

Subject: AIR QUALITY STATUS REPORT 2016

Report to: EMT, 7<sup>th</sup> July 2016; Environmental Committee, 20<sup>th</sup> July 2016

Report by: David Addy, Environmental Health Officer

**SUBJECT MATTER/RECOMMENDATIONS**

Reporting of Great Yarmouth's 2016 Air Quality Annual Status Report.

Recommendation:

That the committee notes the Air Quality Annual Status Report and its contents.

**1. INTRODUCTION/BACKGROUND**

- 1.1 Great Yarmouth Borough Council must annually report on the status of the air quality in the Borough, as required by Part IV of the Environment Act 1995.

**2. AIR QUALITY ANNUAL STATUS REPORT**

- 2.1 Overall, this Air Quality Annual Status Report has shown that air quality standards are being met, and should continue to be for next 12 months.
- 2.2 The Council's detailed air quality monitoring programme gives the surety to vital decisions around transport, infrastructure, business, and housing development for the Borough.
- 2.3 A detailed assessment is not required for any pollutants and the Council will progress to the next Annual Status Report in 2017.

**3. FINANCIAL IMPLICATIONS**

- 3.1 There are no financial implications at present, as the monitoring and reporting work is within existing budget provision, and the Air Quality Objectives in England are being met.

**4. RISK IMPLICATIONS**

- 4.1 There are no risk implications at present, as the Air Quality Objectives in England are being met.

**5. CONCLUSIONS**

- 5.1 Overall, this Air Quality Annual Status Report has not revealed any exceedance of air quality standards and has not predicted any likely exceedance over the next 12 months.

**6. RECOMMENDATIONS**

6.1 That the committee notes the Air Quality Annual Status Report and its contents.

## 7. **BACKGROUND PAPERS**

APPENDIX 1 – Great Yarmouth Borough Council 2016 Air Quality Annual Status Report (ASR)

*Areas of consideration: e.g. does this report raise any of the following issues and if so how have these been considered/mitigated against?*

<b>Area for consideration</b>	<b>Comment</b>
Monitoring Officer Consultation:	No
Section 151 Officer Consultation:	No
Existing Council Policies:	No
Financial Implications:	No
Legal Implications (including human rights):	No
Risk Implications:	No
Equality Issues/EQIA assessment:	No
Crime & Disorder:	No
Every Child Matters:	No

APPENDIX 1



**GREAT YARMOUTH**  
BOROUGH COUNCIL

## 2016 Air Quality Annual Status Report (ASR)

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

July 2016

**Great Yarmouth Borough Council**

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Report Reference number	GYBC/ASR/2016
Date	4 <sup>th</sup> July 2016

## Executive Summary: Air Quality in Our Area

Overall, this Air Quality Annual Status Report has not revealed any exceedance of air quality standards and has not predicted any likely exceedance over the next 12 months.

The Outer Harbour remains in use for general bulk cargo and there are no plans to set up a container terminal. The Port has recently been sold to Peel Ports, who have been successful in securing contracts related to north sea offshore wind turbine construction and maintenance. The detailed assessment in 2010 recommended a watching brief and that position remains the same.

The Local Enterprise Zone for the South Denes peninsula, plus the Local Development Order covering this area, and small parts of Southtown and Gorleston, may attract in new industry over the coming years and with its relaxation of planning standards. Close liaison between Environmental Services and Planning departments is essential in early identification of new business that may impact on local air quality.

The large residential development and enterprise zone in Bradwell and South Gorleston is progressing, and the associated A12 – A143 link road (assessed as unlikely to have adverse impacts) has been completed.

The dualling of the A47 between Acle and Great Yarmouth has no firm timescale for construction yet. Elsewhere the Great Yarmouth Third River Crossing (GYTRC) (between Southtown and the South Denes Peninsula) now has an intended scheme delivery of 2021/2023, with the design phase starting in 2018.

Highways England are currently exploring options to improve a number of A47/A12 junctions in Great Yarmouth, including the Harfrey's Roundabout where the proposed GYTRC would join the A12. The Option Development stage is due to be completed later in 2016 with construction planned for 2020/21. Together the GYTRC and A47/A12 junction improvements have the potential to significantly improve connectivity between the LDO / Enterprise Zone including port of Great Yarmouth, and the strategic road network.

These developments make it absolutely critical that the Council maintains it's type-approved real-time air quality monitoring, so that the data is available to support the design and planning stages of the third crossing, plus to monitor the real-world operational phase.

A detailed assessment is not required for any pollutants and the Council will progress to the next Annual Status Report in 2017.

## **Air Quality in the Borough of Great Yarmouth**

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

The annual health cost to society of the impacts of particulate matter alone in the UK is estimated to be around £16 billion<sup>3</sup>.

Great Yarmouth Borough Council's area is situated in the south east corner of Norfolk. It covers the area from Hopton-on-Sea in the south to Winterton-on-Sea in the north, a coastline of some 24 miles. The southern boundary follows the County boundary with Suffolk. To the west and north, the Borough is bounded by rivers of the Norfolk Broads including the Yare, Waveney, Bure and Thurne.

A mixed urban/rural area, the population of approximately 98,000 is concentrated in the urban centres of Great Yarmouth, Gorleston, Bradwell and Caister-on-Sea, with smaller communities in Hopton-on-Sea, Hemsby, Martham, Ormesby and Winterton on-Sea. In summer, the population doubles. The geology is gently undulating in the east on glacial tills with flat marshland adjacent to the Broadland rivers. The River Yare is the principal river of Broadland and this discharges to the North Sea at Great Yarmouth, forming a long narrow port area. There are a number of Sites of Special Scientific Interest and Breydon Water is considered an important international site with a RAMSAR designation.

Most land use outside the built up urban areas is given over to farming. This is predominantly arable farming although there are grazing marshes on the river flood plains. Large areas adjacent to the coast are used in conjunction with tourism which is one of the main industries. The Port is the principal UK base for the Southern

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<sup>1</sup> Environmental equity, air quality, socioeconomic status and respiratory health, 2010

<sup>2</sup> Air quality and social deprivation in the UK: an environmental inequalities analysis, 2006

<sup>3</sup> Defra. Abatement cost guidance for valuing changes in air quality, May 2013

North Sea offshore oil and gas industry, plus it is becoming established as a centre for the construction and maintenance of offshore wind farms in the North Sea.

## **Actions to Improve Air Quality**

The Borough does not have any Air Quality Management Areas, and so there is no action plan to improve air quality. However, the Council has taken a significant number of measures forward (see section 2) to improve air quality, and reduce the exposure of the public to adverse air quality.

## **Local Priorities and Challenges**

The aforementioned Great Yarmouth Third River Crossing (GYTRC) development makes it absolutely critical that the Council maintains its type-approved real-time air quality monitoring, so that the data is available to support the (2018) design and planning stages of the third crossing, plus to monitor the real-world operational phase. The challenge here is that the Council's air quality monitoring station is over 20 years old and has equipment and enclosure integrity failures, which threaten the Council's ability to continue such a detailed air quality monitoring programme, which gives the surety to vital decisions around transport, infrastructure, business, and housing development for the Borough.

## **How to Get Involved**

If people would like to find out more about air quality, and how they can contribute to improving it in their area, these links can provide further information:

- Defra's – UK Government – UK-Air website: <https://uk-air.defra.gov.uk/>
- Great Yarmouth Borough Council's real-time and historic air quality (and meteorology) monitoring data: <http://www.wecare4air.co.uk/air-quality-data/great-yarmouth-bc-gorleston/>
- Sustrans' 'CleanSpace' sustainable transport and air quality movement: <http://www.sustrans.org.uk/what-you-can-do/use-your-car-less/join-air-quality-movement>
- 'Air Pollution' website – college/university level: <http://www.air-quality.org.uk/index.php>

- BBC 'Bitesize' – GCSE air quality:  
[http://www.bbc.co.uk/schools/gcsebitesize/science/21c/air\\_quality/](http://www.bbc.co.uk/schools/gcsebitesize/science/21c/air_quality/)
- 'Clean Air Kids' – air quality website for children aged 5-11: <http://www.clean-air-kids.org.uk/index.html>

Please note that Great Yarmouth Borough Council does not have any control over the content of the above websites, and is not responsible for their content, which it does not necessarily endorse.



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## **Local Air Quality Management**

This report provides an overview of air quality in the Borough of Great Yarmouth during 2016. It fulfils the requirements of Local Air Quality Management (LAQM) as set out in Part IV of the Environment Act (1995) and the relevant Policy and Technical Guidance documents.

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

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

## Actions to Improve Air Quality

### Air Quality Management Areas

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

Great Yarmouth Borough Council currently does not have any AQMAs.

### Progress and Impact of Measures to address Air Quality in the Borough of Great Yarmouth

Great Yarmouth Borough Council has taken forward a number of measures – both new and building on existing ones – during the current reporting year of 2016 which has helped to improve local air quality. Details of all measures completed, in progress or planned are set out in Table 2.2. Key completed measures are:

- Formation of a Cycling Hub;
- Payment of cycling allowance to Council staff;
- Work bike scheme;
- Energy efficient new build housing;
- Replacement heating system;
- Switch off of streetlights;
- Replacement of streetlights with energy efficient units;
- Establishment of county wide air quality group;
- Promotion of town walks;
- Carbon reduction and fuel poverty;
- Bike & Go scheme at Gt Yarmouth railway station;
- Leisure centre upgrade.

Great Yarmouth Borough Council expects the following measure to be completed over the course of the next reporting year:

- A 'Review of domestic bin presentation', which is expected to help address capacity as part of the Council's domestic waste collection service. It is hoped that the increase in capacity resulting from this will mean a delay in the need for a further refuse collection vehicle and save on emissions.

Great Yarmouth Borough Council's Local Air Quality Management programme ties in with the priorities within the Council's 'The Plan 2015-2020', by:

- Helping businesses with timely, accurate advice on air quality;
- Safeguarding the health of the population, through ensure a suitable and sufficient air quality monitoring network and programme for now and the future, to meet the air quality objectives, and to reduce the exposure of people to potentially harmful air quality
- Consulting and maintaining a dialogue with Norfolk County Council Highways, and Highways England – which is essential as transport related air quality emissions have the greatest impact in health;
- Working with Planning Authorities and Developers, to ensure that air quality is considered in business, transport, industrial, retail, and residential developments.

Table 2.1 – Progress on Measures to Improve Air Quality

Measure No.	Measure	EU Category	EU Classification	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
1	Formation of a Cycling Hub	Promoting Travel Alternatives	Promotion of cycling	GYBC	Completed	Completed	Individual take-up	N/A	Slow growth in take-up	Complete	Not significant take-up to date, scheme continues to be promoted, particularly with tourists
2	Review of domestic bin presentation	Vehicle Fleet Efficiency	Fleet efficiency and recognition schemes	GYBC	Yes	Late February 2015	Reduction in collection vehicle miles	N/A	Planning phase	Autumn 2016	Initial thoughts are that this may remove the need to purchase a new additional refuse vehicle
3	Payment of cycling allowance to Council staff	Alternatives to private vehicle use	Other	GYBC	Completed	Completed	Reduction in car mileage & take-up of scheme	N/A	Implemented	Complete	Small impact
4	Work bike scheme	Alternatives to private vehicle use	Other	GYBC	Completed	Completed	Reduction in car mileage & take-up of scheme	N/A	Implemented	Complete	Bikes regularly used by staff
5	Energy efficient new build housing	Policy Guidance and Development Control	Air Quality Planning and Policy Guidance	GYBC	Completed	Completed	Reduction in householder energy bills	N/A	Implemented	2015	Reduced energy bills for householders
6	Replacement heating system	Promoting Low Emission Plant	Public Procurement of stationary combustion sources	GYB Services	Completed	Completed	Reduction in energy bill	N/A	Implemented	2015	Reduced energy bill

## Great Yarmouth Borough Council

Measure No.	Measure	EU Category	EU Classification	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
7	Switch off of streetlights	Policy Guidance and Development Control	Other policy	GYBC	Completed	Completed	Reduction in energy bill	N/A	Implemented	2014	Reduced energy bills for the Council
8	Replacement of streetlights with energy efficient units	Policy Guidance and Development Control	Low Emissions Strategy	GYBC	Completed	Completed	Reduction in energy bill	N/A	Planned long term replacement scheme	2018	Reduced energy bills
9	Establishment of county wide air quality group	Policy Guidance and Development Control	Regional Groups Co-ordinating programmes to develop Area wide Strategies to reduce emissions and improve air quality	Joint partnership	Completed	Completed	Better air quality in Norfolk	N/A	Implemented	Ongoing	Shared ideas & feeding into County Council policies on transportation & air quality
10	Promotion of town walks	Promoting Travel Alternatives	Promotion of walking	GYBC	Completed	Completed	Reduction in vehicle use in town	N/A	Implemented	Ongoing	Reduction in vehicle use
11	Carbon reduction and fuel poverty	Policy Guidance and Development Control	Other policy	GYBC	Completed	Completed	Reduction in energy bills	N/A	Implemented	Ongoing	Reduction in energy bills for householders
12	Bike & Go scheme at Gt Yarmouth railway station	Promoting Travel Alternatives	Promotion of cycling	Abellio Greater Anglia	Completed	Completed	Reduction in vehicle use in town	N/A	Implemented	2014	Reduction in vehicle emissions
13	Leisure centre upgrade	Policy Guidance and Development Control	Low Emissions Strategy	GYBC	Yes	Completed	Reduction in energy bill	N/A	Implemented	2015	Reduced energy usage

## PM<sub>2.5</sub> – Local Authority Approach to Reducing Emissions and or Concentrations

As detailed in Policy Guidance LAQM.PG16 (Chapter 7), local authorities are expected to work towards reducing emissions and/or concentrations of PM<sub>2.5</sub> (particulate matter with an aerodynamic diameter of 2.5µm or less – this is important as this is so small that it can be breathed in, but not out again). There is clear evidence that PM<sub>2.5</sub> has a significant impact on human health, including premature mortality, allergic reactions, and cardiovascular diseases.

Great Yarmouth Borough Council is taking the following measures to address PM<sub>2.5</sub>:

- Reviewing our air quality monitoring arrangements: we consider that it would be beneficial to accurately measure and monitor the ambient atmospheric concentrations of PM<sub>2.5</sub> within the Borough of Great Yarmouth, in order to be aware what concentrations our residents and visitors are exposed to, and also to enable us to work effectively to our exposure reduction targets. To this end, we will consider whether it is possible to start PM<sub>2.5</sub> monitoring by the 2017-18 financial year;
- The Council is working through the Norfolk Environmental Protection Group's (NEPG) Air Quality Sub-Group, to ensure regular two-way engagement with representatives of Public Health England, and the Director of Public Health at Norfolk County Council;
- The Council has direct dialogue with Officers of Norfolk County Council Highways, and also through the NEPG Air Quality Subgroup, on proposed significant changes to highways and traffic flows in the Borough, when possible improvements to PM<sub>2.5</sub> exposure will also be considered;
- Also the Council's measures from section 2.2 and 'Table 2.2 – Progress on Measures to Improve Air Quality' above, also contribute to reducing PM<sub>2.5</sub> emissions and/or exposure.

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

## Summary of Monitoring Undertaken

### Automatic Monitoring Sites

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

Great Yarmouth Borough Council undertook automatic (continuous) monitoring of nitrogen dioxide, particulate matter, and ozone at one site in Gorleston during 2015. Table A.1 in Appendix A shows the details of the sites.

NB. Great Yarmouth Borough Council does not report on sulphur dioxide (SO<sub>2</sub>), as previous assessments have shown that concentrations are so low that there is no need to monitor. Local authorities do not have to report annually on the following pollutants: 1,3 butadiene, benzene, carbon monoxide and lead, unless local circumstances indicate there is a problem. National monitoring results are available at <https://uk-air.defra.gov.uk/interactive-map>

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



### Non-Automatic Monitoring Sites (diffusion tubes)

Great Yarmouth Borough Council undertook non-automatic (passive) plastic diffusion tube monitoring of NO<sub>2</sub> at 11 sites during 2015. Table A.2 in Appendix A shows the details of the sites.

Maps showing the location of the monitoring sites are provided in Appendix D.

Further details on Quality Assurance/Quality Control (QA/QC) and bias adjustment for the diffusion tubes are included in Appendix C.

### Individual Pollutants

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

#### Nitrogen Dioxide (NO<sub>2</sub>)

Table A.3 in Appendix A compares the ratified and adjusted monitored NO<sub>2</sub> annual mean concentrations for the past 5 years with the air quality objective of 40µg/m<sup>3</sup>.

For diffusion tubes, the full 2015 dataset of monthly mean values is provided in Appendix B.

Table A.4 in Appendix A compares the ratified continuous monitored NO<sub>2</sub> hourly mean concentrations for the past 5 years with the air quality objective of 200µg/m<sup>3</sup>, not to be exceeded more than 18 times per year. There were no exceedances of either the annual, or hourly air quality objectives here, with an improving trend for the annual mean objective, and the hourly objective unchanged at 0 exceedances.

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

Table A.5 in Appendix A compares the ratified and adjusted monitored PM<sub>10</sub> annual mean concentrations for the past 5 years with the air quality objective of 40µg/m<sup>3</sup>.

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

There were no exceedances of either the annual, nor 24 hour mean air quality objectives here, with an improving trend for both.

## Appendix A: Monitoring Results

Table A.1 – Details of Automatic Monitoring Sites

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Monitoring Technique	Distance to Relevant Exposure (m) <sup>(1)</sup>	Distance to kerb of nearest road (m) <sup>(2)</sup>	Inlet Height (m)
CM1	Gorleston	Urban background	TG52492	05612	PM <sub>10</sub>	N	BAM	5	25	3
					Ozone	N	UV Photometer			
					Nitrogen Dioxide	N	Chemiluminescence			

Table A.2 – Details of Non-Automatic (diffusion tube) Monitoring Sites (including historic sites 2011-2015)

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA ?	Distance to Relevant Exposure (m) <sup>(1)</sup>	Distance to kerb of nearest road (m) <sup>(2)</sup>	Tube collocated with a Continuous Analyser?	Height (m)
DT1	12 Bridge Road	Roadside	TG52053	08188	NO <sub>2</sub>	N	1	4	N	3
DT2	44 North Quay	Roadside	TG52079	07828	NO <sub>2</sub>	N	1	2	N	2.5
DT3	60 North Quay (upper)	Roadside	TG52104	07665	NO <sub>2</sub>	N	1	1	N	3
DT5	110 South Quay	Roadside	TG52520	06862	NO <sub>2</sub>	N	1	6	N	3
DT6	9 Southgates Road	Roadside	TG52569	06537	NO <sub>2</sub>	N	1	3	N	3
DT7	41 Southgates Road	Roadside	TG52611	06223	NO <sub>2</sub>	N	1	2	N	3
DT4	Southtown Road Junction	Roadside	TG52092	07419	NO <sub>2</sub>	N	1	2	N	3
DT8	Maltings House Gorleston	Co-location urban background	TG 52492	05612	NO <sub>2</sub>	N	5	26	N	2.5
DT8	Maltings House Gorleston	Co-location urban background	TG 52492	05612	NO <sub>2</sub>	N	5	26	N	2.5
DT8	Maltings House Gorleston	Co-location urban background	TG 52492	05612	NO <sub>2</sub>	N	5	26	N	2.5

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA ?	Distance to Relevant Exposure (m) <sup>(1)</sup>	Distance to kerb of nearest road (m) <sup>(2)</sup>	Tube collocated with a Continuous Analyser?	Height (m)
DT9	81 North Quay	Roadside	TG52066	07874	NO <sub>2</sub>	N	1	3	N	3
DT3	60 North Quay lower	Roadside	TG52104	07665	NO <sub>2</sub>	N	1	1	N	2
DT10	1 South Quay	Roadside	TG52326	07376	NO <sub>2</sub>	N	1	3	N	1.5
DT11	25 South Quay	Roadside	TG52490	07174	NO <sub>2</sub>	N	1	4	N	2

Table A.3 – Annual Mean NO<sub>2</sub> Monitoring Results

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) <sup>(1)</sup>	Valid Data Capture 2015 (%) <sup>(2)</sup>	NO <sub>2</sub> Annual Mean Concentration (µg/m <sup>3</sup> ) <sup>(3)</sup>				
					2011	2012	2013	2014	2015
CM1	Urban Background	Automatic	99.6	99.6	20	18.8	18.2	17.1	16.8
DT1	Roadside	Diffusion Tube	100	100	25.3	25.8	22.1	22.0	21.9
DT2	Roadside	Diffusion Tube	100	100	24.9	24.8	23.95	24.1	22.5
DT3	Roadside	Diffusion Tube	66.7	66.7	27.1	25.6	25.4	26.9	25.4
DT5	Roadside	Diffusion Tube	100	100	25.8	25.1	25.31	23.5	23.8
DT6	Roadside	Diffusion Tube	100	100	27.5	26.4	25.81	25.6	24.4
DT7	Roadside	Diffusion Tube	91.7	91.7	24.3	23.8	20.84	22.9	20.9
DT4	Roadside	Diffusion Tube	100	100	39.6	38.8	37.48	37.8	37.4
DT8	Co-location urban background	Diffusion Tube	100	100	20.3	18.5	18.15	17.8	16.0
DT8	Co-location urban background	Diffusion Tube	100	100	19.9	18.3	14.27	16.9	16.3
DT8	Co-location urban background	Diffusion Tube	100	100	19.5	17.8	17.18	15.4	15.7
DT9	Roadside	Diffusion Tube	100	100	21.5	20.0	20.21	18.7	19.9
DT3	Roadside	Diffusion Tube	N/A	N/A	25.9	27.7	N/A	N/A	N/A
DT10	Roadside	Diffusion Tube	91.7	91.7	35.9	33.2	33.97	30.6	32.8
DT11	Roadside	Diffusion Tube	75	75	32.3	28.8	N/A	N/A	31.6

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

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

(3) Means for diffusion tubes have been corrected for bias. All means have been “annualised” as per Technical Guidance LAQM.TG16 if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

Table A.4 – 1-Hour Mean NO<sub>2</sub> Monitoring Results

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) <sup>(1)</sup>	Valid Data Capture 2015 (%) <sup>(2)</sup>	NO <sub>2</sub> 1-Hour Means > 200µg/m <sup>3</sup>				
					2011	2012	2013	2014	2015
CM1	Urban Background	Automatic	99.6	99.6	0	0	0	0	0

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

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

**Table A.5 – Annual Mean PM<sub>10</sub> Monitoring Results**

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) <sup>(1)</sup>	Valid Data Capture 2015 (%) <sup>(2)</sup>	PM <sub>10</sub> Annual Mean Concentration (µg/m <sup>3</sup> ) <sup>(3)</sup>				
				2011	2012	2013	2014	2015
CM1	Urban Background	94.5	94.5	21.7	19.9	20.7	16.6	16.8

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

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

(3) All means have been “annualised” as per Technical Guidance LAQM.TG16, valid data capture for the full calendar year is less than 75%. See Appendix C for details.

**Table A.6 – 24-Hour Mean PM<sub>10</sub> Monitoring Results**

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) <sup>(1)</sup>	Valid Data Capture 2015 (%) <sup>(2)</sup>	PM <sub>10</sub> 24-Hour Means > 50µg/m <sup>3</sup> <sup>(3)</sup>				
				2011	2012	2013	2014	2015
CM1	Urban Background	94.5	94.5	11 (35.8)	19.9 (30.6)	8	4	0

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

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

(3) If the period of valid data is less than 90%, the 90.4<sup>th</sup> percentile of 24-hour means is provided in brackets.

## Appendix B: Full Monthly Diffusion Tube Results for 2015

Table B.1 – NO<sub>2</sub> Monthly Diffusion Tube Results - 2015

Site ID	NO <sub>2</sub> Mean Concentrations (µg/m <sup>3</sup> )													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean	
													Raw Data	Bias Adjusted <sup>(1)</sup>
DT1 - 12 BRIDGE ROAD	24.8	16.4	28.6	24.0	21.6	21.2	25.8	25.9	16.4	21.8	28.7	28.6	23.6	21.9
DT2 - 44 NORTH QUAY	22.7	21.6	27.1	27.3	18.9	22.0	23.7	27.8	18.8	29.0	25.2	26.9	24.2	22.5
DT3 - 60 NORTH QUAY	-	-	-	29.6	-	23.9	26.7	32.4	21.6	30.1	26.1	28.0	27.3	25.4
DT5 - 110 SOUTH QUAY	23.8	22.4	31.5	26.2	23.1	27.0	27.3	28.0	26.4	23.3	25.1	22.9	25.6	23.8
DT6 - 9 SOUTHGATES ROAD	22.7	24.9	33.8	25.0	24.0	22.4	23.4	25.4	21.8	27.7	32.5	31.2	26.2	24.4
DT7 - 41 SOUTHGATES ROAD	23.6	25.3	28.2	24.6	22.0	17.9	21.5	23.3	17.9	26.1	-	17.5	22.5	20.9
DT4 - SOUTHTOWN ROAD	44.4	22.5	44.4	45.4	39.4	33.7	46.9	42.1	43.8	41.5	44.2	34.1	40.2	37.4
DT8 - MALTINGS HOUSE	19.4	11.6	21.7	19.1	15.2	14.2	14.9	16.7	14.0	20.5	19.5	19.2	17.2	16.0
DT8 - MALTINGS HOUSE	25.8	15.2	21.3	16.5	13.3	15.0	14.6	15.7	13.7	21.8	21.8	15.6	17.5	16.3
DT8 - MALTINGS HOUSE	20.3	17.7	19.5	14.9	14.2	14.7	15.1	16.5	13.6	20.9	19.0	16.2	16.9	15.7
DT9 - 81 NORTH QUAY	19.4	28.8	21.7	20.2	18.1	19.6	20.6	24.4	14.8	21.3	24.2	23.6	21.4	19.9
DT10 - 1 SOUTH QUAY	16.7	24.0	42.5	45.2	37.4	17.9	42.8	46.0	39.6	43.7	32.7	-	35.3	32.8
DT11 - 25 SOUTH QUAY	-	-	-	34.8	28.8	27.9	39.3	38.9	33.1	33.6	32.2	37.4	34.0	31.6

(1) See Appendix C for details on bias adjustment



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

### QA/QC of Diffusion Tube Monitoring

The diffusion tubes are supplied by Gradko Environmental, part of Gradko International Ltd. They consist of 20% TEA (Triethanolamine) in deionised water. Once received by post the tubes are stored in a refrigerator until required. Once the tubes have been placed in their holders, the end caps are removed and the tubes exposed for a month. At the end of the period the tubes are recapped and retrieved and stored in the refrigerator until returned by post to the laboratory for analysis. A travel blank is used. This travels everywhere with the exposed tubes but is not itself exposed. It is stored in the refrigerator and sent for analysis with the exposed tubes. Its purpose is to check on contamination of the tubes.

Gradko International is accredited by UKAS for the analysis of NO<sub>2</sub>. Gradko also take part in the AIR NO<sub>2</sub> Proficiency Testing Scheme on a quarterly basis. Their AIR results over the last twelve rounds of testing gave 100% laboratory performance in terms of the accuracy and precision of results (Summary of Laboratory Performance in AIR NO<sub>2</sub> Proficiency Testing Scheme (April 2014 – February 2016))

### Diffusion Tube Bias Adjustment Factors

The National bias adjustment factor for the period was 0.91 (Spreadsheet Version Number: 3/16)

### Factor from Local Co-location Studies

The Borough Council has co-located three diffusion tubes with its continuous air quality monitors. The site is set up as an urban background site. From the co-location study the local bias adjustment factor derived is 0.98 for 12 months of data. However, the tube precision is poor for one month, as detailed in Figure C.1 below. If the month of poor precision data is removed the local bias adjustment factor is 0.93.

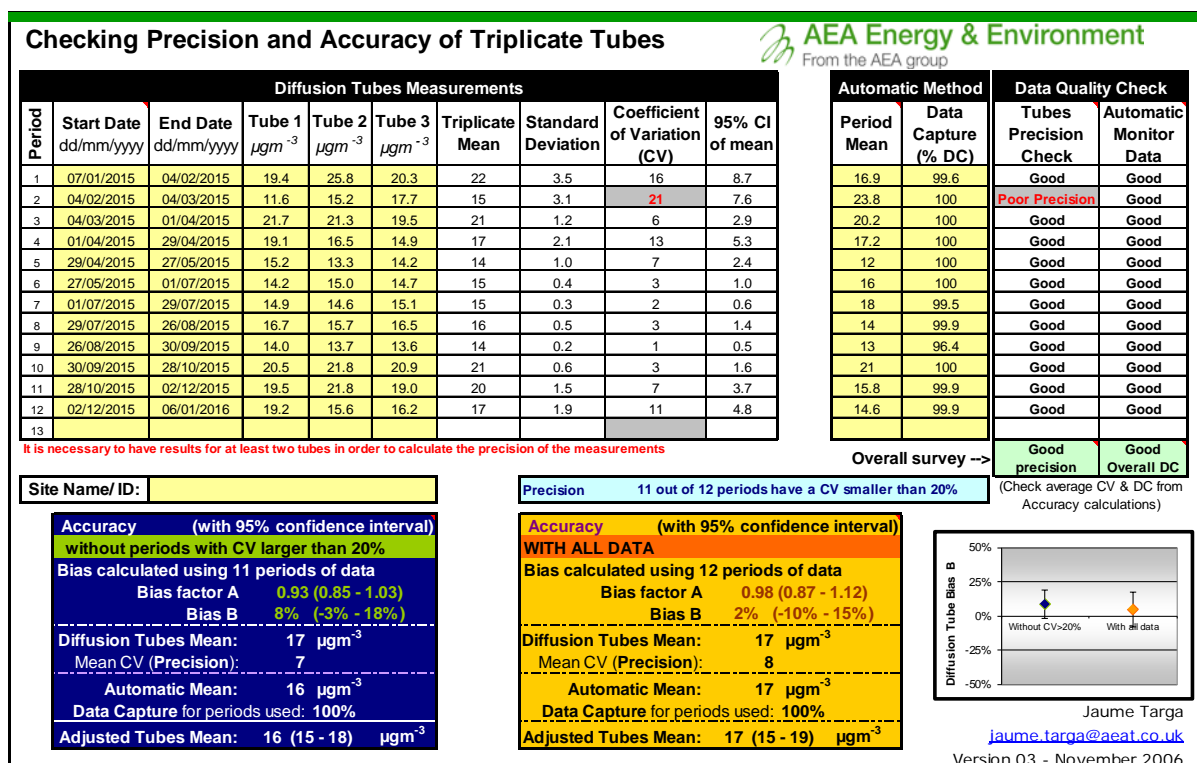


Figure C.1 Derivation of Local Bias Adjustment Figure

### Discussion of Choice of Factor to Use

The Borough Council has used the local bias adjustment figure of 0.93 as the bias adjustment factor. The national factor for 2015 is very similar. There is a preference to use a local factor due to the following:

- The co-location of triplicate tubes alongside the continuous monitoring site;
- There is greater than 9 months of data; and,
- It is considered the local bias adjustment factors will be most representative of the local conditions.

### QA/QC of automatic monitoring

The automatic monitors are maintained in accordance with the manufacturer's recommendations. The Council has a maintenance contract with ET who took over the maintenance contract the Council had enjoyed for many years from the original manufacturers of the equipment, Casella. The site is routinely visited by ET every six months for routine maintenance and the contract allows for a 48hour response to emergency call out situations.

Automatic calibrations of the NO<sub>2</sub> analyser are carried out daily. BOC specialist calibration gases are used to obtain span values and instrumental drift is accounted for during the processing of the data. Data processing and handling is provided by

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WeCare4Air who took over the original data handling contract the Council had for many years with Casella, then briefly Supporting U. Regular check calibrations and inlet filter changes are also carried out by local Council personnel.

The BAM unit is also maintained as part of the servicing contract with local Council personnel carrying out tape changes approximately every two months.

All site visits are recorded in the site log and describe adjustments, repairs, problems encountered etc. Following scheduled service visits reports are issued by the engineers.

### **PM Monitoring Adjustment**

The Met-One BAM PM monitoring unit utilises an unheated inlet and meets the equivalence criteria for PM10 provided the results are corrected for slope.

## Appendix D: Map(s) of Monitoring Locations

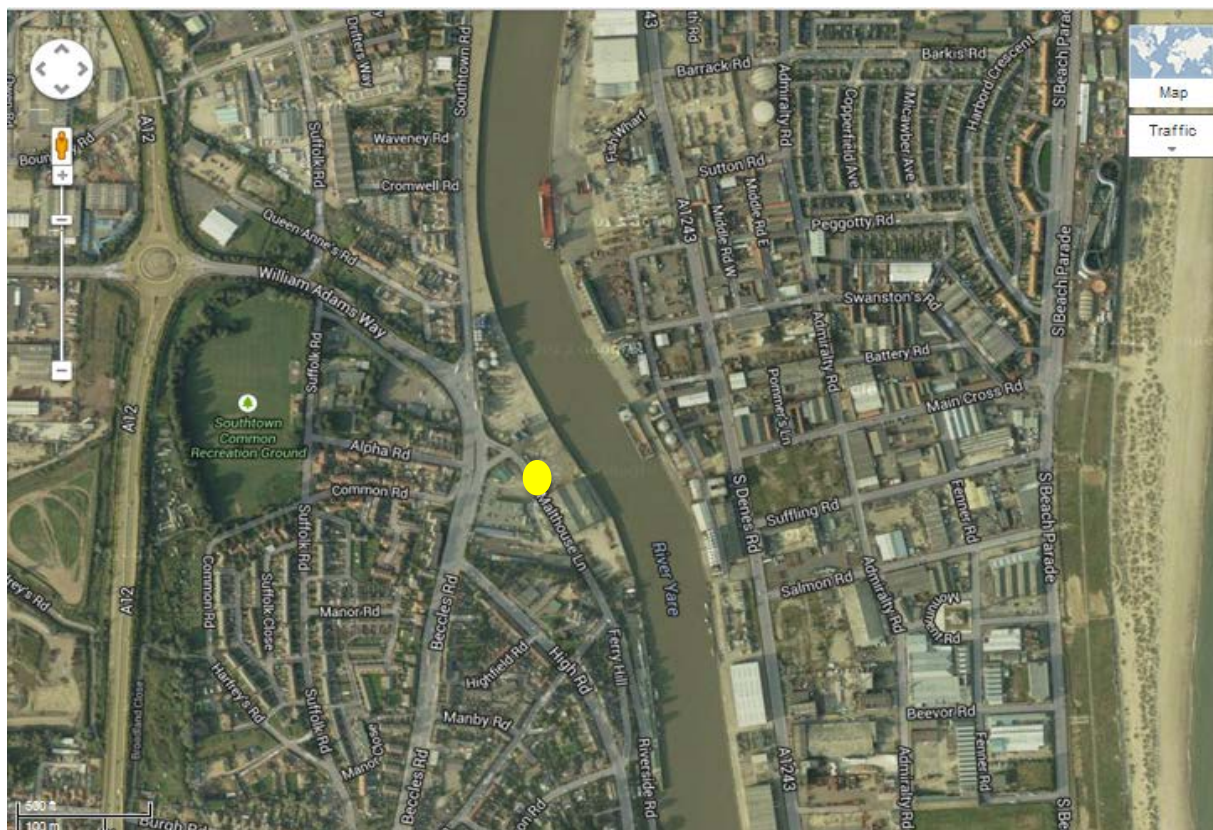


Figure D.1 Location of the Automatic Air Quality Monitoring Station



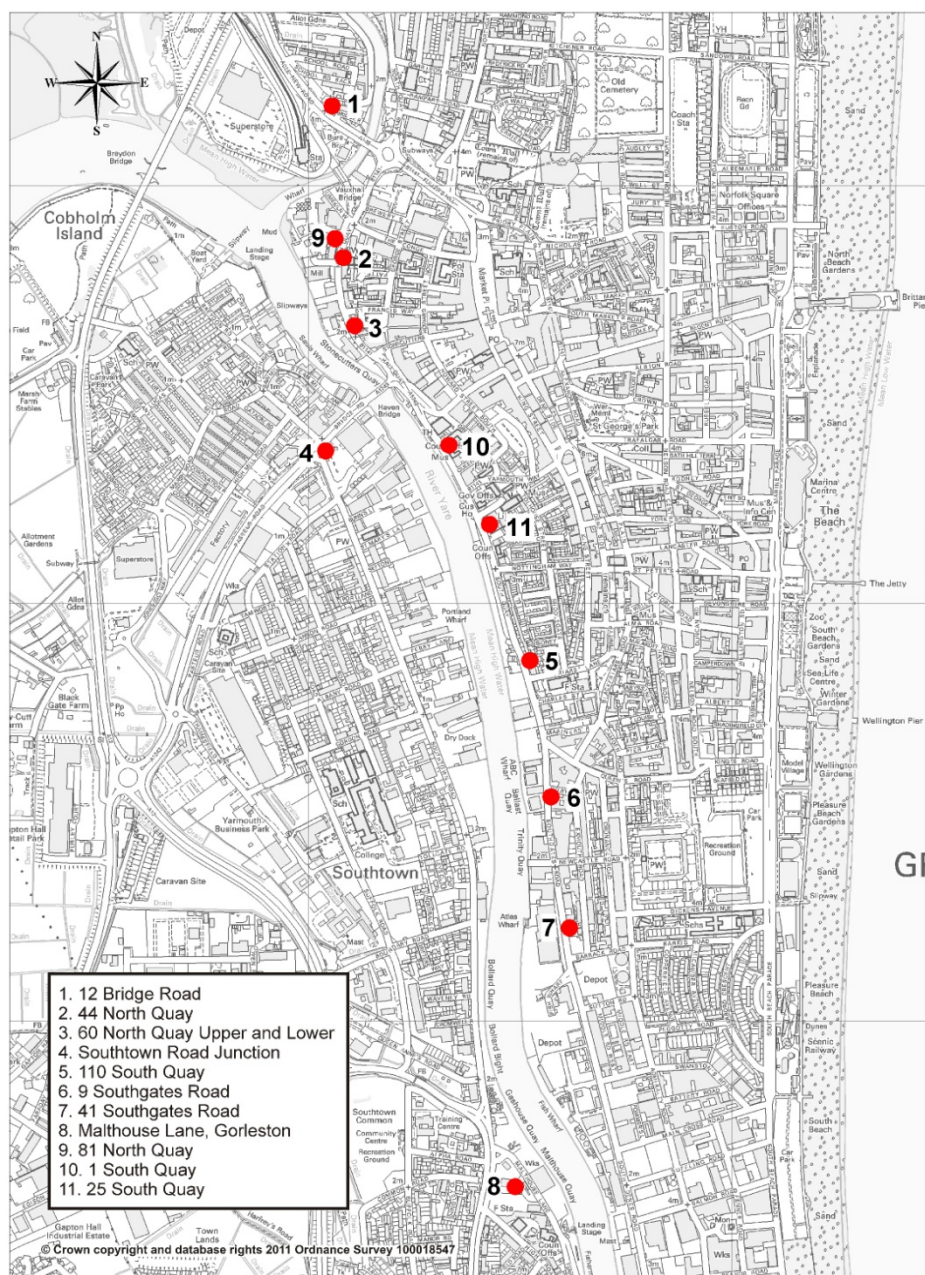


Figure D.2 Map(s) of Non-Automatic Monitoring Sites

## Appendix E: Summary of Air Quality Objectives in England

Table E.1 – Air Quality Objectives in England

Pollutant	Air Quality Objective <sup>4</sup>	
	Concentration	Measured as
Nitrogen Dioxide (NO <sub>2</sub> )	200 µg/m <sup>3</sup> not to be exceeded more than 18 times a year	1-hour mean
	40 µg/m <sup>3</sup>	Annual mean
Particulate Matter (PM <sub>10</sub> )	50 µg/m <sup>3</sup> , not to be exceeded more than 35 times a year	24-hour mean
	40 µg/m <sup>3</sup>	Annual mean
Sulphur Dioxide (SO <sub>2</sub> )	350 µg/m <sup>3</sup> , not to be exceeded more than 24 times a year	1-hour mean
	125 µg/m <sup>3</sup> , not to be exceeded more than 3 times a year	24-hour mean
	266 µg/m <sup>3</sup> , not to be exceeded more than 35 times a year	15-minute mean

<sup>4</sup> The units are in microgrammes of pollutant per cubic metre of air (µg/m<sup>3</sup>).

## Glossary of Terms

Abbreviation	Description
AIR	Independent analytical proficiency-testing scheme by LGC Ltd. and the Health and Safety Laboratory (HSL)
AQAP	Air Quality Action Plan – a detailed description of measures, outcomes, achievement dates and implementation methods, showing how the local authority intends to achieve air quality limit values
AQMA	Air Quality Management Area – an area where air pollutant concentrations exceed / are likely to exceed the relevant air quality objectives. AQMAs are declared for specific pollutants and objectives
ASR	Air Quality Annual Status Report
Defra	Department for Environment, Food and Rural Affairs
DMRB	Design Manual for Roads and Bridges – air quality screening tool produced by Highways England
EU	European Union
FDMS	Filter Dynamics Measurement System
GYTRC	Great Yarmouth Third River Crossing
LAQM	Local Air Quality Management
NEPG	Norfolk Environmental Protection Group
NO <sub>2</sub>	Nitrogen Dioxide
NO <sub>x</sub>	Nitrogen Oxides
PM <sub>10</sub>	Airborne particulate matter with an aerodynamic diameter of 10µm (micrometres or microns) or less
PM <sub>2.5</sub>	Airborne particulate matter with an aerodynamic diameter of 2.5µm or less
QA/QC	Quality Assurance and Quality Control
SO <sub>2</sub>	Sulphur Dioxide
TEA	Triethanolamine: the reagent used in diffusion tubes as an absorbent for ambient NO <sub>2</sub>

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