2016 Air Quality Annual Status Report (ASR)

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

October 2016

Local Authority Officer	Sue Kennedy
Department	Environmental Protection
Address	Swale House East Street Sittingbourne ME10 3HT
Telephone	01622 602873
E-mail	sue.kennedy@midkent.gov.uk
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Executive Summary: Air Quality in Our Area

Air Quality in Swale Borough Council

Air pollution is associated with a number of adverse health impacts. It is recognised as a contributing factor in the onset of heart disease and cancer. Additionally, air pollution particularly affects the most vulnerable in society: children and older people, and those with heart and lung conditions. There is also often a strong correlation with equalities issues, because areas with poor air quality are also often the less affluent areas[1, 2]. Improving air quality can benefit those who may find their conditions are made worse through exposure to air pollution, for example people with heart or lung conditions. More information about the health effects of air pollution can be found at:

http://www.kentair.org.uk/health-impacts?view=effects

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

Swale Borough Council is committed to improving air quality. The main pollutant of concern is nitrogen dioxide released from motor vehicles. Swale Borough Council has a comprehensive monitoring network for nitrogen dioxide including measurement by automatic analysers at four locations and fifty seven locations with diffusion tubes. At some of the sites there are triplicate and duplicate tubes to ensure the accuracy of the monitoring data.

A number of air quality management areas (AQMAs) have been declared where the air pollution has been shown to exist above permitted concentrations. These AQMAs are listed below:

- Newington declared 2009 (AQMA 1)
- Ospringe Street declared June 2011 (AQMA 2). Extended up to the Mount in May 2016 (AQMA 6).
- St Pauls Street, Milton, Sittingbourne declared January 2013 (AQMA 3).

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

- East Street/Canterbury Road, Sittingbourne declared January 2013 (AQMA 4)
- Teynham declared December 2015 (AQMA 5).

Nitrogen dioxide concentrations measured at all four automatic monitoring stations were below the annual objective mean concentration in 2015. There was also no exceedance of the hourly mean objective.

Exceedance of the annual objective was measured by diffusion tube at a number of locations within AQMA 1, AQMA 2 and AQMA 6[4]. The other AQMAs have one or two sites for which non exceedance results are borderline. Monitoring by both continuous analysers and diffusion tubes should continue within the AQMAs to confirm that the air quality measures and mitigation are having the required impact on air quality improvements in the Borough.

Nitrogen dioxide monitoring within Sheerness will be continued to monitor the impact of expansion of Sheerness Port and the regeneration areas at Queenborough as well as the impact of increased traffic from housing developments on the Island

Although PM_{10} concentrations are not exceeding either the annual objective or the daily objective, monitoring should continue (or change to $PM_{2.5}$ monitoring). This will help Swale Borough Council demonstrate that they are taking measures to reduce particulate matter concentrations. The Public Health Outcomes Framework (PHOF), which calculated the fraction of mortality attributed to particulate air pollution, showed that the mortality within Swale Borough Council is marginally worse than that calculated for England as a whole.

Actions to Improve Air Quality

In spring 2015 a summary report of the measures to improve air quality within the Borough Council area were provided to Defra (see Table 2.2 of this report). These measures were also included in the National Air Quality Plan for the achievement of EU air quality limit value for NO_2 in South East (UK 0031)[5]

[4] AQMA 6 is essentially an extension of AQMA 2
[5] https://www.gov.uk/government/collections/air-quality-plan-for-nitrogen-dioxide-no2-in-uk-2015

Since spring 2015, a number of additional measures have been undertaken and others proposed by the AQMA steering groups and other partners. These include:

- The revival of a greening local community project,
- Officer attendance at the Swale Green grid meetings to link our work with environmental groups meeting locally.
- In 2016 a display regarding air quality in Teynham library was used to inform the local residents. This was very successful. Ideas from all of the community display and the internal and external steering groups have been put into a draft Teynham AQMA action plan ready for submission to Defra once it has been agreed by the members.
- Contact has been made with external stakeholders ready for the wider consultations
- The existing community steering groups were contacted to discuss the progress with their action plans. Amendments were made to the existing action plans to take account f progress with actions.
- The Freight transport plan steering group meeting was held and a draft plan is ready to be submitted to Defra
- In October 2013 Grant funding was obtained for 15 retrofit clean fuel buses in Swale. The proposal was to fit Selective Catalytic Reduction and economisers to the company fleet. Unfortunately money (£235,000) was subsequently returned to Department for Transport as the bus company were unable to implement the retrofit. Further work is needed to educate engage the bus companies and this has been taken forward via the quality bus partnership
- Work with KCC on Swale (MKIP) smart travel challenge, Kent workplace active travel challenge, better business awards, cycling training, new travel planning website 2015
- Swale Ecostars Kent pilot 2015 was undertaken in 2015-2015. It was hoped that this might be able to expand in 2016/7 in Kent. This will depend on finance being available

- Parking restrictions were agreed by the Joint Transport Board to be implemented on part of the A2 at Teynham. This could affect traffic flow improvements and reduce congestion in the AQMA
- Kent Smarter travel project has continued
- Healthy business awards for the promotion of healthy business practice with partners such as the KCC
- KM Green Champions Schools project continued to encourage sustainable school travel
- Air quality mitigation measures were obtained though planning development consultations. Conditions were suggested to Planning and Developers to protect the residents from suffering increasing levels of air pollutants and ensure the impact of the development proposals on air quality is minimised
- Swale continued to promote the air quality and health project “text alert” based on Sussex-Air with Kings College London.

Local Priorities and Challenges

The Council cannot achieve improvements to air quality alone. In order to fulfil its goal in producing quantifiable outcomes to timescale all residents businesses and delivery partners need to take responsibility and engage constructively in the process. Contact has been made with external bodies in 2015/6 to continue work with them in 2017.

How to Get Involved

- Attend Public meetings- all residents and consultees invited to attend public displays to raise awareness.
- Volunteer to belong to a steering group and meet annually to discuss action plans. For example, the Sittingbourne Teynham , Ospringe and Newington community steering groups have been established and are in regular email contact with Council regarding progress with actions within their plans.
- Take part in a local greening community project. For example, ideas from the community display, the internal and external steering groups have been put into an AQMA action plan ready for submission in this annual status report.
- Look at any displays regarding air quality.

Conclusions

Swale Borough Council during the coming year will :

1. Work towards completing their Air Quality Strategy.
2. Work with Teynham AQ Steering Group to implement actions in their plan.
3. Work with partners in Freight Plan.
4. Work towards expanding the Ecostars scheme.
5. Investigate the feasibility of creating a Clean Air Zone or a low emission zone
6. Work towards implementing the Greening Up Teynham Scheme.

Table of Contents

Executive Summary: Air Quality in Our Area i

Air Quality in Swale Borough Council i

Actions to Improve Air Quality ii

Local Priorities and Challenges iv

How to Get Involved iv

Conclusions v

1 Local Air Quality Management 1

2 Actions to Improve Air Quality 2

2.1 Air Quality Management Areas 2

2.2 Progress and Impact of Measures to address Air Quality in Swale Borough Council 7

2.3 $PM_{2.5}$ – Local Authority Approach to Reducing Emissions and or Concentrations 17

3 Air Quality Monitoring Data and Comparison with Air Quality Objectives and National Compliance 18

3.1 Summary of Monitoring Undertaken 18

3.1.1 Automatic Monitoring Sites 18

3.1.2 Non-Automatic Monitoring Sites 18

Table 3-1- Areas monitored by diffusion tube and whether monitoring occurs within an AQMA 19

3.2 Individual Pollutants 19

3.2.1 Nitrogen Dioxide (NO_2) 19

3.2.2 Particulate Matter (PM_{10}) 24

Appendix A: Monitoring Results 26

Appendix B: Full Monthly Diffusion Tube Results for 2015 37

Appendix C: Supporting Technical Information / Air Quality Monitoring Data QA/QC 41

Appendix D: Map(s) of Monitoring Locations 46

Appendix E: Summary of Air Quality Objectives in England 51

Glossary of Terms 52

References ..... Error! Bookmark not defined.

List of Tables

Table 2.1 – Declared Air Quality Management Areas 2

Table 2.2 – Progress on Measures to Improve Air Quality 9

List of Figures

Figure 2-1 Air Quality Management Areas in Swale Borough Council area 3
Figure 2-2 Fraction of mortality attributed to particulate air pollution in Swale Borough Council.....17
Figure 3-1: Nitrogen dioxide concentrations measured at automatic monitoring stations from 2011 to 2015 20
Figure 3-2 Nitrogen dioxide concentrations measured by diffusion tubes in Sheerness from 2011 to 2015.....21
Figure 3-3 Nitrogen dioxide concentrations measured by diffusion tubes in Newington from 2011 to 2015. Area contains AQMA 1. 21
Figure 3-4 Nitrogen dioxide concentrations measured by diffusion tubes in Faversham and Teynham from 2011 to 2015. Area contains AQMA 2 and AQMA 5 (SW79, SW80, SW91 and SW92).....22
Figure 3-5 Nitrogen dioxide concentrations measured by diffusion tubes in Sittingbourne from 2011 to 2015. Area contains AQMA 3. 22
Figure 3-6 Nitrogen dioxide concentrations measured by diffusion tubes in Milton from 2011 to 2015. Area contains AQMA 4. 22
Figure 3-7 PM_{10} concentrations measured at Ospringe Road from 2011 to 2015 24
Figure 3-8 Number of exceedances of daily mean objective of 50 μg m^{-3} at Ospringe Street since 2011.....25

1 Local Air Quality Management

This report provides an overview of air quality in Swale Borough Council during 2015. It fulfils the requirements of Local Air Quality Management (LAQM) as set out in Part IV of the Environment Act (1995) and the relevant Policy and Technical Guidance documents.

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

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

2 Actions to Improve Air Quality

2.1 Air Quality Management Areas

Air Quality Management Areas (AQMAs) are declared when there is an exceedance or likely exceedance of an air quality objective. After declaration, the authority must prepare an Air Quality Action Plan (AQAP) within 12-18 months setting out measures it intends to put in place in pursuit of the objectives. A summary of AQMAs declared by Swale Borough Council can be found in Table 2.1.

Table 2.1 – Declared Air Quality Management Areas

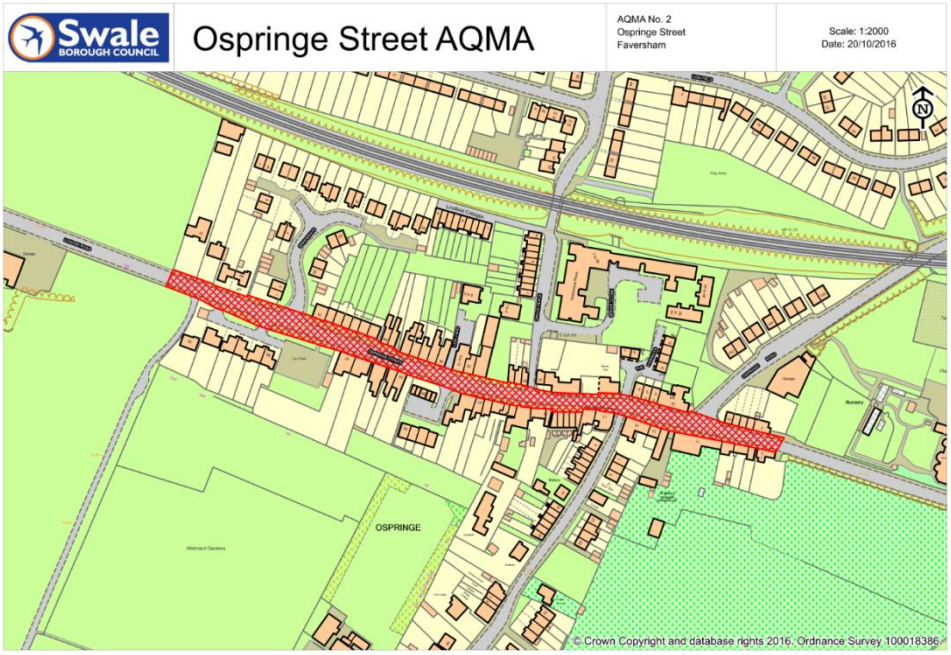
AQMA Name	Pollutants and Air Quality Objectives	City / Town	One Line Description	Action Plan
AQMA 1 Newington	NO_2 annual mean	Newington	An area encompassing those parts of London Road and High Street, Newington where the speed limit is 30mph	2009 to 2010 http://www.kentair.org.uk/documents/Newington_Air_Quality_Management_Area_Action_Plan_161110_version.pdf
AQMA 2 - Ospringe St, Faversham, Kent	NO_2 annual mean	Faversham	Area incorporating all of Ospringe Street, Ospringe which is a section of the A2 London Road, trunk road near Faversham between the grid reference 600106, 160936 and the grid reference 600466, 160839.	To be revoked next reporting year as it has been replaced by AQMA 6
AQMA No 3 - East Street, Sittingbourne Kent	NO_2 annual mean	Sittingbourne	The designated area incorporates the area of East Street, Sittingbourne	To be provided next reporting year
AQMA No 4 - St Paul's Street, Sittingbourne	NO_2 annual mean	Sittingbourne	The designated area incorporates the area of St Pauls Street, Sittingbourne	To be provided next reporting year
AQMA 5 Teynham	NO_2 annual mean	Teynham	A2 London Teynham	To be provided next reporting year
AQMA 6- Ospringe St, Faversham, Kent	NO_2 annual mean	Faversham	Extension of AQMA 2 eastwards to the Mount	To be provided next reporting year

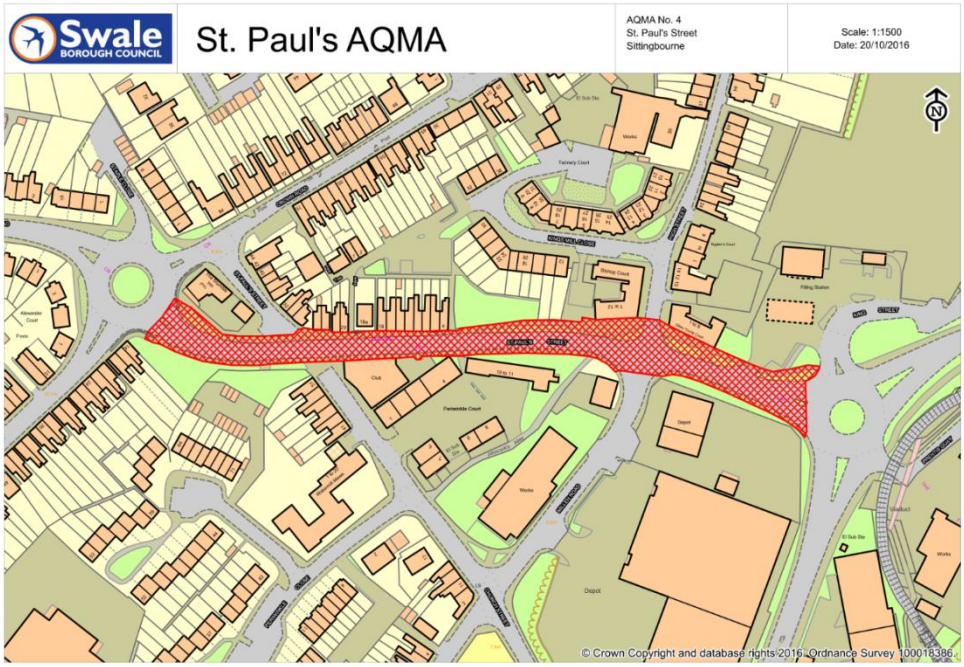
Further information related to declared or revoked AQMAs, including maps of AQMA boundaries (for AQMA 1 to 4) are available online at:

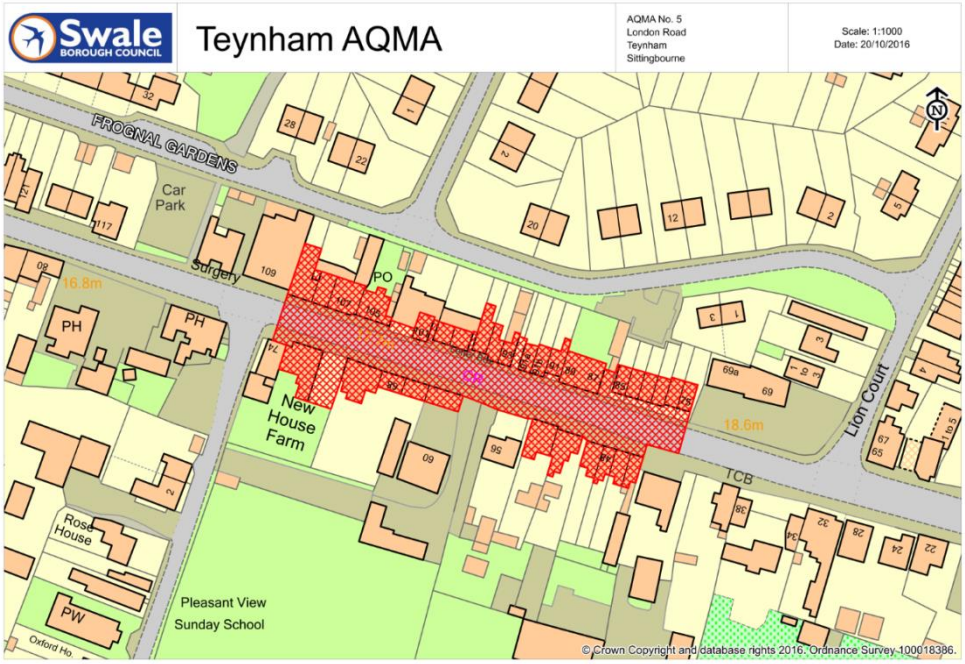
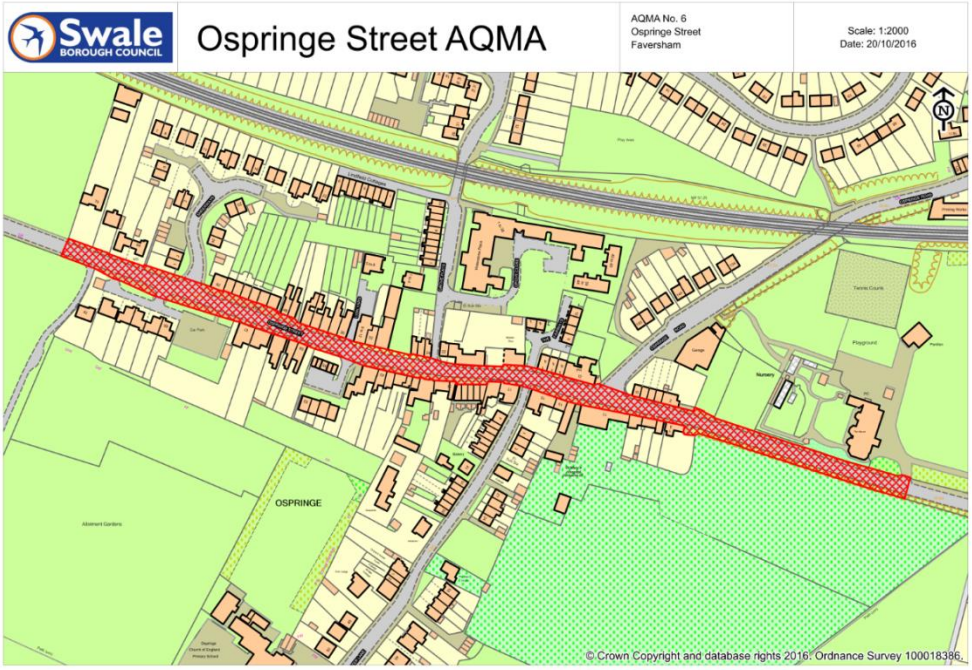
https://uk-air.defra.gov.uk/aqma/local-authorities?la_id=268

Air Quality Management Areas are also shown for convenience in Figure 2-1.

Figure 2-1 Air Quality Management Areas in Swale Borough Council area

AQMA 1 Newington	https://uk-air.defra.gov.uk/aqma/details?aqma_id=127
AQMA 2 Ospringe St, Faversham, Kent	https://uk-air.defra.gov.uk/aqma/details?aqma_id=1 

AQMA 3 East Street, Sittingbourne	https://uk-air.defra.gov.uk/aqma/details?aqma_id=934
AQMA 4 St Pauls	https://uk-air.defra.gov.uk/aqma/details?aqma_id=935 

AQMA 5 Teynham	AQMA not area not yet available on LAQM website. 
AQMA 6 (extension of AQMA 2) Ospringe St, Faversham, Kent	

A list of LAQM reports, including progress reports, updating and screening assessments, further assessments, detailed assessments etc. can be found on the Kent Air library website[6]

[6] http://www.kentair.org.uk/library.php?view=la&sort=undefined&author=9

2.2 Progress and Impact of Measures to address Air Quality in Swale Borough Council

Swale Borough Council has taken forward a number of measures during the current reporting year of 2015 in pursuit of improving local air quality. Details of all measures completed, in progress or planned are set out in Table 2.2.

More detail on these measures can be found in their respective Action Plans. Key completed measures are:

- Diversion of HGV traffic (time/weight or other restriction)
- Freight transport planning
- Amended signage to direct traffic away from Newington
- Discussions with the Co-op re lorry deliveries and emissions and use of parking behind the store as well as community schemes and food miles
- Promotion of public transport alternatives with quality bus partners and train services

Consideration was given to the implementation of the following measures:

- Church Lane Residents Parking Survey
- Pay car park at Newington Station
- Reclassification of A2 through Newington
- Average speed cameras in village (replacing single fixed camera)
- Diversion of HGV traffic at Key Street
- NOx absorbent materials and plants to absorb traffic pollutants

Progress has been slower than expected due to reorganisation of the department and a lack of resources.

Swale Borough Council expects the following measures to be completed over the course of the next reporting year:

An action plan for Teynham is being created in2015-2017 for submission to Defra as well as the development of a draft Freight transport plan .

The Swale Ecostars pilot will be completed in 2016.

Arrangements will be made to continue to corresponds and where possible meet with the Newington and Teynham AQMA steering groups re- form the Ospringe and Sittingbourne community air quality management area steering group, apply for funding to implement the suggestions in the action plan.

Swale Borough Council's priorities for the coming year 2016-2017 are:

- The greening local community project, attending and feeding into Green grid meetings. Ideas from the community display, the internal and external steering group have been put into a draft AQMA action plan ready for submission with the annual status report.
- Establish contact with external stakeholders ready for their consultation.
- Display regarding air quality in Teynham library. The existing community steering groups were contacted to discuss the progress with their action plans. Amendments were made to existing action plans.
- Swale Ecostars Kent pilot to expansion in 2016/7.
- Parking restrictions on the A2 at Teynham by the Joint Transport Board.
- Continuing to support KCC Kent Smarter travel project.
- Continuing to support Healthy business Awards
- Continuing to support KM Schools project promoting sustainable travel to primary schools
- Working with partners such as the KCC, Highways England, The Environment Agency and Public health England
- Continuing to require planning development mitigation measures on new development proposals.
- It is hoped that an air quality strategic document can be devised for Swale during 2017.

Table 2.2 – Progress on Measures to Improve Air Quality (26th August 2016 update)

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 2012	Estimated Completion Date	Comments	2016 update for ASR
1	**Temporary continuous Monitoring location in Post Office, High Street**	Traffic Management	UTC, Congestion management, traffic reduction	Swale Borough Council	Completed	Completed and resited in AQMA	NOx	measurement of NOx %	Ongoing despite breakdowns	2012	Evidence for AQMA	Consideration of AQ strategy
2	**Data analysis from the existing and new NOx diffusion tube monitoring locations**	Public Information	Vía the Internet	SBC	Completed	Ongoing	NOx	As above	installation completed in 2012		used for Kent partnership website and text alert	Ongoing as provides information and evidence of need to continue AQMA
3	**Siting a new permanent continuous monitoring location at Co-op High Street Newington**	Public Information	Vía the Internet	SBC	Completed	ongoing	Measurement of NOx continued	As above	Vast improvement in monitoring equipment in Newington	2012	Measurable evidence for complete years in future with modern up to date equipment to MCERTs standard	Measureable improvement in air pollution in Newington Continuing to monitor as site near the border with Medway and new development proposals
4	**Discussions with the Co-op re lorry deliveries and emissions and use of parking behind the store as well as community schemes and food miles**	Public Information	Vía the Internet	SBC	Completed	completed and new car and lorry parking provided	Success as	1%	Cycling project ongoing and Funding was obtained in 2014 for a Bus project but had to be returned as the Bus company would not do the adaptation	2012	As above	Works completed2012 Use of car park continues. This together with the implementation of a greening project and other simultaneous had a measurable impact

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 2012	Estimated Completion Date	Comments	2016 update for ASR
5	**Promotion of public transport alternatives with quality bus and train services at enhanced frequencies**	Alternatives to private vehicle use	Other	KCC	Ongoing	ongoing	Statistical evidence of behaviour and travel choices	1%	Ongoing	Ongoing	Failure of the bus project will have a detrimental impact on promotion of travel alternatives in the AQMAs however 2 companies in Swale replaced some of their buses with alternative fuel ones there is a train but since the High speed rail this does not stop at Newington as frequently	Still being done with promotion of KCC smarter travel planning website link from our website
6	**Car hire /share schemes**	Alternatives to private vehicle use	Car & lift sharing schemes	KCC	working with KCC on Kent Car share	Ongoing	KCC journey reductions	0.50%		Ongoing	None	Ditto
7	**Investigation of impact from additional traffic from any proposed planning applications re housing and industry**	Policy Guidance and Development Control	Air Quality Planning and Policy Guidance			Implemented 2012	comments made on application regarding air quality mitigation					Continuing
8	**Church Lane Residents Parking Survey**	Promoting Travel Alternatives	Personalised Travel Planning	SBC	Not done	Not started	number of parked vehicles				suggestion dismissed by steering group	KCC smarter travel challenge website

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 2012	Estimated Completion Date	Comments	2016 update for ASR
9	**Pay car park at Newington Station**	Alternatives to private vehicle use	Rail based Park & Ride	South Eastern rail	Not done	Not started					ditto	New planning applications for homes may provide an opportunity to progress this
10	**Reclassification of A2 through Newington**	Transport Planning and Infrastructure	Other	National	Not realistic	Not started					major old road with no alternative other than bypasses which will not be funded	Consultants appointed 2016
11	**Diversion of HGV traffic** (time/weight or other restriction)	Traffic Management	Strategic highway improvements, Re-prioritising road space away from cars, inc Access management, Selective vehicle priority, bus priority, high vehicle occupancy lane	DFT /SBC/ KCC/	Northern relief road partially completed	Started	Traffic counts	3%	Ongoing			Discussed at Freight transport plan meeting
12	**Work with Satellite Navigation companies to amend appropriate (HGV) routes**	Public Information	via other mechanisms	KCC	Discussions with KCC	started	traffic counts	1%	Slow not supported by KCC	2015		KCC have SN route planning

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 2012	Estimated Completion Date	Comments	2016 update for ASR
13	**Amended signage to direct traffic away from Newington**	Transport Planning and Infrastructure	Other	KCC	suggested in discussions with KCC Highways	Started	signs improved to ask HGV to avoid the A2 and use the M2 so that only local traffic	2%				Discussed at Freight transport plan meeting
14	**Average speed cameras in village** (replacing single fixed camera)	Traffic Management	Reduction of speed limits, 20mph zones	KCC/ Parish Council	discussions with KCC	Not started	CCTV only local cameras					Discussed at steering groups and KCC and Freight transport plan meeting
15a	**Close Bull Lane to vehicles**	Transport Planning and Infrastructure	Other	KCC	discussions with KCC	consideration given by KCC						Would need to be agreed to be implemented by KCC and Highways England
15b	**Diversion of HGV traffic at Key Street**	Transport Planning and Infrastructure	Other	KCC	discussions with KCC	Not started					The A2 is used when the M2 is blocked	Discussed at Freight transport plan meeting
16	**Low emission zones (LEZ) or Clean air zones**	Promoting Low Emission Transport	Low Emission Zone (LEZ)	SBC	Will be considered once a funded / model scheme is devised for smaller Councils							To be considered as London scheme expands to Kent

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 2012	Estimated Completion Date	Comments	2016 update for ASR
17	**Ideas such as NOx absorbing paint, tarmac, roofing etc.**	Public Information	Other	SBC Highways and Property owners	Pilot investigated	Not started			On hold until sponsorship and funding			On hold until sponsorship and funding
18	**Community trees and planting projects**	Public Information	Other	Parish Council/ Highways and SBC	completed	completed	number trees and planting projects	1%				Possible project opportunity meeting with Swale in Bloom for Green walls and roofs projects
19	**Co-op**: Encourage improvements to car park, delivery off A2, etc.	Traffic Management	Workplace Parking Levy, Parking Enforcement on highway	Co-op	discussions with co-op	completed	reduction in cars parked inappropriately	0.10%	ongoing free car park for customers at Newington			Initial discussions at Teynham for parking explored
20	**Industry:** Encourage consideration of alternative routes/times for traffic	Traffic Management	Workplace Parking Levy, Parking Enforcement on highway	KCC / MKIP Healthy workplace initiative	partnership project	Started	number of travel planning schemes	1%		2020		Discussed at Freight transport plan meeting and with Head of MKIP parking
21	School Promote alternative routes for access and journeys.	Promoting Travel Alternatives	School Travel Plans	KCC/ SBC KM group	discussions with KCC	Started	sign up for Kent travel project	1%	22 schools participatd in 2012 WOW and Walk on Wednesday and Iwade was awarded top eco school in Kent			Project continues Swale wide with KM group

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 2012	Estimated Completion Date	Comments	2016 update for ASR
22	Work with school's School Travel Plan	Promoting Travel Alternatives	School Travel Plans	KM/ SBC funded projects in schools	ongoing	Ongoing	measured reduction in school traffic in Swale	1%				KCC encourage these in all schools
23	School OPAL project-NO**x** monitoring involvement	Public Information	Other	Imperial college	completed	completed	monitoring and statistical evidence					
27	Stagger school times.	Policy Guidance and Development Control	Other policy	KCC	considered by the KCC and schools		some schools wanted it and did it		ongoing			
28	**Promotion of public transport** e.g. Ride on the train, green taxis and bus schemes	Promoting Travel Alternatives	Intensive active travel campaign & infrastructure	KCC SBC / local transport and businesses	In progress	ongoing discussions and partnership activities	change in travel modes and measurement of the use of alternatives	1%	ongoing	ongoing	2022	Work continues with the KCC prtnership projects each year
30	**Working through the planning process to require and encourage action to minimise impact of new developments affecting the High Street :**	Policy Guidance and Development Control	Air Quality Planning and Policy Guidance	SBC / KCC	In progress	ongoing discussions	number of AQ reports resulting in mitigation	1%	ongoing	2022		Ongoing work with Strategic planning

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 2012	Estimated Completion Date	Comments	2016 update for ASR
31	**Reduction of Traffic**	Transport Planning and Infrastructure	Public transport improvements-interchanges stations and services		In progress	ongoing discussions and partnership activities	change in travel modes and measurement of the use of alternatives	1%	ongoing	ongoing	2022	Discussed at Bus quality partnership meeting in 2013
32	**Supporting reduction in traffic impact**	Promoting Travel Alternatives	Promotion of cycling	SBC	In progress	ongoing discussions and partnership activities	change in travel modes and measurement of the use of alternatives	1%	ongoing	ongoing	2022	Involved in promotion and marketing of an annual KCC project
33	**Promotion of more efficient vehicles** (especially Council owned or supported bus services)	Vehicle Fleet Efficiency	Fleet efficiency and recognition schemes	SBC/KCC	In progress	ongoing discussions and partnership activities	change in travel modes and measurement of the use of alternatives	1%	planning	ongoing	2022	Considered when contractors, fleets and vehicles are procured
34	**Tyre inflation and smart driving campaigns**	Freight and Delivery Management	Freight Partnerships for city centre deliveries	Project started for Swale ECO stars with contractors TTR	competed and funding obtained for freight transport project pilot	started Spring 2015	HGV signed up	1%	ongoing	Jun-15	is successful could be continued in other areas in Kent	Swale Ecostars pilot project resulted in 14 businesses signing up for this award scheme in Swale 2015-2016
35	**Plug in points for electric cars and bikes in village car parks, local employers and at the station**	Promoting Low Emission Transport	Procuring alternative Refuelling infrastructure to promote Low Emission Vehicles, EV recharging, Gas fuel recharging	SBC/KCC	In progress	ongoing discussions and partnership activities	change in travel modes and measurement of the use of alternatives	1%		ongoing	2022	Climate change synergies and Regional funds enabled some charging points for electric vehicles in Swale

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 2012	Estimated Completion Date	Comments	2016 update for ASR
36	**Freight transport Plan**	Freight and Delivery Management	Freight Partnerships for city centre deliveries	SBC KCC and other partners	In progress 2016	ongoing discussions and partnership activities	Submission to Defra followed by implementation once approved	3 %		2018		Three year project Draft plan to be sent to Defra and the KCC and external consultees during 2017
37	**New equipment in Sittingbourne in two locations as well as resited in Ospringe to measure on the roadside in the street canyon**	Public information from measurement of air pollution levels	Via the internet	SBC	2012	2013	Results of measuring improved air pollution	3 %	planned and installed	2013/2014		Equipment sites to be reduced due to budget and staff resources restrictions to only 3 for the whole of Swale one at Ospringe to be re-sited again

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

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

Work carried out by Public Health England as part of the Public Health Outcomes Framework (PHOF) shows that the mortality associated with particulate air pollution within Swale Borough Council is 5.5 %. This information is available from the following web link: http://www.phoutcomes.info/search/air#page/1/gid/1/pat/6/par/E12000008/ati/101/are/E07000113/iid/30101/age/230/sex/4

Figure 2-2 shows that the mortality calculated for Swale Borough Council is slightly greater than that calculated for south east England (5.2 %) and England (5.3 %) as a whole.

Figure 2-2 Fraction of mortality attributed to particulate air pollution in Swale Borough Council

Indicator	Period	Swale		Region	England	England		
		Count	Value	Value	Value	Worst/ Lowest	Range	Best/ Highest
3.01 - Fraction of mortality attributable to particulate air pollution	2013	-	5.5%	5.2%	5.3%	2.8%		8.4%

Swale Borough Council is currently developing its approach to address $PM_{2.5}$ in partnership with public health local authority officers. The approach to address $PM_{2.5}$ will be reported on in the 2017 Annual Status report. However this will depend on staff and resources being available to the local authority in 2017.

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

3.1 Summary of Monitoring Undertaken

3.1.1 Automatic Monitoring Sites

This section sets out what monitoring has taken place and how it compares with annual mean and short term objectives. Swale Borough Council undertook automatic monitoring at four sites during 2015:

- Newington 3 AQMA 1
- Ospringe Roadside 2, Faversham AQMA 2
- Canterbury Road, Sittingbourne AQMA 3
- St Paul's Street, Milton AQMA 4

Table A.1 in Appendix A shows the details of the sites. A map showing the location of the automatic monitoring sites is provided in Figure D.2. Monitoring results are available on the Kent Air website[7]. As the data capture at the Canterbury Road sampling site was site was less than 75 %, the concentrations required annualisation. Further details on how the monitors are calibrated and how the data has been adjusted are included in Appendix C.

3.1.2 Non-Automatic Monitoring Sites

Swale Borough Council undertook non- automatic (passive) monitoring of NO2 at fifty seven sites during 2015. Table A.2 in Appendix A provides of the sites in terms of distance to kerb, distance to relevant exposure, whether in AQMA or not and sampling inlet height. Within Table A.2 the sites are listed in five separate geographical areas: Sheerness, Newington, Faversham and Teynham, Sittingbourne and Milton. **Error! Not a valid bookmark self-reference.** connects these areas with the AQMAs. Maps showing the location of the monitoring sites are provided in Appendix D.

[7] http://www.kentair.org.uk/data/data-selector

Table 3-1- Areas monitored by diffusion tube and whether monitoring occurs within an AQMA

Area	Location	Are sites in an Air Quality Management Area?	Figure in Appendix D
Sheerness	Sheerness	No	D.3
Newington	Along Newington High Street	Yes, some are located in AQMA 1	D.4
Faversham and Teynham	Along Ospringe Street and London Road within Faversham Within Teynham along London Road	Yes, Faversham some sites in AQMA 2 Yes, Teynham some sites in AQMA 5	D.5 D.7 D.6
Sittingbourne	Most sites are located along Canterbury Road in Sittingbourne	Yes, some sites in AQMA 3	D.8
Milton	St Paul's Street located within Milton (a suburb of Sittingbourne)	Yes, some sites in AQMA 4.	D.9

The diffusion tube annual average concentrations were corrected using a bias correction factor (0.80) derived from local co-located diffusion tube and automatic analysers. Further details on Quality Assurance/Quality Control (QA/QC) and bias adjustment for the diffusion tubes are included in Appendix C.

3.2 Individual Pollutants

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

3.2.1 Nitrogen Dioxide (NO_2)

Table A.3 in Appendix A and Figure 3-1 shows that the annual mean nitrogen dioxide concentrations from 2011 to 2015 measured at each of the automatic monitoring stations. A summary of trends in concentrations at the automatic sampling sites is provided below:

- Concentrations at Newington 3, along the High Street in Newington, reached a maximum of 34.8 µg m^{-3} in 2013 but were just below 30 µg m^{-3} in 2015.
- Concentrations at Ospringe Roadside 2, showed a steady decrease from 38.8 µg m^{-3} in 2011 to 32.6 µg m^{-3} in 2015.
- Concentrations at the Canterbury Road site peaked at 42.5 µg m^{-3} in 2013 but decreased 35.9 µg m^{-3} (annualised value) in 2015.
- Concentrations at St Paul's street showed a steady increase from 33.7 µg m^{-3} in 2013 to 38.8 µg m^{-3} in 2015.

Figure 3-1: Nitrogen dioxide concentrations measured at automatic monitoring stations from 2011 to 2015

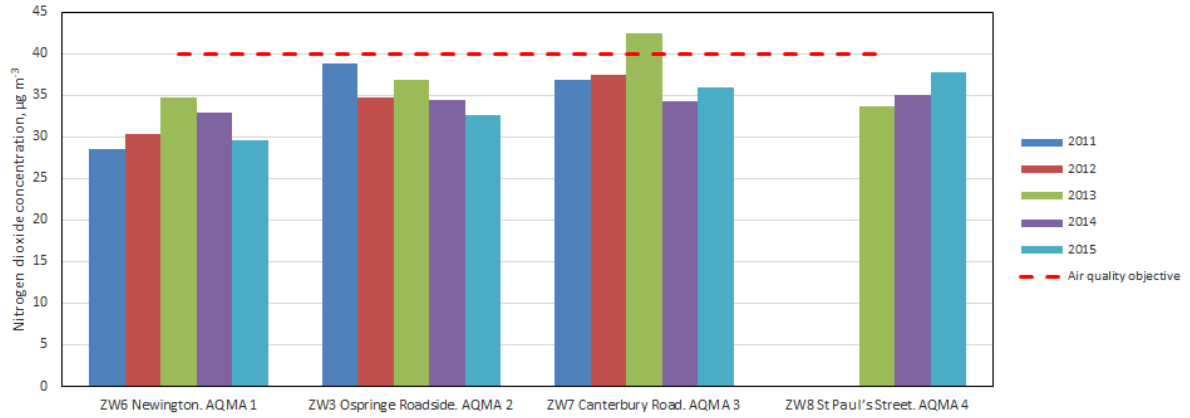


Figure 3-2 to Figure 3-6 shows in a graphical format the annual average nitrogen dioxide concentrations measured by diffusion tube at each at of the fifty seven sites from 2011 to 2015. The data can also be seen in Table A.3 in Appendix A. The full 2015 dataset of monthly mean diffusion tube values is provided in Appendix B.

In general, concentrations in 2015 tend to be amongst the lowest of the five year period, though at some sites, like SW35 (60 High Street Newington) and SW42 (High Street opposite Church Lane) the concentration has remained consistently above the annual objective concentration.

Figure 3-2 Nitrogen dioxide concentrations measured by diffusion tubes in Sheerness from 2011 to 2015

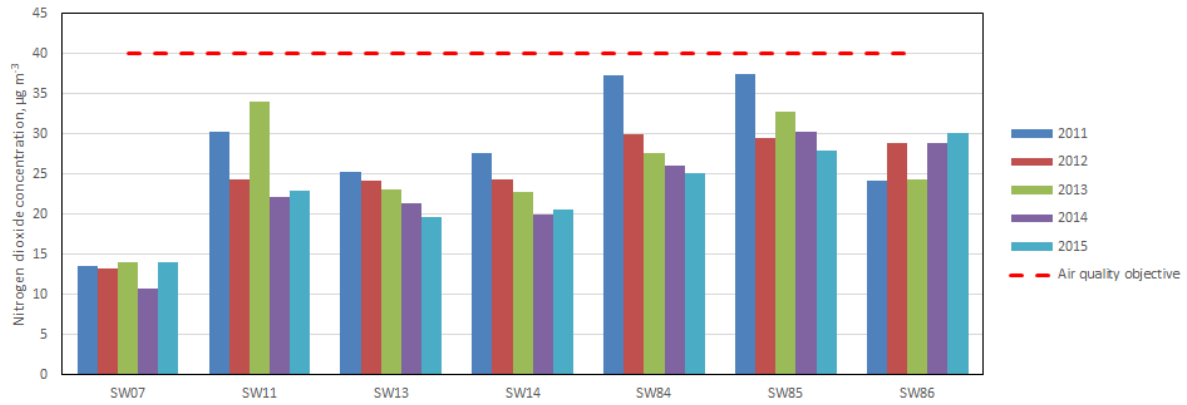


Figure 3-3 Nitrogen dioxide concentrations measured by diffusion tubes in Newington from 2011 to 2015. Area contains AQMA 1.

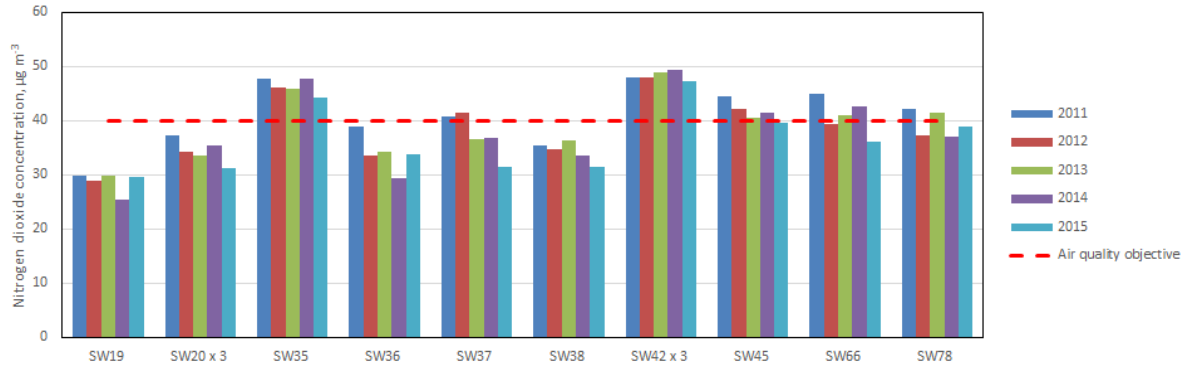


Figure 3-4 Nitrogen dioxide concentrations measured by diffusion tubes in Faversham and Teynham from 2011 to 2015. Area contains AQMA 2 and AQMA 5 (SW79, SW80, SW91 and SW92)

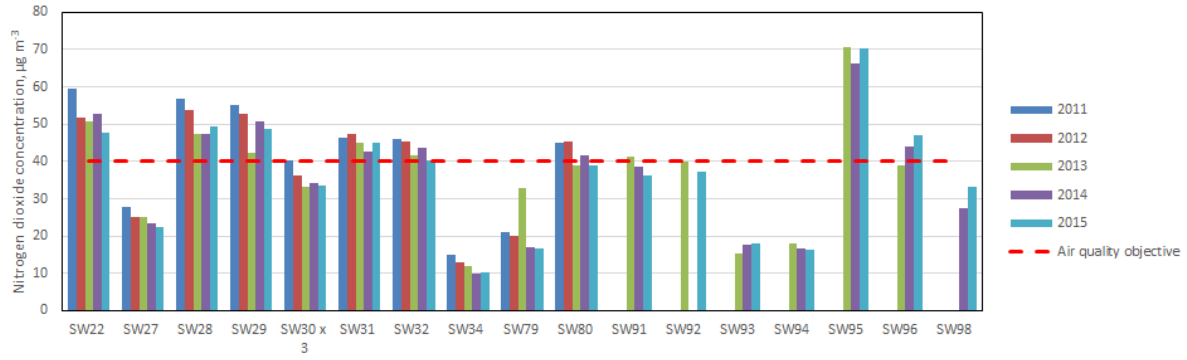


Figure 3-5 Nitrogen dioxide concentrations measured by diffusion tubes in Sittingbourne from 2011 to 2015. Area contains AQMA 3.

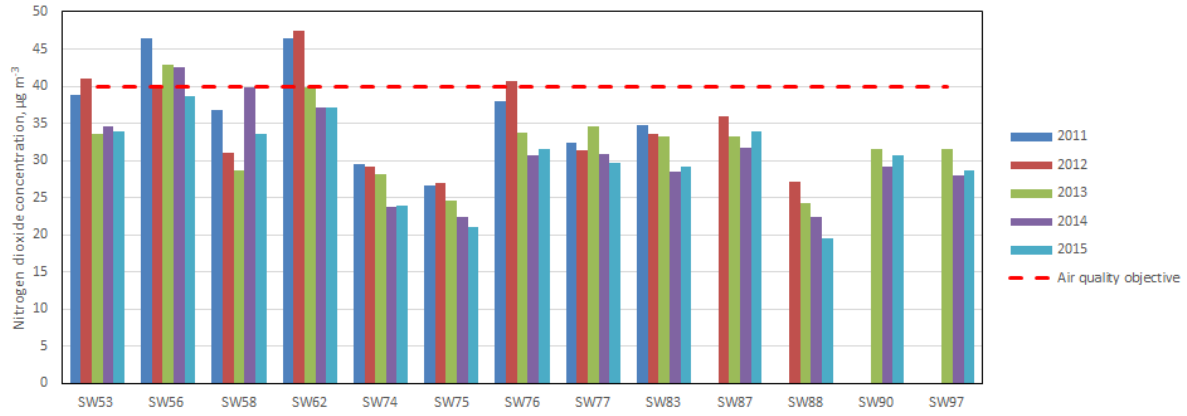
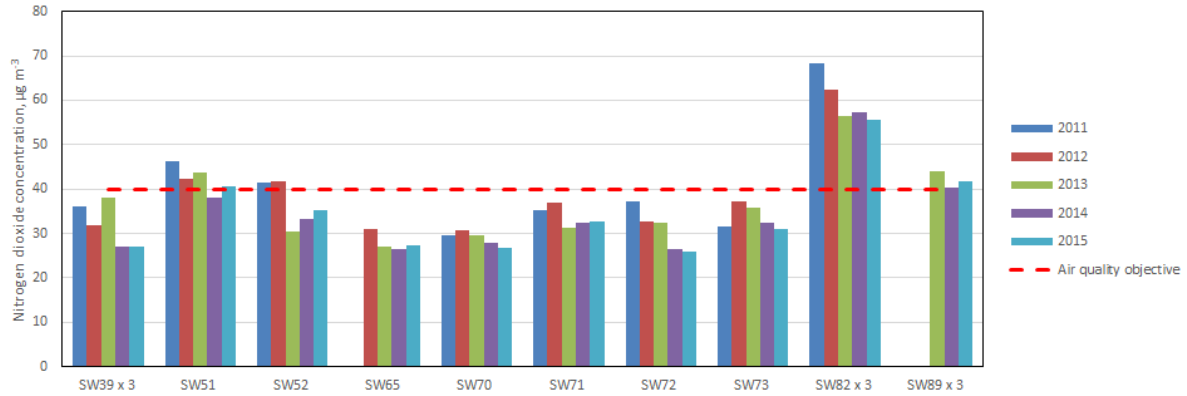


Figure 3-6 Nitrogen dioxide concentrations measured by diffusion tubes in Milton from 2011 to 2015. Area contains AQMA 4.



In 2015, twelve diffusion tube sampling sites measured above the annual objective concentration (40 µg m^{-3}). These are listed in Table 3-2. Also presented are the

distance corrected concentrations calculated at nearby relevant receptor locations (derived using the distance with roads calculator s[8]). Even after applying the distance corrections, concentrations at most sites remain above the above the annual objective concentration.

Following the recommendation in the 2015 USA report, there was sufficient evidence to suggest that the Ospringe Road AQMA (AQMA 2) should be extended to include the Mount. The revised AQMA Order for Ospringe Road came in to effect on 3rd May 2016 (as AQMA 6). There is no relevant exposure at SW82 (Conservative Club, St Paul's Street).

Table 3-2 Sampling sites where the annual average exceeds the annual objective in 2015

Site code	Location	AQMA	Annual average NO_2 concentration, µg m^{-3}	
			Ratified with bias correction (from Table A.3)	Distance correction
SW35	60 High Street, Newington	1	44.2	39.6
SW42 x 3	High Street, Opp Church Lane	1	47.3	42.1
SW22	35 Ospringe Street	2	47.7	47.7
SW28	Mayors Arms, Ospringe Street	2	49.4	49.4
SW29	43 Ospringe Street	2	48.6	41.3
SW31	4 Ospringe Street	2	45.2	41.4
SW32	11 Ospringe Street	2	40.2	37.1
SW95	The Mount, London Road, Faversham	6	70.2	54.9
SW96	Maison Dieu, Ospringe Street, Faversham	2	47.0	47.0
SW51	14/16 St Pauls Street, Milton	4	40.5	39.2
SW82 x 3	Conservative Club, St Pauls Street	4	55.5	Not applicable
SW89 x 3	St Paul's Air Quality Station, Milton	4	41.8	33.4

[8] http://laqm.defra.gov.uk/documents/NO2withDistancefromRoadsCalculatorIssue4.xls

Table A.4 in Appendix A compares the ratified continuous monitored NO_2 hourly mean concentrations for the past 5 years with the air quality objective of 200µg/m^3, not to be exceeded more than 18 times per year.There was only a single measured hour exceedance for all four automatic analysers- so there no exceedance of the hourly objective for nitrogen dioxide.

Taking into account that there was no distance corrected distance corrected annual average concentrations (shown in Table 3-2) above 60 µg m^{-3} it would be unlikely that there was exceedance of the hourly objective at these diffusion tube sites.

3.2.2 Particulate Matter (PM_{10})

Table A.5 in Appendix A presents the ratified monitored PM_{10} annual mean concentrations measured at the Ospringe Roadside for the past 5 years. These annual mean concentrations are compared with the air quality objective of 40µg/m^3 in Figure 3-7. The measured annual mean concentration has remained consistently more than 10 µg m^{-3} below the annual mean objective concentration.

Figure 3-7 PM_{10} concentrations measured at Ospringe Road from 2011 to 2015

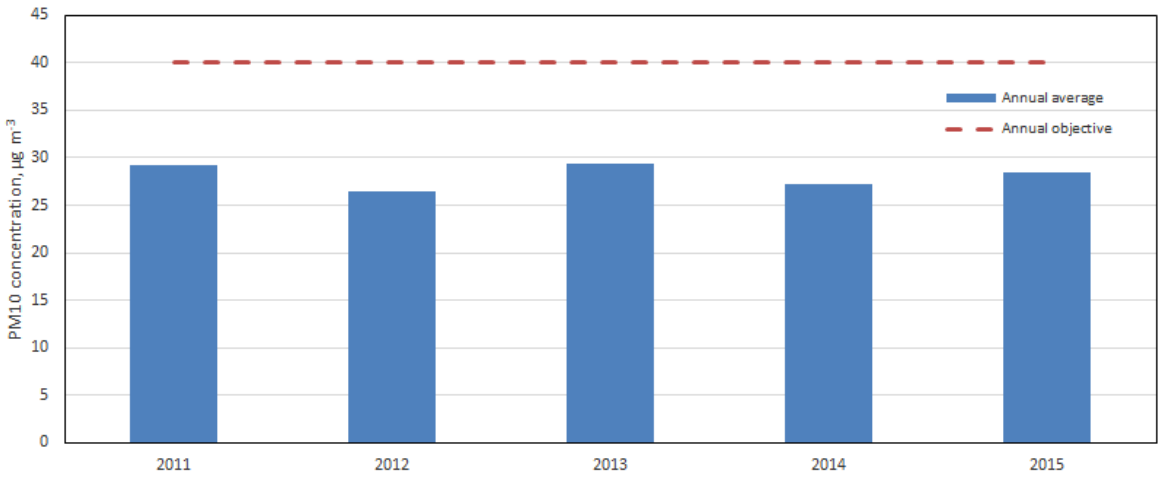
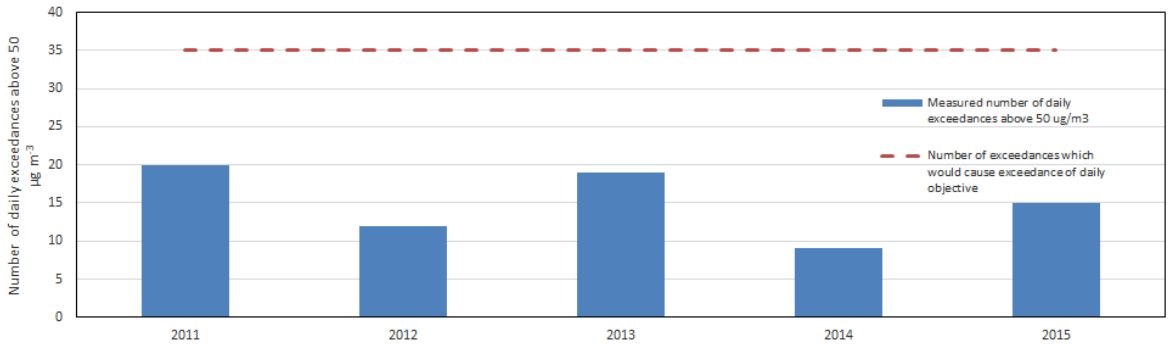


Table A.6 in Appendix A presents the ratified continuous monitored PM_{10} daily mean concentrations measured at Ospringe Street for the past 5 years. Figure 3-8 compares the number of days which exceeded the air quality objective of 50µg/m^3 with the number (35 days) which would caused exceedance.

Figure 3-8 Number of exceedances of daily mean objective of 50 µg m^{-3} at Ospringe Street since 2011



The number of measured exceedances is significantly less than 35 days so there is no exceedance of the daily objective for PM_{10}.

Appendix A: Monitoring Results

Table A.1 – Details of Automatic Monitoring Sites

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Monitoring Technique	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Inlet Height (m)
ZW6	Newington (3)	Roadside	585861	164817	NO2	Y	Chemiluminescence	Y(5m)	1.6	2.35
ZW3	Ospringe Roadside (2)	Roadside	600360	160869	NO2 PM10	Y- NO2	Chemiluminescence TEOM	Y (0m)	1.7	1.95
ZW7	Canterbury Road	Roadside	591483	163472	NO2	Y	Chemiluminescence	Y(4m)	2	1.9
ZW8	St Paul's Street	Roadside	590264	164396	NO2	Y	Chemiluminescence	Y (9m)	2.5	3.2

1. 0m if the monitoring site is at a location of exposure (e.g. installed on the façade of a residential property).
2. N/A if not applicable.

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

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube collocated with a Continuous Analyser?	Height (m)
Sheerness										
SW07	Harty, Sheerness	Rural	600745	169572	NO2	N	N	N/A	N	1.5
SW11	Queenborough Rd, Halfway	Roadside	593002	172853	NO2	N	Y-0	5.5	N	1.75
SW13	Main Road, Q/B	Roadside	591487	172048	NO2	N	Y-1.4	3.8	N	1.9
SW14	Rushenden Road, Q/B	Roadside	591170	172087	NO2	N	Y-1.4	1.7	N	2.45
SW84	Sheerness College 1	Roadside	591725	175045	NO2	N	N	3.5	N	1.85
SW85	Sheerness College 2	Roadside	591751	175009	NO2	N	N	2.3	N	1.9
SW86	Swale Foyer	Roadside	591723	175020	NO2	N	N	1.6	N	2
Newington										
SW19	Newington Social Club	Roadside	585918	164790	NO2	Y (Newington AQMA)	Y-0	2.3	N	2.4
SW20 x 3	Newington Co Op, A2, Newington	Roadside	585846	164820	NO2	Y (Newington AQMA)	Y-0	1.6	Triplicate & co-located (ZW6 - Newington (3))	2.3
SW35	60 High Street, Newington	Roadside	585961	164779	NO2	Y (Newington AQMA)	1.4	1.4	N	2.4
SW36	49 High Street, Newington	Roadside	585928	164798	NO2	Y (Newington AQMA)	<1	3.1	N	2.2
SW37	32 High Street, Newington	Roadside	585867	164801	NO2	Y (Newington AQMA)	4	1.7	N	2.3

SW38	15a High Street, Newington	Roadside	585781	164834	NO2	Y (Newington AQMA)	1.6	2.4	N	2
SW42 x 3	High Street, Opp Church Lane	Roadside	585936	164788	NO2	Y (Newington AQMA)	Y-1.4	1.3	Triplicate	2.2
SW45	64 High Street, Newington	Roadside	585992	164772	NO2	Y (Newington AQMA)	Y-0	1.2	N	2.3
SW66	96/94 High Street, Newington	Roadside	586083	164747	NO2	N	Y – 0	1.2	N	1.9
SW78	Vari Restaurant, High Street	Roadside	585960	164787	NO2	Y (Newington AQMA)	Y – 0.9	2.2	N	1.9
Faversham and Teynham										
SW22	35 Ospringe Street	Roadside	600307	160863	NO2	Y (Ospringe Rd AQMA)	Y-0	2.7	N	2
SW27	44 Ospringe Street, Faversham	Roadside	600241	160894	NO2	Y (Ospringe Rd AQMA)	Y-0	2.5	N	2
SW28	Mayors Arms, Ospringe Street	Roadside	600223	160889	NO2	Y (Ospringe Rd AQMA)	Y-0	1.5	N	2.4
SW29	43 Ospringe Street	Roadside	600274	160871	NO2	Y (Ospringe Rd AQMA)	3	2.4	N	2.07
SW30 x 3	18/19 Ospringe Street	Roadside	600358	160869	NO2	Y (Ospringe Rd AQMA)	1.7	2.3	Triplicate & co-located (ZW3 - Ospringe Roadside (2))	1.9
SW31	4 Ospringe Street	Roadside	600444	160848	NO2	Y (Ospringe Rd AQMA)	<1	1.5	N	2.4
SW32	11 Ospringe Street	Roadside	600420	160845	NO2	Y (Ospringe Rd AQMA)	1.3	2.3	N	2
SW34	Hernehill Village Hall	Urban Background	606624	161110	NO2	N	N/A	N	N	1.9
SW79	Belle Friday Centre, A2 Teynham	Roadside	594840	162566	NO2	N	Y – 0	4	N	1.6
SW80	Michaels Hairdressers A2 Teynham	Roadside	595160	162470	NO2	N	Y – 0.6	1.5	N	1.8
SW91	72 London Road, Teynham	Roadside	595149	162459	NO2	N	Y- 0	2	N	1.75

SW92	64 London Road, Teynham	Roadside	595195	162446	NO2	N	Y-1	3.1	N	1.9
SW93	4 Water Lane, Ospringe, Faversham	Roadside	600361	160842	NO2	N	Y-0	1.7	N	1.8
SW94	Water Lane R/o 15 Ospringe Street, Faversham	Roadside	600370	160842	NO2	N	Y-2.0	2.2	N	1.8
SW95	The Mount, London Road, Faversham	Roadside	600518	160826	NO2	N	Y-3.6	1.6	N	1.9
SW96	Maison Dieu, Ospringe Street, Faversham	Roadside	600358	160859	NO2	Y (Ospringe Rd AQMA)	Y-0	3	N	1.9
SW98	Canterbury Road, Faversham	Roadside	601818	160474	NO2	N	Y-2.0	0.5	N	1.9
Sittingbourne										
SW53	114 East Street, Sittingbourne	Roadside	591401	163471	NO2	Y (East St AQMA)	Y-0	5.1	N	1.6
SW56	126 East Street, Sittingbourne	Roadside	591451	163465	NO2	Y (East St AQMA)	Y-0	2.9	Triplicate	1.85
SW58	Dover Street Filling Station, Dover Street	Roadside	590365	163748	NO2	N	N	2	N	2.4
SW62	Key Street, Sittingbourne	Roadside	588178	164235	NO2	N	Y-15	1.9	N	2.1
SW74	Bell Road Retirement Apartments	Roadside	590983	163545	NO2	N	Y-2.17	1.7	N	1.95
SW75	109 Canterbury Road, Sittingbourne	Roadside	592026	163342	NO2	N	Y-4.0	1.3	N	2
SW76	155 Canterbury Road, Sittingbourne	Roadside	592194	163306	NO2	N	Y-3.5	1.7	N	2.2
SW77	Kemsley Fields, Swale Way	Urban Background	591035	166521	NO2	N	N	4.4	N	2
SW83	Pembury Court, Dover Street	Roadside	590375	163774	NO2	N	Y	1.5	N	2.05
SW87 x 3	Canterbury Road AQ Station	Roadside	591489	163472	NO2	Y (East St AQMA)	N	4.8	Triplicate & co-located (ZW7 - Canterbury Road)	1.7
SW88	Sonara Way	Urban Background	589320	165047	NO2	N	N	1.8	N	1.9

SW90	J Of Canterbury Rd & Goodnestone Rd, Sittingbourne	Roadside	591551	163456	NO2	N	Y-2.9	2	N	1.6
SW97	Swale House, Crown Quay Lane, Sittingbourne	Roadside	591007	163614	NO2	N	Y-1.6	2.4	N	2
Milton										
SW39 x 3	Giles Young Court, Milton	Roadside	590359	164408	NO2	Y (St Paul's AQMA)	Y-0	9	N	2.6
SW51	14/16 St Pauls Street, Milton	Roadside	590235	164408	NO2	Y (St Paul's AQMA)	Y-0.5	2	N	2.2
SW52	20/22 St Pauls Street, Milton	Roadside	590203	164409	NO2	Y (St Paul's AQMA)	Y-0	3	N	2.25
SW65	5 Crown Road, Milton	Roadside	590341	164558	NO2	N	Y-0	2.4	N	1.85
SW70	Stumble Inn, St Pauls Street, Sittingbourne	Roadside	590142	164425	NO2	Y (St Paul's AQMA)	Y-3.6	3	N	2.5
SW71	o/s 8 Staple Close, Staplehurst Road	Roadside	590096	164455	NO2	N	Y-6.1	3	N	2.2
SW72	o/s 1 Alexander Court, Chalkwell Road	Roadside	590094	164397	NO2	N	Y-2	1.7	N	2.1
SW73	Adj to 14 Chalkwell Road, Sittingbourne	Roadside	590122	164405	NO2	Y (St Paul's AQMA)	Y-2.8	3	N	2.2
SW82 x 3	Conservative Club, St Pauls Street	Roadside	590228	164396	NO2	Y (St Paul's AQMA)	N	1.65	Triplicate	2.3
SW89 x 3	St Paul's Air Quality Station, Milton	Kerbside	590264	164396	NO2	Y (St Paul's AQMA)	Y-9.0	4	Triplicate & co-located (ZW8 - St Paul's Street))	3.1

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

(2) N/A if not applicable.

Table A.3 – Annual Mean NO_2 Monitoring Results

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2015 (%) (2)	NO_2 Annual Mean Concentration (µg/m^3) (3)				
					2011	2012	2013	2014	2015
ZW6 Newington (3)	Roadside	Chemilumesence	97.8	97.8	28.5	30.4	34.8	32.9	29.7
ZW3 Ospringe Roadside (2)	Roadside	Chemilumesence	95.2	95.2	38.8	34.8	36.9	34.4a	32.6
ZW7 Canterbury Road	Roadside	Chemilumesence	98.6	98.6	36.9	37.4	**42.5**	34.3	35.9a
ZW8 St Paul's Street	Roadside	Chemilumesence	87.6	87.6	-	-	33.6	35.1	37.7
Sheerness									
SW07	Rural		100	100	13.5	13.3	14.1	10.7	14.0
SW11	Roadside	Diffusion Tube	100	100	30.3	24.3	34.1	22.1	22.9
SW13	Roadside	Diffusion Tube	100	100	25.2	24.2	23.1	21.3	19.6
SW14	Roadside	Diffusion Tube	100	100	27.6	24.4	22.7	20	20.5
SW84	Roadside	Diffusion Tube	92	92	37.3	30	27.6	26.1	25.2
SW85	Roadside	Diffusion Tube	83	83	37.4	29.5	32.8	30.3	27.9
SW86	Roadside	Diffusion Tube	75	75	24.2	28.9	24.4a	28.8	30.1
Newington									
SW19	Roadside	Diffusion Tube	83	83	29.7	28.8	29.8	25.4	29.6
SW20	Roadside	Diffusion Tube	92	92	37.3	34.2	33.4	35.3a	31.2
SW35	Roadside	Diffusion Tube	100	100	**47.6**	**46.1**	**45.9**	**47.7**	**44.2**
SW36	Roadside	Diffusion Tube	83	83	38.9	33.4	34.1	29.2	33.8
SW37	Roadside	Diffusion Tube	100	100	**40.7**	**41.5**	36.5a	36.7	31.4
SW38	Roadside	Diffusion Tube	58	58	35.4	34.7	36.4	33.4a	**31.4a**
SW42	Roadside	Diffusion Tube	92	92	**47.9**	**47.9**	**48.8**	**49.3**	**47.3**
SW45	Roadside	Diffusion Tube	75	75	**44.4**	**42**	**40.4**	**41.3**	39.6
SW66	Roadside	Diffusion Tube	92	92	**45**	39.2	**40.9**	**42.6**	36.2
SW78	Roadside	Diffusion Tube	75	75	**42.1**	37.2	**41.3**	37	38.8
Faversham and Teynham									

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2015 (%) (2)	NO_2 Annual Mean Concentration ($\mu g/m^3$) (3)				
					2011	2012	2013	2014	2015
SW22	Roadside	Diffusion Tube	92	92	**59.6**	**51.7**	**50.8**	**52.9**	**47.7**
SW27	Roadside	Diffusion Tube	100	100	27.8	25.2	25	23.3	22.4
SW28	Roadside	Diffusion Tube	92	92	**56.7**	**53.9**	**47.5**	**47.4**	**49.4**
SW29	Roadside	Diffusion Tube	100	100	**55.1**	**52.8**	**42.3**	**50.7**	**48.6**
SW30	Roadside	Diffusion Tube	100	100	**40.4**	36.4	33.3	34.3	33.4
SW31	Roadside	Diffusion Tube	100	100	**46.5**	**47.5**	**45.1**	**42.7**	**45.2**
SW32	Roadside	Diffusion Tube	100	100	**45.9**	**45.5**	**41.5**	**43.6**	**40.2**
SW34	Urban Background	Diffusion Tube	83	83	14.9	13.1	11.9	10	10.2
SW79	Roadside	Diffusion Tube	100	100	**20.9**	20.2	32.8	17.1	16.7
SW80	Roadside	Diffusion Tube	92	92	45	**45.2**	39.1a	**41.6**	38.9
SW91	Roadside	Diffusion Tube	92	92	-	**-**	**41.3a**	38.5a	36.4
SW92	Roadside	Diffusion Tube	50	50	-	**-**	39.9a	-	37.3a
SW93	Roadside	Diffusion Tube	67	67	-	**-**	15.3a	17.6	17.9a
SW94	Roadside	Diffusion Tube	92	92	-	**-**	17.9a	16.6	16.4
SW95	Roadside	Diffusion Tube	67	67	-	**-**	**70.5a**	**66.3**	**70.2a**
SW96	Roadside	Diffusion Tube	67	67	-	**-**	38.8a	**44.1**	**47.0a**
SW98	Roadside	Diffusion Tube	100	100				27.6 a	33.2
Sittingbourne									
SW53	Roadside	Diffusion Tube	100	100	38.8	**41**	33.6	34.5	33.9
SW56	Roadside	Diffusion Tube	100	100	**46.5**	39.8	**42.8**	**42.5**	38.7
SW58	Roadside	Diffusion Tube	100	100	36.8	31.1	28.6a	39.8	33.5
SW62	Roadside	Diffusion Tube	100	100	**46.5**	**47.5**	39.9	37.1	37.2
SW74	Roadside	Diffusion Tube	100	100	29.5	29.2	28.1	23.8	23.9
SW75	Roadside	Diffusion Tube	100	100	26.7	26.9	24.6a	22.4	21.0
SW76	Roadside	Diffusion Tube	92	92	37.9	**40.7**	33.8	30.7	31.6
SW77	Urban Background	Diffusion Tube	83	83	32.3	31.3	34.5	30.9	29.7
SW83	Roadside	Diffusion Tube	100	100	34.7	33.6	33.3	28.4	29.1

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2015 (%) (2)	NO_2 Annual Mean Concentration ($\mu g/m^3$) (3)				
					2011	2012	2013	2014	2015
SW87	Roadside	Diffusion Tube	100	100	-	36	33.2	31.7a	33.8
SW88	Urban Background	Diffusion Tube	92	92	-	27.2	24.3a	22.3a	19.5
SW90	Roadside	Diffusion Tube	83	83	-	-	31.6	29.1a	30.7
SW97	Roadside	Diffusion Tube	67	67	-	-	31.6a	27.9a	28.7a
Milton									
SW39	Roadside	Diffusion Tube			36.1	31.9	38.1	27.1	26.9
SW51	Roadside	Diffusion Tube			46.3	42.2	43.7	38.1	**40.5**
SW52	Roadside	Diffusion Tube			**41.5**	**41.7**	30.4	33.3	35.2
SW65	Roadside	Diffusion Tube			-	30.9	27.1	26.5	27.3
SW70	Roadside	Diffusion Tube			29.7	30.8	29.6a	27.8	26.8
SW71	Roadside	Diffusion Tube			35.3	37	31.3	32.5	32.7
SW72	Roadside	Diffusion Tube			37.2	32.7	32.5	26.6	25.8
SW73	Roadside	Diffusion Tube			31.6	37.2	35.9	32.4	31.1
SW82	Roadside	Diffusion Tube			**68.2**	**62.3**	**56.4**	**57.4**	**55.5**
SW89	Kerbside	Diffusion Tube			**-**	**-**	**44**	**40.3**	**41.8**

Notes: Exceedances of the NO_2 annual mean objective of $40\mu g/m^3$ are shown in **bold**.

NO_2 annual means exceeding $60\mu g/m^3$, indicating a potential exceedance of the NO_2 1-hour mean objective are shown in **bold and underlined.**

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

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

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

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

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2015 (%) (2)	NO_2 1-Hour Means > 200µg/m^3 (3)				
					2011	2012	2013	2014	2015
ZW6 Newington (3)	Roadside	Chemilumesence	97.8	97.8	0	0	1	1	0
ZW3 Ospringe Roadside (2)	Roadside	Chemilumesence	95.2	95.2	0	0	0	0 (121.2)	0
ZW7 Canterbury Road	Roadside	Chemilumesence	98.6	98.6	0 (107)	0	7 (175.7)	2 (136.6)	0 (107)
ZW8 St Paul's Street	Roadside	Chemilumesence	87.6	87.6	-	-	0	0	1 (120)

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

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

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

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

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

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2015 (%) (2)	PM_{10} Annual Mean Concentration ($\mu g/m^3$) (3)				
				2011	2012	2013	2014	2015
Ospringe Roadside 2	Roadside	98.2	98.2	29.2	26.4	29.4	27.2	28.5

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

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

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

(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_{10} Monitoring Results

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2015 (%) (2)	PM_{10} 24-Hour Means > 50µg/m^3 (3)				
				2011	2012	2013	2014	2015
OspringeRoadside 2	Roadside	98.2	98.2	20	12	19	9	15

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

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

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

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

Appendix B: Full Monthly Diffusion Tube Results for 2015

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

Site ID	NO_2 Mean Concentrations ($\mu g/m^3$)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean	
													Raw Data	Bias Adjusted (1)
SW07	18.0	18.2	16.3	11.2	8.1	7.8	74.5	12.3	11.7	11.9	11.9	9.1	17.6	14.0
SW11	35.4	33.6	32.4	24.7	25.9	23.3	23.5	24.2	29.1	36.6	36.6	18.8	28.7	22.9
SW13	32.3	35.8	23.9	23.8	20.8	15.6	19.8	19.6	26.0	28.5	28.5	20.4	24.6	19.6
SW14	35.2	37.4	30.2	20.6	19.2	16.5	20.1	20.4	26.8	29.9	29.9	22.6	25.7	20.5
SW84	41.6	42.7		26.8	25.9	22.9	24.4	31.3	30.1	35.9	35.9	29.4	31.5	25.2
SW85	39.9	36.7	39.0	30.8	24.7		31.3	34.6	39.5	36.3	36.3		34.9	27.9
SW86	42.3	44.7	32.6	34.0	25.2		26.1		37.1	48.6	48.6		37.7	30.1
SW19	45.6	38.9	43.4			28.9	31.1	30.0	35.4	47.2	47.2	22.7	37.0	29.6
SW20	46.6	50.0	43.5	36.1	28.8		32.7	37.4	38.7	44.9	44.9	26.9	39.1	31.2
SW35	65.1	62.8	60.7	52.7	50.1	46.0	61.3	56.0	52.0	54.2	54.2	49.1	55.4	44.2
SW36	50.7	48.1	48.1	35.9	28.2	27.8		33.9	43.7	53.3	53.3		42.3	33.8
SW37	24.7	50.0	48.5	43.1	23.0	26.0	33.7	43.3	46.4	50.8	50.8	31.9	39.4	31.4
SW38	47.4	52.3	45.9	39.1	31.0	27.8			45.1				41.2	31.4a
SW42	65.7	68.1	57.8	62.9		50.6	55.3	60.1	58.9	60.7	60.7	51.0	59.3	47.3
SW45	62.7	59.2	49.9	47.5	50.2		30.8	48.1	55.1			43.4	49.7	39.6
SW66	56.6	44.9	44.3	46.4	42.9	38.1		45.0	47.9	44.8	44.8	42.6	45.3	36.2
SW78	46.1	46.7	57.2	52.4		34.6	35.3		51.5	56.8	56.8		48.6	38.8
SW22	70.3	69.2	63.7	61.1	59.7	62.3	31.4	66.6		60.7	60.7	51.5	59.7	47.7
SW27	34.8	34.2	31.2	23.2	21.2	20.1	24.4	29.7	32.1	32.6	32.6	20.4	28.0	22.4
SW28	64.6	64.3	54.9	63.0	59.7	55.2	57.4	71.6	68.3	61.0	61.0		61.9	49.4

Site ID	NO_2 Mean Concentrations ($\mu g/m^3$)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean	
													Raw Data	Bias Adjusted (1)
SW29	55.7	72.5	57.9	54.7	52.3	56.6	66.1	80.8	66.0	59.0	59.0	49.7	60.9	48.6
SW30	47.2	50.4	44.2	39.9	43.3	35.5	39.2	43.4	44.4	43.0	43.0	28.8	41.9	33.4
SW31	61.5	64.5	57.2	57.8	44.5	45.6	51.5	65.0	63.5	67.6	67.6	32.7	56.6	45.2
SW32	56.2	63.1	52.3	46.7	43.0	40.5	53.2	70.8	47.0	43.0	43.0	44.7	50.3	40.2
SW34		18.2	14.5		9.7	6.8	10.0	12.3	12.4	17.3	17.3	9.4	12.8	10.2
SW79	27.5	27.1	25.2	19.6	15.0	15.0	17.4	18.6	23.3	24.5	24.5	13.0	20.9	16.7
SW80	68.0	55.3		58.0	43.6	41.1	35.6	40.5	55.6	56.9	56.9	24.8	48.8	38.9
SW91	59.8	50.2	46.1	43.5	37.0	38.3	45.4	45.9		48.0	48.0	38.9	45.6	36.4
SW92			48.3		42.5	33.6		43.3	42.3			33.2	40.5	37.3a
SW93	30.3			22.1		14.3	17.3		24.8	27.3	27.3	13.6	22.1	17.9a
SW94	27.3	25.8	27.1	21.3	17.0	15.1	14.6	15.5		23.4	23.4	15.4	20.5	16.4
SW95	73.0	99.1	94.0	98.4	72.8	75.2	88.1	96.3					87.1	70.2a
SW96	62.9		53.2		53.0	51.8	51.8	62.2	52.3			45.9	54.1	47.0a
SW98	51.5	44.2	44.3	40.5	37.8	32.0	37.5	41.1	48.9	42.8	42.8	36.0	41.6	33.2
SW53	48.7	48.8	45.7	48.8	35.6	31.6	38.8	41.9	35.3	44.9	44.9	43.8	42.4	33.9
SW56	61.6	58.6	44.7	43.9	44.5	42.9	42.2	52.0	49.3	49.0	50.5	41.9	48.4	38.7
SW58	55.9	62.6	54.3	45.6	29.5	20.3	22.3	36.6	40.1	52.9	52.9	30.2	41.9	33.5
SW62	71.2	61.4	47.0	35.3	32.6	39.3	31.3	43.2	49.9	56.9	56.9	33.8	46.6	37.2
SW74	34.8	38.4	32.2	27.3	21.6	19.7	23.2	27.9	33.1	36.6	36.6	27.2	29.9	23.9
SW75	39.6	37.0	29.3	20.2	12.5	18.2	22.8	21.6	27.9	33.2	33.2	20.2	26.3	21.0
SW76	46.5	48.3	41.3	29.6	29.3	23.6	39.9	36.6	48.6	45.5	45.5		39.5	31.6
SW77	49.1	44.5	48.1	42.0	26.8	30.8	29.1	35.7	44.8			20.7	37.2	29.7
SW83	41.2	42.4	40.8	38.4	30.1	27.4	29.9	32.8	37.8	44.0	44.0	29.3	36.5	29.1
SW87	52.5	51.0	50.9	40.9	37.2	32.4	32.0	38.8	43.3	50.6	50.9	28.2	42.4	33.8

Site ID	NO_2 Mean Concentrations (µg/m^3)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean	
													Raw Data	Bias Adjusted (1)
SW88	35.9	33.7	31.0	20.2	17.7	16.9	17.0	21.9		26.6	26.6	20.9	24.4	19.5
SW90	50.6	43.4		26.8		24.3	35.8	36.8	40.2	43.3	54.1	29.2	38.5	30.7
SW97	43.2		41.5	37.0	25.9	28.8				44.9	42.9	26.7	36.4	28.7a
SW39	41.3	40.5	41.8	28.5	25.8	24.5	24.6	31.2	35.5	42.4	42.4	26.2	33.7	26.9
SW51	58.2	52.5	57.8	48.4	35.7	36.7	36.9	43.1	56.6	76.3	76.3	30.0	50.7	40.5
SW52	52.5	46.5	48.8			28.4	26.7		48.8	57.3	57.3	30.4	44.1	35.2
SW65	41.0	41.3	36.7	33.1	26.6	21.3		26.8	33.0	43.9	43.9	28.0	34.1	27.3
SW70	45.9	42.5	39.5	25.1	26.8		24.0	30.4	35.3	37.3	37.3	25.0	33.6	26.8
SW71	58.0	46.9	49.2	20.0	40.2	25.3	25.1	38.9	49.4	51.5	51.5	36.0	41.0	32.7
SW72	37.3	36.6	37.5	27.8	24.6	22.9	25.4	29.9	34.4	43.1	43.1	25.9	32.4	25.8
SW73	46.5	45.0	33.5	34.9	29.0	30.6	30.8	37.4	43.3	50.6	50.6	35.2	39.0	31.1
SW82	81.1	79.2	65.4	67.6	64.3	58.4	63.5	75.3	73.3	75.1	75.1	55.5	69.5	55.5
SW89	63.3	61.0	52.4	48.9		35.1	49.2	50.8	53.3	57.9	60.0	44.4	52.4	41.8

(1) See Appendix C for details on bias adjustment

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

Diffusion Tube Bias Adjustment Factors

In keeping with the guidance in TG(16) a comparison is made between the national bias adjustment factor spreadsheet and the locally derived co-located studies.

National bias adjustment factor spreadsheet.

The diffusion tubes are supplied and analysed by Environmental Scientifics Group (ESG) Didcot utilising the 50% triethanolamine (TEA) in acetone preparation method. A bias adjustment of 0.79 for the year 2015 (based on 26 studies) has been derived from the national bias adjustment calculator[9] .

National Diffusion Tube Bias Adjustment Factor Spreadsheet — Spreadsheet Version Number: 06/16

Follow the steps below **in the correct order** to show the results of **relevant** co-location studies
Data only apply to tubes exposed monthly and are not suitable for correcting individual short-term monitoring periods
Whenever presenting adjusted data, you should state the adjustment factor used and the version of the spreadsheet
This spreadhseet will be updated every few months: the factors may therefore be subject to change. This should not discourage their immediate use.

This spreadsheet will be updated at the end of September 2016
LAQM Helpdesk Website

The LAQM Helpdesk is operated on behalf of Defra and the Devolved Administrations by Bureau Veritas, in conjunction with contract partners AECOM and the National Physical Laboratory.

Spreadsheet maintained by the National Physical Laboratory. Original compiled by Air Quality Consultants Ltd.

Step 1: Select the Laboratory that Analyses Your Tubes from the Drop-Down List

If a laboratory is not shown, we have no data for this laboratory.

Step 2: Select a Preparation Method from the Drop-Down List

If a preparation method is not shown, we have no data for this method at this laboratory.

Step 3: Select a Year from the Drop-Down List

If a year is not shown, we have no data[2]

Step 4:

Where there is only one study for a chosen combination, you should use the adjustment factor shown with caution. Where there is more than one study, use the overall factor[3] shown in blue at the foot of the final column.

If you have your own co-location study then see footnote[4]. If uncertain what to do then contact the Local Air Quality Management Helpdesk at LAQMHelpdesk@uk.bureauveritas.com or 0800 0327953

	Analysed By[1]	Method	Year[5]	Site Type	Local Authority	Length of Study (months)	Diffusion Tube Mean Conc. (Dm) (µg/m³)	Automatic Monitor Mean Conc. (Cm) (µg/m³)	Bias (B)	Tube Precision[6]	Bias Adjustment Factor (A) (Cm/Dm)
1908	ESG Didcot	50% TEA in acetone	2015	B	Gravesham Borough Council	12	30	23	29.8%	P	**0.77**
1915	ESG Didcot	50% TEA in acetone	2015	UI	North Lincolnshire	11	24	18	36.5%	P	**0.73**
1918	ESG Didcot	50% TEA in acetone	2015	R	Swale Borough Council	12	41	33	24.1%	P	**0.81**
1919	ESG Didcot	50% TEA in acetone	2015	R	Swale Borough Council	10	48	38	24.2%	G	**0.81**
1920	ESG Didcot	50% TEA in acetone	2015	R	Swale Borough Council	11	38	30	28.4%	P	**0.78**
1925	ESG Didcot	50% TEA in acetone	2015	R	Wrexham County Borough Council	12	19	19	0.6%	G	**0.99**
1946	ESG Didcot	50% TEA in acetone	2015	KS	Marylebone Road Intercomparison	12	104	81	27.3%	G	**0.78**
1969	ESG Didcot	50% TEA in acetone	2015	R	Vale of White Horse District Council	11	34	29	15.1%	G	**0.86**
1983	ESG Didcot	50% TEA in acetone	2015	UI	Stockton on Tees	12	24	19	25.5%	G	**0.80**
1984	ESG Didcot	50% TEA in acetone	2015	R	Stockton on Tees	12	17	14	19.4%	G	**0.84**
1985	ESG Didcot	50% TEA in acetone	2015	KS	Suffolk Coastal DC	12	44	35	26.0%	P	**0.79**
1999	ESG Didcot	50% TEA in acetone	2015	SU	Thanet District Council	9	17	15	10.6%	G	**0.90**
2000	ESG Didcot	50% TEA in acetone	2015	R	Thanet District Council	12	27	23	17.8%	G	**0.85**
2003	ESG Didcot	50% TEA in acetone	2015	B	Medway Council	12	21	12	77.3%	G	**0.56**
2004	ESG Didcot	50% TEA in acetone	2015	R	Medway Council	11	32	23	42.6%	G	**0.70**
2011	ESG Didcot	50% TEA in acetone	2015	R	North East Lincolnshire Council	10	34	28	21.2%	P	**0.83**
2012	ESG Didcot	50% TEA in acetone	2015	R	North East Lincolnshire Council	11	39	28	38.6%	G	**0.72**
2013	ESG Didcot	50% TEA in acetone	2015	R	North East Lincolnshire Council	11	55	47	16.2%	G	**0.86**
2015	ESG Didcot	50% TEA in acetone	2015	R	Hambleton District Council	10	22	19	17.6%	G	**0.85**
2023	ESG Didcot	50% TEA in acetone	2015	UB	City of York Council	11	24	16	50.6%	G	**0.66**
2024	ESG Didcot	50% TEA in acetone	2015	R	City of York Council	11	36	27	31.9%	G	**0.76**
2025	ESG Didcot	50% TEA in acetone	2015	R	City of York Council	11	34	25	34.8%	G	**0.74**
2026	ESG Didcot	50% TEA in acetone	2015	R	City of York Council	12	39	28	41.1%	G	**0.71**
2040	ESG Didcot	50% TEA in acetone	2015	R	Rugby Borough Council	12	23	21	10.6%	G	**0.90**
2295	ESG Didcot	50% TEA in acetone	2015		**Overall Factor[3] (26 studies)**				**Use**		**0.79**

[9] Spreadsheet can be downloaded from the link: http://laqm.defra.gov.uk/bias-adjustment-factors/national-bias.html

Factor from Local Co-location studies

There are four co-location studies in Swale Borough Council. The spreadsheet tool[10] developed to support local authorities calculate bias was used to assess the bias for each co-location study. Screen shots showing the diffusion tube concentrations, associated concentrations measured by the automatic analyser and the derived A and B bias factors are shown in the following screen prints. Table C.1 summarises the required bias information (using the information shown in the respective blue boxes).

Table C.1: A summary of bias factors and annual averages derived from co-located spreadsheets

Co-located sampling site	Periods of data used	Bias A factor	Bias B factor	NO_2 concentration measured by	
				Diffusion tube, µg m^{-3}	Continuous analyser, µg m^{-3}
Newington 3 (SW20)	8	0.79	0.26	37	29
Ospringe Road (SW30)	11	0.79	0.27	42	33
Canterbury Road (SW87)	7	0.91	0.1	43	39
St Paul Street (SW89)	9	0.73	0.38	53	38

Following the guidance in TG(16) a reasonable approximation for the combined bias can be obtained by adding the average of the Bias B factors (0.2525) adding to 1.0 and then taking the inverse. This resulted in a bias factor of 0.80. This value is slightly higher than the value derived from the national adjustment spreadsheet (0.79) and hence presents a more conservative approach.

Newington (SW20)

[10] http://laqm.defra.gov.uk/documents/AEA_DifTPAB_v04.xls

Checking Precision and Accuracy of Triplicate Tubes

AEA Energy & Environment
From the AEA group

Diffusion Tubes Measurements

Period	Start Date dd/mm/yyyy	End Date dd/mm/yyyy	Tube 1 µgm^{-3}	Tube 2 µgm^{-3}	Tube 3 µgm^{-3}	Triplicate Mean	Standard Deviation	Coefficient of Variation (CV)	95% CI of mean	Automatic Method: Period Mean	Automatic Method: Data Capture (% DC)	Data Quality Check: Tubes Precision Check	Data Quality Check: Automatic Monitor Data
1	07/01/2015	04/02/2015	44.4	41.3	54.0	47	6.6	14	16.4	41	99.7	Good	Good
2	04/02/2015	04/03/2015	55.1	43.7	51.1	50	5.8	12	14.4	38	81.7	Good	Good
3	04/03/2015	01/04/2015	52.7	45.6	32.3	44	10.4	24	25.7	35	99.9	Poor Precision	Good
4	01/04/2015	29/04/2015	39.6	36.4	32.3	36	3.7	10	9.1	29	99.7	Good	Good
5	29/04/2015	27/05/2015	31.7	25.4	29.3	29	3.2	11	7.9	23	98.2	Good	Good
6	27/05/2015	01/07/2015								26	99		Good
7	01/07/2015	29/07/2015	31.4	36.9	29.7	33	3.8	12	9.3	27	98.5	Good	Good
8	29/07/2015	26/08/2015	40.0	37.5	34.6	37	2.7	7	6.7	27	99.6	Good	Good
9	26/08/2015	30/09/2015	37.3		40.1	39	2.0	5	17.8	30	99.5	Good	Good
10	30/09/2015	28/10/2015	35.6	41.6	57.6	45	11.4	25	28.3	35	96.4	Poor Precision	Good
11	28/10/2015	02/12/2015	35.6	41.6	57.6	45	11.4	25	28.3	26	99.2	Poor Precision	Good
12	02/12/2015	06/01/2016	24.7	28.8	27.1	27	2.1	8	5.1	20	98.9	Good	Good
13													
											Overall survey -->	Poor precision	Good Overall

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

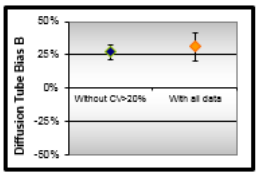
(Check average CV & DC from Accuracy calculations)

Site Name/ ID:

Precision 8 out of 11 periods have a CV smaller than 20%

Accuracy (with 95% confidence interval) without periods with CV larger than 20%	
Bias calculated using 8 periods of data	
Bias factor A	0.79 (0.76 - 0.83)
Bias B	26% (21% - 32%)
Diffusion Tubes Mean:	37 µgm^{-3}
Mean CV (Precision):	10
Automatic Mean:	29 µgm^{-3}
Data Capture for periods used:	97%
Adjusted Tubes Mean:	29 (28 - 31) µgm^{-3}

Accuracy (with 95% confidence interval) WITH ALL DATA	
Bias calculated using 11 periods of data	
Bias factor A	0.77 (0.71 - 0.84)
Bias B	30% (20% - 40%)
Diffusion Tubes Mean:	39 µgm^{-3}
Mean CV (Precision):	14 caution
Automatic Mean:	30 µgm^{-3}
Data Capture for periods used:	97%
Adjusted Tubes Mean:	30 (28 - 33) µgm^{-3}



Jaume Targa, for AEA
Version 04 - February 2011

Ospringe Roadside (SW30)

Checking Precision and Accuracy of Triplicate Tubes

AEA Energy & Environment
From the AEA group

Diffusion Tubes Measurements

Period	Start Date dd/mm/yyyy	End Date dd/mm/yyyy	Tube 1 µgm^{-3}	Tube 2 µgm^{-3}	Tube 3 µgm^{-3}	Triplicate Mean	Standard Deviation	Coefficient of Variation (CV)	95% CI of mean
1	07/01/2015	04/02/2015	45.8	48.7	47.0	47	1.5	3	3.6
2	04/02/2015	04/03/2015	48.1	50.4	52.8	50	2.4	5	5.8
3	04/03/2015	01/04/2015	47.3	46.7	38.7	44	4.8	11	11.9
4	01/04/2015	29/04/2015	41.3	37.7	40.8	40	2.0	5	4.8
5	29/04/2015	27/05/2015	36.5	38.4	55.0	43	10.2	24	25.3
6	27/05/2015	01/07/2015	34.6	32.6	39.2	35	3.4	10	8.4
7	01/07/2015	29/07/2015	36.7	40.6	40.3	39	2.2	6	5.4
8	29/07/2015	26/08/2015	43.4	43.8	43.1	43	0.4	1	0.9
9	26/08/2015	30/09/2015	43.1	44.7	45.5	44	1.2	3	3.0
10	30/09/2015	28/10/2015	42.1	43.4	43.6	43	0.8	2	2.0
11	28/10/2015	02/12/2015	42.1	43.4	43.6	43	0.8	2	2.0
12	02/12/2015	06/01/2016	31.0	30.7	24.8	29	3.5	12	8.7
13									

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

Automatic Method		Data Quality Check	
Period Mean	Data Capture (% DC)	Tubes Precision Check	Automatic Monitor Data
41	94.9	Good	Good
42	96.3	Good	Good
43	99	Good	Good
37	95.5	Good	Good
31	87.2	Poor Precision	Good
30	93.1	Good	Good
25	95.8	Good	Good
32	90.6	Good	Good
29	95.5	Good	Good
32	96.4	Good	Good
28	97.1	Good	Good
22	98.1	Good	Good
Overall survey -->		Good precision	Good Overall

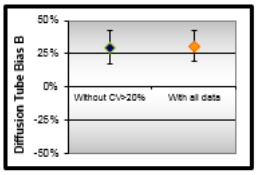
(Check average CV & DC from Accuracy calculations)

Site Name/ ID:

Precision 11 out of 12 periods have a CV smaller than 20%

Accuracy (with 95% confidence interval) without periods with CV larger than 20%
Bias calculated using 11 periods of data
Bias factor A 0.79 (0.71 - 0.87)
Bias B 27% (15% - 40%)
Diffusion Tubes Mean: 42 µgm^{-3}
Mean CV (Precision): 5
Automatic Mean: 33 µgm^{-3}
Data Capture for periods used: 96%
Adjusted Tubes Mean: 33 (30 - 36) µgm^{-3}

Accuracy (with 95% confidence interval) WITH ALL DATA
Bias calculated using 12 periods of data
Bias factor A 0.78 (0.71 - 0.86)
Bias B 28% (16% - 40%)
Diffusion Tubes Mean: 42 µgm^{-3}
Mean CV (Precision): 7
Automatic Mean: 33 µgm^{-3}
Data Capture for periods used: 95%
Adjusted Tubes Mean: 33 (30 - 36) µgm^{-3}



Jaume Targa, for AEA
Version 04 - February 2011

Canterbury Road (SW87)

Checking Precision and Accuracy of Triplicate Tubes

AEA Energy & Environment
From the AEA group

Diffusion Tubes Measurements

Period	Start Date dd/mm/yyyy	End Date dd/mm/yyyy	Tube 1 µgm^{-3}	Tube 2 µgm^{-3}	Tube 3 µgm^{-3}	Triplicate Mean	Standard Deviation	Coefficient of Variation (CV)	95% CI of mean
1	07/01/2015	04/02/2015	49.9	53.1	54.6	53	2.4	5	6.0
2	04/02/2015	04/03/2015	51.8	51.4	49.8	51	1.1	2	2.6
3	04/03/2015	01/04/2015	51.8	51.9	49.0	51	1.6	3	4.1
4	01/04/2015	29/04/2015	41.7	39.7	41.2	41	1.0	3	2.6
5	29/04/2015	27/05/2015	36.5	37.2	37.9	37	0.7	2	1.7
6	27/05/2015	01/07/2015	34.2	31.8	31.1	32	1.6	5	4.0
7	01/07/2015	29/07/2015	29.7		34.2	32	3.2	10	28.6
8	29/07/2015	26/08/2015	39.3	39.4	37.8	39	0.9	2	2.2
9	26/08/2015	30/09/2015	40.2	44.9	44.9	43	2.7	6	6.7
10	30/09/2015	28/10/2015	51.0	51.7	49.0	51	1.4	3	3.5
11	28/10/2015	02/12/2015	50.0	51.0	51.7	51	0.9	2	2.1
12	02/12/2015	06/01/2016	27.5	31.0	26.2	28	2.5	9	6.2
13									

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

Automatic Method		Data Quality Check	
Period Mean	Data Capture (% DC)	Tubes Precision Check	Automatic Monitor Data
32	74.3	Good	Poor Data Capture
27	99.7	Good	Good
31	70.1	Good	Poor Data Capture
50	79	Good	Good
	41.8	Good	Poor Data Capture
	6.9	Good	Poor Data Capture
	41.3	Good	Poor Data Capture
44	89.6	Good	Good
38	99.6	Good	Good
54	99.6	Good	Good
36	99	Good	Good
26	99.4	Good	Good
Overall survey -->		Good precision	Good Overall

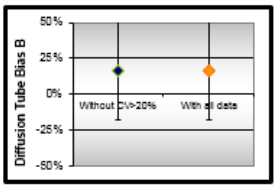
(Check average CV & DC from Accuracy calculations)

Site Name/ ID:

Precision 12 out of 12 periods have a CV smaller than 20%

Accuracy (with 95% confidence interval) without periods with CV larger than 20%
Bias calculated using 7 periods of data
Bias factor A 0.91 (0.69 - 1.32)
Bias B 10% (-24% - 45%)
Diffusion Tubes Mean: 43 µgm^{-3}
Mean CV (Precision): 4
Automatic Mean: 39 µgm^{-3}
Data Capture for periods used: 95%
Adjusted Tubes Mean: 39 (30 - 57) µgm^{-3}

Accuracy (with 95% confidence interval) WITH ALL DATA
Bias calculated using 7 periods of data
Bias factor A 0.91 (0.69 - 1.32)
Bias B 10% (-24% - 45%)
Diffusion Tubes Mean: 43 µgm^{-3}
Mean CV (Precision): 4
Automatic Mean: 39 µgm^{-3}
Data Capture for periods used: 95%
Adjusted Tubes Mean: 39 (30 - 57) µgm^{-3}



Jaume Targa, for AEA
Version 04 - February 2011

St Paul's Street (SW89)

Checking Precision and Accuracy of Triplicate Tubes

AEA Energy & Environment
From the AEA group

Period	Start Date dd/mm/yyyy	End Date dd/mm/yyyy	Tube 1 µgm^{-3}	Tube 2 µgm^{-3}	Tube 3 µgm^{-3}	Triplicate Mean	Standard Deviation	Coefficient of Variation (CV)	95% CI of mean	Automatic Method: Period Mean	Automatic Method: Data Capture (% DC)	Data Quality Check: Tubes Precision Check	Data Quality Check: Automatic Monitor Data
1	07/01/2015	04/02/2015	59.7	64.7	65.4	63	3.1	5	7.7	42	94.2	Good	Good
2	04/02/2015	04/03/2015	55.7	66.6	60.6	61	5.5	9	13.6	45	94.4	Good	Good
3	04/03/2015	01/04/2015	54.2	47.9	55.0	52	3.9	7	9.7	43	96.1	Good	Good
4	01/04/2015	29/04/2015	52.0	51.1	43.7	49	4.6	9	11.3	43	97.8	Good	Good
5	29/04/2015	27/05/2015								37	97		Good
6	27/05/2015	01/07/2015	35.5	32.1	37.6	35	2.8	8	6.9	32	92.9	Good	Good
7	01/07/2015	29/07/2015	47.0	48.4	52.2	49	2.7	5	6.7	30	51.3	Good	r Data Capture
8	29/07/2015	26/08/2015	54.3	54.1	44.0	51	5.9	12	14.6	40	73.6	Good	r Data Capture
9	26/08/2015	30/09/2015	53.6	53.8	52.5	53	0.7	1	1.7	40	80.4	Good	Good
10	30/09/2015	28/10/2015	58.9	60.6	54.1	58	3.4	6	8.4	45	94.8	Good	Good
11	28/10/2015	02/12/2015	60.6	58.9	60.6	60	1.0	2	2.4	33	83.7	Good	Good
12	02/12/2015	06/01/2016	40.7	43.6	48.8	44	4.1	9	10.2	23	92.6	Good	Good
13													
										Overall survey -->		Good	Poor

Diffusion Tubes Measurements

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

(Check average CV & DC from Accuracy calculations)

Site Name/ ID:

Precision: 11 out of 11 periods have a CV smaller than 20%

Accuracy (with 95% confidence interval) without periods with CV larger than 20%

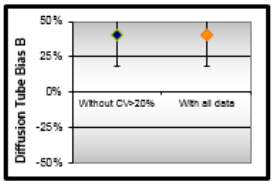
Bias calculated using 9 periods of data

Bias factor A	0.73 (0.63 - 0.87)
Bias B	38% (15% - 60%)
Diffusion Tubes Mean:	53 µgm^{-3}
Mean CV (Precision):	6
Automatic Mean:	38 µgm^{-3}
Data Capture for periods used:	92%
Adjusted Tubes Mean:	39 (33 - 46) µgm^{-3}

Accuracy (with 95% confidence interval) WITH ALL DATA

Bias calculated using 9 periods of data

Bias factor A	0.73 (0.63 - 0.87)
Bias B	38% (15% - 60%)
Diffusion Tubes Mean:	53 µgm^{-3}
Mean CV (Precision):	6
Automatic Mean:	38 µgm^{-3}
Data Capture for periods used:	92%
Adjusted Tubes Mean:	39 (33 - 46) µgm^{-3}



Jaume Targa, for AEA
Version 04 - February 2011

Appendix D: Map(s) of Monitoring Locations

Figure D1: Location of automatic analysers in Swale Borough Council

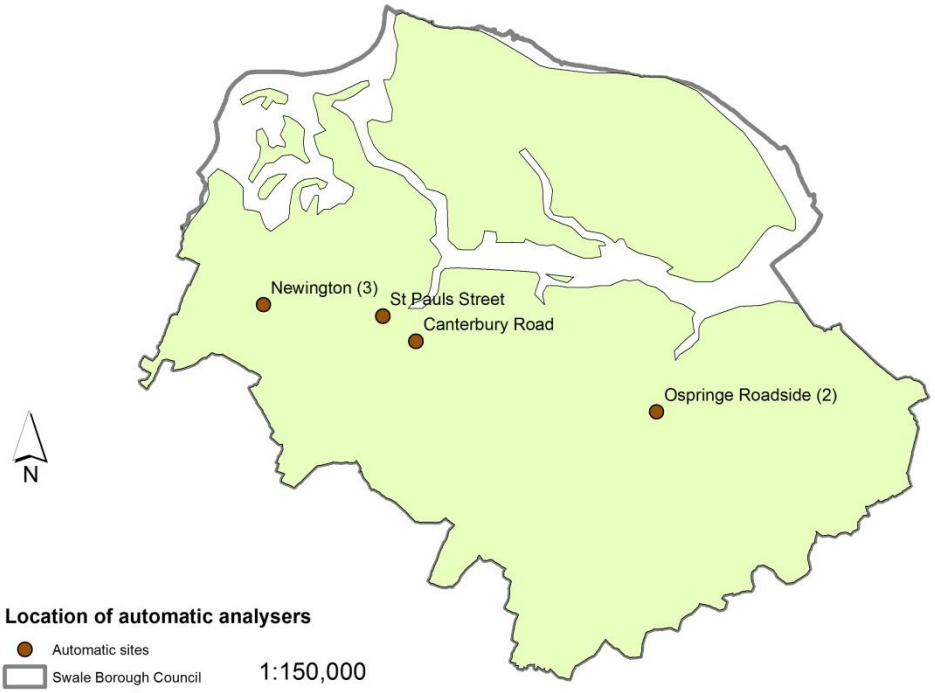


Figure D2: Location of NO_2 diffusion tubes in Swale Borough Council

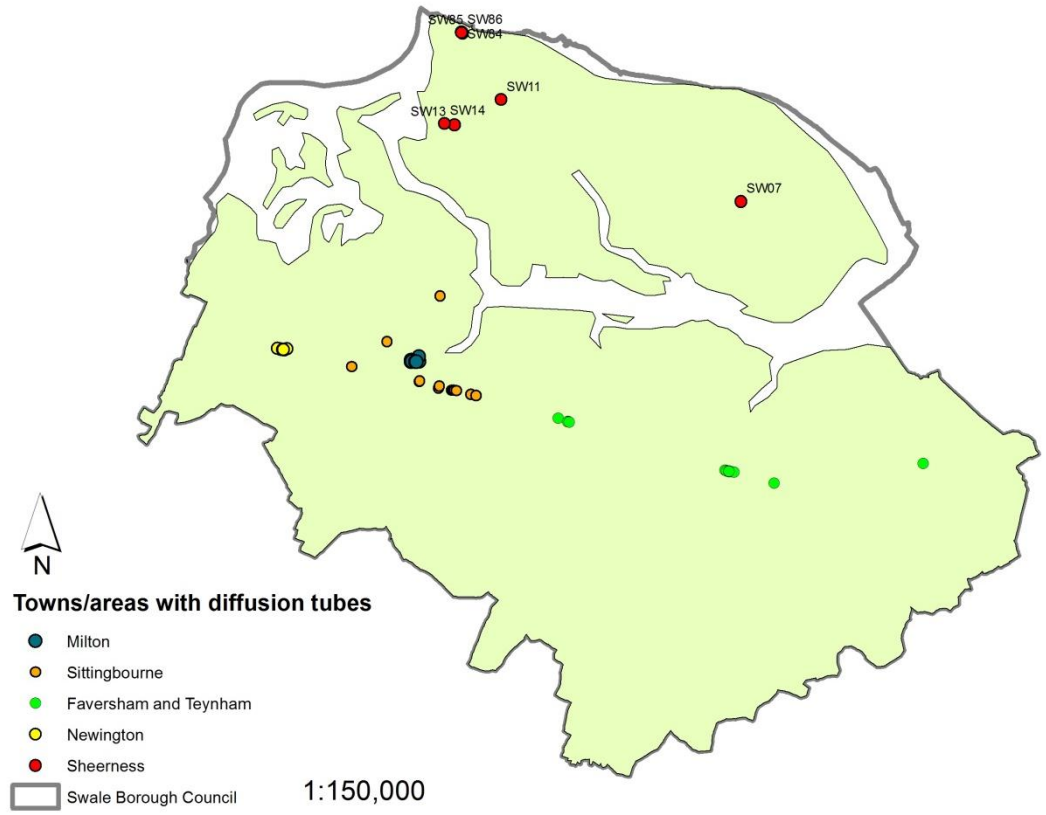
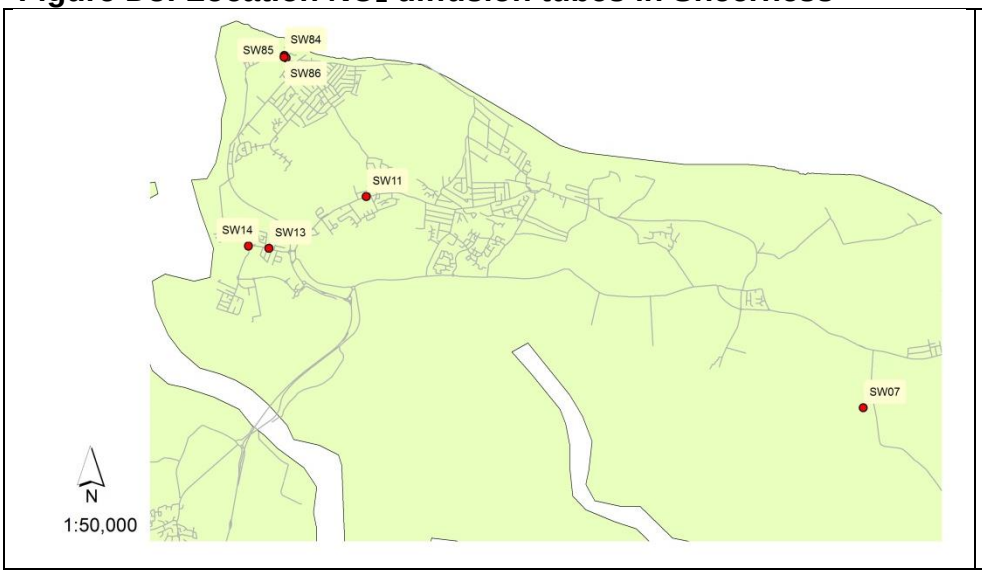
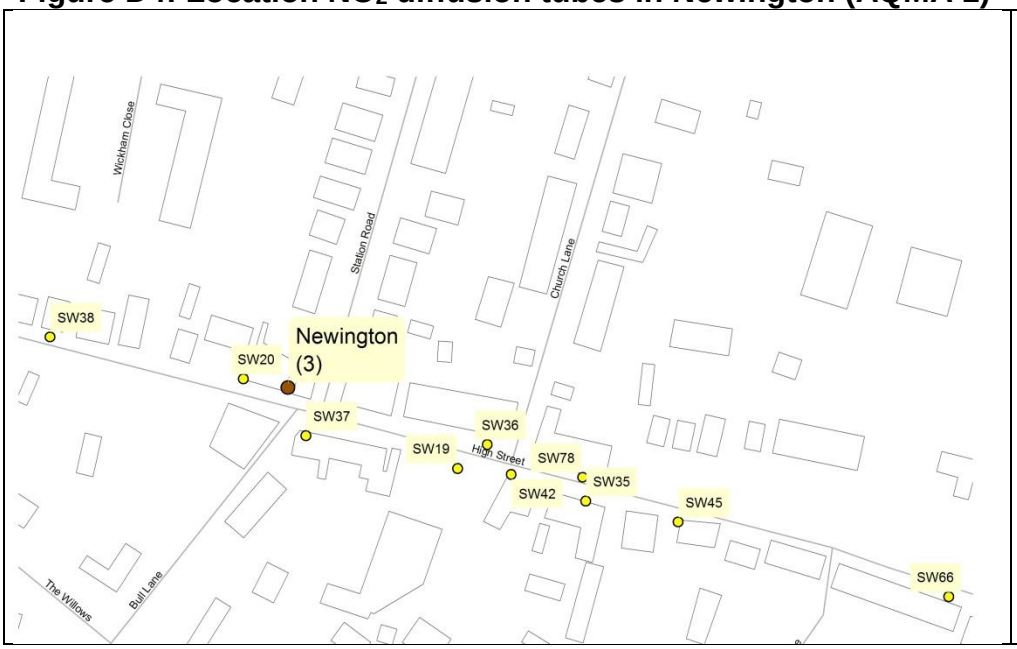


Figure D3: Location NO_2 diffusion tubes in Sheerness



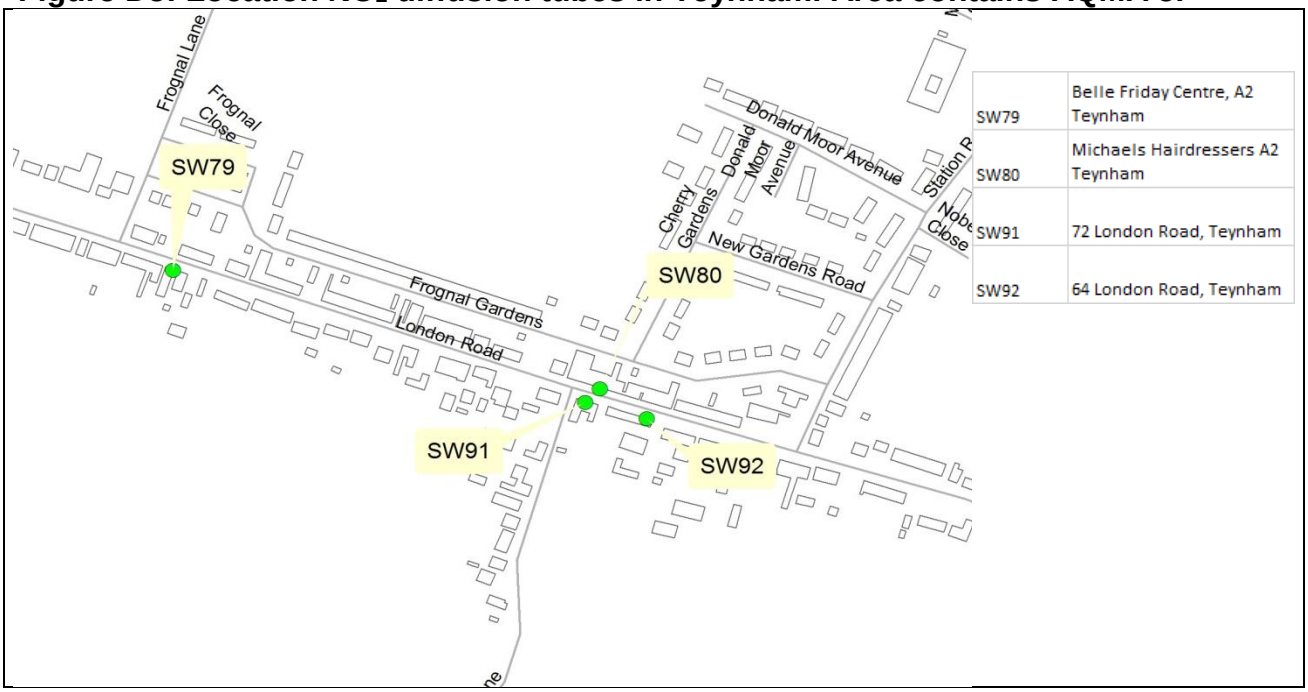
SW07	Harty, Sheerness
SW11	Queenborough Rd, Halfway
SW13	Main Road, Q/B
SW14	Rushenden Road, Q/B
SW84	Sheerness College 1
SW85	Sheerness College 2
SW86	Swale Foyer

Figure D4: Location NO_2 diffusion tubes in Newington (AQMA 1)



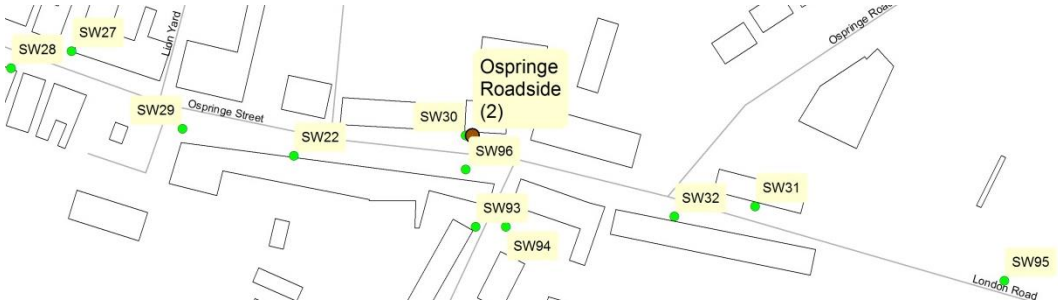
SW19	Newington Social Club
SW20 x 3	Newington Co Op, A2, Newington
SW35	60 High Street, Newington
SW36	49 High Street, Newington
SW37	32 High Street, Newington
SW38	15a High Street, Newington
SW42 x 3	High Street, Opp Church Lane
SW45	64 High Street, Newington
SW66	96/94 High Street, Newington
SW78	Vari Restaurant, High Street

Figure D5: Location NO_2 diffusion tubes in Teynham. Area contains AQMA 5.



SW79	Belle Friday Centre, A2 Teynham
SW80	Michaels Hairdressers A2 Teynham
SW91	72 London Road, Teynham
SW92	64 London Road, Teynham

Figure D6: Location NO_2 diffusion tubes in Faversham. Area contains AQMA 2.



SW22	35 Ospringe Street
SW27	44 Ospringe Street, Faversham
SW28	Mayors Arms, Ospringe Street
SW29	43 Ospringe Street
SW30 x 3	18/19 Ospringe Street
SW31	4 Ospringe Street
SW32	11 Ospringe Street
SW34	Hernehill Village Hall
SW93	4 Water Lane, Ospringe, Faversham
SW94	Water Lane R/o 15 Ospringe Street, Faversham
SW95	The Mount, London Road, Faversham
SW96	Maison Dieu, Ospringe Street, Faversham

Figure D7: Location NO_2 diffusion tubes in Faversham. Not in AQMA

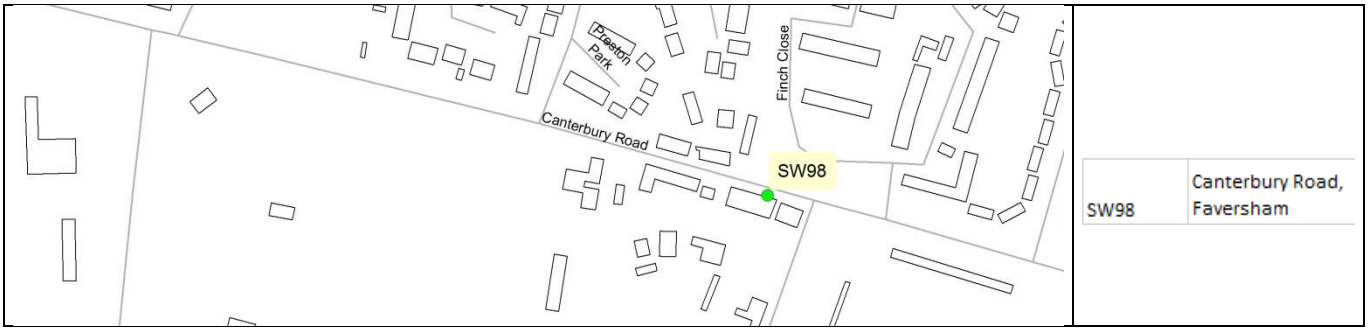


Figure D8: Location NO_2 diffusion tubes in Sittingbourne. This map shows location of the automatic analyser in St Paul's Street (within AQMA 4) and the automatic analyser at Canterbury Road within AQMA 3.

Figure D9: Location NO_2 diffusion tubes in St Paul's Street, Milton, Sittingbourne. This area contains the St Paul's Street AQMA (AQMA 4).

SW39 x 3	Giles Young Court, Milton
SW51	14/16 St Pauls Street, Milton
SW52	20/22 St Pauls Street, Milton
SW65	5 Crown Road, Milton
SW70	Stumble Inn, St Pauls Street, Sittingbourne
SW71	o/s 8 Staple Close, Staplehurst Road
SW72	o/s 1 Alexander Court, Chalkwell Road
SW73	Adj to 14 Chalkwell Road, Sittingbourne
SW82 x 3	Conservative Club, St Pauls Street

Appendix E: Summary of Air Quality Objectives in England

Table E.1 – Air Quality Objectives in England

Pollutant	Air Quality Objective[11]	
	Concentration	Measured as
Nitrogen Dioxide (NO_2)	200 µg/m^3 not to be exceeded more than 18 times a year	1-hour mean
	40 µg/m^3	Annual mean
Particulate Matter (PM_{10})	50 µg/m^3, not to be exceeded more than 35 times a year	24-hour mean
	40 µg/m^3	Annual mean
Sulphur Dioxide (SO_2)	350 µg/m^3, not to be exceeded more than 24 times a year	1-hour mean
	125 µg/m^3, not to be exceeded more than 3 times a year	24-hour mean
	266 µg/m^3, not to be exceeded more than 35 times a year	15-minute mean

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

Glossary of Terms

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