North East Lincolnshire

Air Quality Detailed Assessment – Grimsby – Cleethorpes Road

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1. Executive Summary

Following the conclusions of the Updating and Screening Assessment of air quality 2009, a Detailed Assessment of nitrogen dioxide (NO_2) has been undertaken for Cleethorpes Road at Riby Square, Grimsby as part of the Local Air Quality Management regime.

The Detailed Assessment is based on detailed atmospheric dispersion modelling of NO_2 resulting from road traffic sources. The assessment has used updated background pollutant concentrations, air quality monitoring, traffic and meteorological data for year 2008.

The conclusions of this assessment are that North East Lincolnshire should declare an Air Quality Management Area (AQMA) for annual mean NO_2 on Cleethorpes Road between Freeman Street and Nacton Street.

2. Introduction

2.1. Project Background

Part IV of the Environment Act, 1995, places a statutory duty on local authorities to periodically review and assess the air quality within their area. Bureau Veritas was commissioned by North East Lincolnshire Council to undertake the air quality Detailed Assessment of Cleethorpes Road at Riby Square in Grimsby for nitrogen dioxide (NO_2).

The Detailed Assessment is required following the conclusions of North East Lincolnshire Council's fourth round air quality Updating and Screening Assessment (April 2009) which identified measured exceedences of the annual mean NO_2 Air Quality Strategy (AQS) objective at a number of diffusion tube monitoring sites at the junction of Cleepthorpes Road and Riby Square.

2.2. Legislative Background

2.2.1. Local Air Quality Management

As established by the Environment Act 1995 Part IV, all local authorities in the UK are under a statutory duty to undertake an air quality assessment within their area and determine whether they are likely to meet the air quality objectives set down by Government for a number of pollutants. The process of review and assessment of air quality undertaken by local authorities is set out under the Local Air Quality Management (LAQM) regime and involves a phased three yearly assessment of local air quality. Where the results of the review and assessment process highlight that problems in the attainment of health-based objectives for air quality will arise, the authority is required to declare an AQMA – a geographic area defined by high levels of pollution and exceedences of health-based standards.

The LAQM regime was first set down in the 1997 National Air Quality Strategy (NAQS)[1] and introduced the idea of local authority 'Review and Assessment'. The Government subsequently published policy and technical guidance related to the review and assessment processes in 1998. This guidance has since been revised in light of increased understanding and the development of additional assessment tools and the latest documents include Policy Guidance (LAQM.PG (09))[2] and Technical Guidance (LAQM.TG (09))[3]. The guidance lays down a progressive, but continuous, framework for the local authorities to carry out their statutory duties to monitor, assess and review air quality in their area and produce action plans to meet the air quality objectives.

Where the results of the review and assessment process highlight that problems in the attainment of health-based objectives for air quality are likely to arise, the authority is required to declare an AQMA – a geographic area defined by high levels of pollution and exceedences of health-based standards.

Having declared an AQMA the authority is required to confirm the findings of the Detailed Assessment work through further monitoring or modelling assessments.

2.2.2. Air Quality Strategy Objectives

The latest Air Quality Strategy[4] released in July 2007 provides an over-arching strategic framework for air quality management in the UK and contains national air quality standards and objectives established by the Government to protect human health. The objectives for ten pollutants (benzene, 1,3-butadiene, carbon monoxide, lead, nitrogen dioxide, sulphur dioxide,

[1] DoE, 1997, 'The United Kingdom National Air Quality Strategy', The Stationary Office

[2] Policy Guidance LAQM.PG(09) (2009), Part IV of the Environment Act 1995, Local Air Quality Management, Published by Defra in partnership with the Scottish Government, Welsh Assembly Government and Department of the Environment Northern Ireland, The Stationery Office

[3] Technical Guidance LAQM.TG (09) (2009), Part IV of the Environment Act 1995, Local Air Quality Management, Published by Defra in partnership with the Scottish Government, Welsh Assembly Government and Department of the Environment Northern Ireland, The Stationery Office

[4] The Air Quality Strategy for England, Scotland, Wales and Northern Ireland (2007), Published by Defra in partnership with the Scottish Executive, Welsh Assembly Government and Department of the Environment Northern Ireland

particulates - PM_{10} and $PM_{2.5}$, ozone and PAHs-Polycyclic Aromatic Hydrocarbons) have been prescribed within the Air Quality Strategy based on The Air Quality Standards (England) Regulations 2007[5]. The Objectives set out in the AQS for the protection of human health are presented in Table 2.1.

Table 2.1 AQS Objectives and Standards for England

Pollutant	Objective	Concentration Measured As	Date To Be Achieved By And Maintained Thereafter
Benzene	16.25 µg/m^3	running annual mean	31st December 2003
	5 µg/m^3	running annual mean	31st December 2010
1,3-Butadiene	2.25 µg/m^3	running annual mean	31st December 2003
Carbon monoxide	10 mg/m^3	maximum daily running 8 hour mean	31st December 2003
Lead	0.5 µg/m^3	annual mean	31st December 2004
	0.25 µg/m^3	annual mean	31st December 2008
Nitrogen dioxide	200 µg/m^3, not to be exceeded more than 18 times a year	hourly mean	31st December 2005
	40 µg/m^3	annual mean	31st December 2005
Particles (PM_{10})	50 µg/m^3, not to be exceeded more than 35 times a year	24 hour mean	31st December 2004
	40 µg/m^3	annual mean	31st December 2004
Particles ($PM_{2.5}$)	25 µg/m^3	Annual mean	2020
	Target of 15% reduction in concentrations at urban background[6]	annual mean	In urban areas between 2010 and 2020
Sulphur dioxide	266 µg/m^3, not to be exceeded more than 35 times a year	15 minute mean	31st December 2005
	350 µg/m^3, not to be exceeded more than 24 times a year	hourly mean	31st December 2004
	125 µg/m^3, not to be exceeded more than 3 times a year	24 hour mean	31st December 2004
Polycyclic Aromatic Hydrocarbons	0.25 ng/m^3 B(a)P[7]	Annual average	31st December 2010
Ozone	100 µg/m^3, not to be exceeded more than 10 times a year	8 hour mean	31 December 2005

The Air Quality Standards (England) Regulations 2007[5] came into force on 15th February 2007. This brings together in one statutory instrument the Governments requirements to fulfill separate

[5] The Air Quality Standards Regulations 2007, Statutory Instrument No 64, The Stationary Office Limited

[6] 25µg/m^3 is a concentration cap combined with a 15% reduction

[7] Benzo(a)Pyrene

EU Daughter Directives through a single consolidated statutory instrument, which is fully aligned with the latest EU CAFE (Clean Air For Europe) Air Quality Directive, 2008/50/EC[8]. The Regulations 2007 also include objectives for Arsenic, Cadmium and Nickel. These are required to be assessed by Member States in response to the new EU Air Quality Directive. However, the AQS does not contain objectives for these pollutants and local authorities are not currently required to assess against these. The UK Government and the Devolved Administrations have also set new national air quality objectives for $PM_{2.5}$. These objectives have not been incorporated into LAQM Regulations, and authorities at this stage have no statutory obligation to review and assess air quality against them.

2.3. Summary of the air quality Review and Assessment

North East Lincolnshire Council (NELC) completed its first round of Review and Assessment of air quality in 2001. Conclusions were that NO_2 concentrations were likely to exceed the annual mean AQS objective at Riby Square, Grimsby. However, an AQMA was not declared, as residential properties in the area were not occupied at the time. A continuous monitoring station was installed to confirm pollutant levels. All other pollutants complied with the AQS objectives.

The second round of Review and Assessment began with an Updating and Screening Assessment (USA), completed in May 2003. The report confirmed that NO_2 was still exceeding the objective in Riby Square, while properties were now occupied. It also highlighted several other areas in Grimsby where there was a risk of exceeding the NO_2 and PM_{10} annual mean objectives. Therefore a Detailed Assessment was carried out at these locations in 2005. Based on detailed dispersion modelling, the report concluded that properties were not at risk of exceeding the NO_2 or PM_{10} objectives and that no AQMA was required in Grimsby.

The USA 2003 also concluded that NO_2 and SO_2 concentrations at Kings Road/Pelham Road junction in Immingham were likely to exceed the objectives due to the combination of shipping and traffic emissions linked to the operation of the Immingham Port. A separate Detailed Assessment was carried out for the Immingham Port area in 2006. The report, which also assessed PM_{10} concentrations in the area, concluded that an AQMA for NO_2 or SO_2 was not required in Immingham. However, it was recommended that an AQMA for PM_{10} be declared on the grounds of updated monitoring data. NELC declared an AQMA in Immingham for PM_{10} in October 2006, encompassing properties near the junction of Kings Road and Pelham Road, as well as a few properties in Hawthorn Avenue near Kings Road.

A draft Action Plan presenting measures to tackle air pollution in the AQMA in Immingham was prepared and sent for consultation in May 2008. The final Action Plan was sent to Defra for approval end of 2008.

In parallel to the Action Plan, the third round of Review and Assessment began with a new USA, completed in April 2006. The report provided an update with respect to air quality issues in North East Lincolnshire since the previous round. The USA supported the decision to declare the AQMA for PM_{10} in Immingham and concluded that all other pollutant objectives would be met in North East Lincolnshire.

The Annual Progress Report released in 2007 confirmed the conclusions of the USA 2006. However, updated NO_2 monitoring data at the continuous analyser located along the A1243 Bargate, near Fryston House, Grimsby, showed that there was a risk of exceedence of the annual mean AQS objective for NO_2. Therefore, the report recommended that a Detailed Assessment be carried out for this location.

The Detailed Assessment of Fryston Corner was completed in January 2009 and concluded that exceedence of the NO_2 annual mean objective was unlikely at locations relevant of public exposure and therefore there was no need to declare an AQMA. It was however recommended that the monitoring programme should continue at Fryston Corner to accurately assess future changes in NO_2 concentrations.

[8] Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe

In April 2009, NELC completed their third USA report as part of the fourth round of Review and Assessment under new technical guidance LAQM.TG(09). The report concluded that all air quality objectives would be met outside of the Immingham AQMA, except for on Cleethorpes Road at Riby Square where exceedences of the annual mean NO_2 objective were measured at a number of diffusion tube monitoring sites. The USA concluded that an updated Detailed Assessment should be conducted at Riby Square for annual mean NO_2.

2.4. Scope and Methodology of the Detailed Assessment

The approach to the Detailed Assessment is to provide the Local Authority with an opportunity to supplement the information they have gathered in their earlier review and assessment work and more accurately assess the impact of pollution sources on local receptors at identified hotspots through dispersion modelling. The aim of the dispersion modelling is to reflect the results from local monitoring sites across the whole assessment area and allow comparison of pollutant concentrations against the AQS objectives.

The Detailed Assessment will identify with reasonable certainty whether or not there is likely to be an exceedence of the AQS objectives and if so, define the extent and magnitude of the exceedence.

3. Baseline Information

3.1. Traffic Data

Traffic data for the assessment were provided by North East Lincolnshire Council. Data were provided in Annual Average Daily Traffic (AADT) flow format with information on percentage of Heavy Duty Vehicles (%HDVs) and average traffic speeds on each road link. Traffic data were provided for the baseline model year (2008) and future year (2010). 2010 projected figures were estimated by the Council based on average area-wide traffic growth from the Road Traffic Reduction Act (RTRA) studies from 1999 to 2008. The traffic data provided for this Detailed Assessment is displayed in Table 3.1. The modelled road links are displayed in Appendix 3.

Traffic speeds have been reduced to 20kph at the Riby Square junction to account for the effects of queuing and congestion. The speed limit on Freeman Street is 48kph; however this has been reduced to 32kph in the model. This assumption was based on observations made during a site visit to Riby Square which identified Freeman Street as very narrow and dissected by many side roads and as such not likely to support vehicles moving at 48kph.

Table 3.1 Traffic Data

Road	AADT 2008	AADT 2010	%HDV	Average Speed (kph)
A180	33275	33188	7.1	48
Riby Square	9521	9497	9.8	48
Cleethorpes Road	26449	26380	6.9	48
Freeman Street	6443	6426	8.5	32

3.2. Air Quality Data

3.2.1. NO_2 Continuous Monitoring

Between 2002 and 2007, NELC operated a continuous air quality monitoring station at Riby Square in Grimsby. Since April 2007, this station has been relocated to Woodlands Avenue, Immingham. During the period of continuous air quality monitoring at Riby Square, the annual mean NO_2 objective was consistently exceeded as shown in Table 3.2. However, the station was not considered representative of relevant exposure and following a Detailed Assessment in 2005 which concluded the annual mean NO_2 objective would be met at locations relevant of public exposure near Riby Square, this station was moved to Woodlands Avenue.

Table 3.1 Riby Square NO_2 Monitoring Results 2002-2006

Year	Data Capture %	Annual Mean NO_2 ($\mu g/m^3$)
2002	Unknown	41.4
2003	Unknown	45.2
2004	Unknown	40.6
2005	80.6	41.5
2006	85.8	46.2

3.2.2. NO_2 Diffusion Tubes

North East Lincolnshire Council operated 34 NO_2 diffusion tube monitoring sites across North East Lincolnshire in 2008, including four sites on Cleethorpes Road and one site on Freeman Street both near Riby Square. The properties along Cleethorpes Road and Freeman Street at Riby

Square are predominantly occupied for commercial use. Those few residential properties that do exist are found to be at first and second floor level.

The diffusion tubes are supplied and analysed by Bureau Veritas Laboratories utilising the 10% Triethanolamine (TEA) in water preparation method. Bureau Veritas Laboratories participate in the Workplace Analysis Scheme for Proficiency (WASP) for NO_2 diffusion tube analysis and the Annual Field Inter-Comparison Exercise. These provide strict performance criteria for participating laboratories to meet, thereby ensuring NO_2 concentrations reported are of a high calibre. The laboratory follows the procedures set out in the Harmonisation Practical Guidance.

The technical guidance LAQM.TG (09) and the air quality Review and Assessment Helpdesk provide guidance with regard to the application of a bias adjustment factor to correct diffusion tubes. Triplicate co-location studies can be used to determine a local bias factor based on the comparison of diffusion tube results with data from NO_x / NO_2 continuous analysers. Alternatively, the national database of diffusion tube co-location surveys[9] provides bias factors for the relevant laboratory and preparation method.

In 2008, the bias adjustment factor was obtained from a triplicate diffusion tube co-location study at the Fryston House continuous analyser in Grimsby. A calculated bias correction factor of 1.01 has been applied to the 2008 diffusion tube results.

The results of NO_2 diffusion tube monitoring at sites near to Riby Square from 2006 to 2008 are displayed in Table 3.3. The diffusion tube locations are shown in Appendix 3.

Table 3.2 Riby Square NO_2 Diffusion Tube Results– 2006- 2008

Site Name	Location	X	Y	NO_2 Annual Mean (bias adjusted, µg/m^3)		
				2006 (Bias =0.87)	2007 (Bias =0.90)	2008 (Bias =1.01)
NEL10.11.12 (a)	112 Cleethorpes Road	527761	410426	**46.7**	**50.5**	**56.1**
NEL13	113 Cleethorpes Road	527756	410446	**40.3**	**56.4**	**52.3**
NEL14	123 Cleethorpes Road	527787	410439	36.3	**50.5**	**51.0**
NEL15	197 Cleethorpes Road	527993	410398	24.9	31.6	31.7
NEL17	42 Freeman Street	527679	410277	26.8	37.4	31.8

(a) – triplicate diffusion tubes
In bold, exceedence of the annual mean NO_2 AQS objective (40µg/m^3)

Diffusion tube sites at 112, 113 and 123 Cleethorpes Road are all roadside sites with tubes mounted on lampposts between the building façade and the kerbside. These sites are not representative of relevant exposure hence the need for a modelling assessment to determine the true potential for exceedences of the annual mean NO_2 objective. Diffusion tubes at 197 Cleethorpes Road and 42 Freeman Street are mounted on the building façade, however neither site represents relevant exposure as these properties are currently in commercial use.

3.2.3.Background air quality data

As there is no local background air quality monitoring site in Grimsby, background concentrations for NO_x and NO_2 were obtained from the UK pollutant background maps[10]. These maps provide a modelled background pollutant concentration for each OS 1km×1km grid square in the UK.

[9] www.uwe.ac.uk/aqm/review/mguidance

[10] Estimated background air pollution levels for the UK - www.airquality.co.uk/archive/laqm/laqm.php

Modelled pollutant concentrations of NO_X and NO_2 were obtained from the grid square in which Riby Square lies. The background pollutant maps for NO_X include a breakdown of source contribution for each grid square including major and minor roads, industrial, domestic and rural sources. The in-square contribution from primary roads has been removed from the background NO_X and NO_2 concentrations used in this Detailed Assessment to avoid the risk of double-counting the contribution of the A180 which is included as a source in the ADMS model.

Background data used in this assessment are summarised in Table 3.4.

Table 3.3 Background Concentrations near Riby Square

Pollutant	2008 concentration ($\mu g/m^3$)	2010 concentration ($\mu g/m^3$)
NO_2	25.6	24.4
NO_x	40.6	38.0
From UK background maps (X=527500, Y=410500)		

4. Dispersion Modelling Methodology

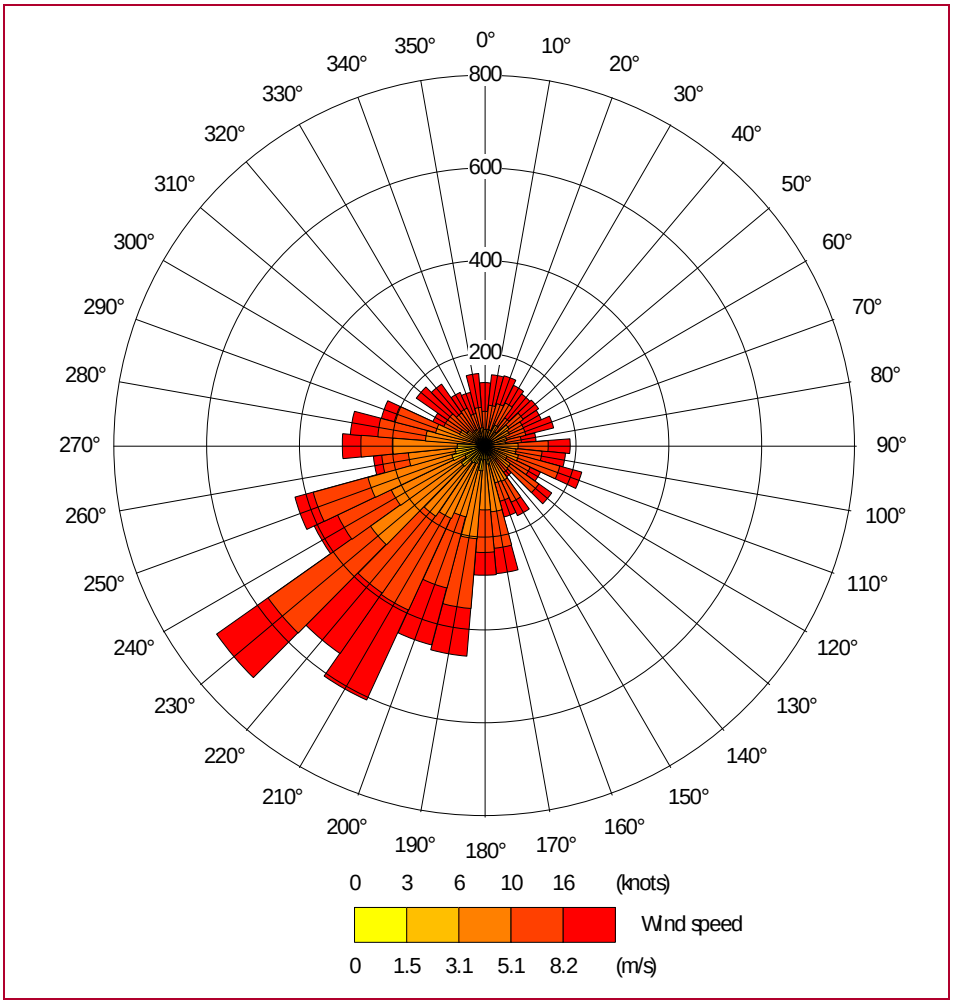
Detailed dispersion modelling of NO_x was undertaken based on the ADMS-Roads (version 2.3) advanced Gaussian air dispersion model, from Cambridge Environmental Research Consultants (CERC) Ltd. Conversion to NO_2 was carried out using the latest NO_X/NO_2 calculator tool published by Defra and available to download from the Air Quality Archive website[11].

ADMS-Roads has been extensively used in local air quality management and has formed the basis for many AQMA declarations. A number of validation studies have been completed, showing overall good agreement between model outputs and observations at continuous monitoring sites.

4.1. Meteorological data

Dispersal of pollutant emissions is entirely dependent upon the prevailing meteorological conditions at the time of emissions release. Hourly sequential meteorological data for year 2008 from the closest Met Office station (Donna Nook, 20 km South East of Grimsby) was used in this assessment. Cloud cover data were completed by information from other nearby stations due to low cloud cover data capture at Donna Nook station. The wind rose derived from the meteorological data is shown in Figure 4.1.

Figure 4.1 Donna Nook 2008 Hourly Sequential Meteorological Data



[11] www.airquality.co.uk

4.2. Other input parameters

The traffic emissions for NO_x were calculated using the latest emissions factor database published by Defra.

A minimum Monin-Obukhov length of 30m was selected to represent the stability of the atmosphere due to the characteristics of the local area. This is considered to be the minimum height above ground level above which vertical turbulence is inhibited.

A surface roughness length of 0.5m was assigned to the model, which is characteristic of suburban environments and is deemed to best represent the assessment area on the outskirts of Grimsby close to the docks.

5. Results

5.1. ADMS-Roads Model Verification

Model verification involves a comparison of ADMS-Roads model results with the results of local air quality monitoring. Should a discrepancy between modelled and monitored results be identified, then the modelled results may be adjusted up or down to align them with the monitoring results. This improves the accuracy and reliability of the model outputs.

Monitoring data for the five local NO_2 diffusion tube monitoring sites close to Riby Square have been considered for inclusion in model verification. Table 5.1 shows the four diffusion tube sites considered.

Table 5.1 Air Quality Monitoring Locations used for DMRB Model Verification

Site Name	Location	X	Y	2008 Annual Mean NO_2 ($\mu g/m^3$)	Used in Verification?
NEL10.11.12 [(a)]	112 Cleethorpes Road	527761	410426	**56.1**	Yes
NEL13	113 Cleethorpes Road	527756	410446	**52.3**	Yes
NEL14	123 Cleethorpes Road	527787	410439	**51.0**	Yes
NEL15	197 Cleethorpes Road	527993	410398	31.7	No
NEL17	42 Freeman Street	527679	410277	31.8	Yes

Diffusion tube NEL15 at 197 Cleethorpes Road has not been included in the model verification. The model results were found to over predict NO_2 concentration compared to monitored concentrations at this site, which is in contrast to a model under-prediction at the other four diffusion tube sites on Cleethorpes Road and Freeman Street. Although tube NEL15 is located further away from the junction, where the A180 is less congested, this has already been taken into account in the model through a higher vehicle speed on this section of the road. Although it is expected that site NEL15 measures lower concentrations compared to sites closer to the junction, it is not clear why there is such a difference in monitored results (about 20µg/m^3) between NEL15, and NEL13/NEL14.

As this difference could not be reproduced by the model, and due to the fact that the monitored exceedences of the annual mean NO_2 objective are at site NEL10.11.12, NEL13 and NEL14, it is deemed more important that model results correlate well with these monitoring locations.

The model verification has been carried out in accordance with the methodology described in air quality technical guidance LAQM.TG(09). The full calculation of NO_2 model verification is displayed in Appendix 1. All modelled Road-NO_x results have been adjusted by a factor of 2.7. The verification shows a good correlation between final modelled NO_2 concentrations and monitored NO_2 concentrations at Cleethorpes Road which are all within ±6% of each other. The Root Mean Squared Error (RMSE) in model verification is only 1.2µg/m^3. This shows a tight correlation when compared to the target RMSE value of 4µg/m^3.

5.2. ADMS-Roads Model Results

Annual average NO_2 concentrations were predicted for the baseline year 2008 and future year 2010 at four specific receptors representing locations relevant of public exposure, located at the facade of the properties. There are only four receptors included in the model as these were the only properties confirmed as representing residential exposure during the site visit, all located at first floor level. Properties at ground floor level in Cleethorpes Road are all business premises and as such, are not representative of public exposure with regards to the NO_2 annual mean AQS objective.

Additionally, predictions were made on a 5m-grid spacing across the assessment area to produce NO_2 concentration contour maps for 2008 and 2010. All results were predicted at 4.5m height from the ground to represent first floor level.

Table 5.2 summarises predicted NO_2 results for years 2008 and 2010 at the identified specific receptor locations. Modelled NO_2 contour plots for 2008 and 2010 are displayed in Appendix 2. The contour plots also shows the properties associated to the receptors listed in Table 5.2. These receptors are also displayed in Appendix 3.

Analysis of UK continuous NO_2 monitoring data[12] has shown that the hourly mean NO_2 AQS objective (of 18 hourly means over 200µg/m^3) is not likely to be exceeded if the annual mean concentration is below 60µg/m^3. The maximum predicted annual average for NO_2 is below 60µg/m^3. Therefore the NO_2 hourly mean AQS objective is expected to be met at all relevant locations. Consequently, where mentioned below, the NO_2 AQS objective refers to the annual mean AQS objective of 40µg/m^3.

Table 5.2 Predicted NO_2 Annual Mean Concentrations – Specific Receptors

Name	X(m)	Y(m)	Z(m)	NO_2 2008 (µg/m^3)	NO_2 2010 (µg/m^3)
Receptor 1	527693	410424	4.5	31.2	29.3
Receptor 2	527780	410443	4.5	35.5	33.1
Receptor 3	527781	410421	4.5	**51.3**	**47.8**
Receptor 4	527859	410404	4.5	**50.1**	**46.6**
In bold, concentrations above the NO_2 annual mean AQS objective (40µg/m^3)					

Modelled results show that there are predicted exceedences of the annual mean NO_2 objective at Receptor 3 and Receptor 4, both of which are on the south side of Cleethorpes Road. The contour plots displayed in Appendix 2 suggest that exceedences of the annual mean objective are also occurring at first floor façade level on the north side of Cleethorpes Road, although results at specific receptor modelling show that the annual mean NO_2 objective will be met at Receptor 2, which was the only receptor relevant of public exposure identified on that side of the road.

In 2010, modelled NO_2 concentrations are lower than in 2008 due to predicted reductions in background concentrations and improvements in vehicle emission technology. However, there are still predicted exceedences of the annual mean NO_2 objective at receptors 3 and 4, as displayed in Table 5.2, and at first floor façade level on both sides of Cleethorpes Road as shown in the Figure A2-2 in Appendix 2.

Modelled NO_2 contour plots displayed in Appendix 2 suggest that NO_2 concentrations are higher on the south side of Cleethorpes Road when compared to modelled NO_2 concentrations on the north side of Cleethorpes Road. This is consistent with monitoring results as shown in Table 5.1. This is likely to be due to a combination of the effects of meteorology and queuing westbound traffic at the Riby Square junction.

Based on both modelled and monitoring results, it is therefore recommended that an AQMA be declared for the NO_2 annual mean in Cleethorpes Road. Grimsby. The boundaries of the AQMA should be based on the map of NO_2 concentration contours as illustrated in Appendix 2, which suggests exceedences on Cleethorpes Road between the B1213 Freeman Street to the west and Nacton Street to the east.

[12] Laxen, D. & Marner, B., July 2003. Analysis of the Relationship Between 1-Hour and Annual Mean Nitrogen Dioxide at UK Roadside and Kerbside Monitoring Sites. www.uwe.ac.uk/aqm/review/hourlyNO2report.pdf - Section 4.2

6. Conclusions

As part of the Local Air Quality Management regime, a Detailed Assessment of Cleethorpes Road at the Riby Square junction in Grimsby was carried out following a monitored exceedence of the annual mean Air Quality Strategy objective for NO_2 in 2008.

The Detailed Assessment was based on detailed atmospheric dispersion modelling of NO_2 resulting from road traffic sources, using updated background pollutant concentrations, air quality monitoring, traffic and meteorological data for year 2008.

Results of detailed atmospheric dispersion modelling identify exceedences of the annual mean NO_2 objective at sensitive receptor facades on Cleethorpes Road at the Riby Square junction in Grimsby in the baseline year (2008) and the EU Limit year (2010).

Modelled annual mean NO_2 concentrations are well below 60µg/m^3 and therefore the hourly mean NO_2 objective is not predicted to be exceeded on Cleethorpes Road.

Based on these results, it is recommended that North East Lincolnshire Council declare an Air Quality Management Area for annual mean NO_2 along Cleethorpes Road, between Freeman Street and Nacton Street.

Appendix 1

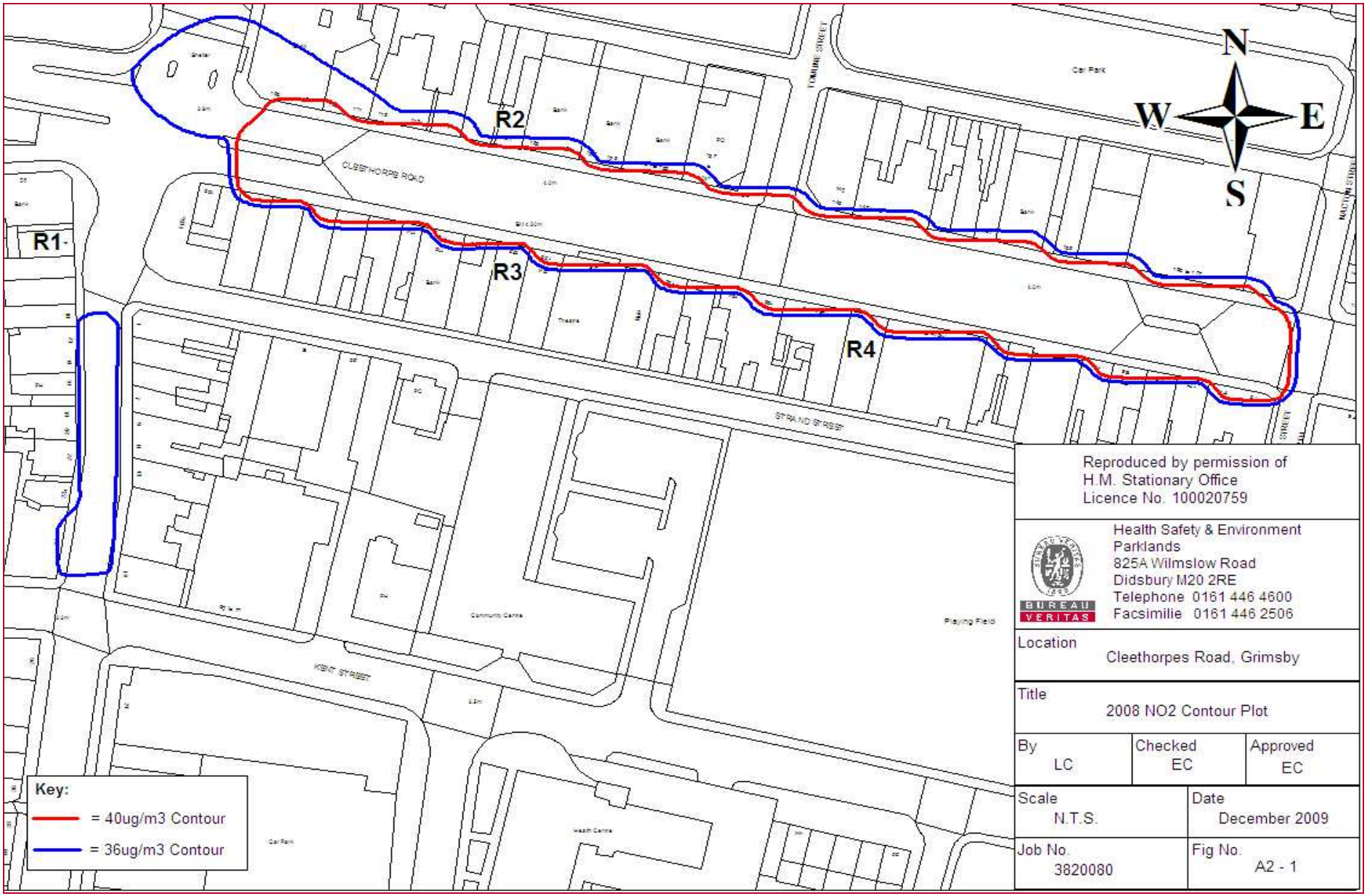
Model Verification

Table A 1 – Details of NO_2 Model Verification

Site ID	Monitor Type	Background NO_2 ($\mu g/m^3$)	Monitored Road Contribution NO_x ($\mu g/m^3$)	Modelled Road Contribution NO_x ($\mu g/m^3$)	Ratio of Monitored Road NO_X / Modelled Road NO_X	Adjustment Factor for Modelled Road Contribution	Adjusted Modelled Road Contribution NO_x ($\mu g/m^3$)	Modelled Total NO_2 ($\mu g/m^3$)	Monitored Total NO_2 ($\mu g/m^3$)	% Difference [(Modelled - Monitored)/ Monitored] x100
42 Freeman Street	DT	25.6	15.5	3.9	4.0	2.7	10.5	29.9	31.8	-6
113 Cleethorpes Road	DT	25.6	88.8	31.4	2.8	2.7	84.8	51.5	52.3	-2
112 Cleethorpes Road	DT	25.6	107.9	41.8	2.6	2.7	113.0	57.1	56.1	+2
123 Cleethorpes Road	DT	25.6	82.8	29.7	2.8	2.7	80.4	50.5	51.0	-1

Appendix 2

Modelled NO_2 Contour Plots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STRAND STREET
KENT STREET
Key:
= 40ug/m3 Contour
= 36ug/m3 Contour
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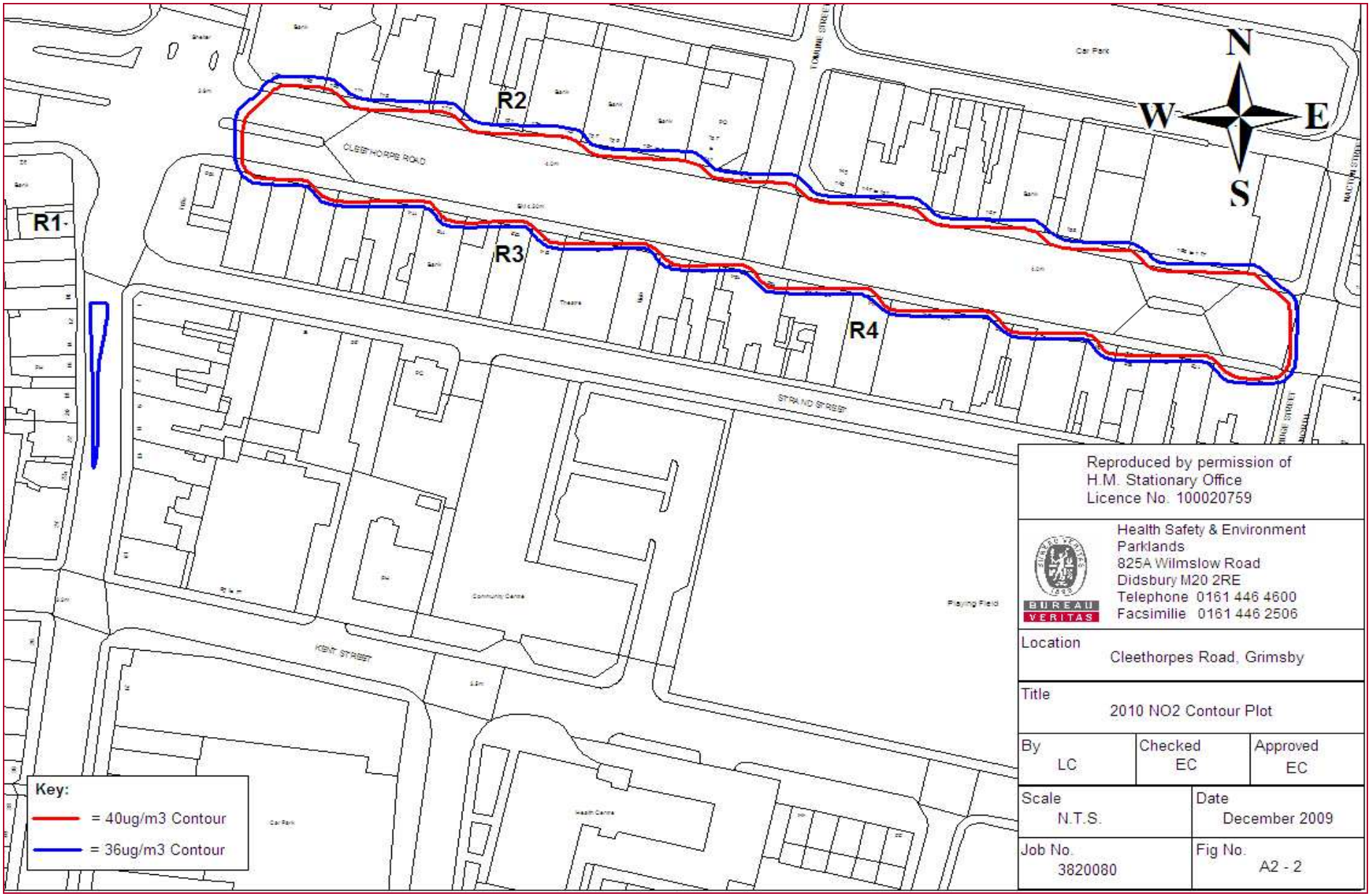
Health Safety & Environment
Parklands
825A Wilmslow Road
Didsbury M20 2RE
Telephone 0161 446 4600
Facsimilie 0161 446 2506
BUREAU VERITAS
Location
Cleethorpes Road, Grimsby
Title
2008 NO2 Contour Plot
By
LC
Checked
EC
Approved
EC
Scale
N.T.S.
Date
December 2009
Job No.
3820080
Fig No.
A2 - 1


R1
R2
R3
R4
N
W
E
S
CLEETHORPE ROAD
STRAND STREET
KENT STREET
Key:
= 40ug/m3 Contour
= 36ug/m3 Contour
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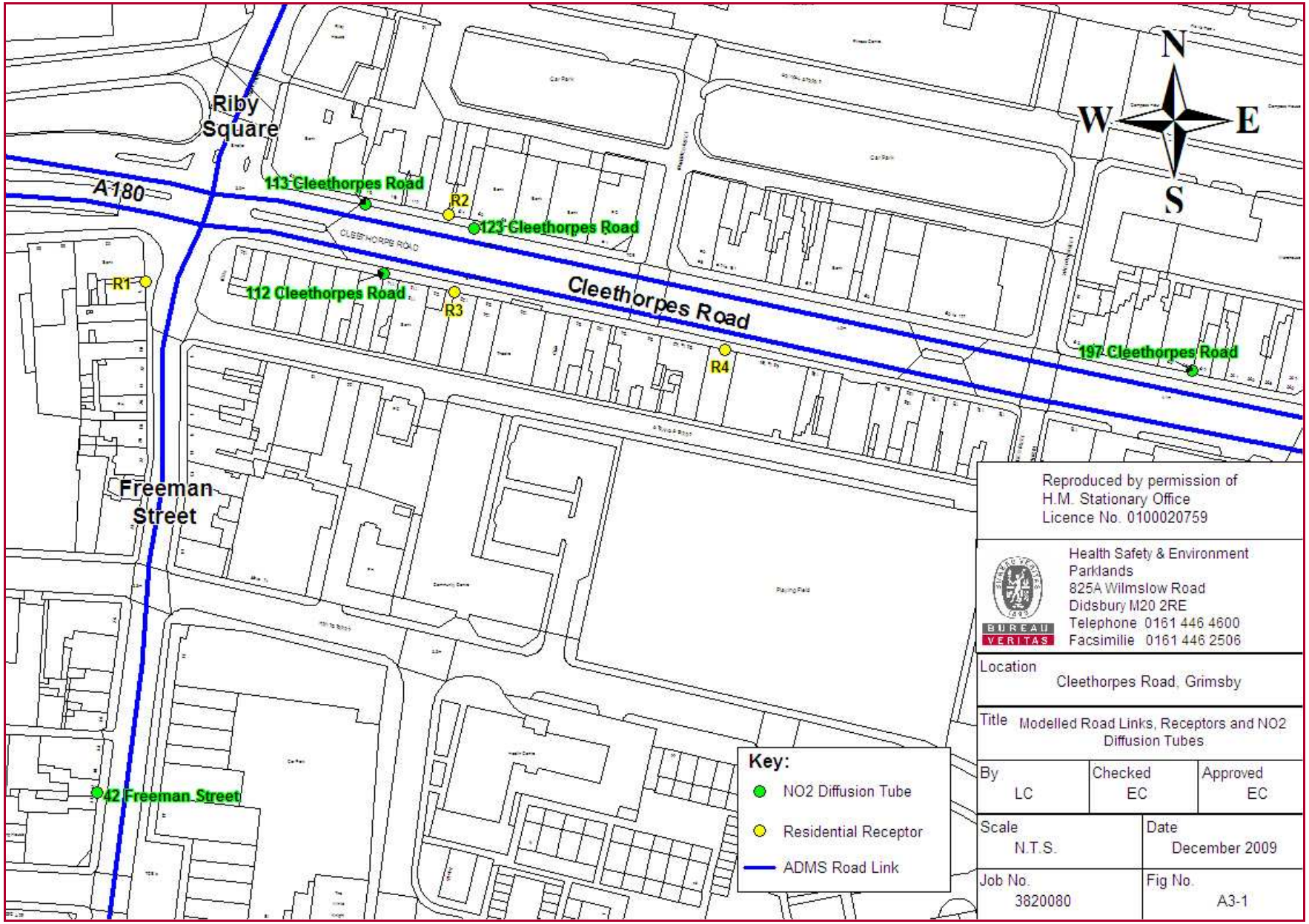
Parklands
825A Wilmslow Road
Didsbury M20 2RE
Telephone 0161 446 4600
Facsimilie 0161 446 2506
BUREAU VERITAS
Location
Cleethorpes Road, Grimsby
Title
2010 NO2 Contour Plot
By
LC
Checked
EC
Approved
EC
Scale
N.T.S.
Date
December 2009
Job No.
3820080
Fig No.
A2 - 2

Appendix 3

Modelled Roads, Receptors and NO_2 Diffusion Tubes


Riby Square
A180
113 Cleethorpes Road
R2
123 Cleethorpes Road
CLEETHORPES ROAD
R1
112 Cleethorpes Road
R3
Cleethorpes Road
R4
197 Cleethorpes Road
Freeman Street
42 Freeman Street
N
W
E
S
Key:
NO2 Diffusion Tube
Residential Receptor
ADMS Road Link
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Health Safety & Environment
Parklands
825A Wilmslow Road
Didsbury M20 2RE
Telephone 0161 446 4600
Facsimilie 0161 446 2506
BUREAU VERITAS
Location
Cleethorpes Road, Grimsby
Title
Modelled Road Links, Receptors and NO2 Diffusion Tubes
By
LC
Checked
EC
Approved
EC
Scale
N.T.S.
Date
December 2009
Job No.
3820080
Fig No.
A3-1