Local Air Quality Management

Detailed Assessment of Air Quality in Newhaven

Part IV of the Environment Act 1995

Prepared by Lewes District Council December 2012

SUSSEX-air
Air Quality Partnership

Lewes District Council

CONTENTS

1.0 Executive Summary

Part IV of the Environment Act 1995 requires all local authorities to periodically review and assess the quality of air within its boundaries.

The quality of air is to be measured using monitoring and modelling results and then compared against national Air Quality objectives (AQO) set by the National Air Quality Strategy for England, Wales and Northern Ireland.

The Lewes Updating and Screening Assessment (USA) 2009 was undertaken to identify those parts of the district that may be at risk of exceeding the national objectives for several pollutants including nitrogen dioxide. Results taken from passive monitoring using diffusion tubes indicated that South Way, part of the gyratory system in Newhaven, was at risk of exceeding the set objective level for nitrogen dioxide (40 μg/m3 annual mean) and would therefore require a Detailed Assessment to be undertaken.

The Detailed Assessment uses an air quality forecasting model called 'ADMS Urban' and passive monitoring results for 2010 taken from diffusion tubes located on and in the vicinity of the gyratory system in Newhaven. A corrective bias adjustment is applied to the results to enhance accuracy.

The air quality modelling results forecast that annual levels of nitrogen oxide (NO2) exceeded the AQO at a number of key receptor locations on the gyratory system for the year 2010.

If the results of the Detailed Assessment indicate that the AQO for NO2 is likely to be exceeded, Lewes District Council is required to take the next step in the air quality management process and designate an Air Quality Management Area (AQMA).

The Detailed Assessment results for the gyratory system in Newhaven indicate that an exceedance of the AQO for NO2 annual mean has occurred so an AQMA will need to be designated in the current round of review and assessment.

2.0 Introduction

2.1 Part IV of the Environment Act 1995 requires all local authorities to periodically review and assess the current and likely future air quality in their local area. The Government's Air Quality Strategy for England, Wales and Northern Ireland (Defra, 2007) provides a framework for achieving improvements in ambient air quality on a local, national and international level. It sets out a number of air quality objectives that need to be met in a given timeframe and measures that can be adopted to meet those objectives. The objectives are prescribed in The Air Quality (England) Regulations (Amended) 2002 (Stationary Office, 2002).

2.2 The European Union prescribes limit values for a number of key air pollutants which all member states must meet. The UK Government has set more stringent objectives than the limit values; it is these objectives that provide the focus for this assessment.

2.3 The Local Air Quality Management Technical Guidance (LAQM.TG (09)) provides guidance to Local Authorities through the review and assessment process and sets out a general approach to be used. The guidance explicitly states that the level of assessment taken should be commensurate with the risk of an air quality objective being exceeded.

2.4 A review and assessment of air quality is the first step in the LAQM process and consists of a series of 'rounds' every three years. Local authorities in England, Scotland and Wales have now completed four rounds and the fifth will be underway in 2012.

2.5 The 2-step phased approach to review and assessment requires an 'Updating and Screening Assessment' followed by a 'Detailed Assessment'. The USA aims to identify those areas where there is a risk that any of the air quality objectives could be exceeded. The locations focussed upon are areas or sites where members of the public are likely to be regularly present and are likely to be exposed over the averaging period of the objective.

2.6 For those areas where a risk has been identified, a Detailed Assessment (DA) is required. The aim of the Detailed Assessment is to identify with reasonable certainty, using more sophisticated modelling tools, whether or not a likely exceedance will occur.

2.7 If the outcome of the DA shows that one or more of the national air quality objectives is unlikely to be met or exceeded by the relevant deadline then an Air Quality Management Areas (AQMA) will need to be declared. A Further Assessment (Source apportionment) is then required to justify the need for the AQMA by providing supplementary information such as the sources of emissions to air. This information can then inform an Air Quality Action Plan, the aim of which is to set out what measures need to be adopted and implemented in pursuit of the Air Quality Objectives.

2.8 This report represents a Detailed Assessment in the fourth round of review and assessment following on from the most recent Updating and Screening Assessment undertaken in July 2009.

2.9 To study the findings of all Lewes District Council air quality review and assessments to date please visit: http://www.lewes.gov.uk/environment/824.asp

3.0 National Air Quality Objectives (Defra, 2007)

Pollutant	Concentration	Measured as	Date to be achieved by
Benzene	16.25 $\mu g/m^3$	Running annual mean	31.12.2003
	5.00 $\mu g/m^3$	Running annual mean	31.12.2010
1,3-Butadiene	2.25 $\mu g/m^3$	Running annual mean	31.12.2003
Carbon monoxide	10.0 mg/m^3	Running 8-hour mean	31.12.2003
Lead	0.5 $\mu g/m^3$	Annual mean	31.12.2004
	0.25 $\mu g/m^3$	Annual mean	31.12.2008
Nitrogen dioxide	200 $\mu g/m^3$ not to be exceeded more than 18 times a year	1-hour mean	31.12.2005
	40 $\mu g/m^3$	Annual mean	31.12.2005
Particles (PM_{10}) (gravimetric)	50 $\mu g/m^3$, not to be exceeded more than 35 times a year	24-hour mean	31.12.2004
	40 $\mu g/m^3$	Annual mean	31.12.2004
Sulphur dioxide	350 $\mu g/m^3$, not to be exceeded more than 24 times a year	1-hour mean	31.12.2004
	125 $\mu g/m^3$, not to be exceeded more than 3 times a year	24-hour mean	31.12.2004
	266 $\mu g/m^3$, not to be exceeded more than 35 times a year	15-minute mean	31.12.2005

4.0 Conclusion of Updating & Screening Assessment

4.1 Lewes District Council completed its most recent Updating and Screening Assessment in July 2009 and subsequent Progress Report in July 2011. The results show that the majority of the district will meet national air quality objectives. However, passive monitoring for nitrogen dioxide at two sites on South Way, which is part of the gyratory system in the centre of Newhaven, has highlighted possible breaches of the annual mean objective. A Detailed Assessment is therefore required to determine whether the objective is being exceeded, and if so, the extent of the AQMA that would need to be designated.

5.0 Focus of Detailed Assessment

5.1 As a result of the levels of nitrogen dioxide in the area surrounding South Way and Northway in Newhaven, this detailed assessment will focus on all sections and major adjoining junctions of the gyratory system.

6.0 Detailed Assessment Methodology

6.1 This Detailed Assessment takes a closer look at those areas that were identified in the Updating & Screening Assessment (USA) 2009 as requiring further assessment. To achieve this, all the available monitoring data on traffic flows, pollution monitoring and the weather data from 2010 has been used. Additional data was collected as required.

6.2 Following on from the USA, the Detailed Assessment needs the use of a more advanced forecasting model. The model will forecast NO2 against the 2005 air quality objective, which must be met in every subsequent year thereafter.

6.3 There are various advanced forecasting models available; however, for the purpose of these assessments at "road-side" locations the model used was ADMS Urban. More information on this air quality-forecasting model is shown in section 7.

6.4 The model uses various input data so inevitably a certain amount of inherent error will exist. Therefore, the model has to be validated by its supplier and the modelling results have to be verified by the user. The verification process is described in section 7.

6.5 In all the locations modelled, 'discrete receptors' were used to mark the locations where the general public (non-occupational) is identified as likely to be present for the respective pollutant exposure period. To be as accurate as possible all traffic, air pollutant monitoring and weather data has been used from a single year 2010.

Table 1: Sections/junctions of the gyratory system

Site Reference	Site Location	Site Type
5	A259 Brighton Road West	Roadside
7	A259 Brighton Road Entering South Way	Roadside
4	South Way Entering A259 Brighton Road West	Roadside
16	North Way to Swing Bridge	Roadside
15	North Way to South Way	Roadside
14	North Way-1	Roadside
12	North Way-2	Roadside
10	North Way-3	Roadside
9	South Way/North Way	Roadside
8	South Way-7	Roadside
11	South Way to Lewes Road	Roadside
13	Lewes Road to North Way	Roadside
6	A259 Brighton Road East	Roadside
17	A259 Swingbridge East	Roadside
1	Swing Bridge to Southway	Roadside
2	Southway to South Road Junction	Roadside
3	Southway South Road Junction to Brighton road Junction	Roadside
28	Southway to Lewes Road Junction	Roadside

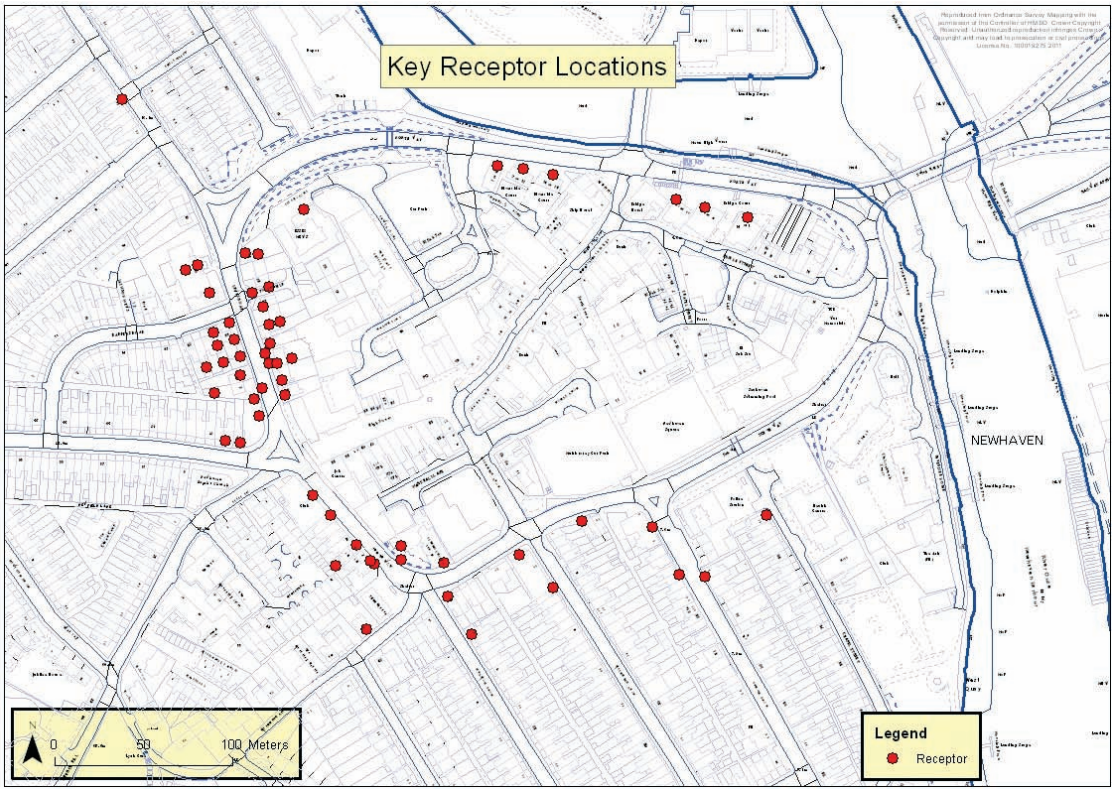


Figure 1: Location of air quality modelling (key) receptors

6.6 The modelling results were subjected to the verification correction and the ambient background pollutant value added. The result is the modelled value at the receptor location.

6.7 This Detailed Assessment is not based on modelling results alone to predict pollution levels at specific locations. Monitoring results have also been considered as they provide an indication of actual pollution levels. Diffusion tube monitoring has its errors so to minimise this, a bias-adjustment factor is applied to the results. The factor is obtained by collocating three diffusion tubes for a year at a continuous monitoring site that follows strict quality control/quality assurance. The average value from the monthly exposed tubes is compared directly to the corresponding continuously monitored values.

6.8 Once the results have been obtained they need to be assessed to see if there is any likelihood that the public will be subjected to the relevant pollutant for the respective exposure period. If there is no likelihood of exposure then any exceedance areas need not be considered.

6.10 If either the model or monitored results suggest that the AQO for the respective pollutant will not be met or exceeded, where public exposure is likely, an Air Quality Management Area has to be designated around the areas of exceedance.

7.0 Advance Model Details

7.1 The pollution dispersion model 'ADMS Urban is validated by its designers, CERC, and is designed to estimate carbon monoxide, PM10 Particulates, nitrogen dioxide and other inert pollutant concentrations from various sources.

ADMS-Urban is a PC based model of dispersion in the atmosphere of pollutants released from industrial, domestic and road traffic sources in urban areas.

7.2 It requires various data inputs including:

- Elevation of road
- Road width
- Canyon height
- Road geometry
- Traffic flow data including total daily traffic flow (AADT), Heavy Duty Vehicles and Passenger Service Vehicle percentages, average traffic speeds
- Emission factors (derived from EMIT 3.0)
- Meteorological data
- General receptor locations
- Discrete receptor locations
- Background pollutant data

7.3 The resulting outputs from the model are in tabular form. The tabular form provides the modelled value at each receptor point, a receptor in most cases being specific buildings where people live (See Figure 1).

7.4 Discrete receptor sites that show a value greater than the air quality objective level, or immediately close to the AQO, require an Air Quality Management Area (AQMA) to be designated. An AQMA has to be consulted upon and designated by order.

8.0 Monitoring methods

8.1 There are two methods of pollution monitoring used within the Lewes district, continuous and passive.

8.2 The continuous monitoring for several pollutants including nitrogen dioxide, takes place at the fixed location at Denton School, Newhaven and historically adjacent to the A259 at Telscombe Cliffes. This type of monitoring is expensive and requires technical expertise to maintain quality control and quality assurance for the data produced.

8.3 Nitrogen dioxide is measured using a chemiluminescence analyser and a Horiba APNA Ambient NOx Monitor. These are calibrated every two weeks using cylinders containing known concentrations of nitrogen dioxide and an ozone generator.

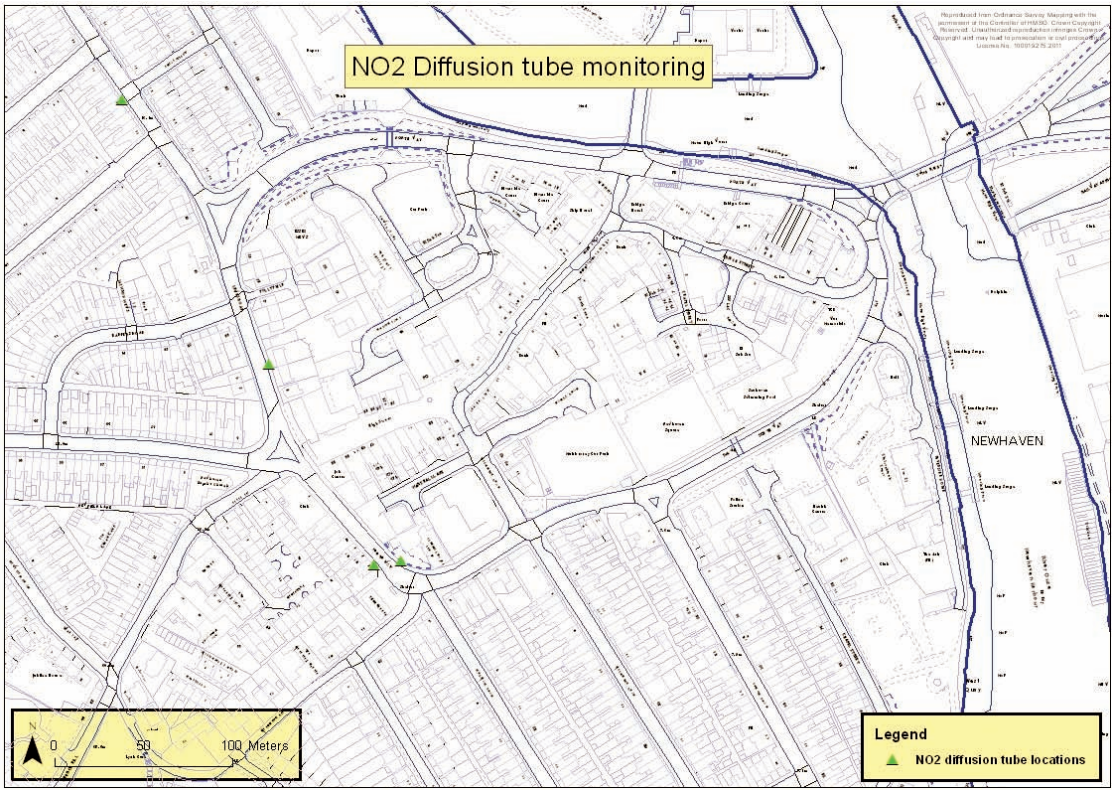
8.4 The calibrations and filter change data is regularly supplied to the Environment Research Group based at Kings College, London (ERG). ERG collect the data from the station on a daily basis, verifying the data against other monitoring stations in the south-east and ratifying it using the calibration information supplied. The information is then placed upon the Sussex Air Quality Steering Groups website www.sussex-air.net

8.5 The passive monitoring involves NO2 diffusion tubes at 8 locations (see figure 2) around Newhaven, with 3 in the vicinity of the gyratory system. East Sussex County Council and Lewes District Council jointly fund this network. The NO2 diffusion tubes provide valuable information at relatively low cost.

8.6 The Updating & Screening Assessment determined the need and focus of the Detailed Assessment of NO2 based on the results from this network.

8.7 Diffusion tubes are an important tool in the assessment of nitrogen dioxide air quality but they are known to be not as accurate as chemiluminescence analysers.

Figure 2: Map showing the position of diffusion tubes in the vicinity of the gyratory system used to monitor levels of NO2.



9.0 Detailed Assessment Results and discussion

Monitored Results

9.1 Monitoring data for the diffusion tube sites identified in Figure 2 are presented in Appendix 2. These results are subject to the bias adjustment factor of 0.85 for 2010 based on UK collocation study results gathered by the University of West England.

9.2 All sites are within 1m of the kerbside and the chosen receptors are the façade of buildings 1.8–2.2m above ground level. As a result, the level of NO2 at the receptor locations will be different to the level at roadside so a correction factor needs to be applied.

9.3 The UWE helpdesk has provided a calculator in order to establish the fall of nitrogen dioxide from road to façade. This can be found at the web site http://laqm.defra.gov.uk/documents/NO2withDistancefromRoadsCalculatorIssue4.xls

9.4 With the factors applied, the data indicate that one site within the gyratory system have exceeded the 40 μg/m3 annual mean objective.

Modelled Results

9.5 The results of the ADMS Urban model suggest that exceedances of the AQO for the NO2 annual average occured in 2010 when using 2010 traffic, air pollution monitoring and meteorological data (refer Table 3).

These modelled results suggest that there are a number of receptor locations where exceedances have likely occured (refer Table 3). In addition, there were also a number of locations which were within 10% of the AQO (40μg/m3).

Table 2: The Annual Mean Concentration of NO2 at diffusion tube sites on the gyratory system, Newhaven

Site	Potential Exceedance	2010 (a)	Façade (b)
9 Southway, Newhaven	Yes	51.0	37.4
16 Southway, Newhaven	Yes	45.0	45.0
Lewes Road, Newhaven	No	37.0	33.7

a Annual mean level of NO2 with bias adjustment of 0.85

b Annual mean level of NO2 at façade with adjustment using **http://laqm.defra.gov.uk/documents/NO2withDistancefromRoadsCalculatorIssue4.xls**

Table 3: Modelled annual average NO2 concentration (μg/m3) for 2010

Receptors identification	Modelled Total NO2	Exceedence of AQO for NO2 *	Relevant receptor Y/N **
C7_NO2 DIFF (No11)	37.9	No	N
Lewes Road Brighton	39.5	No	N
2 Lewes Road Garden	43.3	Yes	N
2 Lewes Road	37.4	No	Y
36 Harpers Road Gard	41.3	Yes	N
36 Harpers Road Gard	41.3	Yes	N
36 Harpers Road Gard	41.6	Yes	N
10 Lewes Road 1	37.8	No	Y
10 Lewes Road 2	**40.2**	**Yes**	**Y**
29 Lewes Road	51.9	Yes	N
NO2 9 Southway tube	50.0	Yes	N
Folly Road Entrance	47.1	Yes	N
17 Folly Field	**42.1**	**Yes**	**Y**
13 Folly Field	**41.3**	**Yes**	**Y**
Flat 3 11 Lewes road	**43.7**	**Yes**	**Y**
9 Lewes Road	**41.3**	**Yes**	**Y**
7 Lewes Road	**42.3**	**Yes**	**Y**
5 Lewes Road	**43.9**	**Yes**	**Y**
4 Brighton Road	**42.8**	**Yes**	**Y**
NO2 16 Southway tube	**45.5**	**Yes**	**Y**
4 Lewes Road	37.4	No	Y
34 Harper Road Garde	32.4	No	N
34 Harpers Road 1	32.3	No	Y
34 Harper Road 2	32.5	No	Y
AQMS	48.0	Yes	N
Summerhayes			
10 Lewes Road NO3	34.4	No	Y
29 Lewes Road No2	**44.2**	**Yes**	**Y**
Folly Field Road	38.3	No	N
13 Folly Field Rear	36.5	No	N
9 Lewes Road Pavemen	51.7	Yes	N
9 Lewes Road Garden	36.1	No	N
8 Brighton Road	**43.1**	**Yes**	**Y**
2 Lewes Road Garden	29.1	No	N
30 Harpers Road Gard	27.9	No	N
16 Southway	36.8	No	Y
12 Southway	36.9	No	Y
2 Southway	46.8	Yes	N
18 Southway	**37.1**	**Yes**	**Y**
Summerhayes 1	39.9	No	Y
Summerhayes 2	**41.0**	**Yes**	**Y**
30 Southway	**44.4**	**Yes**	**Y**
5 Meeching Road	25.1	No	Y
2 Norman Road	23.4	No	Y
3 South Road	30.3	No	Y
15 South Road	21.7	No	Y
4 South Road	20.9	No	Y
43 Chapel Street	23.6	No	Y
Bridge Court 1	35.6	No	Y
Bridge Court 2	35.0	No	Y
Bridge Court 3	37.1	No	Y
Riverside Court 1	**41.5**	**Yes**	**Y**
Riverside Court 2	**40.4**	**Yes**	**Y**
Riverside Court 3	**41.5**	**Yes**	**Y**
Essex Mews 1	36.8	No	Y
Rear 12 Southway	27.6	No	N
24 Meeching Rise	22.1	No	Y
4 Southway	37.3	No	N
28 Southway	**41.7**	**Yes**	**Y**

* NO2 exceeded when measured as an annual mean

** Public are present and likely to be be exposed for a period of time appropriate to the averaging period of AQO.

10.0 Conclusion of Detailed Assessment

10.1 A Detailed Assessment of air quality around the gyratory system in Newhaven has been undertaken to further indicate whether the AQO for NO2 is likely to be exceeded. The area was identified to be at risk in the Lewes Updating and Screening Assessment 2009.

10.2 The Detailed Assessment identified several key receptor sites, where exposure to levels of NO2 above the AQO has the potential to cause adverse health effects on the local population.

10.3 The Detailed Assessment has been carried out using 2010 diffusion tube monitoring data; co-location results from UWE to apply a correction factor; type, volume and flow road traffic data for 2010; Meteorological data from 2010. The concentration of NO2 has been modelled for 2010.

10.4 The results of the modelling indicate there to be a likely exceedance of the annual mean nitrogen dioxide objective in several locations on the Southway part of the gyratory system in 2010. Therefore we recommend an Air Quality Management Area should now be declared to include at a minimum all of the relevant receptors in the vicinity of the Newhaven gyratory.

11.0 Future Development in the District

In the Newhaven and Peacehaven areas there are several proposals which need to be considered that could lead to an increase in traffic around the Newhaven gyratory system, and have a negative impact upon air quality.

In the Coastal strip there are proposals to develop greenfield and brownfield sites for housing and mixed use developments. There has recently been submitted an application to develop the land known as Eastside, it proposes a large supermarket and 180 residential units, there is also a great deal of interest in a number of brownfield sites in Newhaven.

The Energy from Waste facility at North Quay, Newhaven is now fully operational (November 2011). The development will generate additional vehicle movements, and emissions from the incinerator will also contribute towards levels of NO2. During the application both of these impacts were assessed and modelled. However the emmissions from the incinerator are far less significant when compared to the quantity of emissions from existing traffic sources. Future local air quality assessments carried out by Lewes District Council will consider the annual emissions from the traffic and point sources. It is worth mentioning that the vast majority of waste vehicle movements servicing this installation are required to use the A26 and not the A259 and therefore the impact of these movements on the levels of pollution on the gyratory are likely to be negligible. This requirement is enforced through a planning condition regulated by ESCC.

12.0 Next Steps

Should Defra accept the Detailed Assessment as being correct within the terms of the guidance they have provided, we will be consulting with the organisations listed below. A copy of this document will be made available at our offices in the district and within the local libraries; it will also be posted on our website. The Executive Summary will be produced and circulated to aid and assist this process.

The next steps of the process will be to designate an AQMA and then follow-up with a Further Assessment (Source apportionment) to ascertain more accurately what the major emitters are in the area. This work is vital in ensuring that any subsequent Air Quality Action Plan will be as effective as possible in improving air quality in the area.

We would aim to work in partnership with agencies and communities in the locality to develop an Air Quality Action Plan - the main aim being to try and reduce levels of air pollution in this area to below the air quality objectives.

13.0 Statutory Consultation

Under Part IV of the Environment Act 1995, all Local Authorities are required to consult on their air quality review and assessment with the Environment Agency and the local Highway Authority. Through the Sussex Air Quality Steering Group both of these bodies have been involved since the early stages of the air quality management process and will be made fully aware of the results of the Detailed Assessment.

Lewes District Council will send out full or summarised copies of this Detailed Assessment to:

Department of the Environment, Food and Rural Affairs

Sussex Air Quality Partnership

NHS Sussex

Neighbouring Local Authorities

Environment Agency

Highways Agency

East Sussex County Council

Newhaven Ports and Properties

Southern Water

Veolia

14.0 Acknowledgements

The work in this Detailed Assessment has been carried out using advice in the Technical Guidance [LAQM TG(09)], Policy Guidance [LAQM PG(09)] and The Air Quality Strategy for England, Wales and Northern Ireland.

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15.0 References

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Defra/Laxen, Marner and Donovan – *Analysis of the relationship between 1-hour and annual mean nitrogen dioxide at UK roadside and kerbside monitoring sites*. 2003

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University of West of England Review & Assessment website

16.0 Glossary

AADT	Annual Average Daily Traffic (vehicles per day)
AEOLIUSQ	Screening model for street canyons (Met Office)
APEG	Airborne Particles Expert Group
AQMA	Air Quality Management Area
AQO	Air Quality Objective (UK limit levels for pollutants)
AURN	Automatic Urban and Rural (air quality monitoring) Network
CO	Carbon monoxide
COMEAP	Committee on the Medical Effects of Air Pollutants
DA	Detailed Assessment
DEFRA	Department for Environment Food and Rural Affairs
DMRB	Design Manual for Roads and Bridges Screening Model
ESCC	East Sussex County Council
HDV	Heavy Duty Vehicles
LAQM	Local Air Quality Management
mg/m3	Milligrams of the pollutant per cubic meter of air
µg/m3	Micrograms of the pollutant per cubic meter of air
ppb	Parts per billion
ppm	Parts per million
NAEI	National Atmospheric Emissions Inventory
NAQS	National Air Quality Strategy
NO	Nitrogen monoxide
NO2	Nitrogen dioxide
PM10	Particles with diameter less than 10µm
QA/QC	Quality Assurance / Quality Control
R&A	Review and Assessment
SAQSG	Sussex Air Quality Steering Group
SO2	Sulphur dioxide
TEOM	Tapered Element Oscillating Microbalance
USA	Updating and Screening Assessment
UWE	University of West England
Vpd	Vehicles per day
WSCC	West Sussex County Council

17.0 Appendix 1 – Risk to Public Health from Nitrogen Dioxide

17.1 The main reasons for tackling poor air quality are the links between air quality and quality of life and the need to minimise the risk of poor air quality to human health. We now have a better understanding of the short-term and the long-term health effects of air pollution largely due to the work undertaken by the Committee on the Medical Effects of Air Pollutants (COMEAP). Short-term increases in some pollutants are associated with increased deaths. Pollutants can worsen symptoms in those with respiratory illnesses. COMEAP has also reported that long-term exposure to particles is associated with reduced life expectancy, mainly as a result of earlier deaths from heart disease.

17.2 Nitrogen dioxide (NO2) and nitric oxide (NO) are both oxides of nitrogen, and are collectively referred to as nitrogen oxides (NOx). It is nitrogen dioxide that is associated with adverse effects upon human health (Defra, 2003). UK work has shown that exposure to nitrogen dioxide enhances response to allergens and may increase the prevalence of respiratory infections in children. Volunteer studies have shown effects on lung function in asthmatics. There is some evidence for long-term effects of nitrogen dioxide although the evidence is weak. It should also be noted that nitrogen dioxide can be converted to nitrate which is a component of the particle aerosol and can contribute to ozone formation (Defra, 2001).

18.0 Appendix 2 – Diffusion Tube Monitoring Data

Table 5: Diffusion Tube Monitoring Data 2010

Site location	Raw Data – Annual Average NO_2 µgm-3	Bias Adjusted Annual Average NO_2 µgm-3
	2010	2010 (0.85)
9 Southway, Newhaven	60.2	51
16 Southway, Newhaven	52.8	45
Lewes Road, Newhaven	42.9	37

19.0 Appendix 3 – Modelling Input Data

19.1 Model

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.

19.2 Input Data

Modelling Years: 2010(base year)

Meteorological data source:

- Gatwick (year 2010)
- 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
- Average speed estimated from speed limits and local knowledge.

Figure 6: Map of Newhaven Gyratory System indicating the vehicle flows per day in 2010 for all the major adjoining roads. ***Traffic data source: East Sussex County Council***

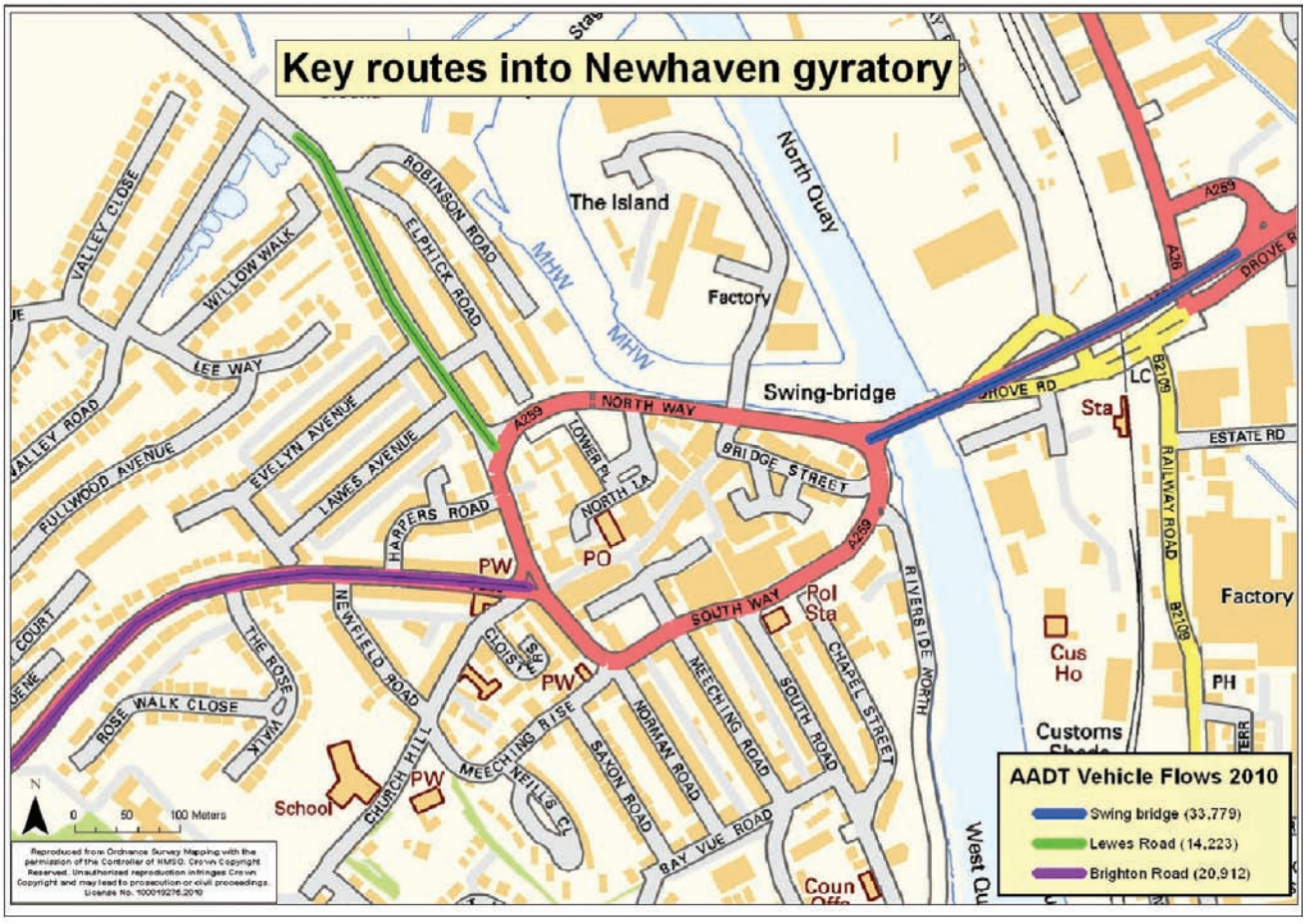

Table 6: Traffic data 2010 for modelling Newhaven gyratory (source: ESCC)

Road name	HGV speed kph	Car speed kph	HGV ADDT 2010	Car ADDT 2010
Swing bridge to South Way	40	48	239	16071
South Way to South Rd Jct	20	30	262	20802
South Way to South Road Jct bridge	20	30	231	18020
South Way A259 to Bridge West	20	30	149	9676
A259 Brighton Road West	25	35	149	9865
A259 Brighton Road East	15	25	150	11047
A259 Brighton Road South Way	15	25	150	10857
South Way 7	32	40	232	18732
North Way 3	25	35	233	21800
North Way 2	25	35	233	21800
North Way 1	20	30	233	21800
North Way to South Way	15	25	23	5178
North Way to Swing Bridge	30	40	210	16889
A259 Swingbridge East	30	40	210	16889
South Way to Lewes Road Junction	20	30	82	7979
South Way to North Way	30	48	159	13532
South Way to Lewes Rd	35	48	38	6879
Lewes Rd to North Way	15	20	19	7344
Lewes Rd 2	35	48	38	7344
Lewes Rd 3	35	48	38	7344
A259 Swingbridge East/West total	35	48	420	33779

19.3 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.

19.4 Emission factors (EF):

Vehicle emission factors used were UK EFT V4.2 (2VC) and were imported from EMIT 3.0.

19.5 Site Characteristics

Additional model inputs required for ADMS Urban:

Road type: EU 09 (3) Urban 10

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, the full details are listed in table 7).

Surface roughness length: 0.5 m

19.6

Table 7: Key Receptors used in Modelling

Receptor Name	X	Y	Height(m)
C7_NO2 DIFF (No11)	544272	101534	2
Lewes Road Brighton Road Junction	544348.8	101356.7	3
2 Lewes Road Garden	544350.4	101372.4	3
2 Lewes Road	544345.7	101366.2	3
36 Harpers Road Garden	544338	101389.9	1.8
36 Harpers Road Garden 2	544334.9	101399.4	1.8
36 Harpers Road Garden 3	544331.8	101409	1.8
10 Lewes Road 1	544321	101425.7	2
10 Lewes Road 2	544314.4	101441.1	2
29 Lewes Road	544341.1	101447.8	2
NO2 9 Southway tube	544354	101386	2
Folly Road Entrance	544344.8	101425.7	1.8
17 Folly Field	544350.7	101417.9	1.8
13 Folly Field	544354	101407.9	1.8
Flat 3 11 Lewes road	544354.9	101397.5	1.8
9 Lewes Road	544358.4	101386.2	2.5
7 Lewes Road	544361.2	101376.5	2.5
5 Lewes Road	544362.9	101368.5	2.5
4 Brighton Road	544338.1	101341.7	2.5
NO2 16 Southway tube	544413	101274	2
4 Lewes Road	544338.2	101379.5	2
34 Harper Road Garden	544328.5	101386.9	2
34 Harpers Road 1	544325.4	101396.4	2
34 Harper Road 2	544323.2	101403.4	2
AQMS Summerhayes	544428.3	101276.1	1.8
10 Lewes Road NO3	544307.3	101438.3	2
29 Lewes Road No2	544348.1	101447.3	1.8
Folly Field Road	544354.4	101428.8	1.8
13 Folly Field Rear	544360.5	101409.7	1.8
9 Lewes Road Pavement	544351.9	101391.7	1.8
9 Lewes Road Garden	544367.2	101388.9	2
8 Brighton Road	544329.8	101343.1	1.8
2 Lewes Road Garden 2	544323.6	101369.5	3
30 Harpers Road Garden rear	544318.9	101383.8	3
16 Southway	544410.8	101275.7	3
12 Southway	544403	101284.5	3
2 Southway	544378.4	101312.3	1.8
18 Southway	544454.5	101255.6	1.8
Summerhayes 1	544452.3	101274.6	3
Summerhayes 2	544428.2	101283.9	1.8
30 Southway	544529.6	101297.6	1.8
5 Meeching Road	544513.2	101260.3	1.8
2 Norman Road	544467.5	101234.4	1.8
3 South Road	544568.6	101294.3	1.8
15 South Road	544583.8	101267.6	1.8

4 South Road	544598.2	101266.8	1.8
43 Chapel Street	544632.9	101301.2	1.8
Bridge Court 1	544598.2	101473.4	2
Bridge Court 2	544622.4	101467.8	2
Bridge Court 3	544582.1	101478.1	2
Riverside Court 1	544496.7	101495	2
Riverside Court 2	544513.1	101491.9	2
Riverside Court 3	544481.9	101497	2
Essex Mews 1	544373.6	101472.2	2
Rear 12 Southway	544391.3	101273	3
24 Meeching Rise	544408.6	101237	4
4 Southway	544388.7	101300.9	3
28 Southway	544494.3	101278.9	1.8

20.0 Appendix 4 - Model Verification

20.1 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.

20.2 NOx adjustment factor

The ADMS Urban model was run for 2010 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 (Table 8). The final NOx adjustment factor was derived from an average of these 3 monitoring locations.

Table 8: NOx verification results 2010 data

Site ID Year 2010	Monitored Total NO2	Monitored Total NOx	Background NO2	Background NOx	Monitored Road Contribution NO2 (total – background)	Monitored Road Contribution NOx (total – background)	Modelled Road Contribution NOx (excludes background)
C7_NO2 DIFF (No11)	37	73.2	13.9	19.6	23.1	53.6	8.30
9 Southway tube	51	115.3	13.9	19.6	37.1	95.7	13.60
16 Southway tube	45	96.1	13.9	19.6	31.1	76.5	11.50

Site ID Year 2010	Ratio of Monitored Road Contribution NOx/ Modelled Road Contribution NOx	Adjust-ment Factor for Mod-elled Road Contrib-ution	Adjusted Modelled Road Contribution NOx	Adjusted Modelled Total NOx (incl. Background NOx)	Modelled Total NO2 (based on empirical NOx/NO2 relation-ship)	Monitored Total NO2	% Difference [(Modelled - Monitored)/ Monitored] x100
C7_NO2 DIFF (No11)	6.5	6.8012	56.4	76.0	38.48	37.0	4.0
9 Southway tube	7.0		92.5	112.1	50.44	51.0	-1.1
16 Southway tube	6.7		78.2	97.8	45.96	45.0	2.1

* Calculations taken from the Nox to NO2 calculation version 2.1 at www.laqm.defra.gov.uk/documents/no2tonox8_ja-forweb_jan2010.xls

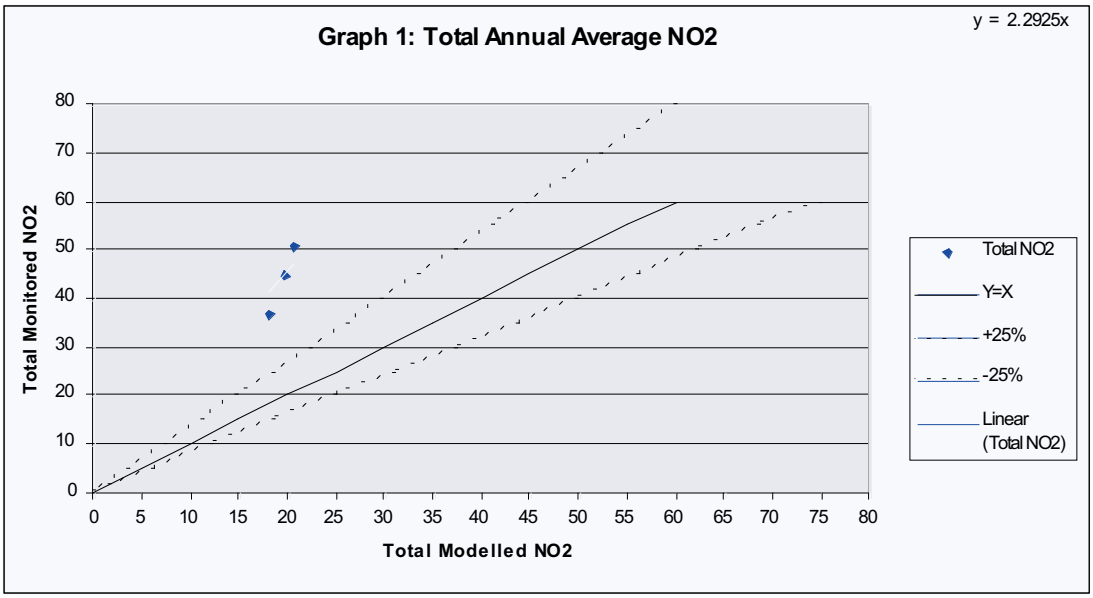

Figure 7: Comparison of monitored NO2 and modelled NO2 (2010)

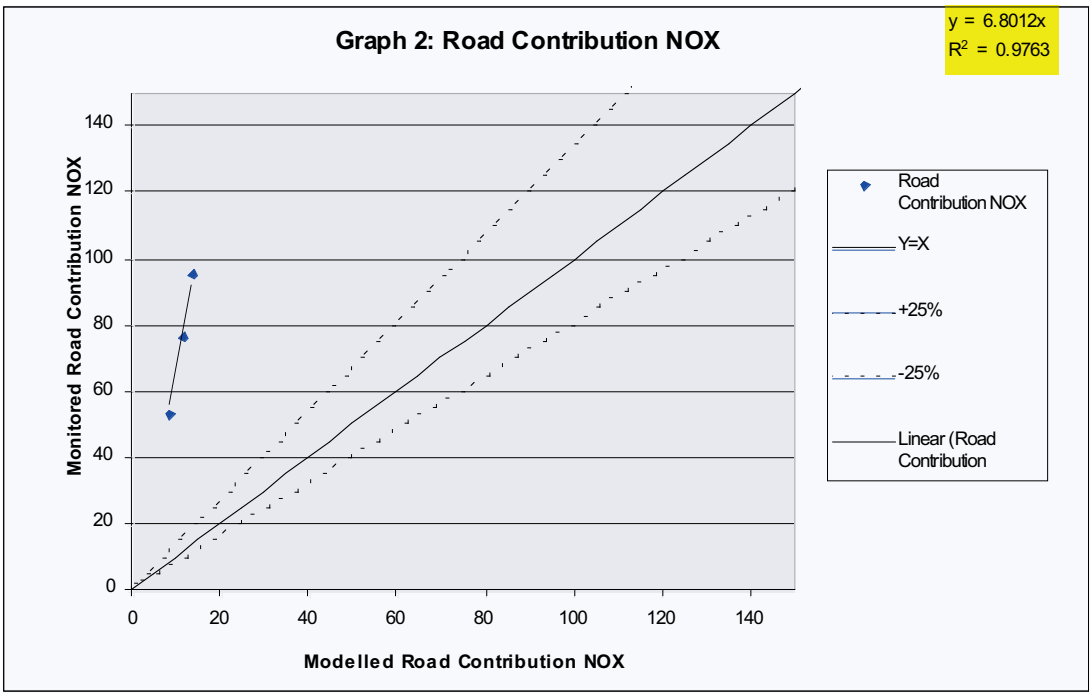

Figure 8: Comparison of monitored road Nox with modelled road NOx (2010)

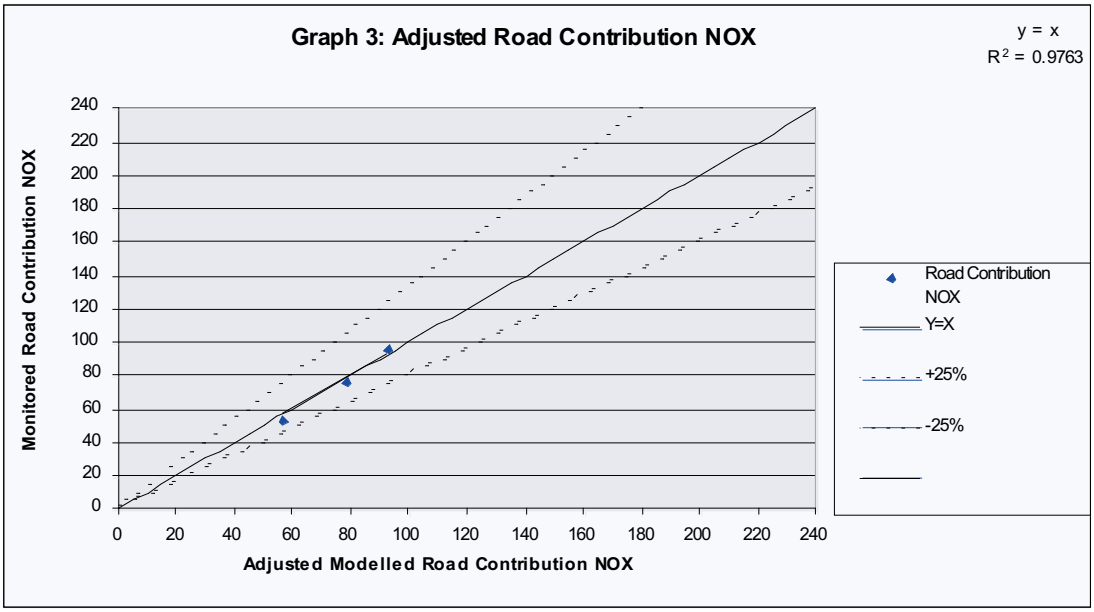

Figure 9: Comparison of monitored total Nox and fully adjusted modelled road Nox (2010)

21.0 Appendix 5 - Uncertainty

21.1 Measurements and modelling results all contain an element of uncertainty. DEFRA (2007c) suggest that this is of the order of plus or minus 20% for diffusion tube data and plus or minus 10% for automatic measurements.

Model results rely on traffic counts and future predictions of traffic flows and thus any uncertainties inherent in these data will carry into this assessment. In addition there will be uncertainties in the modelling as the model simplifies real-world conditions into algorithms to express the air movement, thermal activity and other processes relative to estimating concentrations.

21.2 These limitations of an assessment should be borne in mind when considering the results. Future year results are difficult to assess, due to unknown environmental conditions, emission factors and fleet composition changes, which indicate that future year uncertainties are likely to be greater than present estimates. The results should therefore be treated as "best estimates".

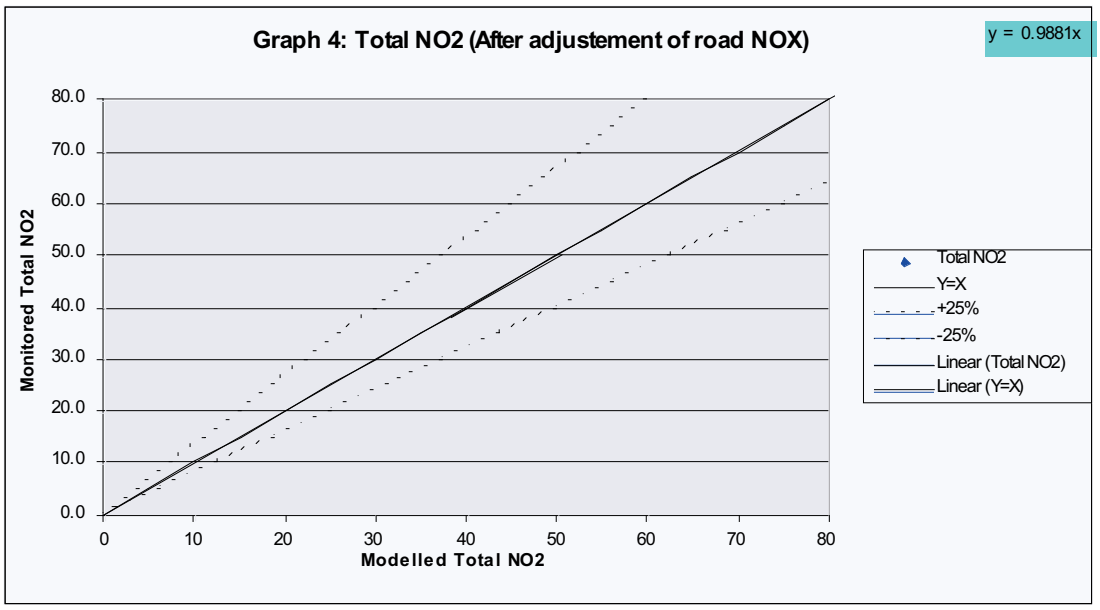

Figure 10: Comparison of monitored total NO2 and fully adjusted modelled total NO2 (2010

December 2012

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Lewes District Council