location in 2011. A second tube will be added to the monitoring programme in the Ingate area, closer to the Ingate/St Mary's Road junction. Although the measured level of NO<sub>2</sub> at this location was elevated it was still well below the target set by the national air quality objectives. A second years monitoring at this location with an additional tube in situ will provide a more accurate picture of the air quality at the location.

There are no newly identified or proposed point or diffuse sources which are likely to have a significant impact on air quality in the Waveney District.

The conclusion is that there is no need for Waveney District Council to proceed to a detailed assessment in 2012 for any of the pollutants considered in this assessment. It is recommended that there is no need for Waveney District Council to proceed to a Detailed Air Quality Assessment at any of the locations surveyed

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# **1 Introduction**

## **1.1 Description of Local Authority Area**

Population 117,700 (2009)

Situated in the northeast corner of Suffolk, Waveney District is bordered by the River Waveney in the north and the River Blyth in the south. The main urban conurbation is Lowestoft, which is a North Sea port and the second largest town in Suffolk.

Lowestoft sustains a variety of industries including food processing and engineering. The Port handles general cargo and is a base for servicing off-shore oil and wind energy installations.

Apart from Lowestoft the main urban centres are Beccles and Bungay situated on the River Waveney adjacent to the Norfolk border and Southwold and Halesworth, both on the River Blyth. The centre of the district is agricultural and is sparsely populated. The whole district has a steadily developing holiday trade.

## **1.2 Purpose of Report**

This report fulfils the requirements of the Local Air Quality Management process as set out in Part IV of the Environment Act (1995), the Air Quality Strategy 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 Air Quality Management Area (AQMA) and prepare an Air Quality Action Plan (AQAP) setting out the measures it intends to put in place in pursuit of the objectives.

The objective of this Updating and Screening Assessment is to identify any matters that have changed which may lead to risk of an air quality objective being exceeded. A checklist approach and screening tools are used to identify significant new sources or changes and whether there is a need for a Detailed Assessment. The USA report should provide an update of any outstanding information requested previously in Review and Assessment reports.



### 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 microgrammes per cubic metre  $\mu\text{g}/\text{m}^3$  (milligrammes 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 Objectives 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 $\mu\text{g}/\text{m}^3$	Running annual mean	31.12.2010
1,3-Butadiene	2.25 $\mu\text{g}/\text{m}^3$	Running annual mean	31.12.2003
Carbon monoxide	10.0 $\text{mg}/\text{m}^3$	Running 8-hour mean	31.12.2003
Lead	0.5 $\mu\text{g}/\text{m}^3$	Annual mean	31.12.2004
	0.25 $\mu\text{g}/\text{m}^3$	Annual mean	31.12.2008
Nitrogen dioxide	200 $\mu\text{g}/\text{m}^3$ not to be exceeded more than 18 times a year	1-hour mean	31.12.2005
	40 $\mu\text{g}/\text{m}^3$	Annual mean	31.12.2005
Particles (PM <sub>10</sub> ) (gravimetric)	50 $\mu\text{g}/\text{m}^3$ , not to be exceeded more than 35 times a year	24-hour mean	31.12.2004
	40 $\mu\text{g}/\text{m}^3$	Annual mean	31.12.2004
Sulphur dioxide	350 $\mu\text{g}/\text{m}^3$ , not to be exceeded more than 24 times a year	1-hour mean	31.12.2004
	125 $\mu\text{g}/\text{m}^3$ , not to be exceeded more than 3 times a year	24-hour mean	31.12.2004
	266 $\mu\text{g}/\text{m}^3$ , not to be exceeded more than 35 times a year	15-minute mean	31.12.2005

## **1.4 Summary of Previous Review and Assessments**

Detailed reviews of air quality within the Waveney District have concluded that the standards and objectives contained within the National Air Quality Strategy would be achieved by the relevant dates and accordingly it has not been necessary to declare any Air Quality Management Areas within the District at any time.

### **1.4.1 First Round of Review and Assessment**

Waveney District Council completed the first round of air quality review and assessment in 2000, concluding that the risk of any of the UK air quality objectives being exceeded was negligible.

### **1.4.2 Second Round Review and Assessment**

The Second Round Updating and Screening Assessment for Waveney District Council was published in May 2003. This assessment indicated that three specific and very localised areas (all associated with busy road junctions) needed a more detailed assessment to be sure that air quality in the Waveney District was still on target to meet the relevant criteria. However, further assessment determined that concentrations did not exceed 2004 objectives. The report recommended that a detailed survey of traffic flow at all three locations be commissioned when the South Lowestoft Relief Road bypass was opened.

In 2005, the Progress Report commissioned by Waveney District Council recommended that although there had been no exceedences of the air quality objectives in 2004, significant developments in Lowestoft town centre warranted monitoring of NO<sub>2</sub> and traffic flow to assess the effects on air quality.

### **1.4.3 Third Round of Review and Assessment**

The Updating and Screening Assessment completed for Waveney District Council in May 2006 predicted that no exceedences of the air quality objectives for the UK would occur in Waveney. The review concluded that whilst there were no areas of

the District exposed to levels of pollution exceeding national guidelines, it was necessary to keep the situation under review to monitor the effects of the new South Lowestoft Relief Road. In particular, an “Urban Traffic Management and Control” system was proposed, to improve traffic flow and a real time pollution monitor to be installed at a key point in Belvedere Road. The area in close proximity to the Port was identified as requiring further monitoring and as a consequence a new diffusion tube survey at Mill Road was established in 2007, which did show concentrations of NO<sub>2</sub> close to the objectives albeit with small data sets

#### **1.4.4 The Fourth Round of Review and Assessment**

The 2009 Air Quality Updating and Screening Assessment commissioned by Waveney District Council concluded that there was no need to proceed to a Detailed Assessment in 2009 for any of the pollutants considered in the assessment. However it was recommended that monitoring should continue in the Mill Road area due to possible exceedence of air quality objectives in the area of the Port. There were no new developments nor existing sources identified in Waveney District that were likely to significantly affect air quality at locations with relevant public exposure.

In 2010, the Progress Report prepared by Waveney District Council recommended that although there had been no exceedences of the air quality objectives in 2009, monitoring of NO<sub>2</sub> and traffic flow to assess the effects on air quality should continue in the area of the Port. It was also recommended that the location of diffusion tube monitoring stations should be reviewed to ensure that the relevant public exposure to NO<sub>2</sub> concentrations are measured with more confidence.

The 2011 Progress Report prepared by Waveney District Council recommended that monitoring of NO<sub>2</sub> should continue in the Port area. There were no exceedences of the air quality objectives in 2010 for any of the pollutants considered in the report. Larger data sets confirmed that an exceedence of the national air quality objectives was unlikely in Mill Road.

## 2 New Monitoring Data

### 2.1 Summary of Monitoring Undertaken

#### 2.1.1 Automatic Monitoring Sites

There is one automatic continuous air quality monitor, which is operated by Suffolk County Council and this measures the concentration of NO<sub>2</sub> and oxides of nitrogen. The monitor is located by the roadside in Belvedere Road, Lowestoft, in close proximity to the Port. Data from the Belvedere Road site can be found at [www.airquality.co.uk](http://www.airquality.co.uk). Other pollutants considered by this report are not measured by the monitor.

Routine calibrations and periodic site audits are carried out every two weeks by Waveney District.

Figure 2.1 Map of the Automatic Monitoring Site in Belvedere Road, Lowestoft



Table 2.1 Details of Automatic Monitoring Sites

<b>Site Name</b>	<b>Site Type</b>	<b>X OS GridRef</b>	<b>Y OS Grid Ref</b>	<b>Pollutants Monitored</b>	<b>In AQMA?</b>	<b>Monitoring Technique</b>	<b>Relevant Exposure? (Y/N with distance (m) to relevant exposure)</b>	<b>Distance to kerb of nearest road (N/A if not applicable)</b>	<b>Does this location represent worst-case exposure?</b>
Belvedere Road	Roadside.	X654651	Y292619	NO <sub>2</sub>	No	Chemiluminescent	No	1.8m	Y

### 2.1.2 Non-Automatic Monitoring Sites

There is one new monitoring site in Waveney District and none have been discontinued since the 2009 Updating and Screening Report.

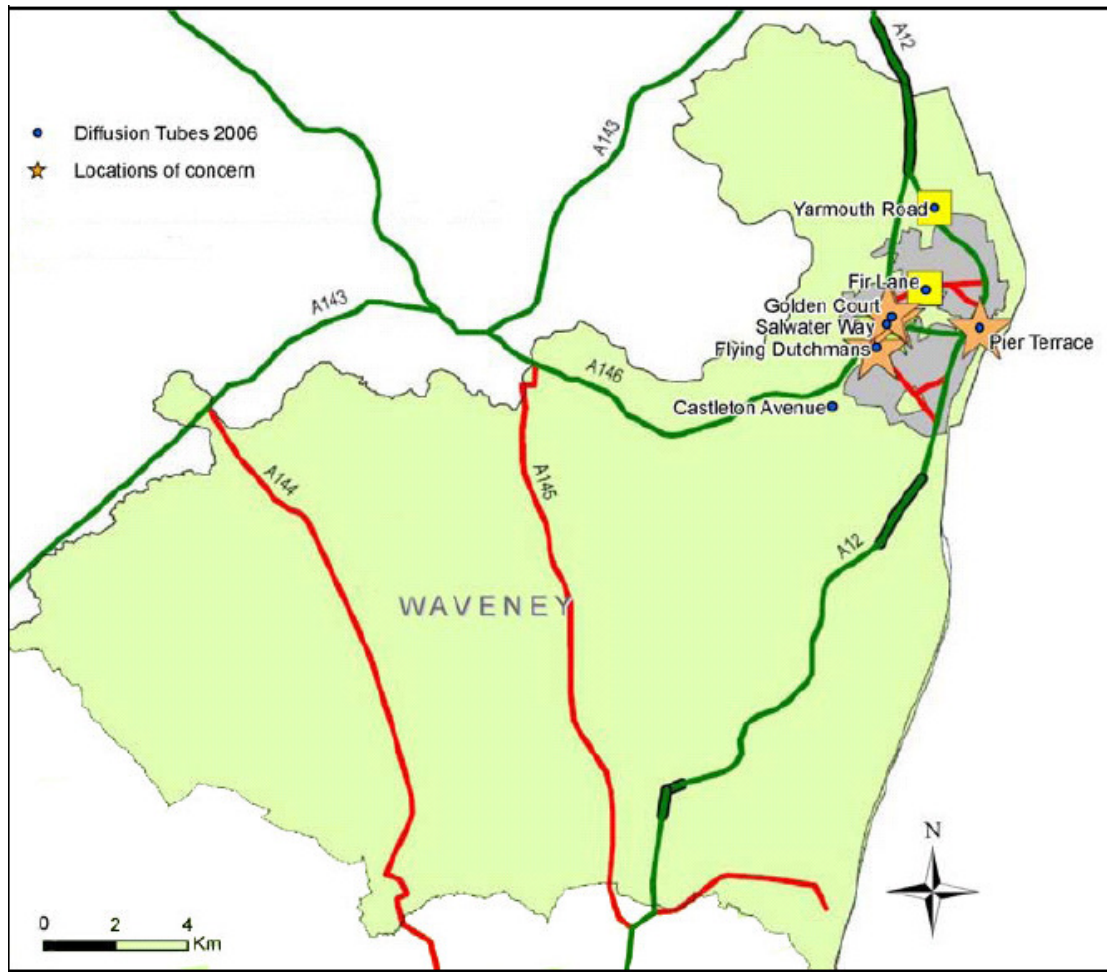
A network of 9 NO<sub>2</sub> diffusion tube monitoring sites extend coverage around the main urban centre of Lowestoft. The sites are situated around the Port area and by the roadside of busy roundabouts on the major A-roads which pass through the town. One diffusion tube has been situated centrally to measure urban background levels of NO<sub>2</sub>.

A new roadside site has been established at Ingate in Beccles. No other non-automatic monitoring is carried out to measure the other pollutants considered in this report.

A triplicate co-location study using diffusion tubes is established at the site of the continuous air quality monitor.

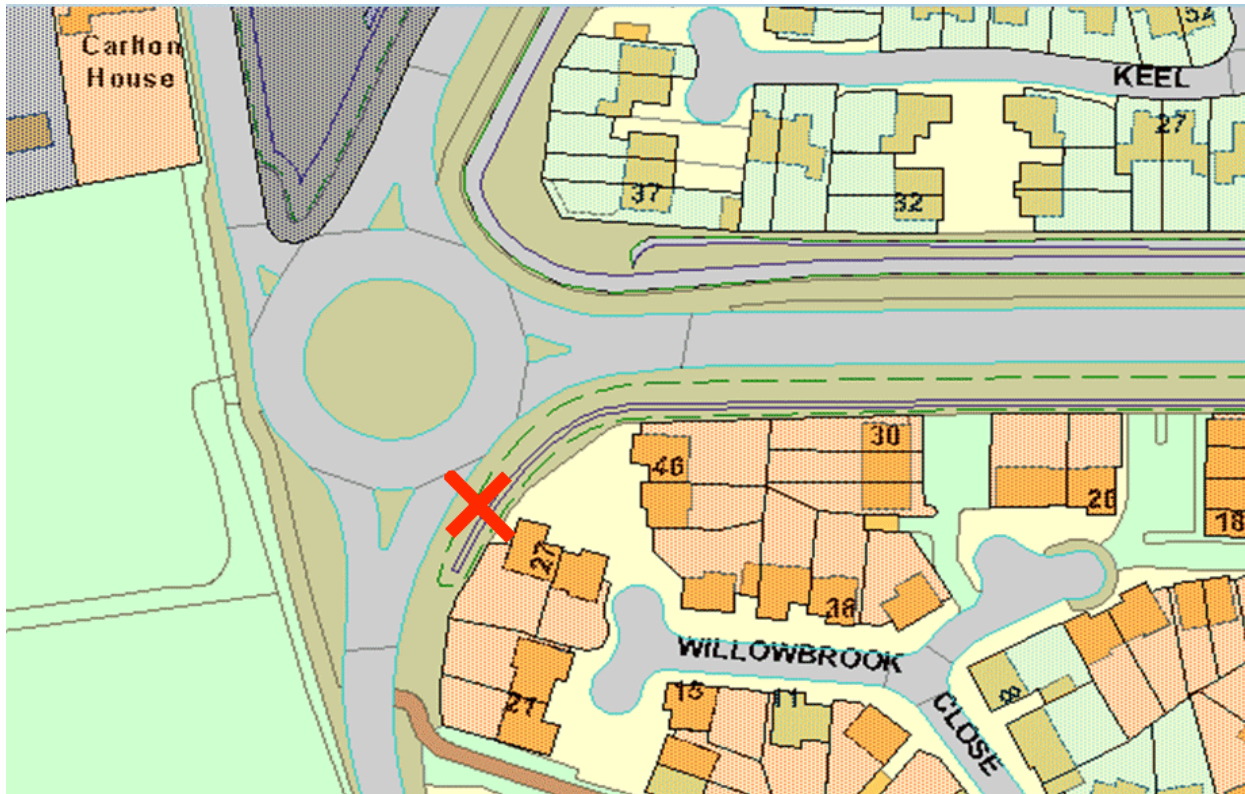
Details of the QA/QC of the diffusion tubes are included in Appendix 1.

Figure 2.2 Maps of Non-Automatic Monitoring Sites



NO<sub>2</sub> monitoring sites in Waveney district  
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**Diffusion Tube Site 1: Castleton Avenue, Carlton Colville.**



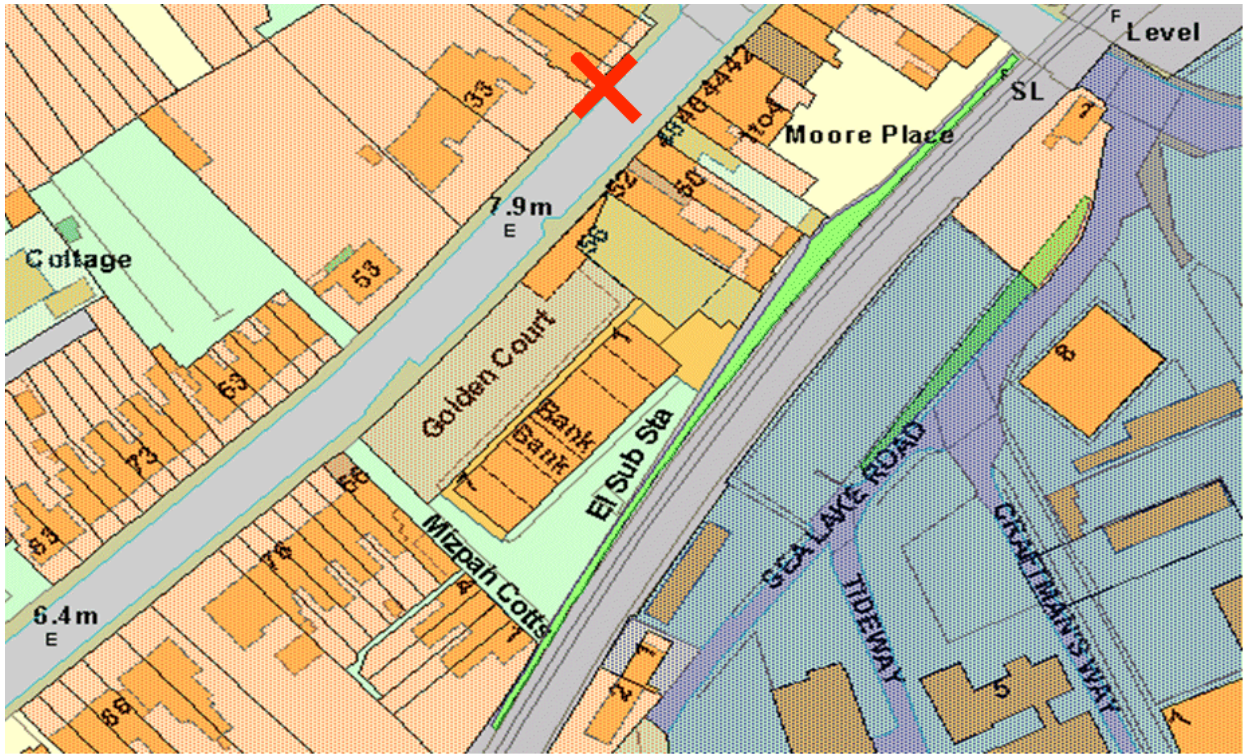
**Diffusion Tube Site 2: Fir Lane, Lowestoft**



**Diffusion tube site 3 :The Flying Dutchman, Cotmer Road, Oulton Broad**



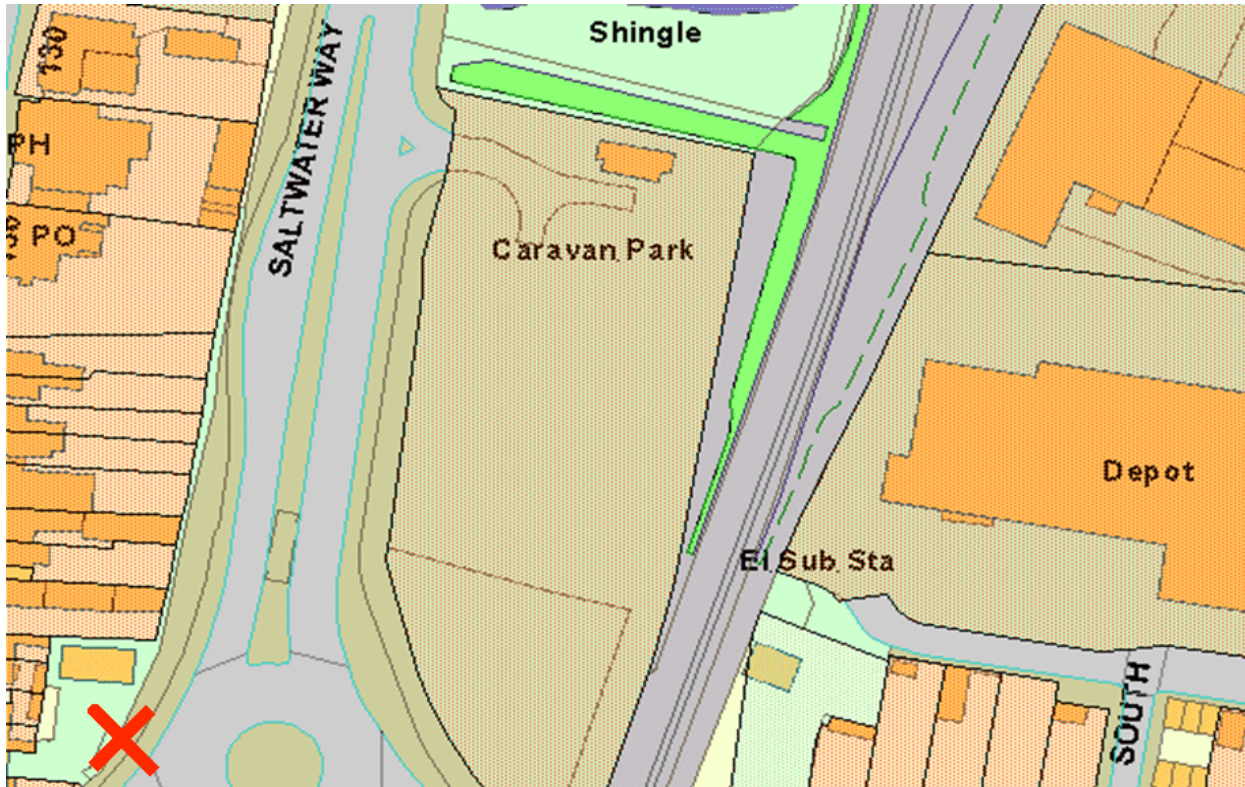
**Diffusion tube site 3 :The Flying Dutchman, Cotmer Road, Oulton Broad**



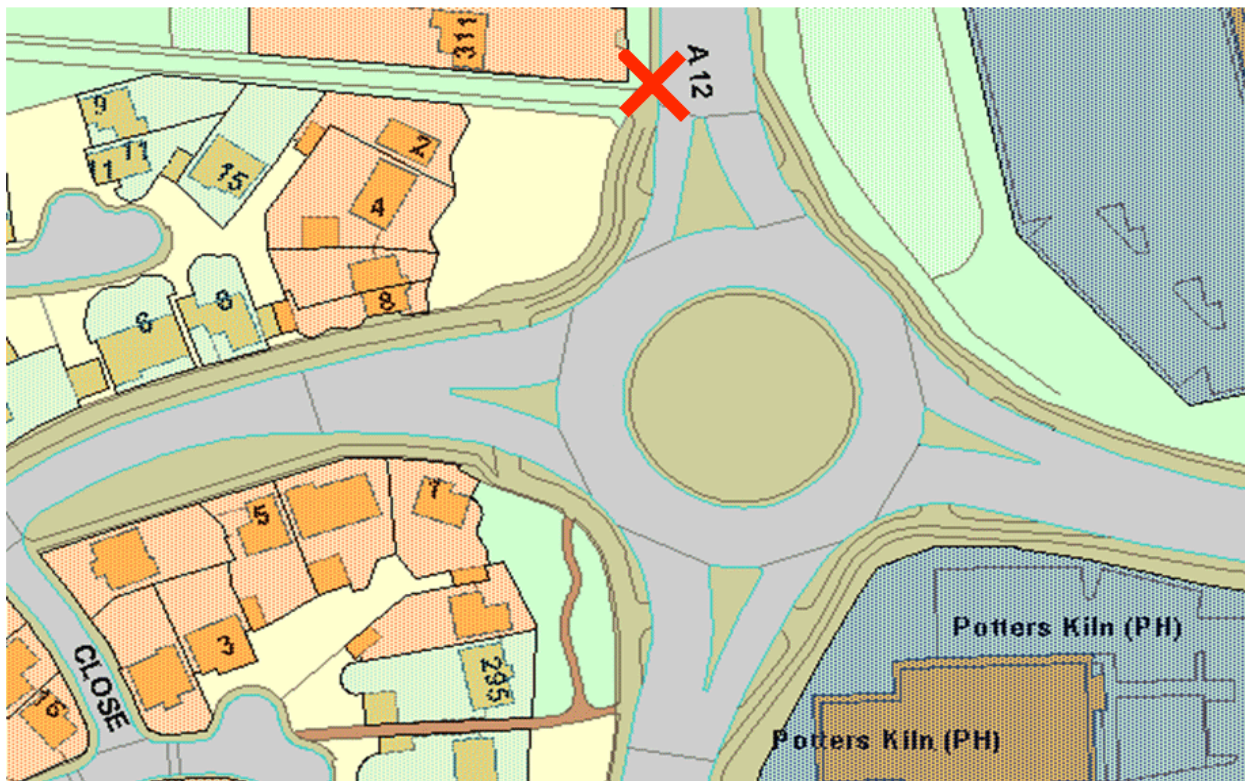
**Diffusion Tube Site 4 : Golden Court, Bridge Road, Oulton Broad**



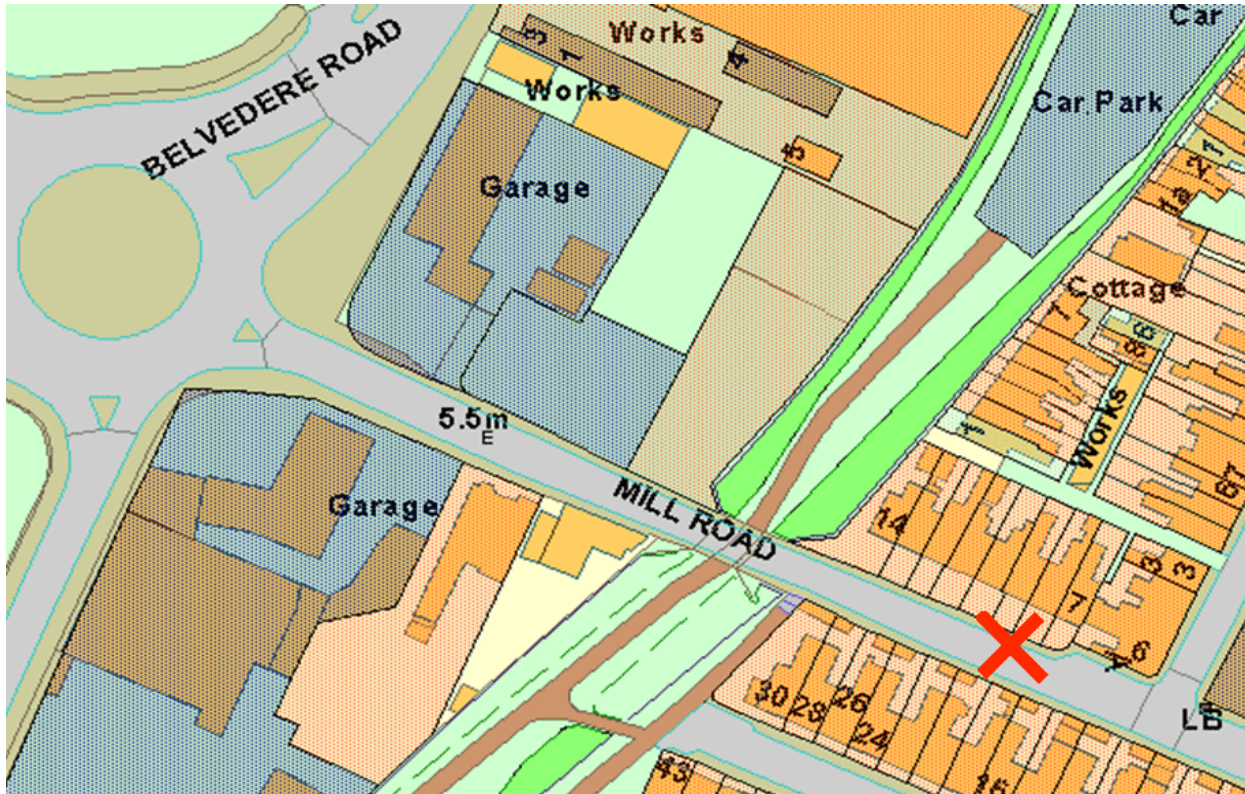
**Diffusion Tube Site 5 : Pier Terrace/Belvedere Road, Lowestoft**



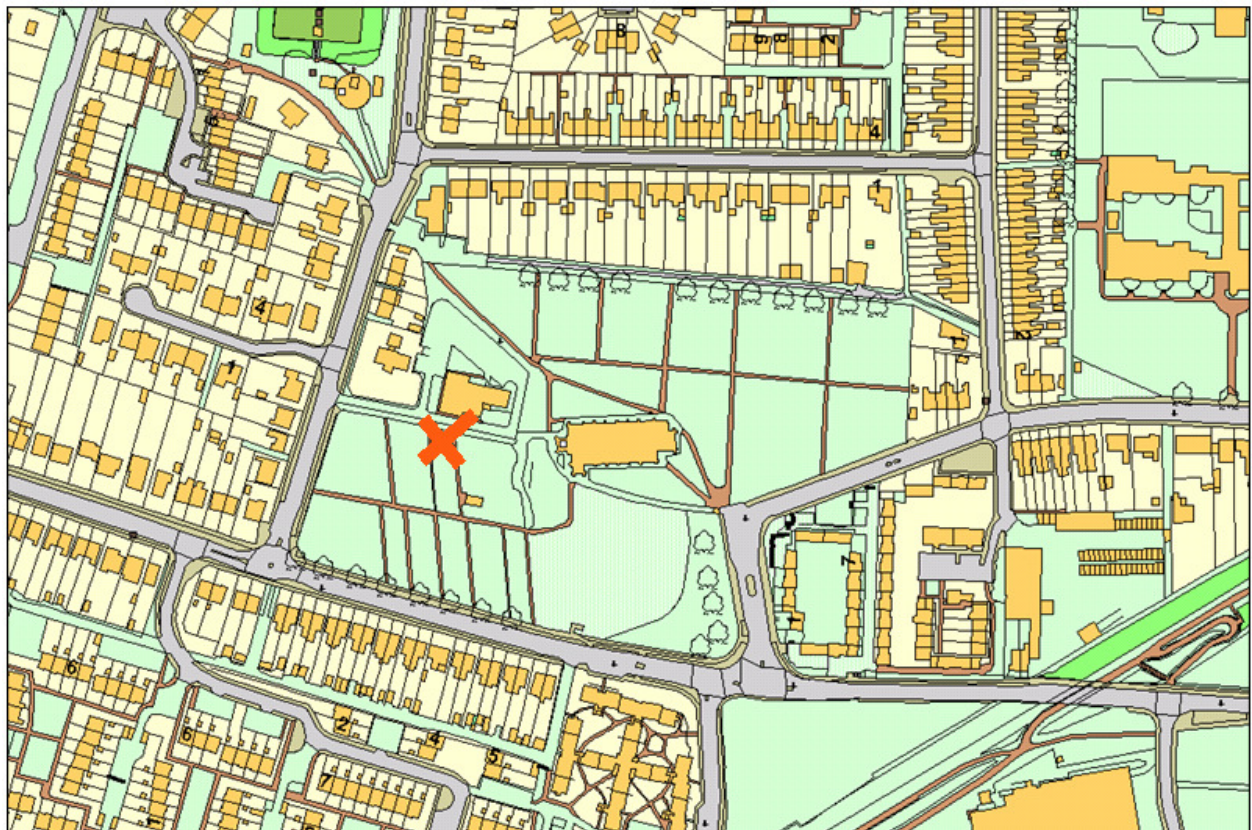
**Diffusion Tube Site 6 : Saltwater Way, Oulton Broad**



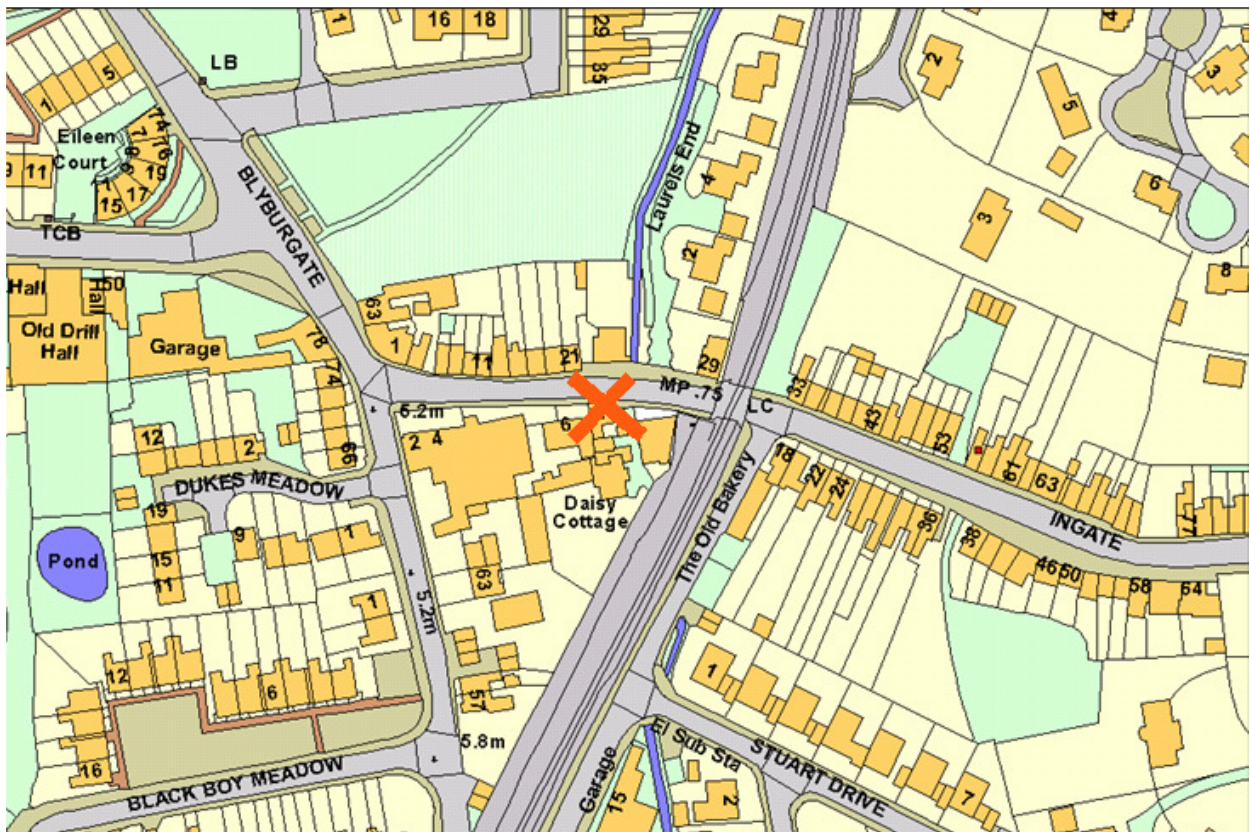
**Diffusion Tube Site 7 : Yarmouth Road, Lowestoft**



**Diffusion Tube Site 8 : Mill Road, Lowestoft**



**Diffusion Tube Monitoring Site 9 St Margaret's Churchyard**



**Diffusion Tube Site 13 : Ingate, Beccles**

Table 2.2 Details of Non-Automatic Monitoring Sites

Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Is monitoring collocated with a Continuous Analyser (Y/N)	Relevant Exposure? (Y/N with distance (m) to relevant exposure)	Distance to kerb of nearest road (N/A if not applicable)	Does this location represent worst-case exposure?
Castleton Avenue	Roadside	X650608	Y290476	NO <sub>2</sub>	N	N	Y (17m)	1.9m	Y
Fir lane	Roadside	X653220	Y293794	NO <sub>2</sub>	N	N	Y (6m)	0.5m	Y
Dutchmans Court	Roadside	X651885	Y292103	NO <sub>2</sub>	N	N	Y (5m)	2.4m	Y
Golden Court	Roadside	X652301	Y293016	NO <sub>2</sub>	N	N	Y (4.0m)	2.0m	Y
Pier Terrace	Roadside	X654658	Y292598	NO <sub>2</sub>	N	N	Y(7.0m)	3.0m	Y
Saltwater Way	Roadside	X652498	Y292751	NO <sub>2</sub>	N	N	Y (6.0m)	3.0m	Y
Yarmouth Road	Roadside	X653049	Y295534	NO <sub>2</sub>	N	N	Y(8.5m)	0.5m	Y
Mill Road	Roadside	X654470	Y292395	NO <sub>2</sub>	N	N	Y (6.8)	1.2m	Y
St Margaret's Churchyard	Urban Background	X654305	Y293914	NO <sub>2</sub>	N	N	N	N/A	N/A
Belvedere Road co-location study	Roadside	X654651	Y292619	NO <sub>2</sub>	N	Y	N	N	Y
Belvedere Road co-location study	Roadside	X654651	Y292619	NO <sub>2</sub>	N	Y	N	N	Y
Belvedere Road co-location study	Roadside	X654651	Y292619	NO <sub>2</sub>	N	Y	N	N	Y

Waveney District Council

<b>Site Name</b>	<b>Site Type</b>	<b>X OS Grid Ref</b>	<b>Y OS Grid Ref</b>	<b>Pollutants Monitored</b>	<b>In AQMA?</b>	<b>Is monitoring collocated with a Continuous Analyser (Y/N)</b>	<b>Relevant Exposure? (Y/N with distance (m) to relevant exposure)</b>	<b>Distance to kerb of nearest road (N/A if not applicable)</b>	<b>Does this location represent worst-case exposure?</b>
Ingate, Beccles	Roadside	X642614	289906	NO <sub>2</sub>	N	N	Y	1.200	Y



## 2.2 Comparison of Monitoring Results with AQ Objectives

### 2.2.1 Nitrogen Dioxide

#### Automatic Monitoring Data

The data obtained by the monitor has been ratified from the start of monitoring in June 2008 through to December 2011.

The 2011 annual mean for the Belvedere Road site was 29.0  $\mu\text{g}^3$  (annualised) and 28.5  $\mu\text{g}^3$  (monitored average mean). Data capture at Belvedere Road during 2011 was 46.7%, which is well below the 90% threshold desirable for LAQM purposes. Therefore conclusions drawn from the monitoring data should be treated with caution as they may not be representative of the full monitoring period.

The data indicates that there were no exceedences of the national annual mean  $\text{NO}_2$  objective at the Belvedere Road location in 2011. There were also no exceedences of the hourly mean  $\text{NO}_2$  objective, and the 99.8<sup>th</sup> percentile of hourly mean  $\text{NO}_2$  concentration was 137.4  $\mu\text{g}^3$ .

The annualisation calculation and the choice of AURN comparison sites are included as an appendix. The methodology in Box 3.2 TG(9) has been used to estimate the annual mean concentrations from short-term monitoring data.

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**Table 2.3 Results of Automatic Monitoring of Nitrogen Dioxide: Comparison with Annual Mean Objective**

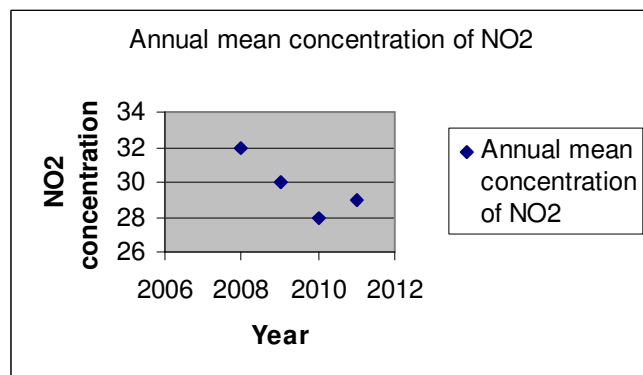
Site ID	Site Type	Within AQMA?	Valid Data Capture for period of monitoring %	Valid Data Capture 2011 %	Annual Mean Concentration $\mu\text{g}/\text{m}^3$				
					2007	2008	2009	2010	2011
A1	Roadside	N	46.7	46.7	n/a	32.0	30.0	28.0	29.0

**Table 2.4 Results of Automatic Monitoring for Nitrogen Dioxide: Comparison with 1-hour mean Objective**

Site ID	Site Type	Within AQMA?	Valid Data Capture for period of monitoring %	Valid Data Capture 2011 %	Number of Exceedences of Hourly Mean (200 µg/m <sup>3</sup> )				
					2007	2008	2009	2010	2011
A1	Roadside	N	46.7	46.7	N/A	0(181)	0(126.7)	0	0(137.4)

There have been no exceedences of the 1-hour mean objective. The 99.8<sup>th</sup> percentile of the hourly means (in brackets) have been used in years 2008, 2009 and in 2011 because the period of valid data was less than 90% of a full year.

**Figure 2.3 Trends in Annual Mean Nitrogen Dioxide Concentrations measured at the Automatic Monitoring Site at Belvedere Road**



Trends in the measured concentration of nitrogen dioxide captured by the automatic monitor during a four year period (2008-2011) show a reduction for three years and then a small rise in 2011. The average mean values in 2008, 2009 and 2011 were all annualised because of poor data capture and in contrast the greatest reduction of nitrogen dioxide occurred in 2010 when data capture was good. It should be noted that the mean values are well below the national air quality objective standards. Although the annualised results should be treated with caution when attempting to identify trends, it is encouraging to find that the annualised mean concentrations do not vary much from annual mean concentration calculated during a year of good data capture.

## Diffusion Tube Monitoring Data

The diffusion tubes were exposed according to the calendar of suggested exposure periods for 2011 and the monitoring period at all diffusion tube sites was twelve months

A full dataset of monthly mean values is included as an appendix.

Results have been distance adjusted to predict the NO<sub>2</sub> concentration at the nearest relevant receptor and the methodology for this calculation is included as an appendix.

Results have been bias adjusted and the decisions behind the choice of the bias adjustment factor used and the relevant methodology are detailed in Appendix1.

Table 2.5 Results of Nitrogen Dioxide Diffusion Tubes in 2011

Site ID	Location	Site Type	Within AQMA?	Triplicate or Collocated Tube	Data Capture 2011 (Number of Months or %)	Data with less than 9 months has been annualised (Y/N)	Confirm if data has been distance corrected (Y/N)	Annual mean concentration (Bias Adjustment factor = 0.84)
								2011 ( $\mu\text{g}/\text{m}^3$ )
1	Castleton Avenue	Roadside	N	N	12	N	Y	16.7
2	Fir Lane	Roadside	N	N	12	N	Y	21.1
3	Dutchmans Cou	Roadside	N	N	12	N	Y	23.5
4	Golden Court	Roadside	N	N	12	N	Y	31.9
5	Pier Terrace	Roadside	N	N	12	N	Y	35.1
6	Saltwater Way	Roadside	N	N	12	N	Y	26.3
7	Yarmouth Road	Roadside	N	N	12	N	Y	18.6
8	Mill Road	Roadside	N	N	12	N	Y	22.8
9	St Margarets Churchyard	Urban background	N	N	10	N	N	17.8
10	Belvedere Road	Roadside	N	Y	12	N	N	32.8
11	Belvedere Road	Roadside	N	Y	12	N	N	32.8
12	Belvedere Road	Roadside	N	Y	12	N	N	33.0
13	Ingate	Roadside	N	N	10	N	N	35.4

The bias adjustment of 0.84 was obtained from the National Diffusion Tube bias adjustment factor spreadsheet version number 03/12. The factor was obtained from a sample of 18 studies. The National Diffusion Tube bias adjustment factor was used because insufficient data was obtained from the local collocation study.

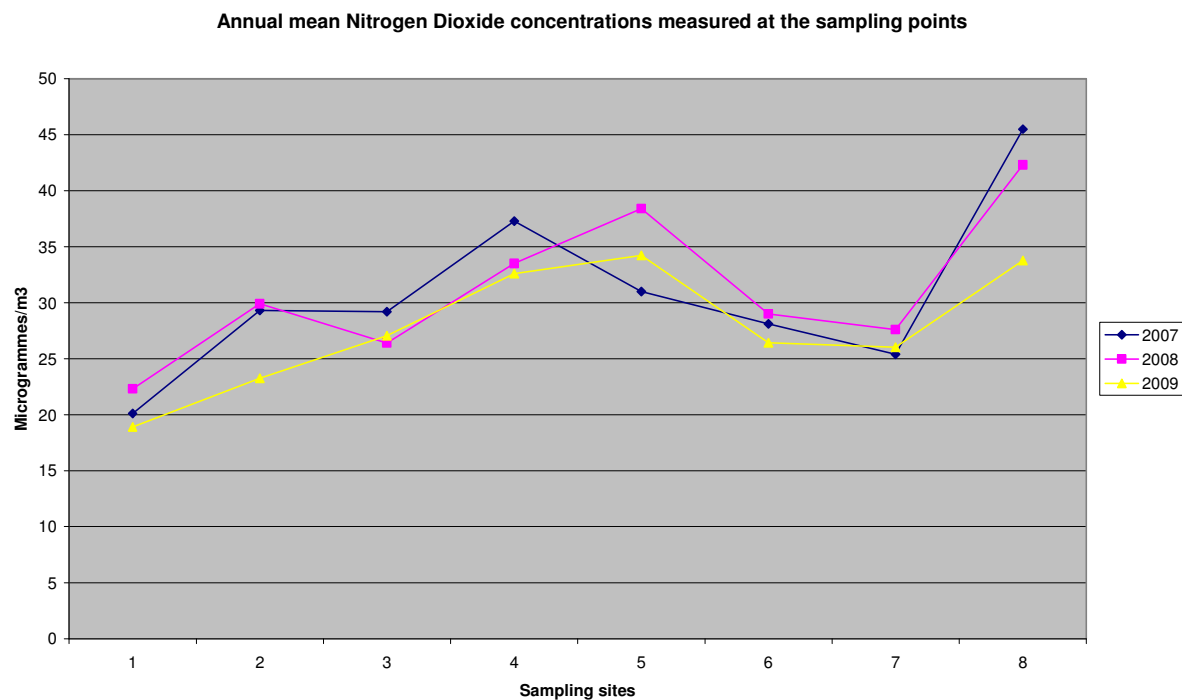
**Table 2.6 Results of Nitrogen Dioxide Diffusion Tubes (2010 & 2011)**

Site ID	Site Type	Within AQMA?	2010*	2011
			(Bias Adjustment Factor =0.85)	(Bias Adjustment Factor = 0.84)
1	Roadside	N	16.7	16.7
2	Roadside	N	20.8	21.1
3	Roadside	N	26.5	23.5
4	Roadside	N	33.6	31.9
5	Roadside	N	37.1	35.1
6	Roadside	N	29.3	26.3
7	Roadside	N	18.2	18.6
8	Roadside	N	26.1	22.8
9	Urban Background	N	n/a	17.8
10	Co-location	N	34	32.8
11	Co-location	N	34.8	32.8
12	Co-location	N	34	33.0
13	Roadside	N	n/a	35.4

\*Optional

The results obtained from the co-location study are shown after bias adjustment using the national bias adjustment factor.

Figure 2.4 Trends in Annual Mean Nitrogen Dioxide Concentrations measured at Diffusion Tube Monitoring Sites (2007-2009)



Trend data from previous years is limited because the monitoring programme was reviewed and revised in 2010 and this has resulted in changes of the locations for all of the diffusion tubes. This was done to enable pollutant concentrations to be measured at relevant



receptors with increased confidence. Only two years reliable data is available at this time and a minimum of five years data is usually considered necessary to identify significant trends.

The trend shown in figure 2.4 which has been reproduced from the 2011 Progress Report suggests that nitrogen dioxide concentrations have reduced at most roadside locations in 2009 when compared to the 2008 measurements. The only exception to this was at Dutchmans Court where there was a very slight increase. This trend can be explained as the 2009 annual means were calculated using a much larger data set, whereas in 2008 an annualised mean was used using data from an AURN roadside monitor, which is likely to over estimate concentrations.

Please note that the comparisons are made using the data obtained direct from the measurements made by the roadside and not estimates of relevant public exposure. In 2010 the diffusion tube sampling locations were reviewed and changed to ensure that the maximum relevant exposure was measured and as a result it is not possible analyse trends this year.

### **2.2.2 PM<sub>10</sub>**

No monitoring of PM<sub>10</sub> has been undertaken by Waveney District Council in 2011, as the 2009 Updating and Screening Assessment concluded that it was not necessary. There have been no substantial changes in emissions of PM<sub>10</sub> to consider monitoring for the pollutant is necessary.

### **2.2.3 Sulphur Dioxide**

No monitoring of SO<sub>2</sub> has been undertaken by Waveney District Council in 2011, as the 2009 Updating and Screening Report concluded that none was necessary. There are no newly identified sources in Waveney District.

### **2.2.4 Benzene**

No monitoring of C<sub>6</sub>H<sub>6</sub> has been undertaken by Waveney District Council in 2011, as the Updating and Screening Report of 2009 concluded it was not necessary. There are no newly identified sources in Waveney District.

### **2.2.5 Other pollutants monitored**

No monitoring of other pollutants has been undertaken by Waveney District Council in 2011 as the Updating and Screening Assessment Report 2009 concluded that none was necessary. There are no newly identified sources in Waveney District.

### **2.2.6 Summary of Compliance with AQS Objectives**

Waveney District Council has examined the results from monitoring in the district and concentrations are all below the objectives, therefore there is no need to proceed to a Detailed Assessment.

### **3 Road Traffic Sources**

This section deals with any changes in the Local Authority area that may affect air quality. It is only necessary to consider locations which:

- have not been assessed during the earlier rounds,
- have experienced a significant change in traffic flows
- have a new development, or
- have new exposure that has not been assessed previously.

#### **3.1 Narrow Congested Streets with Residential Properties Close to the Kerb...**

Waveney District Council confirms that there are no new/newly identified congested streets with a flow above 5,000 vehicles per day and residential properties close to the kerb, that have not been adequately considered in previous rounds of Review and Assessment.

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

Waveney District Council confirms that there are no new/newly identified busy streets where people may spend 1 hour or more close to traffic.

#### **3.3 Roads with a High Flow of Buses and/or HGVs.**

Waveney District Council confirms that there are no new/newly identified roads with high flows of buses/HGVs.

### **3.4 Junctions**

Waveney District Council confirms that there are no new/newly identified busy junctions/busy roads.

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

Waveney District Council confirms that there are no new/proposed roads.

### **3.6 Roads with Significantly Changed Traffic Flows**

...

Waveney District Council confirms that there are no new/newly identified roads with significantly changed traffic flows.

### **3.7 Bus and Coach Stations**

There are no relevant bus stations in Waveney District with the number of bus movements greater than 2,500 per day and there is relevant residential exposure within 10m of any part of a bus station where buses are present. The largest bus station within Waveney has less than 1,000 movements per day and this is below the threshold level requiring further investigation.

Waveney District Council confirms that there are no relevant bus stations in the Local Authority area.

## 4 Other Transport Sources

### 4.1 Airports

Waveney District Council confirms that there are no airports in the Local Authority area.

### 4.2 Railways (Diesel and Steam Trains)

#### 4.2.1 Stationary Trains

Waveney District Council confirms that there are no locations where diesel or steam trains are regularly stationary for periods of 15 minutes or more, with potential for relevant exposure within 15m.

#### 4.2.2 Moving Trains

There are no sections of track that have a large number of movements of diesel locomotives where the background annual mean NO<sub>2</sub> concentration is above 25µg/m<sup>3</sup> per day.

Waveney District Council confirms that there are no locations with a large number of movements of diesel locomotives, and potential long-term relevant exposure within 30m.

### 4.3 Ports (Shipping)

The procedure set out in Section B.3 of Box 5.4 of TG(09) has been used to assess the emissions of sulphur dioxide released by shipping sources.

The Port of Lowestoft does not receive the large ships defined in 8.3 of LAQM. TG(09), which are described as Ro-Ro, container ships, cruise liners and cross channel ferries. In 2011, 53 vessels with a gross tonnage of around 500 tonnes visited the Port and these are the largest vessels that can be received. Vessel movements to service the offshore wind farms have increased, but the number of movements are still below the threshold of 5000 and the size of the vessels are small. The conclusion is that no further action is needed as the total vessel movements are below the threshold (greater than 5000) and below the size criteria requiring a Detailed Assessment.

Waveney District Council confirms that there are no ports or shipping that meet the specified criteria within the Local Authority area.

## 5 Industrial Sources

### 5.1 Industrial Installations

#### 5.1.1 New or Proposed Installations for which an Air Quality Assessment has been Carried Out

##### **Anaerobic Digestion (AD) Plant, Copland Way, Worlingham**

##### **Sotterley Estate and Biocore AD2 Ltd (Planning ref DC/11/0670/FUL)**

Waveney District Council has granted planning consent to Biocore AD2 Limited and the Sotterley Estates to build a biofuels anaerobic digestion facility with combined heat and power generation on the Ellough Industrial Estate, south of Beccles.

The facility will process locally grown biomass using anaerobic digestion (AD) and produce up to 10 million cubic metres of biogas per annum. The biogas is expected to be harnessed as energy in two ways. The first method will result in the transformation of biogas into electricity via combustion in two 1kW gas engines and the electricity will be fed into the public supply grid. The second method will see some of the bio gas fed directly gas grid distribution pipework

The CHP generator engines are to be located in two enclosed buildings on site. Stainless steel exhaust stacks from the engines are proposed to rise to a height of at least 7.5 metres above ground level.

Waveney District Council requested that quantitative atmospheric dispersion modelling of NO<sub>x</sub> and PM<sub>10</sub> from the plant was done to evaluate potential impacts to human receptors in the vicinity of the site. The nearest sensitive receptor is located about 1km to the east of the plant.

A report prepared by Harrison Environmental Consulting assessed the potential impacts of routine emissions from the proposed biogas engines to both ambient air quality and human populations in the vicinity of the area. The assessment was relative to short term impacts (based on the relevant 1-hour air quality objective (s) on the public, and the long-term exposure (annual mean) with reference to residents. The air quality dispersion modelling to predict ambient air concentration at sensitive receptor points was carried out using the computer model ADMS4, which takes into

account projected emission rates, stack dimensions, local meteorology and the effect of nearby buildings.

The following conclusions were made:

The modelled annual average of NO<sub>2</sub> or PM<sub>10</sub> emission was likely to be less than 1.5% of the annual average air quality standard at the nearest sensitive receptors.

The modelled annual average of the emission of NO<sub>2</sub> at Ellough industrial estate (immediately near the site) was likely to be less than 6% of the annual average air quality standard. The background NO<sub>2</sub> levels at the location are low and in the region of 10-15µgm<sup>3</sup> (DEFRA base background Maps 2008), which leaves a substantial headroom of 25-30 µgm<sup>3</sup>. Therefore, it is extremely unlikely that emissions from the stack will have a significant impact on the air quality of nearby receptors.

Waveney District Council has assessed new/proposed industrial installations, and concluded that it will not be necessary to proceed to a Detailed Assessment.

### **5.1.2 Existing Installations where Emissions have Increased Substantially or New Relevant Exposure has been Introduced,**

Waveney District Council confirms that there are no industrial installations with substantially increased emissions or new relevant exposure in their vicinity within its area or nearby in a neighbouring authority.

### **5.1.3 New or Significantly Changed Installations with No Previous Air Quality Assessment**

See 5.1.1 **Anaerobic Digestion (AD) Plant, Copland Way, Worlingham**

Waveney District Council has assessed new/proposed industrial installations, and concluded that it will not be necessary to proceed to a Detailed Assessment.



## 5.2 Major Fuel (Petrol) Storage Depots

There are no major fuel (petrol) storage depots within the Local Authority area.

## 5.3 Petrol Stations

Waveney District Council confirms that there are no petrol stations meeting the specified criteria.

## 5.4 Poultry Farms

The procedure set out in Section C.4 of Box 5.5 of TG(09) was followed to assess emissions of PM<sub>10</sub>

There are 7 poultry farms in Waveney with IPPC permits and none of them meet the criteria in LAQM.TG(09), which requires a detailed assessment for PM<sub>10</sub>.

Waveney District Council confirms that there are no poultry farms meeting the specified criteria in the Waveney district.

## 6 Commercial and Domestic Sources

### 6.1 Biomass Combustion – Individual Installations

#### The Pakefield High School development in Lowestoft (Planning ref

The procedure set out in Section D.1a of chapter 5, TG(09) has been followed and the assessment considers both PM<sub>10</sub> and NO<sub>2</sub> .

Planning consent has been given to construct a new school building and associated infrastructure on the site of the demolished Pakefield Middle School. The site covers an area of approximately 5.8ha and the predominant surrounding land use is residential. The development includes an energy centre in the south-west corner of the site which is located about 25m to the east of residential properties. The energy centre will include a Herz 500kW woodchip burning biomass boiler. The boiler is an 'exempt appliance' under the Clean Air Act, suitable for installation within Smoke Control Zones. The exhaust gases are to be discharged from a 0.3m diameter stack approximately 2m above roof level and 7m off the ground. The nearest receptor is located about 25m away

The air quality is not routinely monitored at this location as the traffic is free flowing and congestion is rare. The new development will not be in or have close proximity to an Air Quality Management Area.

The screening assessment shows that the background adjusted emission rates of are well below the threshold emission rates. The assessment was carried out according to the methodology outlined in the DEFRA Technical Guidance: 'Screening assessment for biomass boilers', which was prepared by AEA. Background concentrations of the pollutants have been estimated using the 1km x 1km maps provided for Local Authority Review and Assessment

The effective stack height was calculated from the following formula  $C = 1.6(U-H)$

Where C is the effective stack height.

U is the actual height above ground

H is the effective height of the tallest building within a distance of 5 times the stack height.

The spreadsheet tool available for review and assessment of biomass combustion source emissions was used to calculate the threshold or target emission rate. This tool is available to view at [LAQM.defra.gov.uk](http://LAQM.defra.gov.uk).

If the maximum stack emission rate is less than the target emission then it is not likely that the most stringent objective for the pollutants will be exceeded. In this case the background adjusted emission rates of the pollutants are well below the threshold emission rates and the conclusion is that there is no reason to move on to a detailed assessment for this installation.

**Table 6.1 Background Adjusted Emission Rates and Threshold Emissions Rates (Pakefield High School – Biomass Plant**

	PM10	PM2.5	Annual mean NO2	Hourly Mean NO2
Emission rate g/s	0.000417	0.000417	0.0340	0.0340
Background concentration µg m-3	9.9	15.9	10.6	10.6
Background adjusted emission rate g/s	0.000019	0.000046	0.0016	0.0076
Threshold emission rate in g/s	0.0219	0.0618	0.1205	0.0639

Waveney District Council has assessed the biomass combustion plant, and concluded that it will not be necessary to proceed to a Detailed Assessment.

## 6.2 Biomass Combustion – Combined Impacts

Waveney district Council has assessed the biomass combustion plant in the Waveney district and concludes that combined impacts are unlikely to result in an exceedence of the air quality objectives for PM<sub>10</sub>. There are no locations with both a high density of houses and the service sector using biomass combustion appliances.

Waveney District Council has assessed the biomass combustion plant, and concluded that it will not be necessary to proceed to a Detailed Assessment.

## 6.3 Domestic Solid-Fuel Burning

There are no areas in Waveney district with high densities of houses and service sector appliances burning solid fuels

Waveney District Council confirms that there are no areas of significant domestic fuel use in the Local Authority area.

## 7 Fugitive or Uncontrolled Sources

The assessment needs to consider PM<sub>10</sub> and the procedure set out in Box E of chapter 5, TG(09) has been followed.

In Waveney District there are no new fugitive sources of PM<sub>10</sub> that have not been covered by previous rounds of review, There is also no new relevant exposure which has not been covered by previous rounds of review and assessment, No further assessment is necessary.

Waveney District Council confirms that there are no potential sources of fugitive particulate matter emissions in the Local Authority area.

## 8 Conclusions and Proposed Actions

### 8.1 Conclusions from New Monitoring Data

Automatic and non-automatic monitoring data obtained near the Port of Lowestoft shows that nitrogen dioxide concentrations at Belvedere Road, Mill Road and Pier Terrace are below the National Air Quality Strategy Objectives and are unlikely to exceed the Objectives in 2012.

The diffusion tube sampling point measuring nitrogen dioxide concentrations in PierTerrace/Belvedere Road has been moved to measure relevant public exposure outside of the grounds of Levington Court, which is adjacent to the traffic lights, at the London Road South/Belvedere Road Junction. Monitoring should continue at this location, so that trends in the local air quality can be identified. The 2011 annual mean concentration remains high at  $35.1 \mu\text{g m}^3$ , however, this does represent a reduction from  $37.1 \mu\text{g m}^3$  in 2010.

The data obtained from the real time continuous air quality analyser situated in Belvedere Road also indicates that monitoring should continue in the Port area to help identify trends. Data capture in 2011 by the analyser was problematic and this impacted detrimentally on the triplicate co-location study.

A diffusion tube has been located at Ingate in the small market Town of Beccles, at a road junction where Traffic Master survey data suggested road traffic congestion may occur at peak times of the day. No monitoring of air quality in Beccles has been done before. This tube measured an annual mean concentration of  $\text{NO}_2$  of  $35.4 \mu\text{g m}^3$  at the façade of a relevant receptor, which suggests that monitoring should continue in this area, in 2012, with an additional tube located close by.

There has been no exceedances of the National Air Quality Strategy objectives elsewhere on the district.

There is no evidence to suggest that there is a need to proceed to a Detailed Assessment for any of the pollutants considered in this report.

## **8.2 Conclusions from Assessment of Sources**

There are no new Developments in Waveney District, which will impact on local air quality significantly. Likewise the assessment of relevant sources indicate that there are no changes which will result in a significant impact on local air quality. Therefore, there is no need to proceed to a Detailed Assessment as exceedences of the National Air Quality Strategy Objectives are unlikely.

## **8.3 Proposed Actions**

There is no need to proceed to a Detailed Assessment for any of the pollutants considered in this report.. The co-location study using triplicate diffusion tubes installed at the automatic air quality monitor will be continued in Belvedere Road during 2012.

Passive monitoring using diffusion tubes will continue in the Port area and in Ingate, Beccles, as the nitrogen dioxide concentrations remain some of the highest in Waveney District. Additional diffusion tubes will be installed at both Pier Terrace and Ingate. The diffusion tube at Pier Terrace will be attached to the façade of Levington Court and the second Ingate tube will be installed close to the traffic lights at the St Marys Road/Ingate junction.

A final action will be the submission of the 2013 Progress Report.

## 9 References

Air Quality Consultants Ltd, Nitrogen Dioxide fall off with Distance Calculator accessed on the Air Quality Archive website (<http://www.airquality.co.uk/archive/aqm/tools/NO2withDistancefromRoadscalculatorIssue2.xls>)

Air Quality Consultants Ltd Spreadsheet of Bias Adjustment Factors (v.02/10) accessed on the Review @ Assessment Helpdesk website (<http://www.uwe.ac.uk/aqm/review/R@Asupport/diffusiantube31009.xls>)

Air Quality Review and Assessment Progress Report (2007), AEA Technology plc., Report AEAT/ENV/R/2562

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The Stationary Office (1995) The Environment Act 1995: Part IV

UK National Air Quality Information Archive, accessed at [www.airquality.co.uk](http://www.airquality.co.uk)

Local Air Quality Management: Note on Predicting NO<sub>2</sub> Concentrations, April 2012, prepared for DEFRA by Bureau Veritas ([laqm.defra.gov.uk/review\\_and\\_assessment/tools/background-maps](http://laqm.defra.gov.uk/review_and_assessment/tools/background-maps))



## Waveney District Council

Local Air Quality Management 2010 NO<sub>x</sub> NO<sub>2</sub> PM<sub>10</sub> CSV Format Background Maps ([laqm.defra.gov.uk/review and assessment/tools/background-maps](http://laqm.defra.gov.uk/review_and_assessment/tools/background-maps)).

UK National Air Quality Information Archive (2009) Monitoring data from AURN Sites ([www.airquality.co.uk](http://www.airquality.co.uk)).

NO<sub>2</sub> Diffusion Tubes for LAQM: Guidance Note for Local Authorities, Prepared for Defra and the Devolved Administrations, AEAT/env/r/2140/Issue 1, March 2006.

NO<sub>2</sub> Concentrations and Distance from Roads, prepared by Professor Duncan Laxen and Dr Ben Marner of Air Quality Consultants Ltd

# Appendices

Appendix 1 QA/QC Data

Appendix 2 Poultry plants in Waveney with Environmental Permits from the Environment Agency

Appendix 3 Environmental Permitting Regulations, Public Register of "Permitted Processes"

Appendix 4 Raw Diffusion tube results and data obtained by the continuous air quality monitor

Appendix 5: Method used to Predict NO<sub>2</sub> Concentrations at Different Distances from Road

## **Appendix A: QA:QC Data**

### **Diffusion Tube Bias Adjustment Factors**

#### **Discussion of Choice of Factor to Use**

The national bias adjustment factor was used and this was obtained from the National Diffusion Tube bias adjustment factor spreadsheet version number 03/12. A factor of 0.84 was obtained from a sample of 18 separate studies of Harwell Scientific Services.

The local co-location study bias adjustment factor has not been calculated and used because of technical problems with the analyser, which resulted in the lack of periodic data.. The data capture was less than 50%

#### **QA/QC of automatic monitoring**

The organisation which carries out the QA /QC is AECOM, Registered Office: AECOM House, 63-77 Victoria Street, St Albans, Herts, AL1 3ER.

#### **QA/QC Procedures**

Monitoring in Lowestoft is performed in accordance with the guidelines outlined in Technical Guidance Notes LAQM.TG(09), LAQM.TG(03) and LAQM.TG1(00). The continuous chemiluminescence NO<sub>x</sub> analyser was set up and calibrated in strict accordance with the manufacturers' recommended procedures prior to and during use. An overview of QA/QC procedures are provided below.

Manual calibrations of the NO<sub>x</sub> analyser are conducted every two to three weeks by the Local Site Operator (LSO) to quantitatively determine instrumental drift. Air Liquid specialist calibration gases are used to obtain span values and instrumental drift is accounted for during the processing of the data. The analyser filter is also changed

during routine calibrations, with span and zero determinations being made before and after. Instrument span or zero drift between calibrations is assumed to be linear between discrete checks, and the data corrected linearly in accordance with any drift.

All fittings in contact with the sample gas stream are either polytetrafluoroethene (PTFE) or stainless steel, so that surface losses are kept to a minimum. Qualified engineers service the analyser at six monthly intervals. The analyser is covered by an unlimited 48-hour emergency call-out agreement, which allows serious analyser malfunctions and technical issues to be resolved in a timely manner.

Remote communications are possible by means of a web logger containing an internal GPRS device, which provides a continuous connection to a web-based server. All data are downloaded automatically to this server and can be displayed in real-time. The web logger and server facilitate easy visual screening of the data and allow any problems with the analyser to be detected at an early stage. This screening helps to minimise data loss due to technical issues.

### **Data Validation and Ratification Procedures**

The raw NO and NO<sub>x</sub> monitoring data are recorded in fifteen-minute increments. The data are downloaded continuously to a web-based server, which is refreshed every fifteen minutes. Validation of the data is carried out manually on a daily basis to 'flag' any suspicious data and remove obvious erroneous values. All validated data are marked as 'Provisional' and remains so until full data ratification is completed.

Data ratification is carried out quarterly and involves a thorough check of the raw data to identify erroneous data (those identified during validation and any additional spurious data that becomes apparent upon closer inspection), adjustment of the raw data for calibration factors and ensuring that good data lies above the zero baseline.

The main steps taken in the ratification process are:

- Collate all calibration records and ensure that the calibration factors are applied correctly to the raw data.
- The calibration-corrected data are examined to identify any anomalies in the dataset, including comparisons made with other nearby monitoring sites.
- Data shown to be erroneous are deleted.
- The monitoring data, calibration records and service reports are used to correct for baseline drift.
- Drift-corrected NO concentrations are subtracted from drift-corrected NO<sub>x</sub> concentrations to obtain drift-corrected NO<sub>2</sub> concentrations.
- Conversion factors are applied to the ratified drift-corrected data to report concentrations in µg/m<sup>3</sup>.
- The ratified 15-minute data are then processed to provide hourly mean pollutant concentrations.
- Basic statistical analysis of the data is performed to determine mean concentrations, maximum hourly mean concentrations and data capture rates.

### **QA/QC of diffusion tube monitoring**

The diffusion tubes used in Waveney District Council are supplied and analysed by ESG Scientifics, which is currently ranked as a **Category Good** (2011) laboratory in the WASP inter-comparison scheme for comparing spiked Nitrogen Dioxide diffusion tubes. The tubes were prepared by spiking acetone:triethanolamine (50:50) into the grids prior to the tubes being assembled. The tubes were desorbed with distilled water and the extract analysed using a segmented flow auto-analyser with ultraviolet detection. The samples were analysed in accordance with Harwell Scientifics (ESG Scientifics) standard operating procedure HS/W1/1015 issue 14 which meets the guidelines set out in DEFRA's 'Diffusion Tubes For Ambient no2 Monitoring practical Guidance'

The results were initially calculated assuming an ambient temperature of 11°C, and the reported values adjusted to 20 °C to allow for direct comparison with EU limits.

Results from tubes that are giving "good" precision will improve the overall reliability of the annual mean concentrations derived from diffusion tubes.

Precision will reflect the laboratory's performance/consistency in preparing and analysing the tubes, as well as the subsequent handling of the tubes in the field. Any laboratory can show "poor" precision for a particular period/collocation study, if this is due to poor handling of the tubes in the field.

For the purposes of Local Air Quality Management, tube precision is separated into two categories, "Good" or "Poor", as follows: 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%, and the average CV of all monitoring periods is less than 10%. Tubes are considered to have "poor" precision where the CV of four or more periods is greater than 20% and/or the average CV is greater than 10%.

A summary of precision results for Nitrogen Dioxide diffusion tube studies by laboratory show that the ESG laboratory (formerly Harwell Scientifics) achieved a **good for precision** in 2009-2011.

Please note that the reported results were not bias adjusted by ESG Scientifics. The diffusion tubes are stored and installed by Waveney District Council in accordance with "NO<sub>2</sub> Diffusion Tubes for LAQM:Guidance Note for Local Authorities"

### **Short-term to Long-term Data adjustment**

Gaps in the data obtained by the continuous air quality monitor meant that the annualisation of data was necessary.

The annualisation of data was done by Alistair Thorpe, Environmental Scientist of Aecom as part of the data ratification process.

Data was used from the AURN sites located at Norwich Lakenfields, St Osyth and Wicken Fen. The period means were calculated based on the following periods:

- 01/01/2011 to 28/03/2011;
- 28/04/2011 to 11/06/2011;
- 03/10/2011 to 08/11/2011; and

## Waveney District Council

- 20/12/2011 to 31/12/2011.

The average ratio was calculated at 1.02, which was then applied to the monitored mean concentration from Lowestoft resulting in an annualised figure of 29.0  $\mu\text{g}/\text{m}^3$ .

The annualisation calculation is summarised below..

<b>Mean Concentrations</b>	<b>NO<sub>2</sub></b>	<b>NO<sub>x</sub></b>	<b>NO</b>	<b>Hourly Exceedences</b>	<b>Data Capture</b>	
<b>Month</b>	<b><math>\mu\text{g}/\text{m}^3</math></b>	<b><math>\mu\text{g}/\text{m}^3</math></b>	<b><math>\mu\text{g}/\text{m}^3</math></b>	<b>&gt;200 <math>\mu\text{g}/\text{m}^3</math></b>	<b>%</b>	
Jan-11	30.5	66.2	23.3	0	80.5	
Feb-11	34.5	79.3	29.2	0	99.9	
Mar-11	27.6	57.5	19.5	0	83.3	
Apr-11	24.2	51.9	18.1	0	11.8	
May-11	26.5	64.0	24.4	0	89.5	
Jun-11	19.9	50.3	19.8	0	41.0	
Jul-11	No Data	No Data	No Data	0	0.0	
Aug-11	25.1	54.7	19.3	0	6.3	
Sep-11	No Data	No Data	No Data	0	0.0	
Oct-11	20.5	56.6	23.5	0	90.1	
Nov-11	57.7	79.0	13.9	0	22.9	
Dec-11	30.0	52.2	14.5	0	37.2	
Annual Mean (Monitored)			28.5		0	46.7
Annual Mean (Annualised)			29.0	99.8 <sup>th</sup> %ile	137.4	
Q1	31.0	68.0	24.1	0	87.5	
Q2	24.4	59.2	22.6	0	47.9	
Q3	25.1	54.7	19.3	0	2.1	
Q4	28.4	58.9	19.9	0	50.4	

### Summary of Annualisation Calcs

<b>Site</b>	<b>Annual Mean</b>	<b>Period Mean</b>	<b>Ratio</b>	<b>Annual Data Capture %</b>	<b>Period Data Capture %</b>
Norwich	13.1	12.6	1.04	92.4%	95.4%
Lakenfields	15.2	14.7	1.03	94.6%	99.1%
St Osyth	11.5	11.7	0.98	96.0%	96.2%
Wicken Fen		Average	1.02		

## **Appendix 2: Poultry plants in Waveney with Environmental Permits from the Environment Agency**

RP3934LN	Bernard Matthews	Ellough Poultry Farm
GP3631MV	Vion Agriculture Ltd	Frostenden Poultry Farm & Wangford Farm Poultry Unit
HP3034MF	Moy Park Ltd	Westhall Poultry Unit
QP3331MD	St Lawrence Hall Farms Ltd	Ilketshall Hall Farm
QP3033US	Hook 2 Sisters Ltd	Flixton Site
LP3333UL	Crown Chicken Ltd.	Hill Farm, Brampton, Beccles
MP3933UV	Crown Chicken Ltd.	Becks Farm, Ilketshall St Andrews, Beccles



**Appendix 3: Environmental Permitting Regulations, Public Register of****"Permitted Processes"****(as at: 11/04/2012 )**

Reference	Trading name/Address	Processes	Granted Date	Map Reference
07/00011/B	P W Waters Ltd Unit 6 P Waters Ltd Harbour Road Lowestoft Suffolk NR32 3LX	PG3_1: Cement and lime Processes	06-Sep- 2007	652538 292967
07/00007/B	The Concrete Company Ltd. Street Record Sandpit Lane Worlingham Suffolk	PG3_1: Cement and lime Processes	06-Sep- 2007	644785 288756
07/00005/B	Cemex Eastern Flixton Gravel Pit Homersfield Road Flixton Bungay Suffolk NR35 1NN	PG3_1: Cement and lime Processes	06-Sep- 2007	629961 286662
07/00010/B	Dudman (Lowestoft) Ltd The Dudman Group Of Companies Commercial Road Lowestoft Suffolk NR32 2TE	PG3_1: Cement and lime Processes	30-Nov- 2005	654178 292777
07/00009/B	C&H Quickmix Ltd Quickmix Sandpit Lane Worlingham Beccles Suffolk NR34 7TH	PG3_1: Cement and lime Processes	06-Sep- 2007	644860 288471
07/00014/B	William Clowes Ltd William Clowes Ltd Copland Way Worlingham Beccles	PG6_16: Coating activities, printing & textile	27-May- 2003	645234 288540

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	Suffolk NR34 7TL			
07/00016/B	Clays Ltd Clays Ltd Popson Street Bungay Suffolk NR35 1EB	PG6_16: Coating activities, printing & textile	02-Nov- 2007	633377 289987
07/00017/B	Supersine Duramark Ltd Supersine Duramark Ltd Freemantle Road Lowestoft Suffolk NR33 0EA	PG6_23: Coating activities, printing & textile	02-Nov- 2007	654392 292192
08/00018/B	Automotive Cleaning Chemicals Ltd. 4 Hadenham Road Gisleham Lowestoft Suffolk NR33 7NF	PG6_44: Coating manufacture	08-Feb- 2008	652968 289524
08/00019/B	Gardwell Coatings Ltd Unit 4c6 Site 3 Ellough Industrial Estate Ellough Airfield Ellough Suffolk	PG6_23: Coating, SED Activities (not dry clean)	08-Feb- 2008	644566 288397
11/00005/B	Gardwell Coatings Limited Germans Yard Hamilton Road Lowestoft Suffolk NR32 1XF	PG6_23: Coating, SED Activities (not dry clean)	16-May- 2011	655361 293190
08/00019/B	Gardwell Coatings Ltd Unit 4c6 Site 3 Ellough Industrial Estate Ellough Airfield Ellough Suffolk	PG6_31: Coating - Polymer, IsoCyan & Dry Powder	08-Feb- 2008	644566 288397
06/00003/B	Wm Morrison Supermarkets Ltd 18 Tower Road Gisleham Lowestoft Suffolk NR33 7NG	PG6_46: Dry cleaners	28-Oct- 2006	652979 289260
08/00008/B	Fashion Clean 140 London Road South Lowestoft	PG6_46: Dry cleaners	06-Jun- 2008	654519 292238

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	Suffolk NR33 0AZ			
11/00002/B	Linen Press 21B New Market Beccles Suffolk NR34 9HA	PG6_46: Dry cleaners	21-Apr- 2011	642123 290356
03/00022/B	Lafarge Aggregates Ltd Flixton Gravel Pit Homersfield Road Flixton Bungay Suffolk NR35 1NN	PG315A: Roadstone coating burning waste oil	06-Sep- 2007	629961 286662
10/00001/B	Asda Asda Stores Limited Belvedere Road Lowestoft Suffolk NR33 0PX	PG1_14: Service Stations	29-Sep- 2010	654189 292547
03/00020/B	R Charlish Ltd St Johns Garage Bardolph Road Bungay Suffolk NR35 1BN	PG1_14: Service Stations	01-Apr- 2003	633922 289286
03/00018/B	Carlton Colville Service Station Carlton Colville Service Station The Street Carlton Colville Lowestoft Suffolk	PG1_14: Service Stations	01-Apr- 2003	651196 289812
03/00016/B	Oulton Broad Express Broadlands Filling Station 122 Beccles Road Lowestoft Suffolk NR33 8QY	PG1_14: Service Stations	01-Apr- 2003	651406 291804
03/00007/B	Anglia Regional Co- operative Society Rainbow Filling Station Saxons Way Halesworth Suffolk IP19 8LU	PG1_14: Service Stations	01-Apr- 2003	638636 277147
03/00005/B	AW&D Hammond A W And D Hammond Ltd Norwich Road	PG1_14: Service Stations	01-Apr- 2003	638767 277886

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	Halesworth Suffolk IP19 8BU			
08/00007/B	Morrisons 18 Tower Road Gisleham Lowestoft Suffolk NR33 7NG	PG1_14: Service Stations	18-Jan- 2008	652979 289260
03/00014/B	Shell Oulton Broad (262) Travellers Check Garage Normanston Drive Lowestoft Suffolk NR32 2PY	PG1_14: Service Stations	01-Apr- 2003	652453 293178
03/00012/B	Malthurst Ltd Mill Road Service Station Mill Road Lowestoft Suffolk NR33 0PP	PG1_14: Service Stations	01-Apr- 2003	654361 292419
07/00008/B	Jubilee Filling Station Jubilee Filling Station High Street Lowestoft Suffolk NR32 1HU	PG1_14: Service Stations	14-Dec- 2007	655111 294050
05/00001/B	Anglia Regional Co-op Rainbow Foodstore Hillside Road East Bungay Suffolk NR35 1RX	PG1_14: Service Stations	10-Nov- 2005	634512 289226
07/00018/B	Morrisons Morrisons George Westwood Way Beccles Suffolk NR34 9EJ	PG1_14: Service Stations	14-Dec- 2007	642725 291090
02/00001/B	Tesco Stores Ltd Tesco Superstore Leisure Way Lowestoft Suffolk NR32 4TZ	PG1_14: Service Stations	01-Apr- 2003	653597 296081
06/00005/B	Tesco Stores Ltd Tesco Gresham Road Beccles Suffolk NR34 9QH	PG1_14: Service Stations	16-Jan- 2006	642340 290556

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03/00009/B	Pageant Garage Pageant Garage Gosford Road Beccles Suffolk NR34 9QP	PG1_14: Service Stations	01-Apr- 2003	642660 290216
03/00003/B	Kirkley Run Service Station 99 Kirkley Run Lowestoft Suffolk NR33 0NH	PG1_14: Service Stations	27-May- 2003	653240 291975
03/00001/B	Gunton Garage Gunton Garage 265-271 Yarmouth Road Lowestoft Suffolk NR32 4AA	PG1_14: Service Stations	29-Jun- 2009	653448 295716
07/00002/B	Hammonds Accident Repair Unit 6 Blyth Road Industrial Estate Blyth Road Halesworth Suffolk IP19 8EN	PG6_34: Vehicle re-finishing	06-Sep- 2007	639021 276820
07/00003/B	Belle Coach Works Ltd 28 Pinbush Road Gisleham Lowestoft Suffolk NR33 7NL	PG6_34: Vehicle re-finishing	06-Sep- 2007	652666 289953
07/00004/B	John Grose Group Ltd 2 Barley Way Gisleham Lowestoft Suffolk NR33 7NH	PG6_34: Vehicle re-finishing	06-Sep- 2007	652982 289786
07/00001/B	Robinsons Accident Repair Centre 2 Cooke Road Gisleham Lowestoft Suffolk NR33 7NA	PG6_34: Vehicle re-finishing	06-Sep- 2007	653067 289754
11/00007/B	Wrights Street Record Common Lane North Beccles Suffolk	PG1_1: Waste oil burners (under 0.4MW)	05-Dec- 2011	642398 290913

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10/00003/B	Emerald Auto Services Ltd. Unit 2 Ellogh Industrial Estate Ellogh Airfield Worlingham Beccles Suffolk	PG1_1: Waste oil burners (under 0.4MW)	18-Nov-2010	644637 288414
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**Appendix 4:** Raw Diffusion tube results and data obtained by the  
continuous air quality monitor

## Waveney District Council

Nox tube result 2011														
Location	Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	Period 7	Period 8	Period 9	Period 10	Period 11	Period 12	Mean	bias ad factor 0.84
1 Castleton Avenue	33.8	30.3	27.4	31.2	21	19.9	12	20.4	22.4	25	36.3	21.5	25.1	21.084
2 Fir Lane	34.5	32.9	41.4	36.7	24.4	30.8	12.8	25.4	32.6	35	43.8	29.4	31.64166667	26.579
3 Saltwater Way	42.1	35.4	33.2	40.2	26.4	22.2	17.8	26.3	39.8	37.1	52.1	36.5	34.09166667	28.637
4 Golden Court	39.5	40.2	44.1	54.2	40.8	47.7	33.2	40	46.2	40	51.3	28.7	42.15833333	35.413
5 Mill Road	35.4	34.3	36.7	47.2	24.2	19	25.1	25.6	27.3	27.1	41.1	23.8	30.56666667	25.676
6 Dutchmans Court	33.1	35.9	28.6	38	25.9	27	18.6	25.9	36.3	31.7	44.6	24.4	30.83333333	25.9
7 Yarmouth Road	28.2	30.9	28	35.1	22.7	28.8	17.1	22.4	29.2	28.6	45.9	21.7	28.21666667	23.702
8 Pier Terrace	52.2	64.9	53.1	59.9	42.6	40.2	35.8	41.1	41.9	42.9	38.3	60.6	47.79166667	40.145
9 St Margarets			29.2	26.4	19.7	16.6	10	13.5	25.2	29	44.8	24.3	21.2	17.808
10 Belvedere Road	44	38.3	39.4	56.4	32.6	33.8	28.1	36.4	34	39.8	51.8	33.9	39.04166667	32.795
11 Belvedere Road	45.3	43.3	39.6	40.9	35	33.7	28.6	34.8	35.8	37.6	53.8	39.9	39.025	32.781
12 Belvedere Road	40.6	42.8	42.9	55.9	31.7	33.3	26.7	31.9	36.4	38.7	51.1	38.4	39.2	32.928
13 Ingate	47.9		47.9	48.7	35.7	37.3		28.5	43.9	42.3	55.4	33.2	42.08	35.3472
14 Blank	0	0	0	0	0	0	0	0	0	0	0		0	

### Co-location Study Mean Values

	Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	Period 7	Period 8	Period 9	Period 10	Period 11	Period 12	Annual Mean
Tube 1	44	38.3	39.4	56.4	32.6	33.8	28.1	36.4	34	39.8	51.8	33.9	39.04166667
Tube 2	45.3	43.3	39.6	40.9	35	33.7	28.6	34.8	35.8	37.6	53.8	39.9	39.025
Tube 3	40.6	42.8	42.9	55.9	31.7	33.3	26.7	31.9	36.4	38.7	51.1	38.4	39.2
mean	43.3	41.46667	40.63333	51.06667	33.1	33.6	27.8	34.36667	35.4	38.7	52.23333	37.4	



## Waveney District Council

Time Period	NO2	NOx	NO	Data Capture	Max 1-hr NO2
Jan-11	30.5	66.2	23.3	80.5%	130.6
Feb-11	34.5	79.3	29.2	99.9%	127.9
Mar-11	27.6	57.5	19.5	83.3%	78.5
Apr-11	24.2	51.9	18.1	11.8%	72.4
May-11	26.5	64.0	24.4	89.5%	86.9
Jun-11	19.9	50.3	19.8	41.0%	68.1
Jul-11	No Data	No Data	No Data	0.0%	No Data
Aug-11	25.1	54.7	19.3	6.3%	59.9
Sep-11	No Data	No Data	No Data	0.0%	No Data
Oct-11	20.5	56.6	23.5	90.1%	62.5
Nov-11	84.0	96.0	7.8	95.7%	328.9
Dec-11	30.9	55.6	16.1	42.2%	165.5
Q1	31.0	68.0	24.1	87.5%	130.6
Q2	24.4	59.2	22.6	47.9%	86.9
Q3	25.1	54.7	19.3	2.1%	59.9
Q4	48.6	72.6	15.7	75.8%	328.9
Annual	35.8	67.5	20.7	53.2%	328.9

**Data obtained from the continuous air quality monitor in Belvedere Road**

## **Appendix 5**

### **Method used to Predict NO<sub>2</sub> Concentrations at Different Distances from Road**

The monitoring sites are located in the areas of concern to represent the worst-case public exposure, but it is not always possible to measure concentrations at the desired location because of practical reasons and the in most cases the relevant public exposure is located a short distance away. The calculator described in LAQM. TG(09) has been used to predict concentrations at the nearest point of relevant public exposure. The local background concentration in µg/m<sup>3</sup> of the appropriate year (2011) has been obtained from the national maps published at [www.airquality.co.uk](http://www.airquality.co.uk). Results derived in this way will have a greater uncertainty than measured data and this uncertainty increases as the distance between the measuring location and relevant receptor grows larger.

The calculator as a spreadsheet is available on [www.airquality.co.uk](http://www.airquality.co.uk) and is shown below.

<p><b>This calculator allows you to predict the annual mean NO<sub>2</sub> concentration for a location ("receptor") that is close to a monitoring site, but nearer or further the kerb than the monitor. The next sheet shows your results on a graph.</b></p>					
<p><b>Enter data into the yellow cells</b></p>					
<b>Step 1</b>	<b>How far from the KERB was your measurement made (in metres)?</b>	(Note 1)	0	<b>2.4</b>	metres
<b>Step 2</b>	<b>How far from the KERB is your receptor (in metres)?</b>	(Note 1)	0	<b>5</b>	metres
<b>Step 3</b>	<b>What is the local annual mean background NO<sub>2</sub> concentration (in µg/m<sup>3</sup>)?</b>	(Note 2)	0	<b>12.13</b>	µg/m <sup>3</sup>
<b>Step 4</b>	<b>What is your measured annual mean NO<sub>2</sub> concentration (in µg/m<sup>3</sup>)?</b>	(Note 2)	0	<b>26.4</b>	µg/m <sup>3</sup>
<b>Result</b>	<b>The predicted annual mean NO<sub>2</sub> concentration (in µg/m<sup>3</sup>) at your receptor</b>	(Note 3)		<b>23.8</b>	µg/m <sup>3</sup>
<p>Note 1: This should be measured horizontally from the kerb and assumes that the monitor and receptor have similar elevations. Each distance should be greater than 0.1m and less than 50m (In practice, using a value of 0.1m when the monitor is closer to the kerb than this is likely to be reasonable). The receptor is the location for which you wish to make your prediction. The monitor can either be closer to the kerb than the receptor, or further from the kerb than the receptor. The closer the monitor and the receptor are to each other, the more reliable the prediction will be. When your receptor is further from the kerb than your monitor, it is recommended that the receptor and monitor should be within 20m of each other. When your receptor is closer to the kerb than your monitor, it is recommended that the receptor and monitor should be within 10m of each other.</p>					
<p>Note 2: The measurement and the background must be for the same year. The background concentration could come from the national maps published at <a href="http://www.airquality.co.uk">www.airquality.co.uk</a>, or alternatively from a nearby monitor in a background location.</p>					
<p>Note 3: The calculator follows the procedure set out in Box 2.3 of LAQM TG(09). The results will have a greater uncertainty than the measured data. More confidence can be placed in results where the distance between the monitor and the receptor is small than where it is large.</p>					
<p>Issue 2: 16/03/09. Created by Dr Ben Marnar; Approved by Prof Duncan Laxen. Contact: <a href="mailto:benmarnar@aqconsultants.co.uk">benmarnar@aqconsultants.co.uk</a></p>					