Lewes District Council

2014 Air Quality Further Assessment for Lewes District Council

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

21st October 2014

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1 Introduction

1.1 This report sets out the Further Assessment of air quality within the air quality management area in Newhaven. It forms part of the air quality Review and Assessment process prescribed by Defra and the Devolved Administrations (including the Welsh Assembly Government). The AQMA is shown in Figure 1 and has been declared because of likely exceedences of the annual mean nitrogen dioxide objective.

Introduction to the Review and Assessment Process

1.2 This report fulfils the requirements of the Local Air Quality Management process as set out in Part IV of the Environment Act (1995), the Air Quality Strategy for England, Scotland, Wales and Northern Ireland 2007 and the relevant Policy and Technical Guidance documents. The LAQM process places an obligation on all local authorities to regularly review and assess air quality in their areas, and to determine whether or not the air quality objectives are likely to be achieved. Where exceedences are considered likely, the local authority must then declare an Air Quality Management Area (AQMA) and prepare an Air Quality Action Plan (AQAP) setting out the measures it intends to put in place in pursuit of the objectives.

1.3 Technical Guidance for Local Air Quality Management (LAQM.TG (09)) (Defra and the DAs, 2009) sets out a phased approach to the Review and Assessment process. This prescribes an initial Updating and Screening Assessment (USA), which all local authorities must undertake. It is based on a checklist to identify any matters that have changed since the previous round. If the USA identifies any areas where there is a risk that the objectives may be exceeded, which were not identified in the previous round, then the Local Authority should progress to a Detailed Assessment (DA).

1.4 The purpose of the DA is to determine whether there is an exceedence of an air quality objective and the geographical extent of that exceedence. If the outcome of the DA is that one or more of the air quality objectives are likely to be exceeded, then an Air Quality Management Area (AQMA) must be declared. Subsequent to the declaration of an AQMA, a Further Assessment must be carried out to confirm that the AQMA declaration is justified and that the appropriate geographical area has been included; to ascertain the sources contributing to the exceedence; and to calculate the magnitude of reduction in emissions required to achieve the objective. This information can be used to inform the Air Quality Action Plan (AQAP), which will identify measures to improve local air quality.

The Air Quality Objectives

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

1.6 The air quality objectives only apply where members of the public are likely to be regularly present for the averaging time of the objective (i.e. where people will be exposed to pollutants). For annual mean objectives, relevant exposure is limited to residential properties, schools and hospitals. The 1-hour objective applies at these locations, as well as at any outdoor location where a member of the public might reasonably be expected to stay for 1 hour or more, such as shopping streets, parks and sports grounds, as well as bus stations and railway stations that are not fully enclosed.

1.7 Measurements across the UK have shown that the 1-hour nitrogen dioxide objective is unlikely to be exceeded unless the annual mean nitrogen dioxide concentration is greater than $60\mu g/m^3$ (Laxen and Marner, 2003). Thus, potential exceedences of the 1-hour mean nitrogen dioxide objective need only be considered where the annual mean is predicted to be above 60 $\mu g/m^3$.

1.8 The European Union has also set limit values for nitrogen dioxide. Achievement of these values is a national obligation rather than a local one. The limit values for nitrogen dioxide are the same level as the UK objectives, but are to be achieved by 2010.

Table 1: Air Quality Objectives for Nitrogen Dioxide

Pollutant	Air Quality Objective		Date to be achieved by
	Concentration	Measured as	
1,3-Butadiene	2.25 µg/m³	Running annual mean	31.12.2003
Carbon monoxide	10 mg/m³	Running 8-hour mean	31.12.2003
Lead	0.50 µg/m³	Annual mean	31.12.2004
	0.25 µg/m³	Annual mean	31.12.2008
Nitrogen dioxide	200 µg/m³ not to be exceeded more than 18 times a year	1-hour mean	31.12.2005
	40 µg/m³	Annual mean	31.12.2005
Particulate Matter (PM_{10}) (gravimetric)	50 µg/m³, not to be exceeded more than 35 times a year	24-hour mean	31.12.2004
	40 µg/m³	Annual mean	31.12.2004
Sulphur dioxide	350 µg/m³, not to be exceeded more than 24 times a year	1-hour mean	31.12.2004
	125 µg/m³, not to be exceeded more than 3 times a year	24-hour mean	31.12.2004
	266 µg/m³, not to be exceeded more than 35 times a year	15-minute mean	31.12.2005

Scope

1.9 Guidance available from the Review and Assessment Helpdesk website (Defra and the DAs, 2008a) explains that a Further Assessment report allows authorities:

- to confirm their original assessment of air quality against the prescribed objectives, and thus ensure that they were right to designate the AQMA;
- to calculate more accurately how much of an improvement in air quality would be needed to deliver the air quality objectives within the AQMA;
- to refine their knowledge of the sources of pollution so that air quality action plans can be properly targeted;
- to take account of national policy developments that may come to light after the AQMA declaration;
- to take account, as far as possible, of any local policy developments that are likely to affect air quality by the relevant date, and which were not fully factored into earlier calculations;
- where practical to carry out real-time monitoring where this has not been done previously;
- to carry out further monitoring in problem areas to check earlier findings;
- to corroborate other assumptions on which the designation of the AQMA has been based, and to check that the original designation is still valid, and does not need amending in any way;
- to respond to any comments made by statutory consultees in respect of local authorities' previous reports, particularly where these have highlighted that insufficient attention has been paid to, for example, the validation of modelled data.

Report Structure and Issues Addressed

1.10 Section 2 of this report introduces the Newhaven AQMA, and hence defines the study area. Section 3 describes new developments that are proposed. Section 4 comprises a review of new monitoring data and the results of new detailed dispersion modelling that has been carried out. These data are then used to determine the likelihood of exceedences of the objectives within the AQMA. Section 5 estimates the relative contribution of the most significant pollution sources to pollutant concentrations. Sections 6 and 7 set out the Air Quality Improvements required to meet the objectives and some hypothetical measures to achieve this.

Key Findings of Previous Review and Assessment Reports

1.11 The third round of Review and Assessment Updating and Screening Assessment (USA) was completed in August 2006. This assessment identified potential exceedances of the annual mean air quality objective for nitrogen dioxide on Southway (A259) Newhaven. A Detailed Assessment was completed in November 2008; however the Detailed Assessment was not accepted by DEFRA due to concerns relating to the modeling methodology. At DEFRA's request further modeling was carried out in March 2010 for the Newhaven area and found no likely exceedance of the AQO for NO_2 when measured as an annual mean (40 $\mu g/m^3$). The report was approved by DEFRA in April 2010.

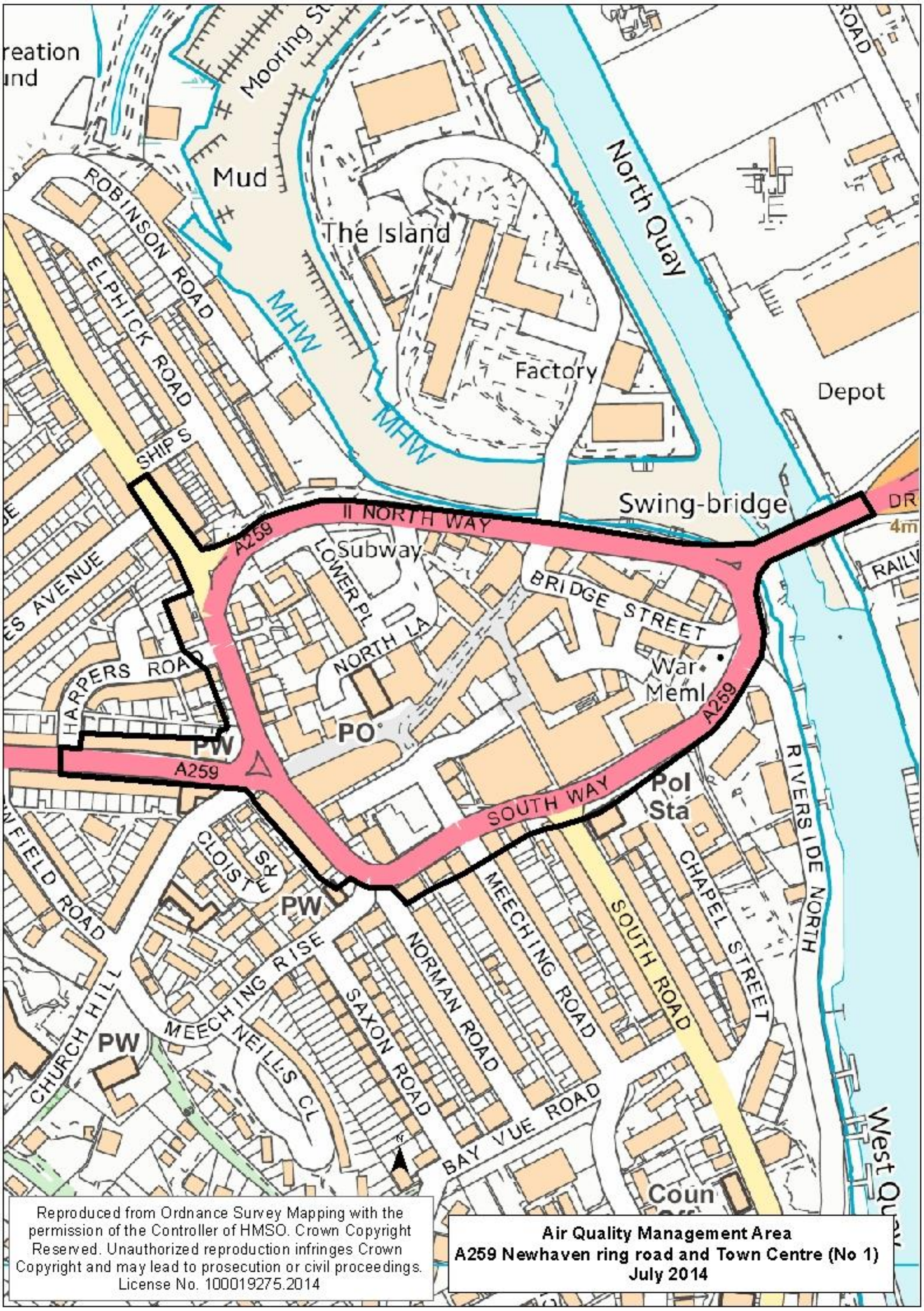
A further Progress Report (PR) was submitted in May 2010 and once again this showed a number of tube locations adjacent to the Newhaven gyratory that were exceeding 40 $\mu g/m^{3.}$ DEFRA requested a further Detailed Assessment in October 2010. Lewes District Council agreed to carry out this Detailed Assessment using 2010 continuous monitoring data and newly acquired modeling software. A further Detailed Assessment for the Newhaven ring road area was submitted to DEFRA in February 2013. The findings recommend declaring an AQMA in Newhaven. The findings of the Detailed Assessment were finally agreed in August 2013. Lewes District Council undertook a consultation in September 2013 on the findings of the Detailed Assessment and in December the geographical extent of the AQMA was also consulted on, the findings of this consultation can be seen in Appendix 4.

1.13 The declaration was made by council order on July 16th 2014 and is described in section 2.

2 AQMA Location

The Newhaven AQMA encompasses Newhaven Town Centre and properties adjacent to the A259 Southway, A259 Northway, sections of the A259 Brighton Road, Lewes Road and the swing bridge, as shown in Figure 1.

Figure 1: Newhaven Air Quality Management Area



3 Developments since the Detailed Assessment approval

New/Proposed Local Developments

3.1 There have been no new road or housing developments within close proximity to the Newhaven AQMA since the AQMA was declared In July 2014.

There has been a great deal of development interest in Newhaven in recent months and currently there are 3 large developments planned for the Newhaven area. These include two separate mixed residential and commercial developments and also a new technical college. All of these proposed developments have the potential to increase emission associated with the movement of traffic on the A259.

National Developments

3.2 DEFRA released the latest version of its NO_x to NO_2 calculator tool (v4.1) on the 19 June 2014, the calculator allows local authorities to derive NO_2 from NO_x wherever NO_x is predicted by modelling emissions from roads and has been used to verify the model.

4 New Monitoring and Modelling Data

New Monitoring

4.1 Lewes District Council has historically undertaken continuous monitoring of air quality pollutants at two roadside locations, Telscombe Cliffs and West Street, Lewes (within the AQMA).

In February 2010 the Telscombe Cliffes site was decommissioned and mothballed until a new site became available. In March 2011 a new site was acquired at Denton Primary School, Newhaven. This site has subsequently been relocated in July 2013, the data and details of this new site will be detailed in future LAQM reports. This principle aim of this site is to monitor the emissions from the Newhaven ERF. It monitors the same species as before, PM_{10} (particulates with an aerodynamic diameter of 10 microns or less), NOx, and ozone with the addition of a new FDMS $PM_{2.5}$ (particulates with an aerodynamic diameter of 2.5 microns or less). In October 2012 the Sussex Air mobile monitoring station was installed adjacent to the A26, Newhaven. This installation monitored the roadside emissions of PM_{10} and NOx.

At both of the fixed monitoring stations nitrogen dioxide is measured using a chemiluminescence analyser, a Horiba APNA Ambient NO_x Monitor, whilst PM_{10} is measured using a RP TEOM (Series 1400a). The $PM_{2.5}$ (Denton School only) is measured using a Thermo Scientific TEOM 1400ab 8500 FDMS.

The calibrations and filter change data is sent to Environment Research Group based at Kings College, London (ERG) every two weeks. ERG collect the data from the stations on a daily basis, verifying the data against other monitoring stations in the south-east and ratifying it using the calibration information supplied. Local Site Operations (LSO) duties are carried out by trained officers from the Environment Team within Lewes District Council's Planning and Environmental Health department.

4.3 The Council also monitors NO_2 using diffusion tubes across the district. The monitoring is undertaken using diffusion tubes supplied and analysed by Gradko. Details relating to the quality control and assurance of this monitoring can be found in Appendix 1. Currently there are 10 diffusion tube sites in Newhaven. A Diffusion tubes is a type of passive sampler, which absorb the pollutant to be monitored directly from the surrounding air with no need for a power supply. Passive samplers are easy to use and relatively inexpensive.

4.4 Historically a tube has been co-located at the continuous monitoring site LS2 (now LS5) and is <0.50m from the inlet to the Horiba APNA Ambient NO_x Monitor. Currently a tube is also co-located at LS6 <0.50m from the inlet to the Horiba APNA Ambient NO_x monitor. The bias adjustment factor for each year is listed in table 2 and have been calculated from the 2012 collocation study as supplied by the DEFRA helpdesk. All monitoring data have been ratified following the methods described in LAQM.TG (09).

Based on guidance available on the Review and Assessment Helpdesk website, it is most appropriate to apply the local bias adjustment factor, as it is in a setting representative of the diffusion tube monitoring to be adjusted. However due the movement of the co-located sites during the study years and incomplete data capture it has decided to use a bias adjustment figure from the national study.

4.5 Monitoring data for 2010, 2011, 2012 and 2013 are presented in Table 2. In all cases, data are bias adjusted, and where appropriate, adjusted to represent an annual mean. The data has also been adjusted to represent relevant exposure using DEFRAs distance from road calculator.

Table 2: The Annual Mean Concentration of NO_2 at diffusion tube sites on the gyratory system, Newhaven

Site	2010(a) 0.94	(b)	2011(a) 0.83	(b)	2012(a) 0.94	(b)	2013(a) 0.95	(b)
9 Southway Newhaven	44.9	37	40.9	34.1	34.5	29.3	40.8	33.6
16 Southway Newhaven	51.2	50.6	43.4	42.6	39.1	38.7	49.3	48.7
Lewes Road Newhaven	37.0	33.7	30.6	28.1	29.3	27.0	31	28.1

a Annual mean level of NO_2 with bias adjustment factor applied
b Annual mean level of NO_2 at façade with adjustment using
http://laqm.defra.gov.uk/documents/NO_2withDistancefromRoadsCalculatorIssue4.xls

4.7 The results indicate that the annual mean nitrogen dioxide objective is being exceeded at two roadside monitoring locations, 9 and 16 Southway for 2010, 2011 and 2013. However only 16 Southway exceeds at the façade of a relevant receptor. This pattern of exceeding and then dropping below the AQO from year to year has been repeated since 2006 despite no significant changes to movement, mix and volume of traffic or other potential sources. This demonstrates the significance of the impact of local weather conditions on monitored levels of nitrogen dioxide. It also demonstrates the negligible impact that the Newhaven ERF has had on monitored levels of NO_2 since its commissioning in October 2011.

New Modelling

4.8 Annual mean concentrations of nitrogen dioxide during 2013 have been modelled using the Atmospheric Dispersion Modelling System for Roads (ADMS Urban, version 3.2). ADMS Urban is one of the dispersion models accepted for modelling within the Government's Technical Guidance (Defra and the DAs, 2009). The model has been run using a full year of meteorological data for 2013 from the meteorological station near Shoreham Airport. Concentrations have been modelled for all monitoring locations (Figure 2). Concentrations have also been modelled for a grid of receptors in order to allow contours of concentrations to be determined. The modelling methodology, and the input data utilised are described in Appendix 2. The model has been verified against monitoring data and adjusted accordingly. Further details of model verification and adjustment are also supplied in Appendix 3.

4.9 Table 3 and Figure 2 presents the concentrations predicted for specific receptor locations in 2013. The model under-predicts at some monitoring locations, and over-predicts at others. This is not uncommon when modelling locations where the complexity of the topography and the movement of the traffic is such that the model cannot always accurately predict the concentrations. These uncertainties are inherent in the model and can be overcome to some extent through the verification of the model and where necessary the correction of the model output**.**

Table 3: The Annual Mean Concentration of NO_2 at relevant receptors in AQMA, Newhaven for 2013.

Receptor name	NO_2 **µg/m³**	**Relevant receptor y/n**
10 Lewes Road 1	32.61	y
10 Lewes Road 2	30.07	Y
29 Lewes Road	41.29	Y
17 Folly Field	35.7	Y
13 Folly Field	36.12	Y
Flat 3 11 Lewes road	38.49	Y
9 Lewes Road	40.11	Y
7 Lewes Road	41.25	Y
5 Lewes Road	42.56	Y
4 Brighton Road	42.41	Y
NO_2 16 Southway tube	42.12	
4 Lewes Road	34.5	Y
FLATS OPP BRGTN RD J	30.03	Y
34 Harper Road	29.98	Y
10 Lewes Road	27.12	Y
29 Lewes Road	35.08	Y
Folly Field Road	32.19	Y
13 Folly Field Rear	32.15	Y
8 Brighton Road	40.29	Y
2 Lewes Road	29.59	N

Garden		
16 Southway	40.13	Y
12 Southway	38.13	Y
18 Southway	37.74	Y
Summerhayes 1	37.67	Y
Summerhayes 2	33.99	Y
30 Southway	42.35	Y
5 Meeching Road	26.39	Y
2 Norman Road	24.6	Y
3 South Road	32.33	Y
15 South Road	24.51	Y
4 South Road	23.75	Y
43 Chapel Street	26.73	Y
Bridge Court 1	31.24	Y
Bridge Court 2	31.04	Y
Bridge Court 3	32.73	Y
Riverside Court 1	39.84	Y
Riverside Court 2	38.53	Y
Riverside Court 3	40.34	Y
Essex Mews 1	31.03	Y
24 Meeching Rise	24.79	Y
28 Southway	39.59	Y

4.10 At all other specific receptor locations within the AQMA, the annual mean air quality objective is predicted to be met in 2013. There are also no predicted annual mean concentrations greater than 60 µg/m^3 at relevant locations, and therefore it is unlikely that the 1-hour objective for nitrogen dioxide will be exceeded.

4.11 Figure 3 indicates predicted exceedences of the annual mean nitrogen dioxide objective at locations of relevant exposure, however when compared with Figure 1, it is clear that the predicted area of exceedence is entirely encompassed by the existing AQMA boundary. The 36 µg/m^3 contour, shown as the dashed contour line, represents one standard deviation of the model, which takes into account the uncertainty inherent in the predicted results. The current AQMA boundary also encompasses all properties within the 36 µg/m^3 contour.

Figure 2: Annual mean concentrations of NO_2 at relevant receptors

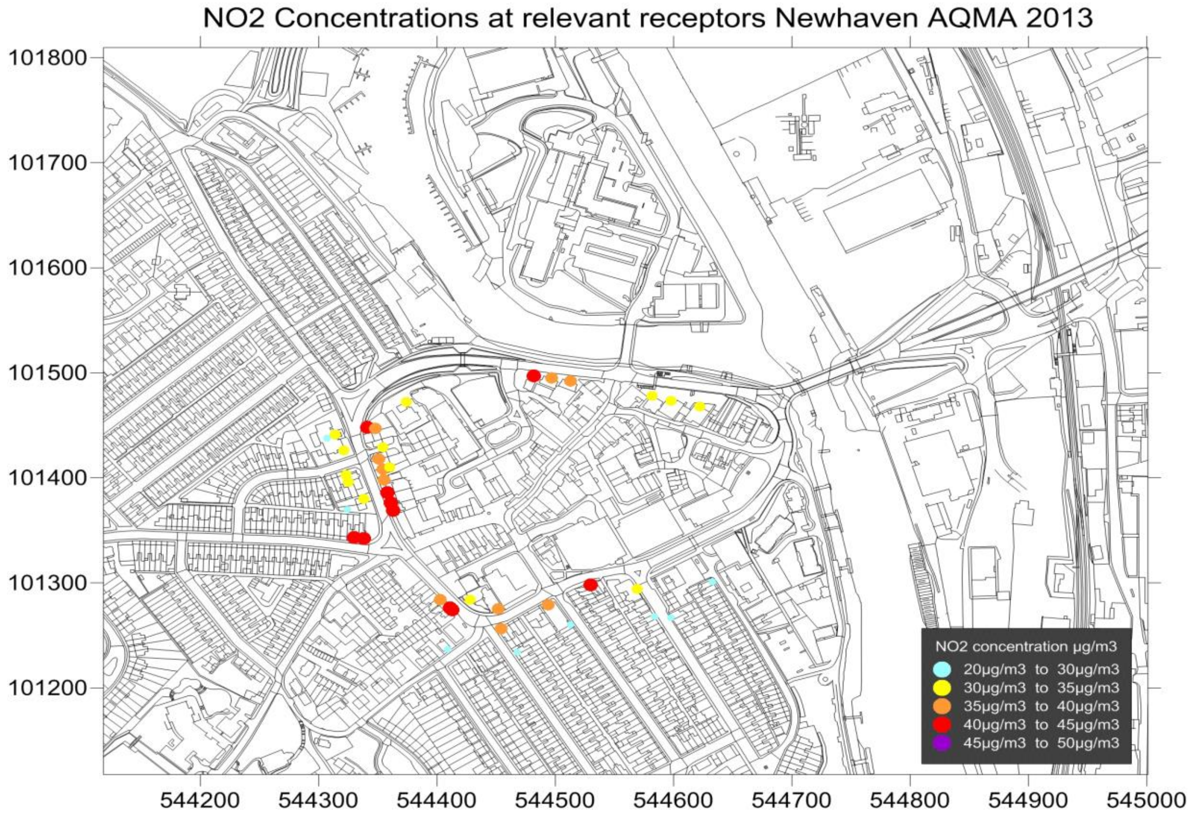
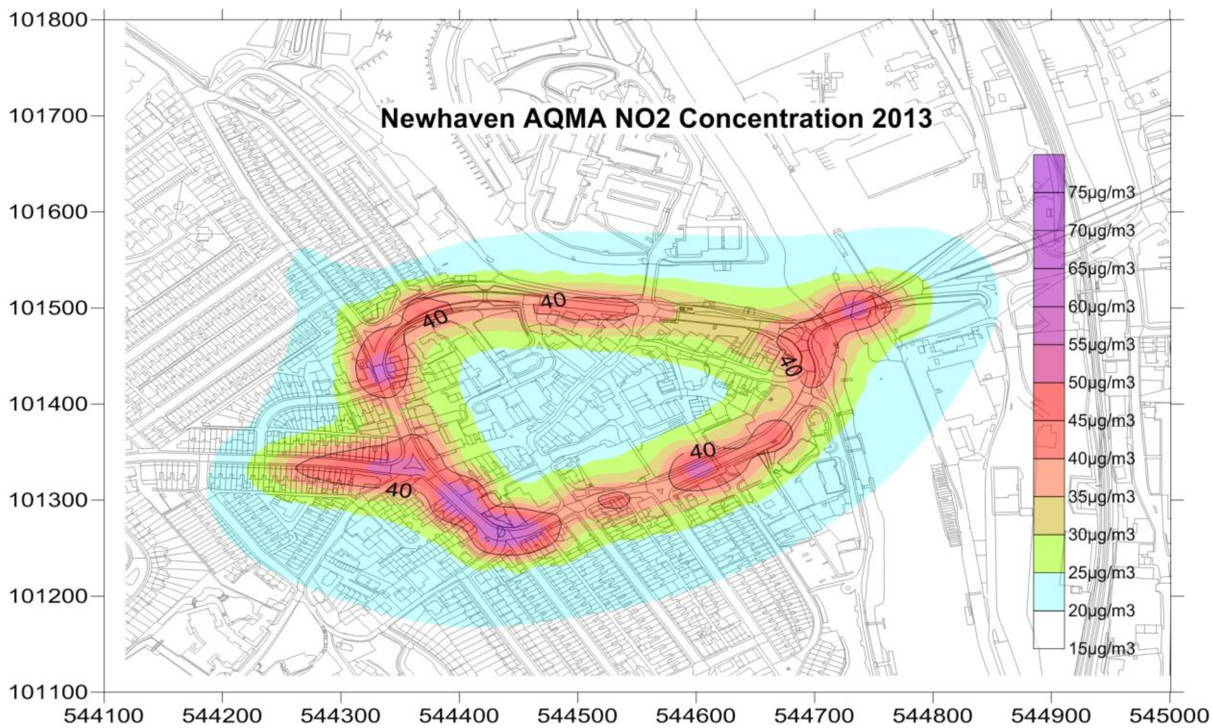


Figure 3: Contour map of the annual mean concentrations of NO_2.



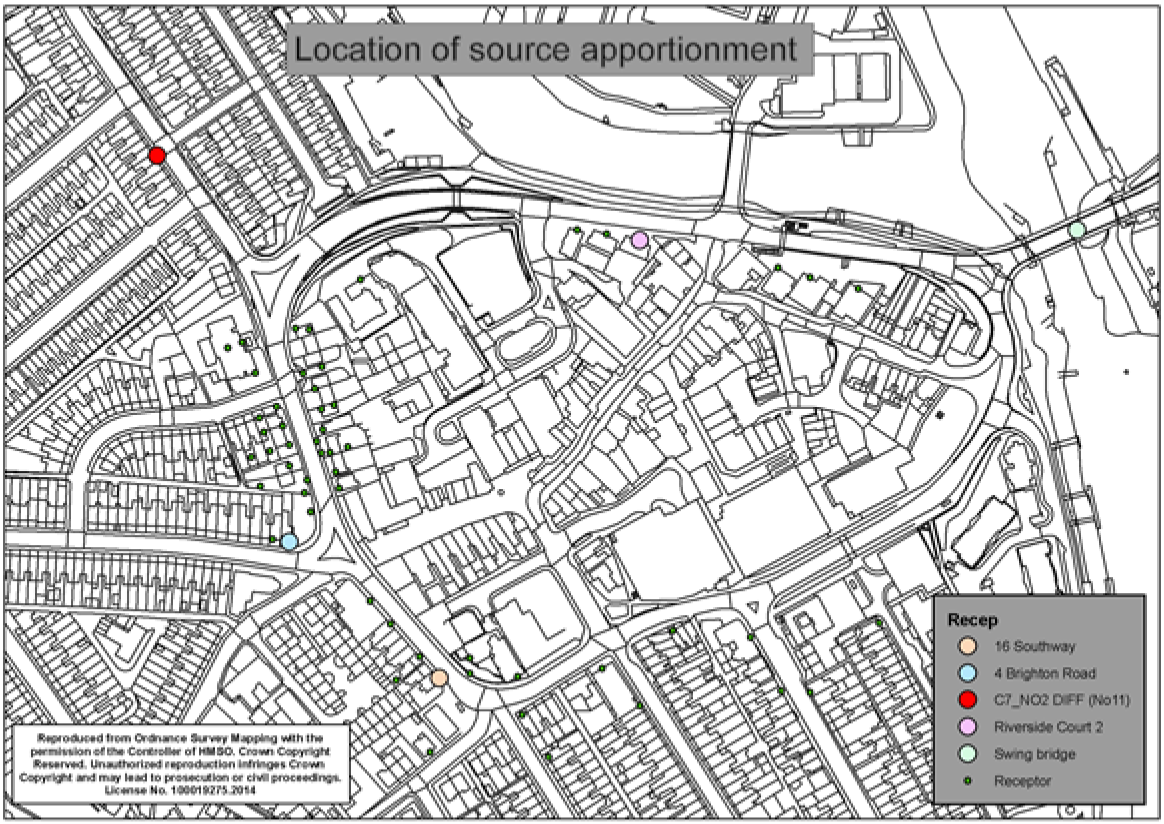
5 Source Apportionment

5.1 In order to develop an appropriate action plan it is necessary to identify the sources contributing to the objective exceedences at locations within the AQMAs. The data presented here could be used to inform any future traffic management decisions. Figure 4 and Table 5 set out the source contributions of traffic related sources, which have been apportioned to the following categories:

· Cars; - petrol and diesel
· Light Goods Vehicles;
· Heavy Goods Vehicles;
· Buses;
· Ambient Background (Including residential, industrial and all other non-traffic sources)

5.2 The five specific receptor locations shown in Figure 4 have been chosen to provide an overview of source contributions at representative locations. They represent worst-case and relevant locations for nitrogen dioxide concentrations, as well as a geographical spread across the modelled area and the primary road sources.

Figure 4: Source apportionment locations



5.3 Figure 5a shows the vehicle split as taken as an average across the roads that run into and through the Newhaven AQMA. Though there are slight variations on each of the main roads not surprisingly cars make up the majority of vehicle movements. Despite accounting for 82% of total vehicle movements figure 5b demonstrates that the percentage contribution of NO_x by each vehicle category is significantly different with the total contribution of cars being 54%, with diesel cars contributing the lion share. Diesel LGVs contribute some 23% with the buses and HGVs accounting for around 11%.

Background levels of NO_x across the AQMA account for around 45% of total, though the variations in the contribution to levels of NO_2 at each of the 5 locations reflects the influence of the traffic emissions on measured and modelled levels of NO_2. The two locations that, despite being in the AQMA, should be discounted for the purposes of further source apportionment work are the swing bridge and C7 location. The C7 location though an important road in terms of the wider performance of the A259 ring road does not in itself exceed the AQO. The swing bridge is again a crucial road link in the flow of the A259 ring road and its location demonstrates the impact that increased vehicle numbers can have on levels of NO_x and NO_2 with vehicle emissions accounting for over 70% in this location. However there are no relevant receptors in this location nor likely to be at any point in the future.

It is reasonable to argue that the A259 Brighton Road, Northway and Southway are the key locations and are most representative of the vehicle mix that influences the Newhaven AQMA and the concentrations of NO_2 measured there in.

Figure 5a: Traffic split in Newhaven AQMA

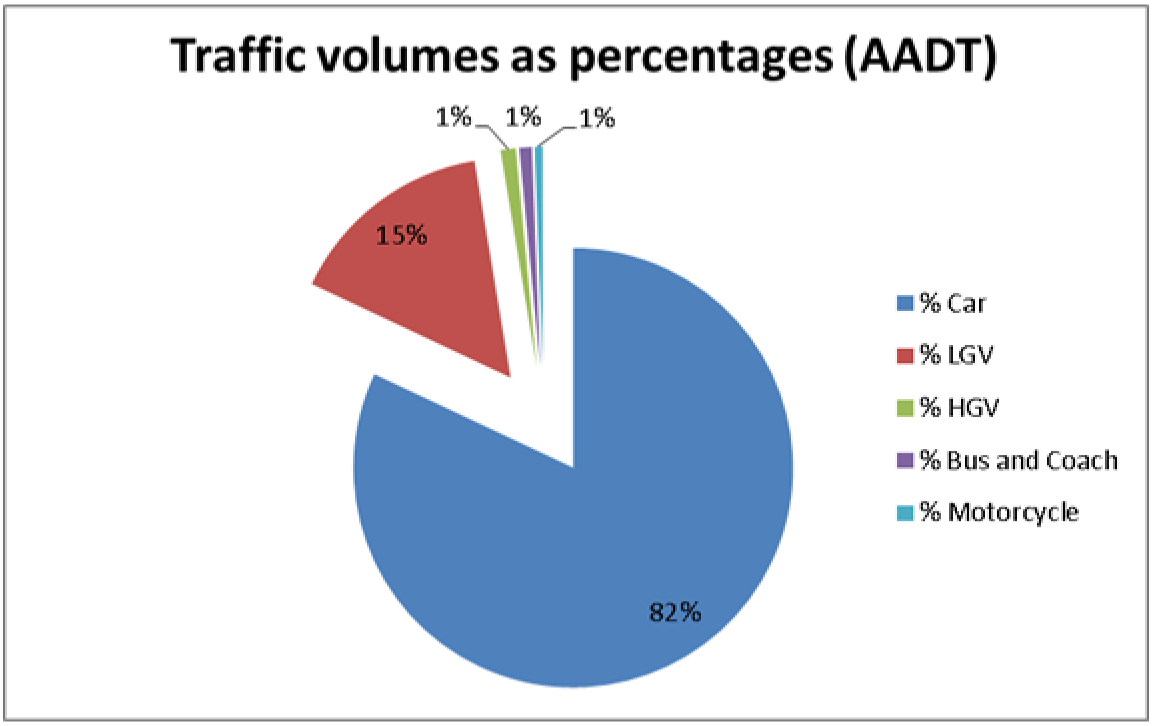


Figure 5b: Average NO_x emissions (excluding background) by source across the Newhaven AQMA.

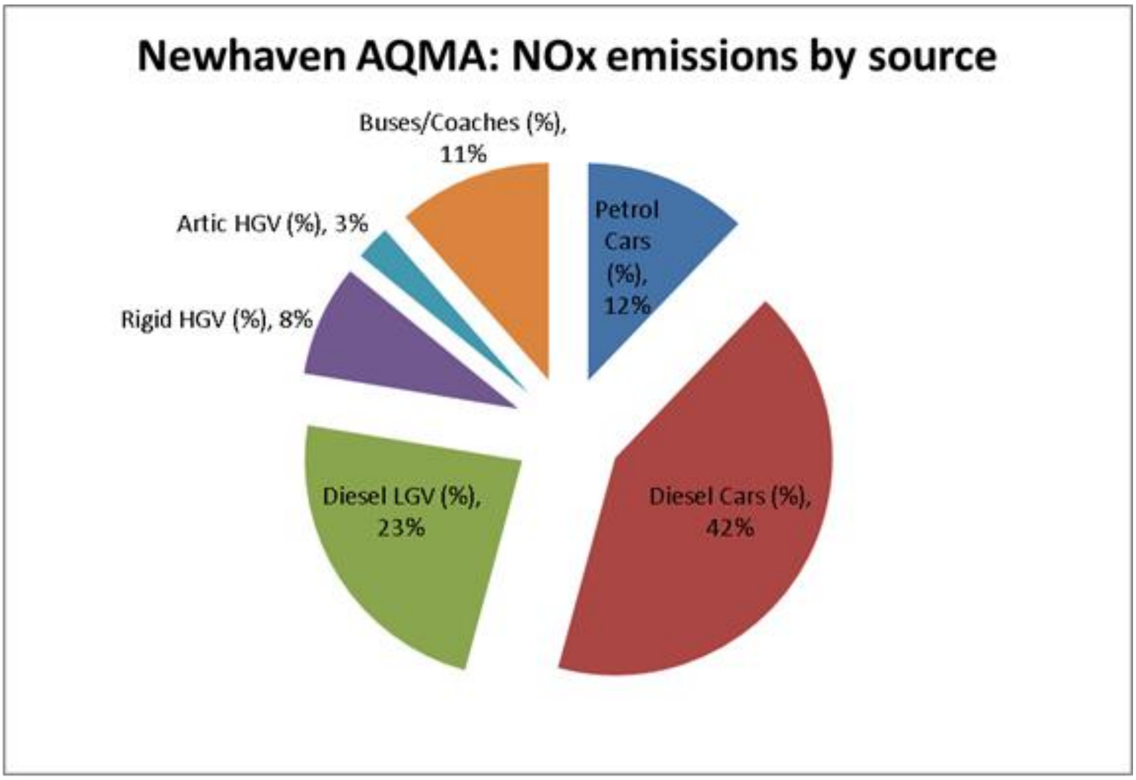


Figure 5c: Average NO_x emissions by source across the Newhaven AQMA including background.

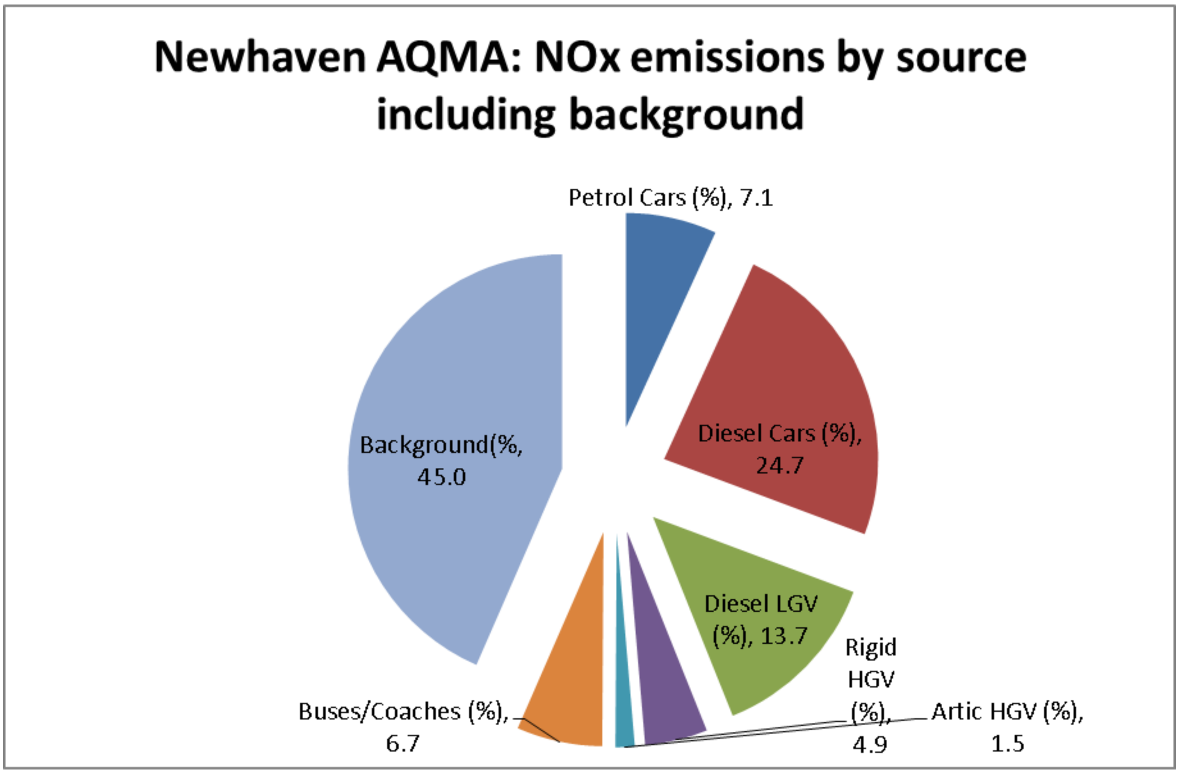
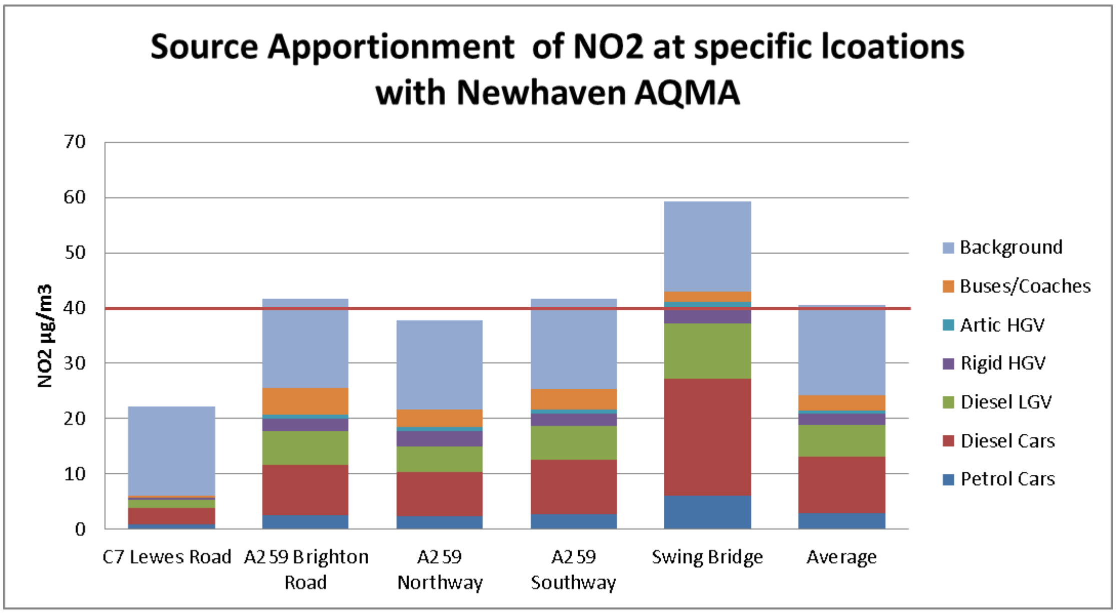


Figure 5d: Percentage of NO_2 at each of the 5 specific locations as detailed in Figure 4



6 Air Quality Improvements Required

6.1 The degree of improvement needed in order for the annual mean objective for nitrogen dioxide to be achieved is defined by the difference between the highest predicted concentration in 2013 and the objective level (40 mg/m3). The highest predicted concentration within the Newhaven AQMA is shared between a number of receptors (42.0 mg/m3) requiring a reduction of 2.0 mg/m3 in order for the objective to be achieved. However as table 2 illustrates the measured concentration at 16 Southway (A259 Southway) reached 48.7µg/m^3 in 2013, which would require a reduction of 8.7 µg/m^3 in order for the objective to be achieved. Further monitoring at new locations on the A259 gyratory have also seen exceedences greater than 2µg/m^3 but this data has yet to cover 12 months, nor been ratified or verified.

6.2 In terms of describing the reduction in emissions that is required it is more useful to consider nitrogen oxides (NOx) as this can be more easily attributed to the source and removes the uncertainty that is associated with the complexity of the chemical reaction and influence of ozone, concentrations of primary and secondary NO_2 and local weather conditions. Table 6 sets out the required reduction in local emissions of NO_x that would be required at 16 Southway (A259 Southway) in order for the annual mean objective to be achieved in 2014. At this monitoring location local emissions would need to fall by up to 30%.

Table 6a: Required reduction at 16 Southway (A259 Southway) monitoring site

	Required reduction in annual mean nitrogen dioxide concentration (µg/m3)	Required reduction in emissions of oxides of nitrogen from local roads (%)
Predicted	2.24	9%
Measured	8.7	30%

7 Air Quality Management Planning

7.1 In the Newhaven AQMA, pollutant concentrations are influenced by vehicle flow patterns, including acceleration, deceleration, and queuing. Action Plan measures to reduce concentrations are likely to include traffic management measures. However, in order to inform the focus of potential measures within the action plan, a number of simple and hypothetical measures to deliver the required NO_x reduction have been explored, based on predicted concentrations.

The measures that have been examined involve stepped reductions in emissions from each of the vehicle categories defined in Section 5. It is not within the remit of this report to speculate on how these reductions might be achieved, and the intention is simply to inform future management decisions. Table 7 sets out the results.

7.2 The results presented in Table 7 highlight that targeting some vehicle types in isolation would achieve very little (HGVs both rigid and artic, Buses and petrol cars). At 16 Southway a location that is broadly representative of the vehicle mix and associated emission in the Newhaven AQMA the following is predicted to reduce modelled concentrations to a level where the annual mean objective would be met.

- 25 % reduction in emissions from diesel cars,
- 25% reduction in emissions from all cars or
- 50% reduction in diesel LGVs vehicles
- 10% reduction in all vehicles

These results are based on the modelled concentrations at 16 Southway, rather than the measured concentrations. Based on measured concentrations at 16 Southway (2013), the reductions in emissions would have to be higher than those predicted below in table 6b.

Table 6b: Required reduction at 16 Southway (A259 Southway) monitoring site

Vehicle Type	% Reduction in Emissions	Predicted Annual Mean Concentration (µg/m3)	
		16 Southway A259	Reduction µg/m3
Petrol Cars	10%	42.19	0.28
	25%	41.77	0.7
	50%	41.07	1.4
Diesel Cars	10%	41.50	0.97
	25%	40.05	2.425
	50%	37.62	4.85
All Cars	10%	41.22	1.25
	25%	39.35	3.125
	50%	36.22	6.25
Diesel LGV	10%	41.85	0.62
	25%	40.92	1.55
	50%	39.37	3.1
Rigid HGV	10%	42.25	0.22
	25%	41.92	0.55
	50%	41.37	1.1
Artic HGV	10%	42.40	0.07
	25%	42.30	0.175
	50%	42.12	0.35
Buses and coaches	10%	42.09	0.38
	25%	41.52	0.95
	50%	40.57	1.9
All Vehicles	10%	39.93	2.54
	25%	36.12	6.35
	50%	29.77	12.7

8 Summary and Conclusion

8.1 Nitrogen dioxide concentrations within and around the Newhaven AQMA have been assessed using both monitoring and detailed dispersion modelling. The results indicate that the annual mean nitrogen dioxide objective was exceeded in 2013 within the AQMA. The exceedences are relatively not widespread and are focussed on the certain sections of the ring road.

8.2 Contour plots of predicted annual mean concentrations show exceedences of the annual mean nitrogen dioxide at the façades at a number of residential properties, all of which lie within or in very close proximity to the existing AQMA boundary.

8.3 The modelling has shown that there are a number of air quality “hot spots” within the existing AQMA and levels of NO_2 are very location specific. For example the centre of the AQMA in the town itself has close to background levels of NO_2, this is to be expected as the increased distance from the road source allows for greater dispersal and mixing to take place. Roadside properties in close proximity to road junctions show the highest levels of NO_2. This is again to be expected as traffic tends to be slower moving and subject to congestion at certain times of the day, both of these factors can result in higher tailpipe emissions. To avoid cycling between declaration and revocation of AQMA boundaries as monitoring data change, it is recommended that: The Newhaven AQMA should remain in its present form and monitoring should continue to further establish the concentrations of NO_2 at relevant locations and to improve the performance of the model. In particular it is recommended that further monitoring is undertaken on Brighton road on both the south and north of the roadside.

8.4 Source apportionment of the local traffic emissions has been undertaken to inform the future action plan.

This shows that emissions from cars, in particular diesel cars and diesel LGVs contribute the largest proportions to the locally generated road component. It also highlights that in order to achieve compliance there would need to be significant reductions in the emissions from each vehicle group individually. This highlights the importance of keeping all sources under consideration when contemplating measures to include within the action plan.

8.5 A reduction in the volume of traffic within the AQMA is predicted to result in a decrease in the concentrations of nitrogen dioxide. Based on predicted concentrations, a reduction in total vehicle emissions of 10% would have been required to achieve the annual mean air quality objective at one of the worst-case receptor locations in 2013. It is worth noting that a 15% reduction would provide a greater level of certainty given a 10% reduction is predicted to result in a concentration of 39.93µg/m^3, a 15% reduction in all vehicles would bring this figure down to 38.66µg/m3.

9 Uncertainties

9.1 All values presented in this report are the best possible estimates, but uncertainties in the results might cause over- or under-predictions. All of the measured concentrations presented have an intrinsic margin of error. Defra and the DAs (2008e) suggest that this is of the order of plus or minus 20% for diffusion tube data and plus or minus 10% for automatic measurements. The model results rely on traffic data projected from count data available on the DfT interactive map and also local count data and any uncertainties inherent in these data or the projection factors will carry into this assessment.

There will be additional uncertainties introduced because the modelling has simplified real-world processes into a series of algorithms. For example: it has been assumed the emissions per vehicle conform to the factors published in DEFRA Eft calculator version 5.2; it has been assumed that wind conditions measured near Shoreham Airport in 2013 will occur throughout the study area during 2013; and it has been assumed that the subsequent dispersion of emitted pollutants will conform to a Gaussian distribution over flat terrain despite this road system being varied in its gradient. An important step in the assessment is verifying the dispersion model against the measured data. By comparing the model results with measurements, and correcting for the apparent under-prediction of the model, the uncertainties can be reduced to some degree. In this modelling assessment only 2 monitoring sites had sufficient data capture that could be used to verify the model against.

9.2 The limitations to the assessment should be borne in mind when considering the results set out in preceding sections. While the model should give an overall accurate picture, i.e. one without bias, there will be uncertainties for individual receptors.

10 APPENDICES

Appendix 1: QA:QC Data

Diffusion Tube Bias Adjustment Factors

The bias adjustment factors are taken form the National Diffusion Tube Adjustment Factor Spreadsheet as provided by the LAQM helpdesk. The adjustment factor for 2013 is 0.95.

Diffusion Tube Bias Adjustment Factors 03/14 Issue of the Spreadsheet				
			New (03/14) Factor	
Laboratory	Method	Year	No. of Studies	Factor
Aberdeen Scientific Services	20% TEA in water	2013	1	0.83
Edinburgh Scientific Services	50% TEA in acetone	2013	1	0.79
ESG Didcot	20% TEA in water	2013	2	0.76
ESG Didcot	50% TEA in acetone	2013	28	0.80
ESG Glasgow	20% TEA in water	2013	1	0.72
ESG Glasgow	50% TEA in acetone	2013	1	0.73
Exova	20% TEA in water	2013	1	0.91
Glasgow Scientific Services	20% TEA in water	2013	5	0.99
Gradko	20% TEA in water	2013	24	0.95
Gradko	50% TEA in acetone	2013	17	1.00
Kent Scientific Services	20% TEA in water	2013	1	0.77
Kirklees Council	50% TEA in acetone	2013	2	0.74
Lambeth Scientific Services	50% TEA in acetone	2013	1	0.83
Milton Keynes Council	20% TEA in water	2013	1	0.84
Northampton BC	20% TEA in water	2013	4	0.73
Somerset County Council	20% TEA in water	2013	3	0.90
South Yorkshire Air Quality Samplers	50% TEA in acetone	2013	3	0.84
Staffordshire Scientific Services	20% TEA in water	2013	11	0.87
Tayside Scientific Services	20% TEA in water	2013	1	0.78
West Yorkshire Analytical Services	50% TEA in acetone	2013	7	0.79
		Number of Studies Included	**115**	

QA/QC of Diffusion Tube Monitoring

The method of preparation is 20% TEA in water. The laboratory participate in the Workplace Analysis Scheme for Proficiency (WASP) for nitrogen dioxide tubes and in a field inter-comparison scheme which is controlled by Netcen and organised by the Health and Safety Laboratory. The tubes are stored and placed with regard to specific quality assurance guidelines. The diffusion tubes are changed on a monthly basis. Travel blanks are supplied regularly throughout the year

Appendix 2 – Modelling methodology

ADMS Urban - an advanced dispersion model which is based on Gaussian plume theory. It requires an amount of input data: site characteristics, meteorological data, traffic information, emission factors, and background pollutant concentrations.

Modelling Years: 2013(base year)

- Shoreham (year 2013) Meteorological data source
- AADT values were used from manual and automatic traffic counts
- AADT projected growth rates supplied by ESCC
- “yearly” growth projection used 2010 = 1.1 %
- % HDV derived for traffic data sourced from ESCC and Dft counts
- Average speed estimated from speed limits and local knowledge.

Background pollutant source:

NOx and NO2 background concentrations were taken from the National Atmospheric Emissions Inventory (NAEI) web-site (www.naei.org.uk) for the grid squares that the specific road section was within.

Emission factors (EF):

Vehicle emission factors used were UK EFT V4.2 (2VC) and were imported from EMIT 3.2.

Site Characteristics

- Additional model inputs required for ADMS Urban:
- Road type: EU 09 (3) Urban 13
- Road width: relative to road sections
- Road slope: relative to road sections
- Receptor height: 1.8 m (Specific receptors may be higher or lower dependent upon which floor a residential property may be on)

Receptor name	X(m)	Y(m)	Z(m)
10 Lewes Road 1	544321	101426	1.8
10 Lewes Road 2	544314	101441	1.8
29 Lewes Road	544341	101448	1.8
17 Folly Field	544351	101418	1.8
13 Folly Field	544354	101408	1.8
Flat 3 11 Lewes road	544355	101398	1.8
9 Lewes Road	544358	101386	1.8
7 Lewes Road	544361	101376	1.8
5 Lewes Road	544363	101369	1.8
4 Brighton Road	544338	101342	1.8
NO2 16 Southway tube	544413	101274	2.5
4 Lewes Road	544338	101380	1.8
FLATS OPP BRGTN RD J	544325	101396	1.8
34 Harper Road	544323	101403	1.8
10 Lewes Road NO3	544307	101438	1.8
29 Lewes Road No2	544348	101447	1.8
Folly Field Road	544354	101429	1.8
13 Folly Field Rear	544360	101410	1.8
8 Brighton Road	544330	101343	1.8
2 Lewes Road Garden	544324	101370	1.8
16 Southway	544411	101276	3
12 Southway	544403	101284	3
18 Southway	544454	101256	1.8
Summerhayes 1	544452	101275	1.8
Summerhayes 2	544428	101284	1.8
30 Southway	544530	101298	1.8
5 Meeching Road	544513	101260	1.8
2 Norman Road	544468	101234	1.8
3 South Road	544569	101294	1.8
15 South Road	544584	101268	1.8
4 South Road	544598	101267	1.8
43 Chapel Street	544633	101301	1.8
Bridge Court 1	544598	101473	1.8
Bridge Court 2	544622	101468	1.8
Bridge Court 3	544582	101478	1.8
Riverside Court 1	544497	101495	1.8
Riverside Court 2	544513	101492	1.8
Riverside Court 3	544482	101497	1.8
Essex Mews 1	544374	101472	1.8
24 Meeching Rise	544409	101237	1.8
28 Southway	544494	101279	1.8

Table 7: Key receptor locations

Appendix 3 – Model verification

The verification of the modelled concentrations is required to ascertain the accuracy of modelled results at other modelled locations in Sussex. To do this modelled results are compared to ratified monitoring results. The modelled NOx and resulting NO2 need to be adjusted by an adjustment factor to produce corrected modelled results for future years.

NOx adjustment factor

The ADMS Urban model was run for 2013 at the diffusion tube sites located adjacent to the Newhaven gyratory. The calculated NOx concentrations were compared with NOx measurements collected from the diffusion tube sites. This comparison was based on the roadside contributions only. The final NOx adjustment factor was derived from an average of these 2 monitoring locations.

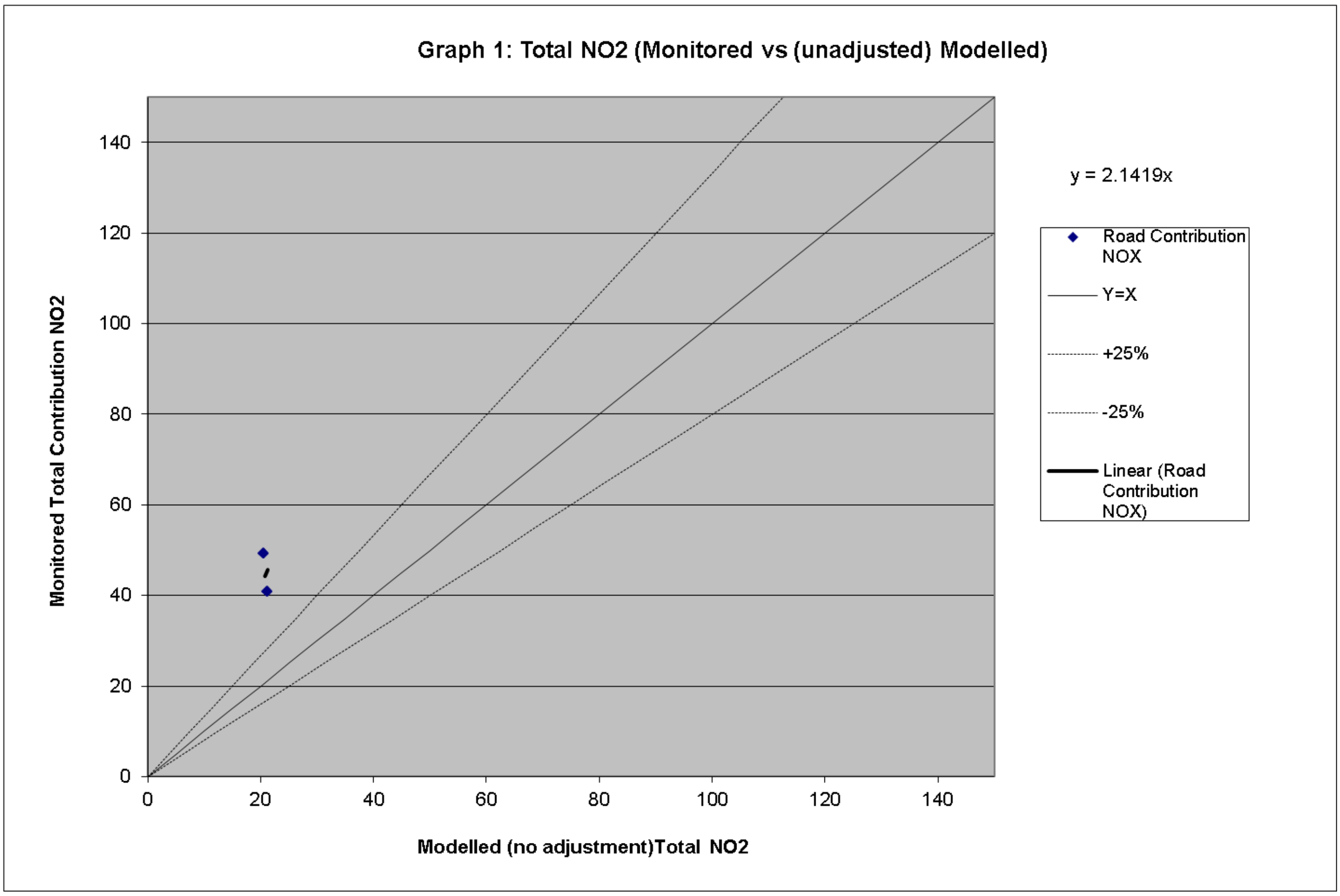


Figure 6a: Comparison of modelled and monitored total NO_2 (2013)

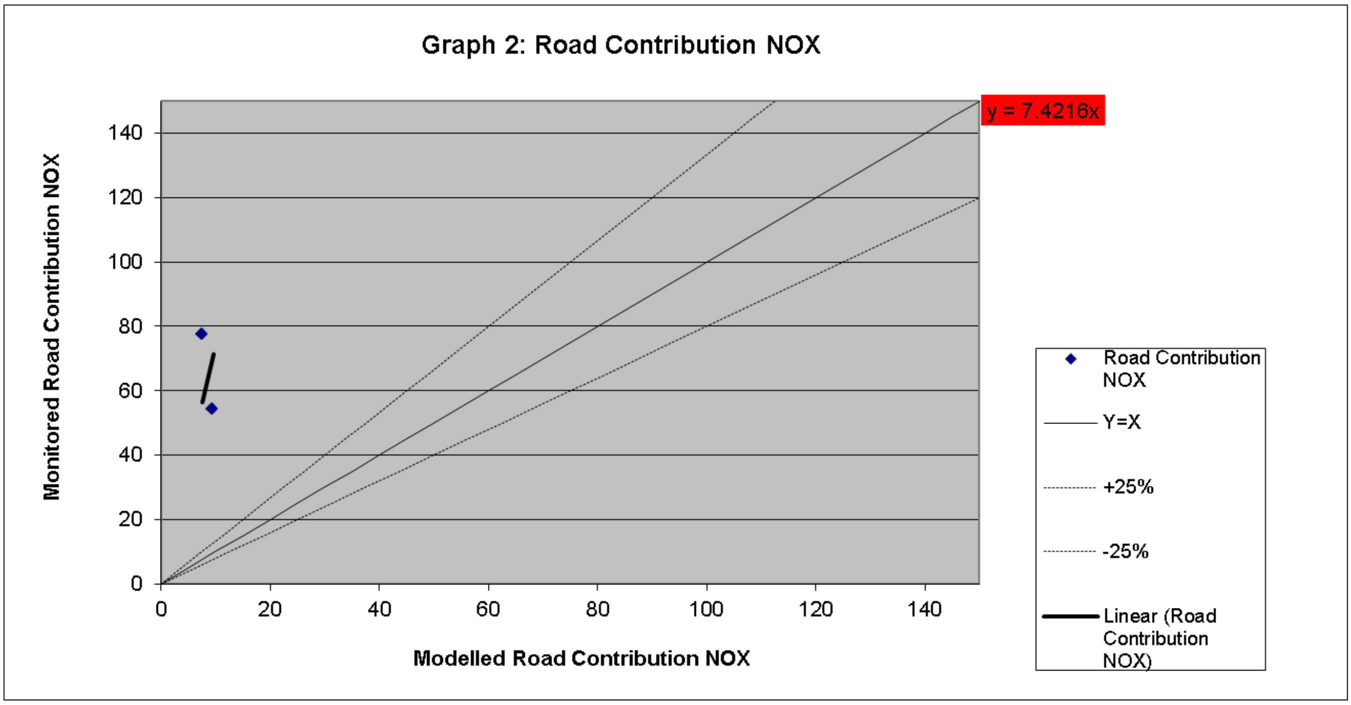


Figure 6b: Comparison of modelled road NO_x with monitored road NO_x (2013)

Site ID	Monitored Total NO2	Monitored Road contribution Nox (from NO2 tubes)	Monitored Total Nox	Background NOx	Background NO2	Monitored Road Contribution NO2 (total – background)	Monitored Road Contribution NOx (total – background)	Modelled Total NOx (includes background)	Modelled Road Contribution NOx (excludes background)
16 SOUTHWAY	49.30	77.61	99.5	21.9	16.2	33.1	77.6	29.5	7.6
9 SOUTHWAY	40.80	54.46	76.4	21.9	16.2	24.6	54.5	31.5	9.6

Ratio of Monitored Road Contribution NOx/ Modelled Road Contribution NOx	Adjustment Factor for Modelled Road Contribution	Adjusted Modelled Road Contribution NOx	Adjusted Modelled Total NOx (incl. Background NOx)	Modelled Total NO2 (based on empirical NOx/NO2 relationship)	Monitored Total NO2	% Difference [(Modelled - Monitored)/ Monitored] x100	Sensitivity check (NO2)
10.2	7.4216	56.4	78.3	42.28	49.30	-14.2	0.9909
5.7		71.2	93.1	47.79	40.80	17.1	

Table 8: Model verification

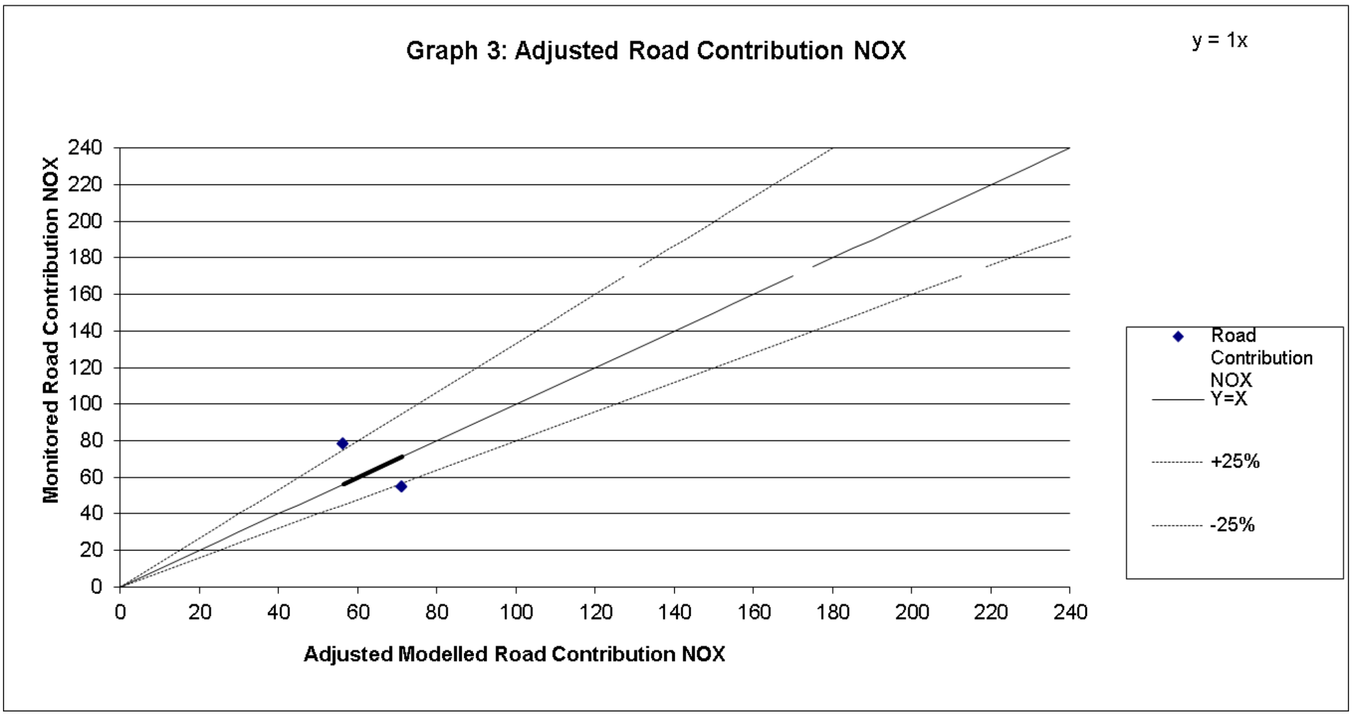


Figure 6c: Comparison of adjusted modelled road NO_x with monitored road NO_x (2103)

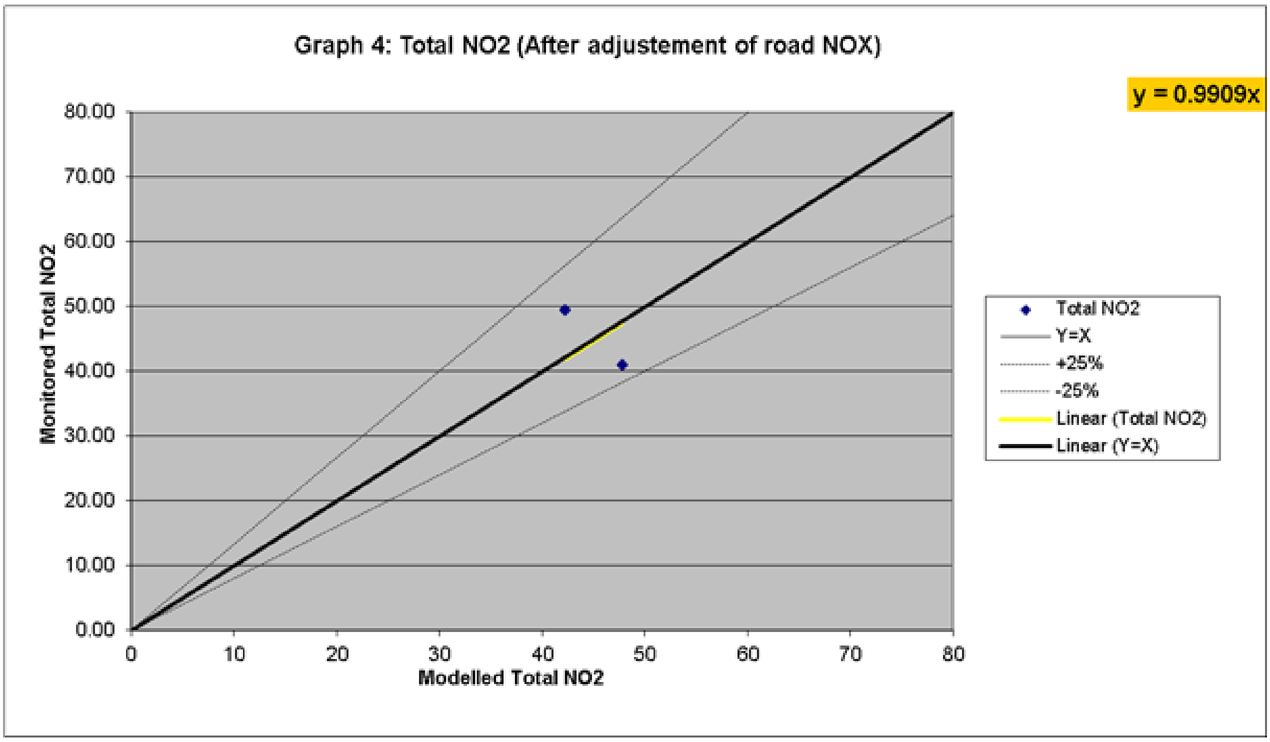


Figure 6d: Comparison of modelled (fully adjusted NO2) with monitored NO2 (2013)

Appendix 4 – Consultation

Newhaven Air Quality Management Area Options

Further to the consultation of the detailed assessment of local air quality in Newhaven, Lewes District Council must now consult on the geographical extent of the Air Quality Management Area. This document outlines the options available.

Lewes District Council

Options for Air Quality Management Area in Newhaven

Air quality in Lewes District is predominantly good with the majority of the District having clean unpolluted air. There are however a small number of locations where the combination of traffic, road layout and geography has resulted in the annual average levels of nitrogen dioxide (NO2) failing to meet EU targets.

If significant pollution is identified the council has to declare an Air Quality Management Area (AQMA). Lewes District Council has already done this for an area in Lewes town centre that also failed to meet the air quality targets for NO2. Following an AQMA declaration the council must put plans in place to seek to improve the air quality.

It is recognised that improving air quality in these specific locations is difficult due to the increased use and reliance on private motor vehicles. Lewes District Councils Air Quality Action Plan published in June 2009 recognises that no one single council, department or community has all the answers and improvements to air quality can only be achieved by taking an integrated, collaborative approach to delivering a package of measures.

The Detailed Assessment of the air quality in Newhaven carried out by Lewes District Council has recently been consulted on. It concluded that the UK national Air Quality Objective (AQO) for the annual mean concentration of nitrogen dioxide (NO2) of 40µg/m3 is likely to be exceeded at a number of locations adjacent to the Newhaven gyratory (A259).

Consequently the local authority has a duty to declare an Air Quality Management Area (AQMA) which will need to cover at least the predicted areas of exceedence in the town. These are identified as being sections of the A259 referred to as Southway and Northway. There is also the option to declare an AQMA that covers a wider area than the area of exceedence. The proposed options are set out within this consultation document.

Once you have decided on your preferred option please complete the online survey at http://www.surveymonkey.com/s/WY39Z7P or reply in writing or email on the details below stating your choice. The consultation is a 6 week consultation and will close on the 10th January 2014.

Contact

Lewes District Council
Environment Team
Planning and Environmental Services
Southover House
Southover Road
Lewes
BN7 1AB
Tel: 01273 494354
Email: ehealth@lewes.gov.uk

Newhaven Air Quality Management Area Options

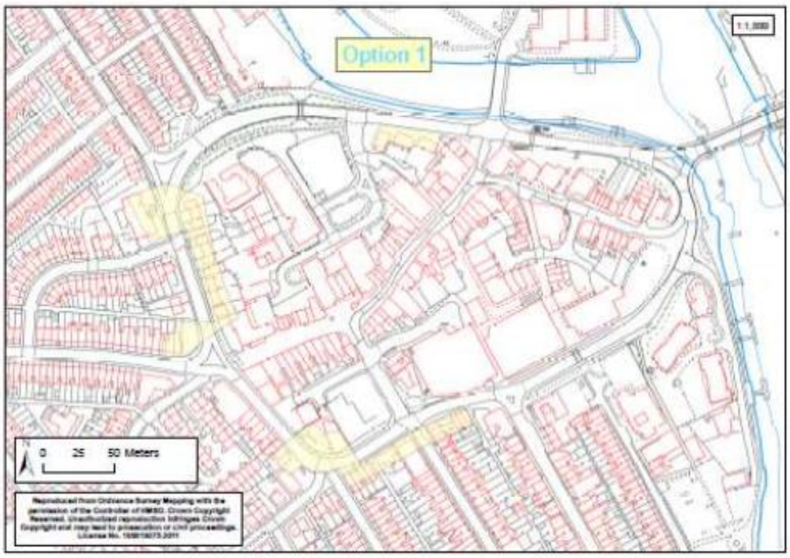
Option 1 – Minimum area of exceedence that would only include the properties (relevant receptors) adjacent to the A259 gyratory that have exceeded the AQO for NO2.

Pros

- This option reflects the area of the actual exceedence most accurately
- Provides focus on the areas of concern and could lead to "ticking off" of AQMA hotspots

Cons

- May result in new declarations as new hotspots that fail to meet the objective are discovered as a result of new weather, traffic data etc.
- If AQMA has to be extended as a result a full consultation will be needed again.
- Potentially more administratively burdensome as new areas are discovered



Option 2 – This option extends the AQMA boundary beyond the areas of exceedence and includes all the major roads that enter and exit the gyratory - this would <u>NOT</u> include the town centre

Pros

- All areas of exceedence covered, unlikely to have to extend at a later date
- Includes all of the roads of influence
- Developments in proximity and influence to the gyratory would be required to consider air quality as a material planning consideration and place it higher up on the agenda – but maybe not developments in the town centre.
- Town centre is not "in" AQMA

Cons

- The town centre itself will not be "in" the AQMA, this may result in air quality not being a material consideration with development in the town centre despite the area being surrounded by an AQMA.

Option 3 – This option extends the AQMA boundary beyond the areas of exceedence and includes all the major roads that enter and exit the gyratory - this would include the town centre

Pros

- All areas of exceedence covered, unlikely to have to extend at a late date
- Development in proximity and influence to the gyratory would be required to consider air quality as a material planning consideration and place it higher up on the agenda – including the town centre
- Includes all of the roads of influence

Cons

- This could be challenged as being too large as it includes areas that are not currently exceeded the air quality objective or likely to in the future.
- Town centre is "in" AQMA

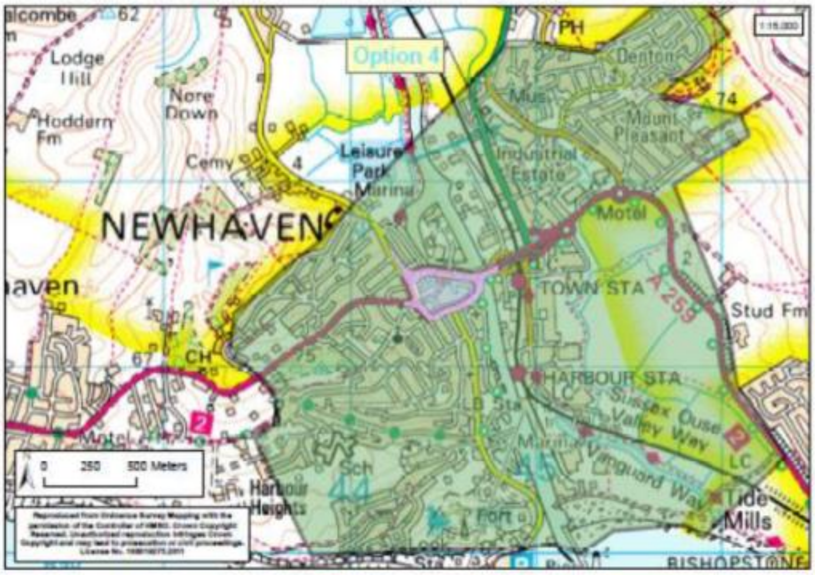
Option 4 – This option extends the AQMA boundary to cover the whole of Newhaven

Pros

- All areas of exceedence covered, unlikely to have to extend at a late date
- Any new development in Newhaven would be "in" the AQMA and air quality would be a material planning consideration.
- Administratively much simpler to draw as it would be dictated by established parish and town boundary

Cons

- This could be challenged as being too large as it includes areas that are not currently exceeded the air quality objective or likely to in the future.
- Resource burdensome as air quality would be material planning consideration for all development within this large AQMA
- More difficult to justify technically as would include roads that do not influence areas of exceedence.



Options summary

Option 1 – Minimum area of exceedence that would only include the properties (relevant receptors) adjacent to the A259 gyratory that have exceeded the AQO for NO2.

☐

Option 2 – This option extends the AQMA boundary beyond the areas of exceedence and includes all the major roads that enter and exit the gyratory - **this would NOT include the town centre**

☐

Option 3 – This option extends the AQMA boundary beyond the areas of exceedence and includes all the major roads that enter and exit the gyratory - **this would include the town centre**

☐

Option 4 – This option extends the AQMA boundary to cover the whole of Newhaven

☐

Timetable

Detailed Assessment approved ✓

↓

Detailed Assessment Consultation ✓

↓

AQMA 6 week Consultation - closes 10th January 2014

↓

AQMA extent agreed - February 2014

↓

AQMA declared by council order - March 2014

↓

Further Assessment

Once a new AQMA has been declared the Local Authority is required to complete a Further Assessment of the Air Quality within 12 months of designating the AQMA

↓

Air Quality Action Plan drafted

The AQAP will essentially set out how the local authority will use its powers and also work in conjunction with other organisations to improve air quality. The AQAP has to be produced within 18 months of the declaration of an AQMA.

↓

Air Quality Action Plan adopted