2012 Air Quality Further Assessment of Copt Oak Air Quality Management Area

for

North West Leicestershire District Council

In fulfilment of

Part IV of the Environment Act 1995

Local Air Quality Management

Date: December 2012

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Executive Summary

Section 84(1) of the Environment Act, and Part 3 of the Environment (Northern Ireland) Order 2002, requires authorities to complete a Further Assessment within 12 months of designating an Air Quality Management Area (AQMA). The main purpose of the Further Assessment is to provide authorities with an opportunity to supplement the information they have already gathered from their earlier Review and Assessment work.

Air Quality monitoring at copt oak was undertaken using diffusion tube and automatic monitoring. The most recent traffic data available was for the site was 2008.

Using modelling and monitoring it has been established that:

- a large proportion of the AQMA is not exceeding the Annual Mean Air Quality Standard for Nitrogen Dioxide and can be revoked.
- One property within north West Leicestershire District is likely to be exceeding the annual mean air quality standard
- One property within Hinckley and Bosworth Borough is possibly exceeding the annual mean air quality standard for NO_2.

It is therefore necessary for North West Leicestershire District Council:

- to amend the North West Leicestershire District Council Air Quality Management Area Order 2009 (No. 1) to reduce the declared area to the extent of Corner Farm.
- to inform Hinckley and Bosworth Borough Council that it is believed a property in their area may be exceeding the Annual mean air quality standard for Nitrogen Dioxide
- to publish an action plan on how the AQMA will be addressed.

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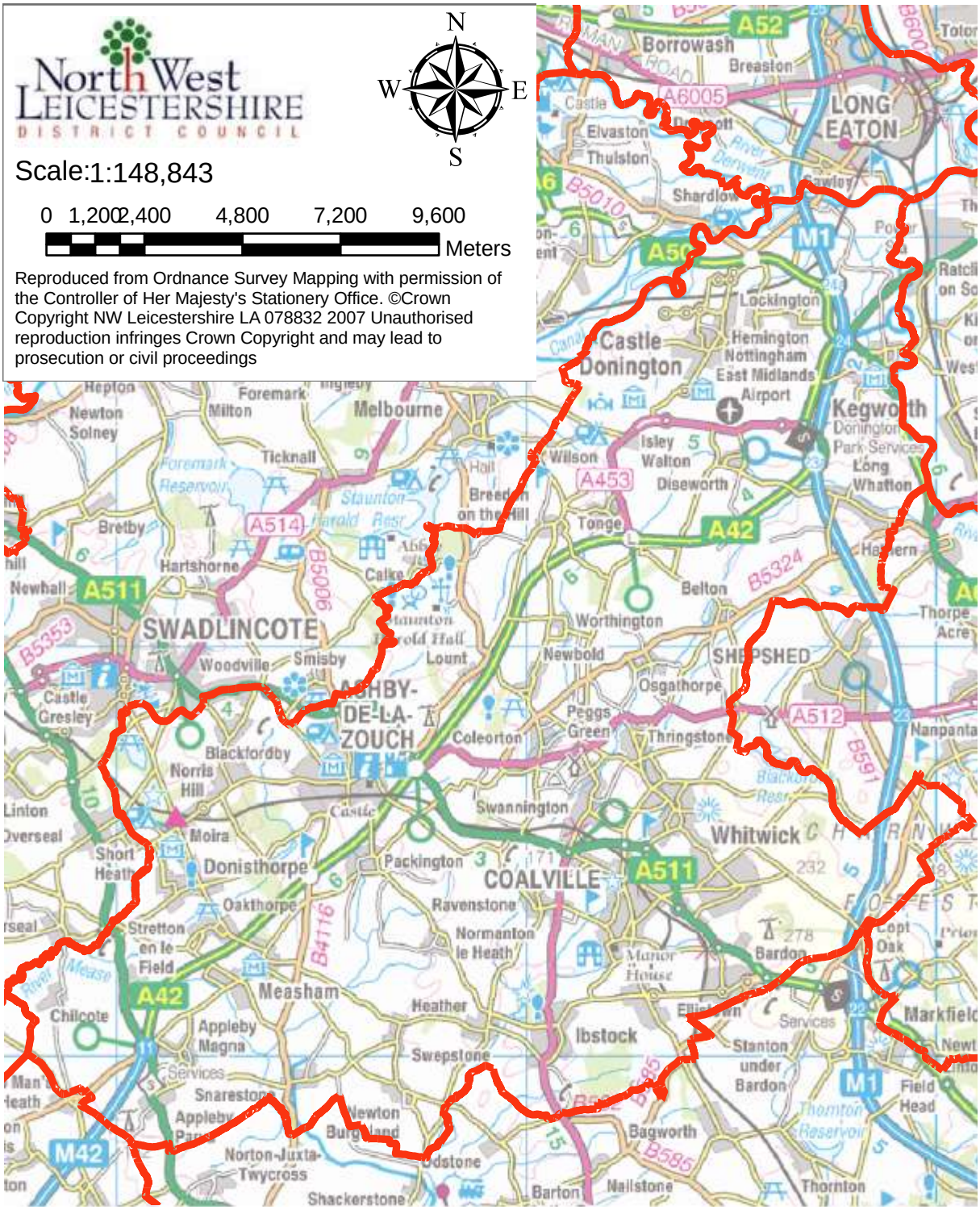
1.1 Description of Local Authority Area

Figure 1 Map of North West Leicestershire District



North West Leicestershire lies in the East Midlands Region and is both the name and geographical location. The district is situated in the heart of the National Forest and lies between Leicester, Burton-on-Trent, Derby and Nottingham, covering approximately 280Km^2 (approximately 108 square miles). The district is mostly rural with a large extent of industry historically from coal mining, but more recently with Nottingham East Midlands Airport and large quarries.

The Office of National Statistics has estimated the population of the district as 90,800[47] in 2010; the population is mainly distributed in the principle towns of Coalville and Ashby-de-la-Zouch; and the large villages of Castle Donington, Kegworth and Ibstock.

Three established main roads run through the district,

- the M42/A42 between Birmingham and Nottingham,
- the M1,
- and the A511 from Leicester to Burton-on-Trent.

1.2 Purpose of Further Assessment Report

Section 84(1) of the Environment Act, and Part 3 of the Environment (Northern Ireland) Order 2002, requires authorities to complete a Further Assessment within 12 months of designating an Air Quality Management Area (AQMA). The main purpose of the Further Assessment is to provide authorities with an opportunity to supplement the information they have already gathered from their earlier Review and Assessment work.

The Further Assessment is intended to allow authorities to:

- confirm their original assessment, and thus ensure they were correct to designate an AQMA in the first place;
- calculate more accurately what improvement in air quality, and corresponding reduction in emissions, would be required to attain the air quality objectives within the AQMA;
- refine their knowledge of sources of pollution, so that the air quality Action Plan may be appropriately targeted;

- take account of any new guidance issued by Defra and the Devolved Administrations, or
- any new policy developments that may have come to light since declaration of the AQMA;
- take account of any new local developments that were not fully considered within the earlier Review and Assessment work. This might, for example, include the implications of new transport schemes, commercial or major housing developments etc, that were not committed or known of at the time of preparing the Detailed Assessment;
- Carry out additional monitoring to support the conclusion to declare the AQMA;
- Corroborate the assumptions on which the AQMA has been based, and to check that the original designation is still valid, and does not need amending in any way; and
- Respond to any comments made by statutory consultees in respect of the Detailed Assessment.

1.3 Air Quality Objectives

The air quality objectives applicable to Local Air Quality Management (LAQM) in England are set out in the

- The Air Quality (England) Regulations 2000 (SI 2000/0928)[22],
- The Air Quality (England) (Amendment) Regulations 2002 (SI 2002/3043)[23]
- The Air Quality Standards Regulations 2007 (SI 2007/0717)[24]
- The Air Quality Standards Regulations 2010 (SI 2010/1001)[25]

They are shown in Table 1. Table 1 includes the number of permitted exceedences in any given year (where applicable).

Table 1. Air Quality Objectives included in Regulations for the purpose of Local Air Quality Management in England.

Pollutant	**Concentration**	**Measured as**	Date to be achieved by
Benzene	16.25 μgm^{-3}	Running annual mean	31.12.2003
	5.00 μgm^{-3}	Running annual mean	31.12.2010
1,3-Butadiene	2.25 μgm^{-3}	Running annual mean	31.12.2003
Carbon monoxide	10.0 μgm^{-3}	Running 8-hour mean	31.12.2003
Lead	0.5 μgm^{-3}3	Annual mean	31.12.2004
	0.25 μgm^{-3}	Annual mean	31.12.2008
Nitrogen dioxide	200 μgm^{-3} not to be exceeded more than 18 times a year	1-hour mean	31.12.2005
	40 μgm^{-3}	Annual mean	31.12.2005
Particles PM_{10} (gravimetric)	50 μgm^{-3}, not to be exceeded more than 35 times a year	24-hour mean	31.12.2004
	40 μgm^{-3}	Annual mean	31.12.2004
Particles $PM_{2.5}$ (gravimetric) (not currently included in regulations)	25 μgm^{-3} (target)	Annual mean	2020
Sulphur dioxide	350 μgm^{-3}, not to be exceeded more than 24 times a year	1-hour mean	31.12.2004
	125 μgm^{-3}, not to be exceeded more than 3 times a year	24-hour mean	31.12.2004
	266 μgm^{-3}, not to be exceeded more than 35 times a year	15-minute mean	31.12.2005

1.4 Summary of Previous Review and Assessments

Six AQMAs were designated in North West Leicestershire during the first round of review and assessment for the level of nitrogen dioxide concentrations. After Further Assessments it was determined that only two of these locations required AQMA designations and the remaining four were revoked. The Update and Screening Assessment (USA) undertaken in 2006 [1] concluded that these two sites should remain AQMAs and identified three additional locations where Detailed Assessments should be undertaken to determine whether new AQMAs were required for nitrogen dioxide concentrations. The two AQMAs designated during the first round are presented in Figure 2 and Figure 3.

The Detailed Assessment [6] undertaken in September 2007 of the three locations identified as possible areas for AQMAs in the USA 2006 [1], the three locations were High Street/Bondgate in Castle Donington, Broom Leys Road, Coalville and Bardon Road, Coalville, found that exceedences of the nitrogen dioxide objective were occurring in Castle Donington at properties located next to the carriageway along High Street and Bondgate due to traffic emissions. Monitoring at both locations in Coalville identified nitrogen dioxide concentrations that exceeded the mean annual objective during 2005, 2006 and 2007. The Detailed Assessment concludes that AQMAs should be designated at all three locations. As a result of these reports, two additional AQMAs were designated; the first in Castle Donington, presented in Figure 4, and the second covering Broom Leys Road and Bardon Road in Coalville, presented in Figure 5.

The Air Quality Progress Report conducted in April 2008 [7] recommended that a detailed assessment of the village of Copt Oak and the area surrounding East Midlands airport be undertaken to determine if AQMA's should be determined at these locations.

The Detailed Assessment of Copt Oak published in January 2009 [9] found that an AQMA should be declared and that the area should cross the district boundary to include an area within the borough of Hinckley and Bosworth as shown in Figure 6.

The Detailed assessment of East Midlands airport published in March 2009 [8] concluded that the Air quality objective for NO_2 would not be exceeded within 1000m of the airport as a result of air traffic emissions.

The further assessment of Bardon Road, Coalville published in February 2009 [10] supported the original declaration of the AQMA comprising the four residential properties at Broom Leys Junction and the one hundred and seventy two residential properties on Bardon Road.

The further assessment of High Street Castle Donington published in April 2009 [11] supported the original declaration of the AQMA comprising ninety one residential properties on High Street and Bondgate, Castle Donington.

The update and screening assessment published October 2009 [12] found that a detailed assessment for SO_2 was required in some areas of the district in relation to the burning of solid fuel, to which this report relates. The report also recommended that the M1 AQMA is expanded to include an exceedence of the 1-hour mean objective for NO_2 as the yearly mean has exceeded 60μgm^{-3}.

The Progress Report published in April 2010 [13] found no significant change in the district.

A Detailed Assessment for SO_2 was conducted in 2010 [14]. This found that solid fuel usage within off-gas areas of the district was insufficient to warrant further investigation.

A Detailed assessment of the M1 AQMA conducted in 2011 [16] found that most of the declared area could be revoked as there is either no relevant receptor or the annual mean air quality standard for NO_2 is not being exceeded.

A Detailed Assessment of the Coalville AQMA conducted in 2011 [15] found that the declared area could be reduced to the declared area of Stephenson Way as the annual mean air quality standard for NO_2 is not being exceeded along Bardon Road.

The 2011 progress report [17] found that Broomleys junction in the Coalville AQMA exceeded the 1-hour mean air quality standard for NO_2 and recommended that a detailed assessment be undertaken.

The progress report also found that the current air quality action plan is insufficient and needs to be updated.

The 2011 detailed assessment of 1-hour Mean Air Quality Standard at Broomleys junction Coalville[18] found that the 1-hour mean air quality standard was being exceeded and the AQMA should be amended.

The 2012 detailed assessment of Castle Donington found that a large proportion of the AQMA was not exceeding the air quality standard and recommended the AQMA be amended.

Figure 2 Kegworth AQMA (highlighted in blue).

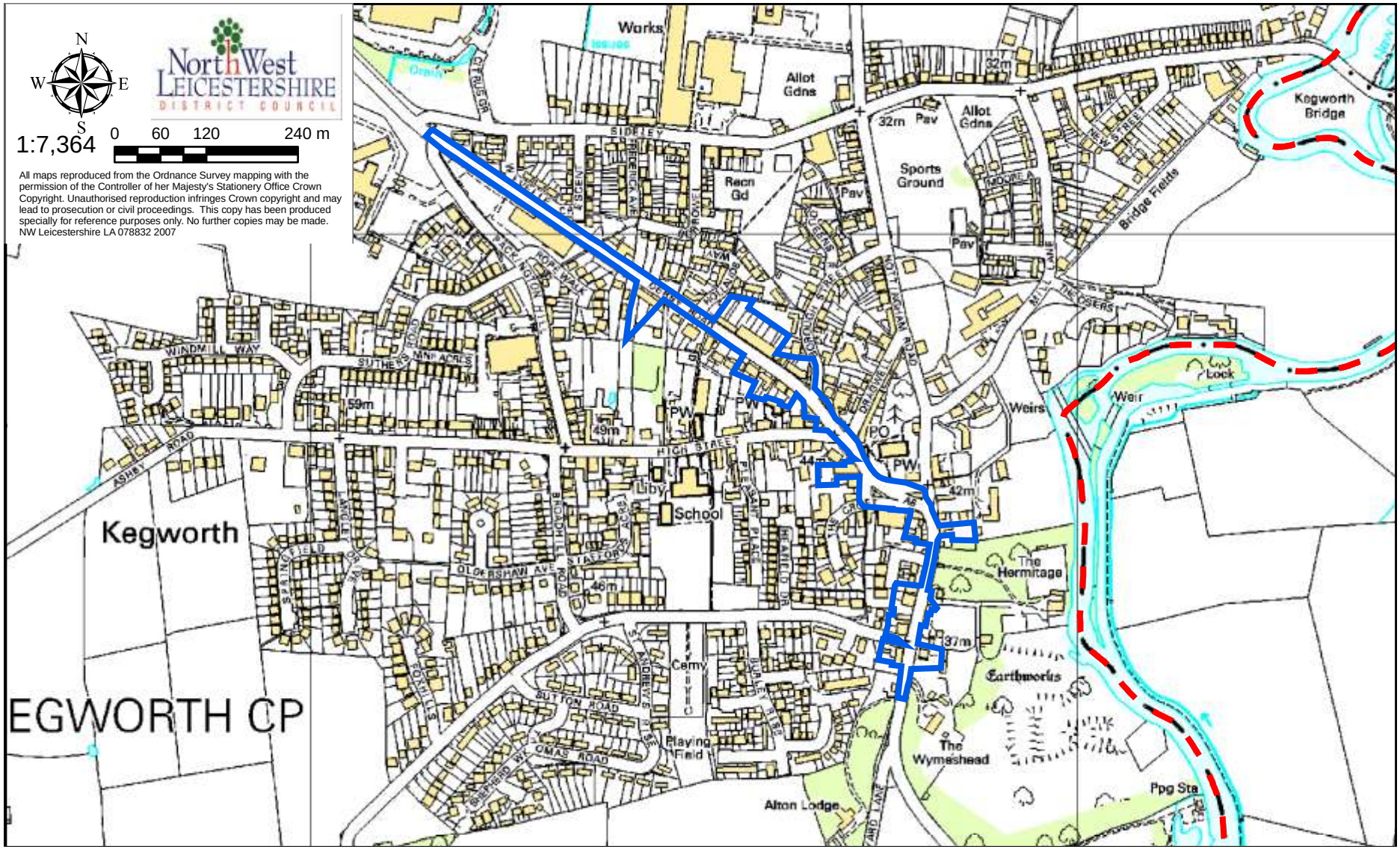


Figure 3 M1 AQMA (Outlined in Dark Blue)

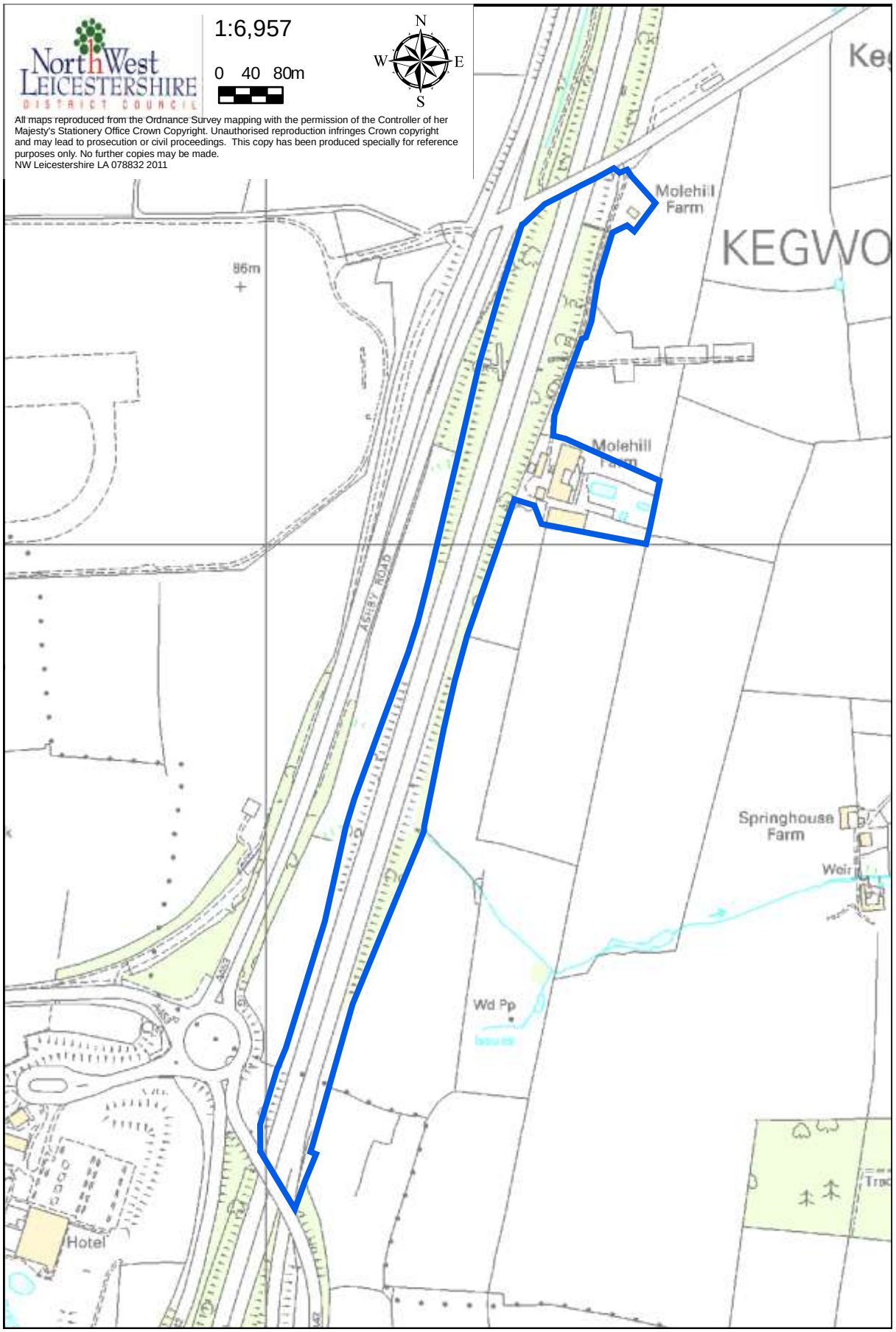


Figure 4 Castle Donington Air Quality Management Area

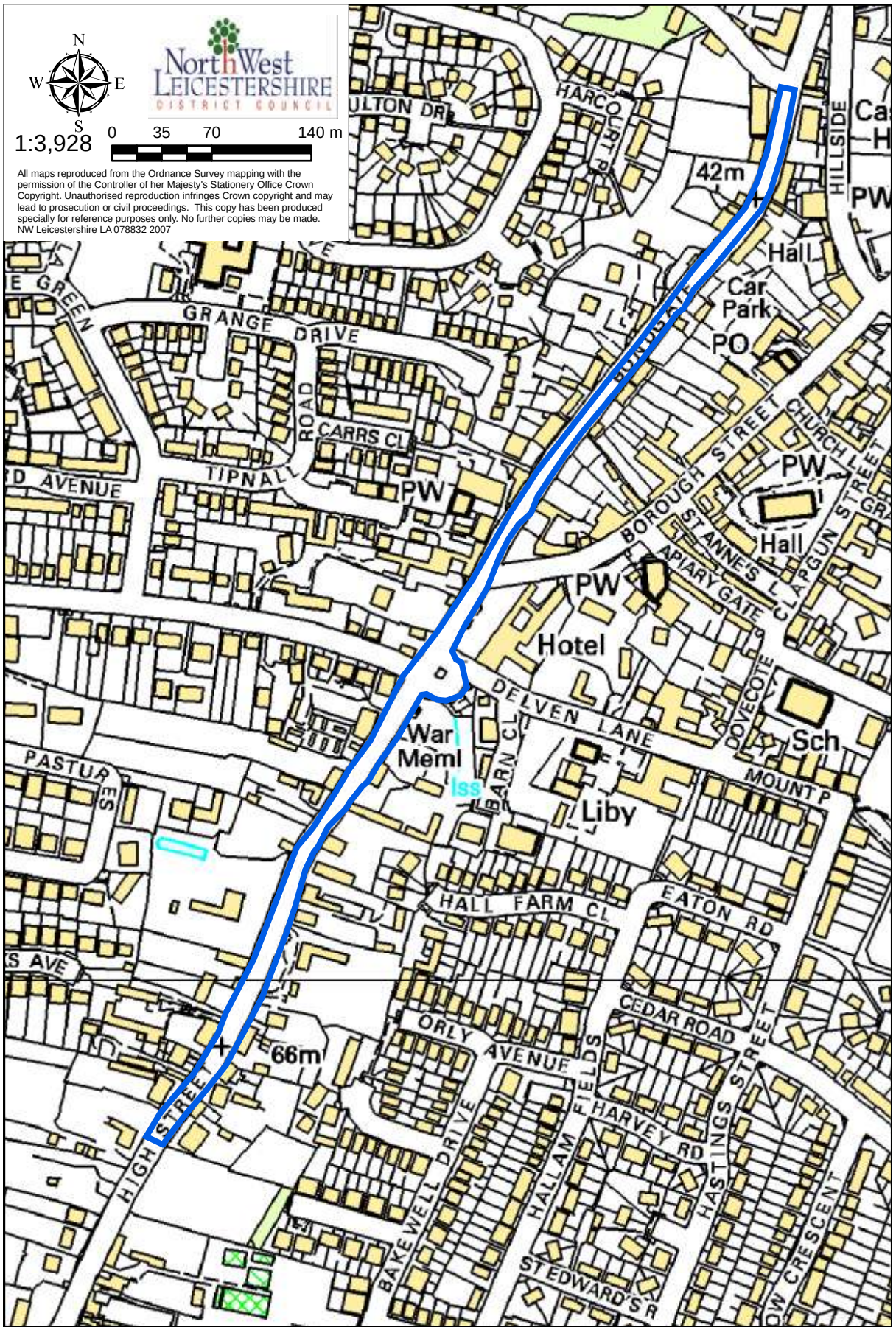


Figure 5 Coalville Air Quality Management Area (Broom Leys Junction)

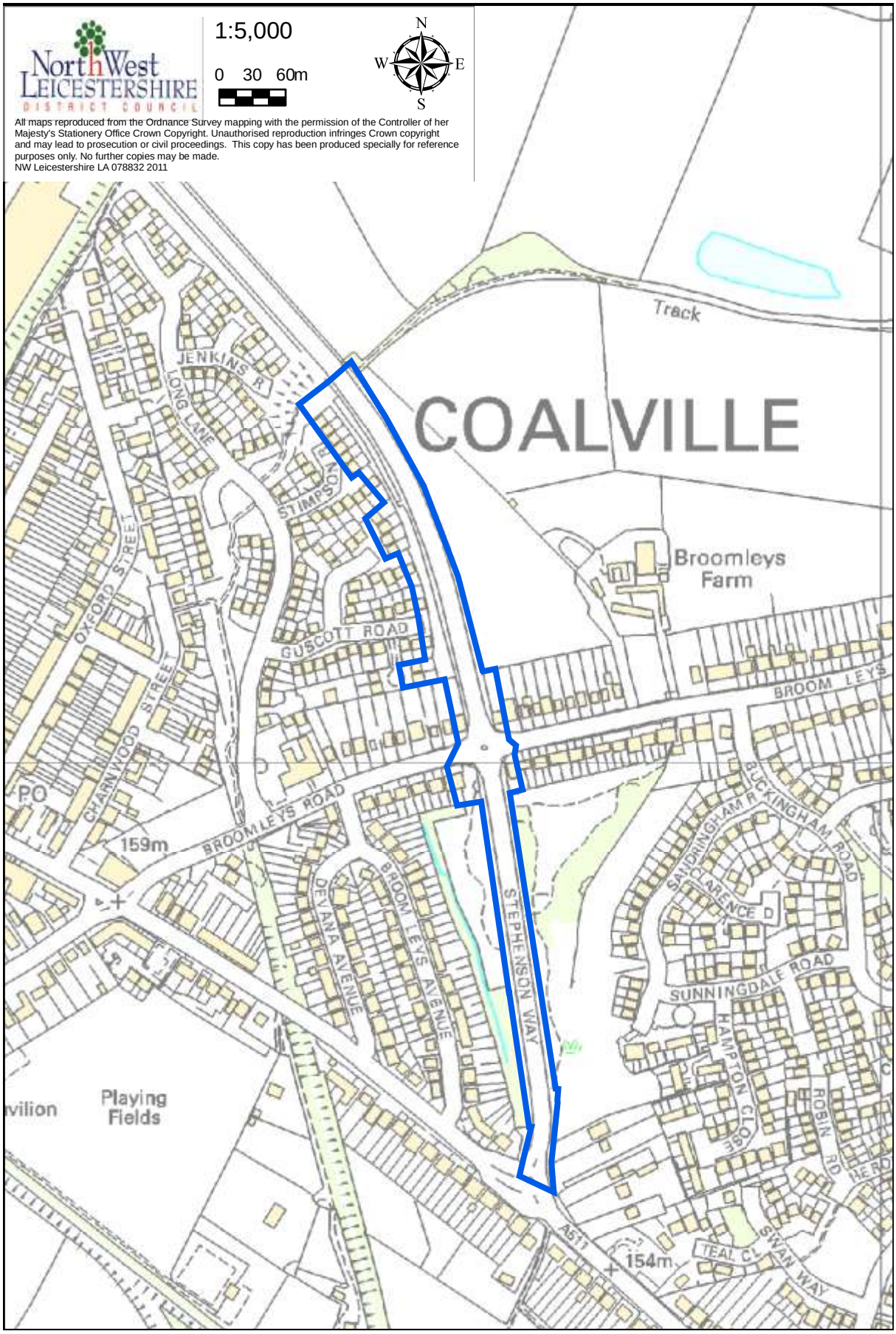
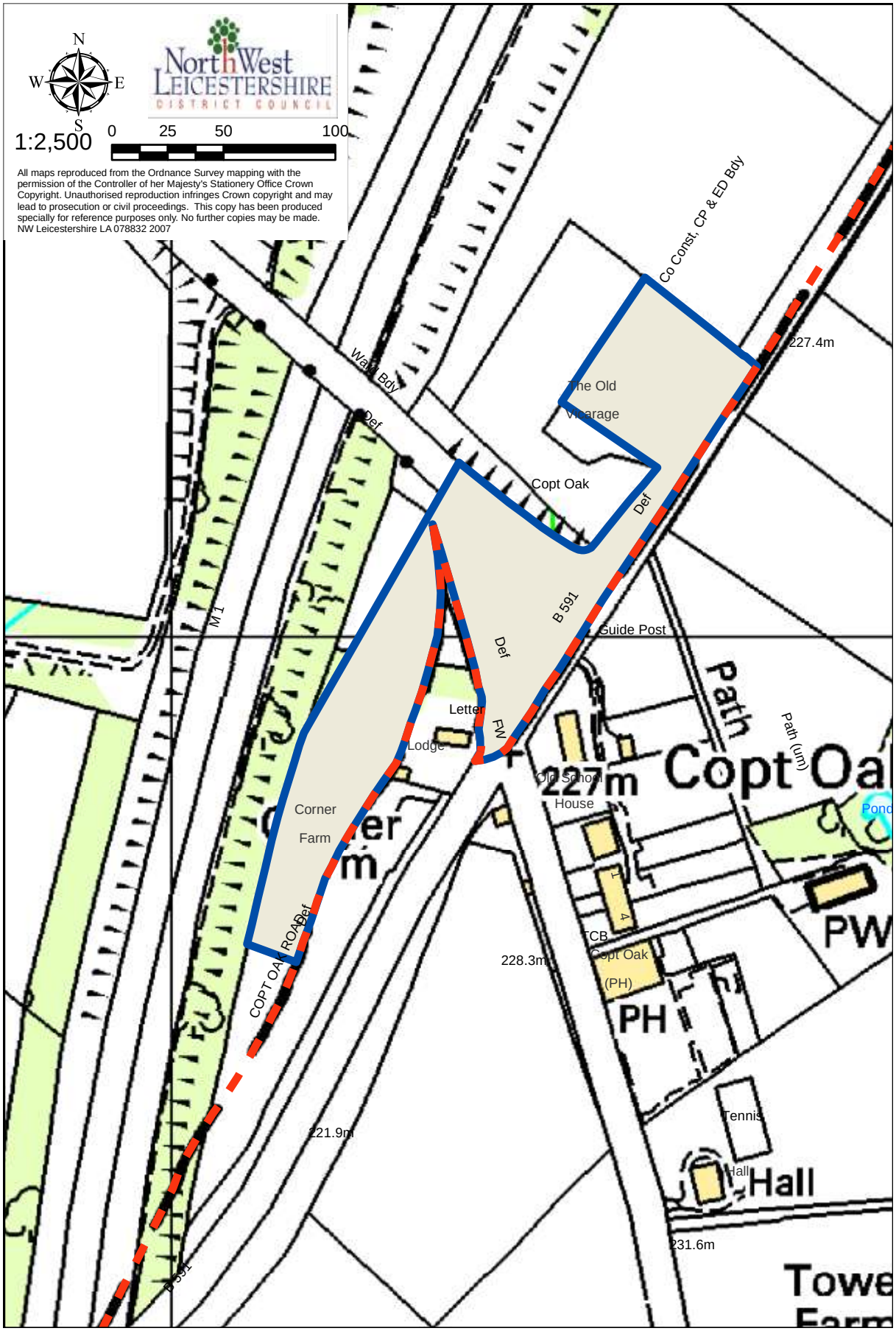


Figure 6 Copt Oak AQMA



2 Methodology

This report will look at monitoring data collected in and around the Copt Oak AQMA. The data looked at will be spread over several years in order to show that areas of the AQMA which are not exceeding the annual mean Air Quality Objective for NO_2 have not exceeded for several years and are unlikely to in the future.

Where appropriate the measured values will be projected forward to 2020 to show that exceedences are unlikely in future years.

2.1 Projecting measured annual mean roadside nitrogen dioxide concentrations to future years

The technical guidance LAQM.TG(09) [36] defines a method for projecting the NO_2 concentration to future years in paragraph 2.13 page 2-3 and box 2.1 on page 2-4. A correction to box 2.1 was published in an Errata published in 2010 [37]. The corrected version of Box 2.1 is reproduced in Table 2 for reference.

Table 2. Box 2.1 from *Errata to LAQM.TG(09): Is the example in box 2.1 of TG(09) correct?*

Box 2.1: Projecting measured annual mean roadside nitrogen dioxide concentrations to future years					
Year	**Adjustment factor to be applied**				**Example:**
	Central London	**Inner London**	**Outer London**	**Rest of UK**	The measured NO_2 concentration at a roadside site in Outer London in 2009 is 45.8 µgm^{-3}. The projected concentration for 2010 would be $45.8 \times \left(\frac{0.832}{0.916}\right) = 41.6\,\mu gm^{-3}$ Roadside locations are typically within 1 to 5 metres of the kerbside, but may extend up to 15 metres depending upon the road configuration and traffic flow.
2008	1.000	1.000	1.000	1.000	
2009	0.940	0.926	0.916	0.916	
2010	0.881	0.853	0.832	0.832	
2011	0.824	0.799	0.780	0.783	
2012	0.766	0.746	0.729	0.735	
2013	0.709	0.692	0.678	0.687	
2014	0.652	0.639	0.626	0.639	
2015	0.595	0.585	0.575	0.591	
2016	0.554	0.549	0.542	0.557	
2017	0.513	0.513	0.508	0.523	
2018	0.472	0.477	0.475	0.489	
2019	0.430	0.441	0.442	0.454	
2020	0.389	0.405	0.408	0.420	

Modified from Box 2.1 in *Errata to TG(09): Is the example in Box 2.1 of TG(09) correct?* [37]

From the example given in Box 2.1 it is believed the projection factors should be used as follows

$$Y_p = Y_m \times \frac{AF_p}{AF_m}$$

Where:

Y_p = NO_2 concentration for the Projected Year

Y_m = Measured NO_2 Concentration

AF_p = Adjustment factor for the year to be projected

AF_m = Adjustment factor for the year NO_2 was measured

2.2 Façade Correction

Some diffusion tubes required a façade correction; the corrections were undertaken using the procedure outlined in Box 2.3: Predicting nitrogen dioxide concentrations at different distances from road of the technical guidance (reproduced in Table 3)

Table 3. Box 2.3: Predicting nitrogen dioxide concentrations at different distances from roads*?*

Box 2.3: Predicting nitrogen dioxide concentrations at different distances from roads

A method has been developed to allow NO_2 measurements made at one distance from a road to be used to predict concentrations at a different distance from the same road. It is appropriate for distances between 0.1 m and 140 m of the kerb.

Step 1: Identify the local background concentration in μgm^{-3}, either from local monitoring or from the national maps published at www.airquality.co.uk. (Note that the background concentration must be less than the measured concentration).

Step 2: apply the following calculation

$$C_z = \left(\frac{C_y - C_b}{-0.5476 \times Ln(D_y) + 2.7171} \right) \times \left(-0.5476 \times Ln(D_z) + 2.7171 \right) + C_b$$

Where:

C_z	is the total predicted concentration (μgm^{-3}) at distance D_z;
C_y	is the total measured concentration (μgm^{-3}) at distance D_y;
C_b	is the background concentration (μgm^{-3});
D_y	is the distance from the kerb at which concentrations were measured;
D_z	is the distance from the kerb (m) at which concentrations are to be predicted.
Ln(D)	is the natural log of the number D.

Results derived in this way will have a greater uncertainty than the measured data. Further assistance with this procedure and interpretation of the results can be obtained from the Review and Assessment helpdesk (http://laqm.defra.gov.uk/helpdesks.html).

Calculator

The equation above is available as a simple calculator (available at http://laqm.defra.gov.uk/tools-monitoring-data/no2-falloff.html). This is set up to work from 0.1 to 50 m from the kerb, as this is the range that is likely to be relevant for Local Air Quality Management (LAQM) work. Kerbside sites should be treated as being at 0.1 m from the kerb. The calculator works for receptors either closer to or further from the kerb than the monitor. The greater the distance between the receptor and monitor, the greater the uncertainty in the derived receptor concentration. It is therefore recommended that if the receptor is further from the kerb than the monitor it should be no more than 20m away. If the receptor is closer to the kerb, then it should be no more than 10 m from the monitor.

Modified from Box 2.3 page 2-6 of the technical Guidance 2009 [36] (modification are improved layout of equation and insertion of updated hyperlinks where footnotes are present in the original.

2.3 Annualisation

Where only short-term periods of monitoring data are available, the results may be adjusted to estimate an annual mean concentration using the approach set out in Box 3.2: Estimation of annual mean concentrations from short-term monitoring data of the technical guidance LAQM.TG(09) [36] (reproduced in Table 4).

Table 4. Box 3.2: Estimation of annual mean concentrations from short-term monitoring data

Box 3.2: Estimation of annual mean concentrations from short-term monitoring data

Example

It has only been possible to carry out a monitoring survey (automatic or diffusion tube) at site **S** for six months between July and December 2008. The measured mean concentration **M** for this period is 30.2µgm^{-3}. How can this be used to estimate the annual mean for this location?

Adjustment to estimate annual mean

The adjustment is based on the fact that patterns in pollutant concentrations usually affect a wide region. Thus if a six month period is above average at one place it will almost certainly be above average at other locations in the region. The adjustment procedure is as follows:

1. Identify two to four nearby, long-term, continuous monitoring sites, ideally those forming part of the national network. These should be background sites to avoid any very local effects that may occur at roadside sites, and should, wherever possible lie within a radius of about 50 miles.
2. Obtain the annual means, **Am**, for the calendar year for these sites, 2008 in this example.
3. Work out the period means, **Pm**, for the period of interest, in this case July to December 2008. [It may be necessary to use unratified automatic data.]
4. Calculate the ratio, **R**, of the annual mean to the period mean $\left(\frac{Am}{Pm}\right)$ for each of the sites.
5. Calculate the average of these ratios, $\mathbf{R_a}$. This is then the adjustment factor.
6. Multiply the measured period mean concentration **M** by this adjustment factor $\mathbf{R_a}$ to give the estimate of the annual mean for 2008.

Long term site	Annual mean 2008 (Am)	Period Mean 2008 (Pm)	Ratio $\left(\frac{Am}{Pm}\right)$
A	28.6	29.7	0.963
B	22.0	22.8	0.965
C	26.9	28.9	0.931
D	23.7	25.9	0.915
		Average (R_a)	0.944

For this example the best estimate of the annual mean for site **S** in 2008 will be **M** × $\mathbf{R_a}$ = 30.2 x 0.944 = 28.5µgm^{-3}.

Notes

Monitoring data for the long-term sites must have adequate data capture rates: above 90% is preferable; sites with data capture below 75% should not be used.

It may be appropriate to use diffusion tube results from a long-term survey to adjust short-term diffusion tube results. To allow for the greater uncertainty of diffusion tubes results from four or more sites should be used. Ensure that the tubes are from the same supplier using the same method of preparation.

If the short-term period covers, for instance, February to June 2009, and the work is being carried out in August 2009, then an annual mean for 2009 will not be available. The calculation can then be carried out using the ratio to the 2008 annual mean, but the result is then an estimate of the 2008 annual mean at the short-term site.

Modified from Box 3.2 page 3-4 of the technical Guidance 2009 [36].

2.4 Design Manual for Roads and Bridges (DMRB)

Due to the complicated layout of roads in the vicinity of the AQMA it may not be appropriate to use façade corrections to estimate exposure at

relevant receptors therefore modelling of the NO_2 concentrations at relevant receptors and correction

3 Summary of Monitoring Undertaken

3.1 Automatic monitoring locations

North West Leicestershire District Council has procured 1 automatic monitor located within the AQMA at Copt Oak and is shown in Table 5. Full Data is available from North West Leicestershire District Council Website [49]

Table 5. Details of Automatic Monitoring Sites

Site ID	Site Name	Site Type	OS Grid Ref		Pollutants Monitored	Monitoring Technique	In AQMA?	Relevant Exposure? (Y/N with distance (m) to relevant exposure)	Distance to kerb of nearest road (N/A if not applicable)	Does this location represent worst-case exposure?
			X	Y						
3	Copt Oak	Other	448124	313048	NO NO_2 NO_x	Chemiluminescence	Y	15	N/A	N/A

3.2 Diffusion tube Monitoring Locations

The council undertakes extensive diffusion tube monitoring within its AQMAs. Details of the tubes currently and historically present within the Copt Oak AQMA are shown in Table 6. Full Data is available from North West Leicestershire District Council Website [48]

Figure 7 Map of Copt Oak Monitoring Sites

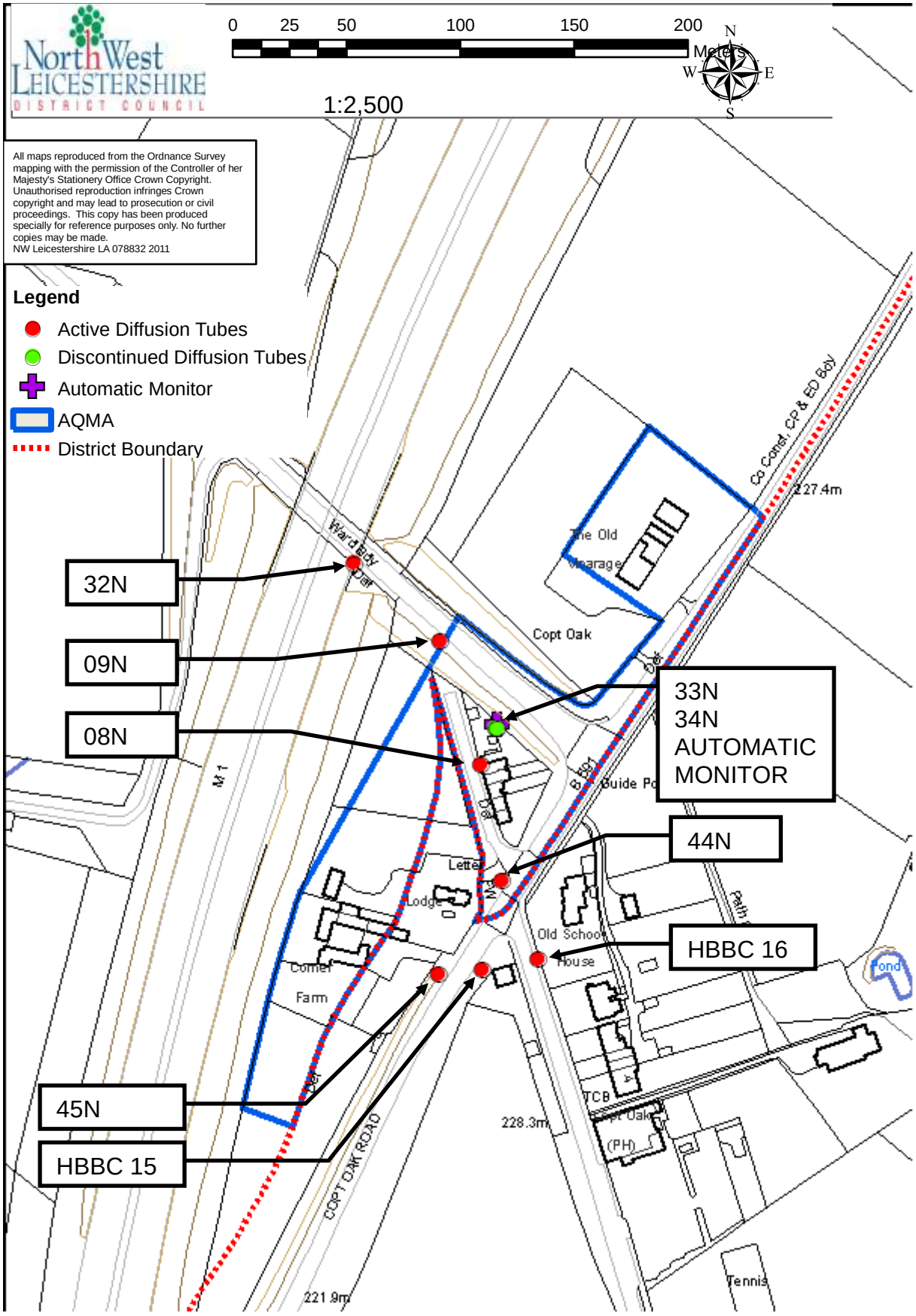


Table 6. Diffusion tube monitoring locations

Site details	Location	Location Type	Grid Reference		Our Tube No.	Pollutant monitored	In AQMA ?	Is monitoring collocated with a Continuous Analyser (Y/N)	Relevant Exposure? (Y/N with distance (m) to relevant exposure)	Distance to kerb of nearest road (N/A if not applicable)	Worst-case Location ?	Monitoring Period	
			X	Y								Start	End
08N	End Cottage Copt Oak	rural	448138	313012	8	NO_2	Y	N	0	N/A	N		
09N	Whitwick Rd Copt Oak	rural	448120	313066	9	NO_2	Y	N	N	N/A	N		
32N	M1 Bridge Copt Oak	other	448082	313100	30	NO_2	N	N	N	N/A	Y		
33N	Monitoring Station Copt Oak (1)	other	448124	313048	5	NO_2	Y	Y	N	N/A	Y		
34N	Monitoring Station Copt Oak (2)	other	448124	313048	10	NO_2	Y	Y	N	N/A	Y		
44N	Copt Oak Cross Roads	roadside	448147	312961	3	NO_2	Y	N	3	2.3	N		
45N	Outside Corner Farm Copt Oak	roadside	448119	312920	4	NO_2	Y	N	27	4.3	N		
HBBC 15	Copt Oak Road	roadside	448139	312922	N/A	NO_2	N	N	6	2	Y		
HBBC 16	Whitwick Road Copt Oak	roadside	448163	312927	N/A	NO_2	N	N	15	2	Y		

4 Results

Table 7. NO_2 Diffusion Tube Result

Site details	Location	NO_2 concentration Year measured μgm^{-3}							
	YEAR	2004	2005	2006	2007	2008	2009	2010	2011
	BAF	0.98	1.1	1.01	0.99	0.94	0.9	1.06	1.06
08N	End Cottage Copt Oak					29.90	29.02	33.76	31.27
09N	Whitwick Rd Copt Oak	35.23	**44.49**	**40.11**	**44.31**	**41.58**	**42.68**	**48.06**	**42.22**
32N	M1 Bridge Copt Oak						**58.28**	**71.21**	**50.79**
33N	Monitoring Station Copt Oak (1)							**38.76**	31.18
34N	Monitoring Station Copt Oak (2)							**40.16**	28.27
44N	Copt Oak Cross Roads								**36.51**
45N	Outside Corner Farm Copt Oak								**38.79**

Site details	Location	NO_2 concentration Year measured μgm^{-3}							
	YEAR	2004	2005	2006	2007	2008	2009	2010	2011
	BAF								0.75
HBBC 15	Copt Oak Road								**36.71**
HBBC 16	Whitwick Road Copt Oak								34.33

Table 8. Automatic Monitoring Result
Data is available from 06/05/2011 to 06/5/2012 and is taken to represent the 2011 calendar year

Minimum NO_2 μgm^{-3}	Average NO_2 μgm^{-3}	St Dev NO_2 μgm^{-3}	Median NO_2 μgm^{-3}	Maximum NO_2 μgm^{-3}	Count (No. of periods)	Data Capture (%)	Exceedence of the NO_2 hourly 200ug/m^3 objective
0.1	29.3	18.8	26.1	162.8	8322	94.74%	0

4.1 Design Manual for Roads and Bridges (DMRB) Modelling

Due to the complex road layout in the AQMA for many locations façade correction is not appropriate, it was also not possible to monitor in some locations due to access restrictions and Health and Safety concerns it is therefore necessary to estimate NO_2 concentrations using the DMRB model.

A traffic survey was conducted on the Junctions within the AQMA in 2008 as part of the 2009 detailed assessment, this is the most recent traffic data available for the AQMA and it is assumed that this data is representative of current traffic volume in 2011.

The locations to be modelled are presented in Figure 8. A summary of all input data utilised in the model is contained within Appendix A.

In the absence of monitored traffic speed data, average traffic speeds were assumed to be identical to the national speed limits of those roads; 30mph (50kph) for Copt Oak Road, Warren Hills Road and Whitwick Road and 70mph (110kph) for the M1.

The background annual mean NO_2 concentration for Copt Oak was estimated using background air pollution maps at 1km x 1km grid resolution published on the UK National Air Quality Archive website

4.1.1 UNCERTAINTY AND MODEL VERIFICATION

There is an element of uncertainty in all measured and modelled data. 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 measurements presented have an intrinsic margin of error. DEFRA (2007b) suggest that this is of the order of plus or minus 20% for diffusion tube data and plus or minus 10% for automatic measurements. There will be uncertainties introduced because the modelling has simplified real-world processes into a series of algorithms.

An important step in the assessment is verifying the dispersion model against the measured data. By comparing the model results with measurements, data can be corrected for any overall under or over-prediction. 8 locations modelled are the same as the monitoring locations presented in Table 6 for the purpose of verification of the NO_2 modelled data.

Modelled vs measured data for the 8 verification locations has been plotted as shown in Figure 9 when a best fit linear trend line is calculate is the formula where modelled value. The trendline is within the ±20% error margin on diffusion tubes for all but one location and has good correlation with 3 of the monitoring locations. it is therefore appropriate to use this equation to correct modelled NO2 concentrations at all locations to better represent likely real world concentrations.

Table 9. Results of DMRB modelling

Receptor number	Receptor Name	NO_2 *	
		Annual mean μgm^{-3}	Corrected Annual mean μgm^{-3}
1	end cottage whitwick road 08N	28.49	35.6
2	rear the lodge	28.90	36.0
3	Front the lodge	28.84	35.9
4	Leycroft cottage	28.16	35.2
5	rear of end cottage	28.38	35.4
6	Rear Corner farm	32.87	40.2
7	Front Corner Farm	28.53	35.6
8	old vicarage 1	25.81	32.7
9	old vicarage 2	25.37	32.3
10	old school 1	27.51	34.5
11	09N warren hill rd COPT OAK	30.62	37.8
12	32N M1 Bridge Copt Oak	43.15	51.0
13	33N 34N Monitoring station Copt Oak	28.83	35.9
14	44N copt oak cross roads	29.00	36.1
15	45N outside corner farm copt oak	27.92	35.0
16	HBBC 15 Copt Oak Road	27.69	34.7
17	HBBC 16 Whitwick Road Copt Oak	27.20	34.2
18	old school 2	26.88	33.9
19	Corner copt oak rd 1	27.55	34.6
20	Corner Copt oak rd 2	27.51	34.5

Figure 8 Map of receptor locations.

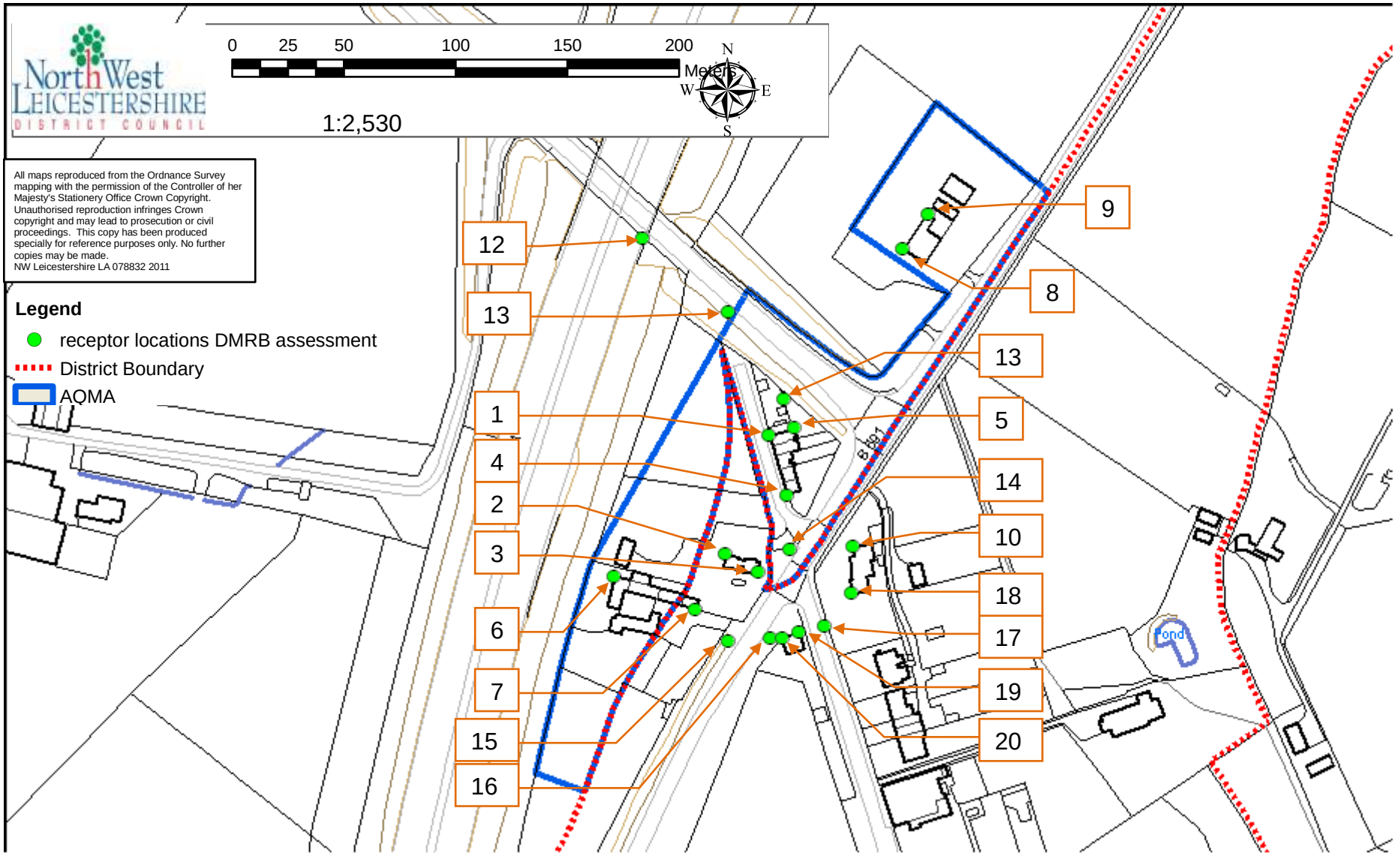


Figure 9 Comparison of Modelled vs measured NO2 concentrations

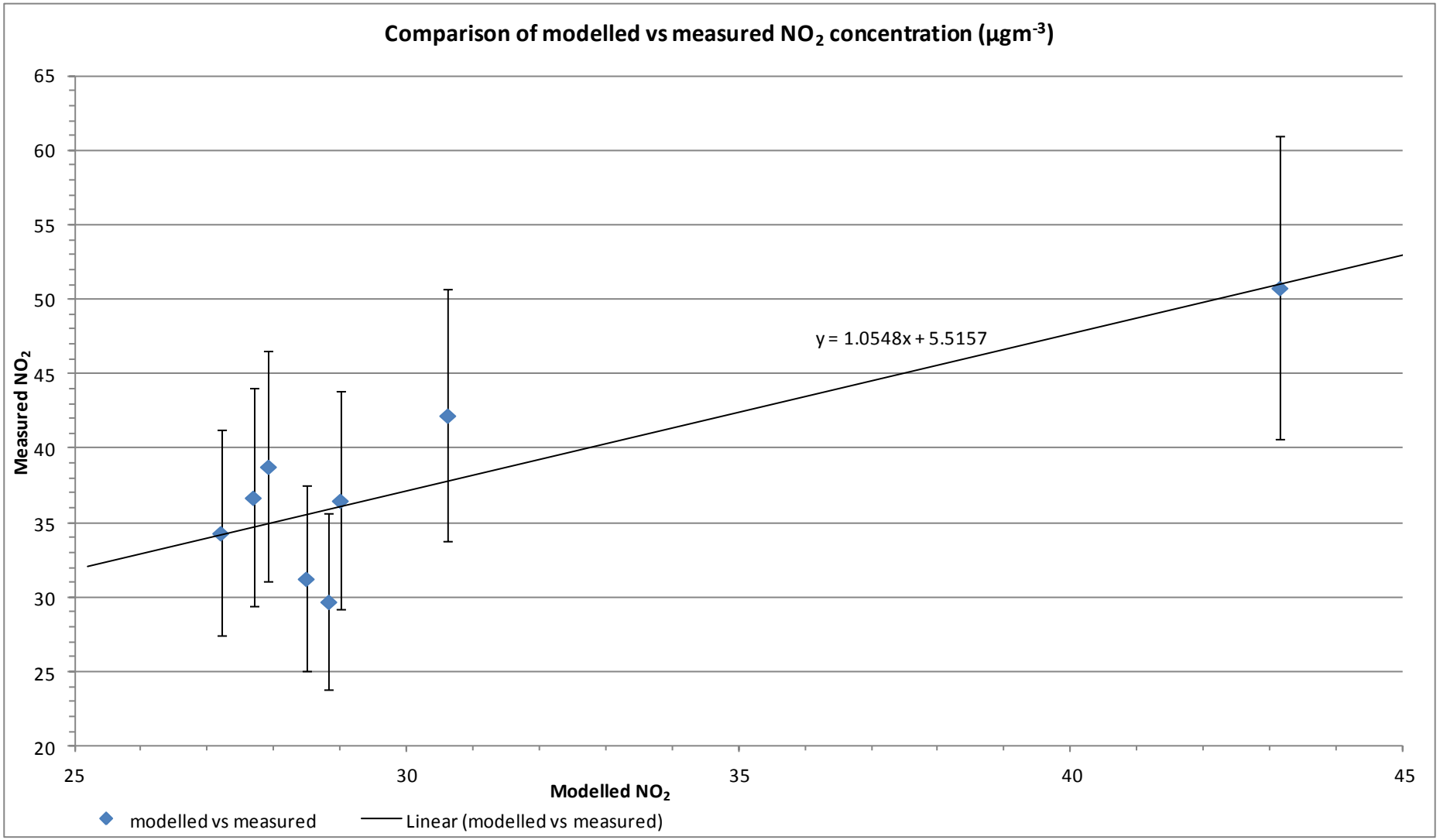
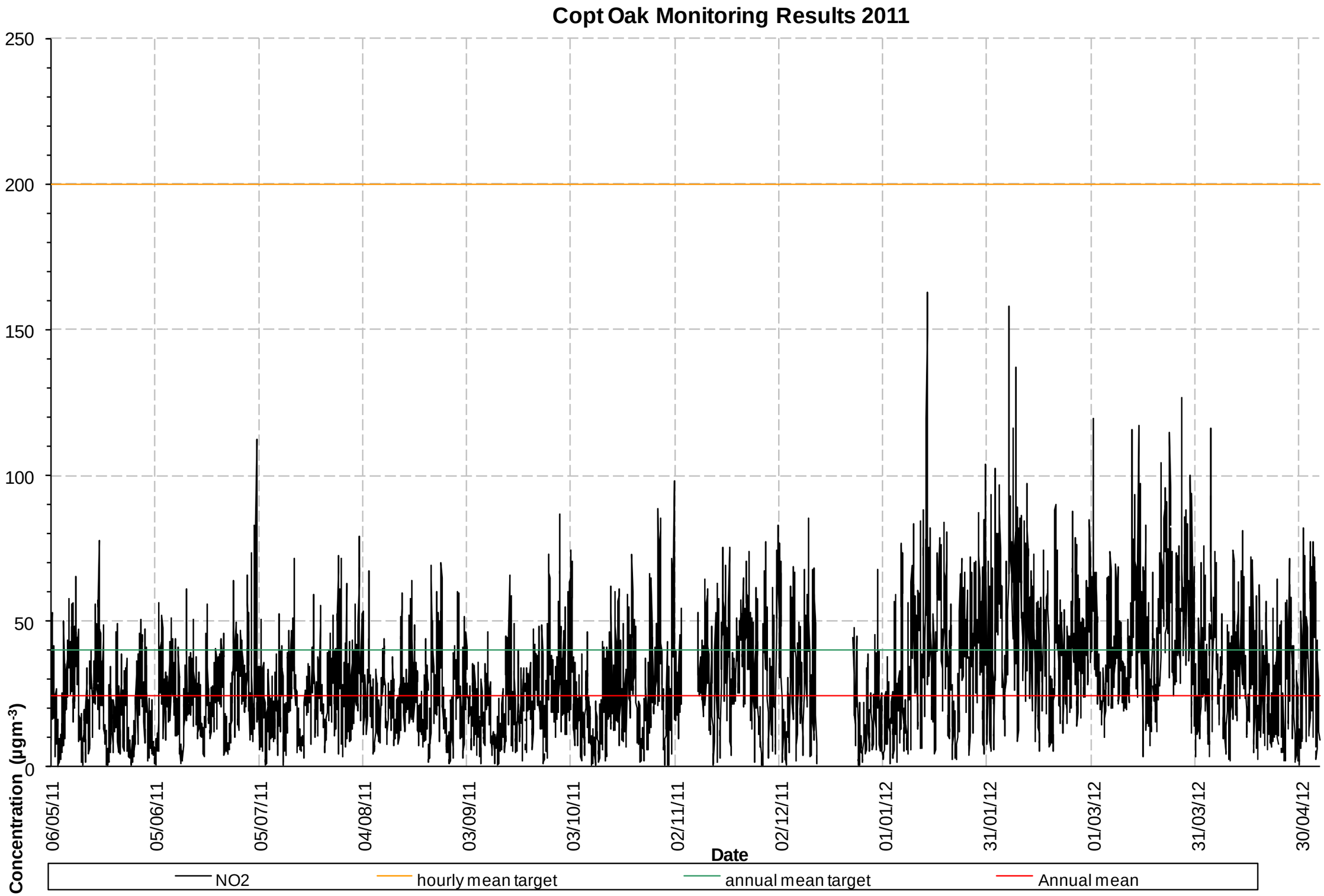


Figure 10 Graph of automatic monitoring compared with NO_2 tubes



5 Analysis of Results

5.1 Findings at monitoring location

The findings of each monitoring location is as follows

5.1.1 08N

The tube is located on the façade of End Cottage it has never exceeded the annual mean Air Quality standard for NO2

5.1.2 09N and 32N

Tube 09N and 34N are located along Whitwick Road they are used to assess fall off with distance from the M1 motorway. These tubes have exceeded the annual mean air quality standard for NO2. it is not possible to estimate the exposure at a relevant receptor at these locations due to the changes in topography

5.1.3 33N, 34N and automatic monitor

Tube 33n in 2010 when annualised does not exceed the annual mean air quality standard for NO2 but does exceed 36µgm-3. Tube 33n did not exceed the annual mean air quality standard in 2011

Tube 44n in 2010 when annualised does exceed the annual mean air quality standard. Tube 34n did not exceed the annual mean air quality standard in 2011.

The automatic monitor ran from 6/5/2011 to the 6/5/2012 treating this period as representative of 2011 the monitor recorded an annual mean of 29.3µgm^{-3} .

5.1.4 44N

Annualisation of tube 44n in 2011 shows that it was unlikely to exceed the annual mean air quality standard however the annualised result did exceed 36µgm^{-3}. Façade correction of both the period mean and the annualised mean are both below 36µgm^{-3}

5.1.5 45N

Annualisation of tube 45n in 2011 shows that it was unlikely to exceed the Annual Mean Air Quality Standard however the annualised result did exceed 36µgm^{-3}.

Façade correction of both the period mean and the annualised mean are both below 36µgm^{-3} however the location of the property between Copt Oak Road and the M1 means that façade correction is unlikely tobe appropriate.

5.1.6 HBBC 15

Annualisation of tube HBBC15 in 2011 shows that it was unlikely to exceed the annual mean air quality standard however the annualised result did exceed 36µgm^{-3}. Façade correction of both the period mean and the annualised mean are both below 36µgm^{-3}.

5.1.7 HBBC 16

Annualisation of tube HBBC16 in 2011 shows that it was unlikely to exceed the annual mean air quality standard. Façade correction of both the period mean and the annualised mean are both below 36µgm^{-3}.

5.2 Analysis of Receptors identified in 2009 Detailed assessment

5.2.1 The Old Vicarage

No Appropriate monitoring locations where available near to this receptor. Modelling of the NO_2 concentration at the façade of this property. The modelling results show that this property is unlikely to be exceeding the Annual Mean Air Quality Standard for NO_2.

5.2.2 End Cottage, Peppers Cottage, Leacroft Bungalow, and Leycroft Cottage

Diffusion tube 08N is located on the façade of End Cottage nearest the M1 this tube has never exceeded 36µgm^{-3} since monitoring began in 2008. The automatic monitor and 2 diffusion tubes are located in the garden of this property at the point closest to the M1 and Warren Hills Road neither the automatic monitor or the diffusion tubes exceeded 36µgm^{-3}.

DMRB modelling of Leycroft Cottage nearest Copt Oak Road (DMRB loc 4) and 2 corners of End Cottage closest to the M1 and Warren Hills Road (DMRB loc 1 and 5), which represent the locations closest to roads surrounding this block of properties are all below 36µgm^{-3}.

It is therefore unlikely that the Annual mean air quality standard for NO_2 is being exceeded at these locations.

5.2.3 1 to 4 Whitwick Road

Hinckley and Bosworth Borough Council started monitoring at location HBBC16 in June 2011 annualisation of this location is below 36µgm^{-3}. Façade correction of this tube is likely to be appropriate for 1-4 Whitwick Road. Façade correction of both the period mean and the annualised mean are both significantly below 36µgm^{-3}.

It is therefore unlikely that the Annual mean air quality standard for NO_2 is being exceeded at these locations

5.2.4 The Old School House

The nearest monitoring location is HBBC16 however the position of the monitoring tube and the road layout means it is not appropriate to use façade correction to estimate NO_2 concentration at the façade of this property.

2 locations on the façade of Old School House were modelled, the corner nearest Whitwick Road (DMRB Loc 18) and the corner nearest Copt Oak Road (DMRB Loc 10) both locations are predicted to be below 36µgm^{-3}.

It is therefore unlikely that the Annual Mean Air Quality Standard for NO_2 is being exceeded at these locations

5.2.5 Property on the corner of Copt Oak Road and Whitwick Road

Hinckley and Bosworth Borough Council started monitoring at location HBBC15 in June 2011. Annualisation of the 2011 data is below the annual mean air quality standard for NO_2 but exceeds 36µgm^{-3}. A façade correction of both the period and annualised means are well below 36µgm^{-3} however as the property is located on the junction of 2 roads façade correction is not appropriate.

2 locations were modelled on the façade of this property, the corner closest to Whitwick Road (DMRB loc 19) and the corner closest to Copt Oak Road (DMRB loc 20). Both locations are predicted to be below 36µgm^{-3}.

It is therefore unlikely that the Annual Mean Air Quality Standard for NO_2 is being exceeded at these locations

5.2.6 Corner Farm Copt Oak Road

The nearest monitoring location is 45N however the position of the monitoring tube and the road layout means it is not appropriate to use façade correction to estimate NO_2 concentration at the façade of this property.

2 locations on the façade of the Corner Farm were modelled the corner nearest M1 (DMRB Loc 6) and the corner nearest Copt Oak Road (DMRB Loc 7). The location nearest the M1 is predicted to be exceeding the Annual Mean Air Quality Standard for NO_2. The Location nearest Copt Oak Road is predicated to be below 36µgm^{-3}.

It is therefore possible that the Annual mean air quality standard for NO_2 is being exceeded at Corner farm nearest to the M1.

5.2.7 The Lodge

The nearest monitoring location is 44N however the position of the monitoring tube and the road layout means it is not appropriate to use façade correction to estimate NO_2 concentration at the façade of this property.

2 locations on the façade of the The Lodge were modelled the corner nearest M1 (DMRB Loc 2) and the corner nearest Copt Oak Road (DMRB Loc 3). The location nearest the M1 is predicted to exceed 36µgm^{-3} it may therefore be exceeding the Annual Mean Air Quality Standard for NO_2. The Location nearest Copt Oak Road is predicated to be very close to 36µgm^{-3} therefore this Location may be exceeding the annual mean air quality standard for NO_2.

Table 10. Façade Correction data

Site details	Location	Location Type	Grid Reference		Our Tube No.	Relevant Exposure? (Y/N with distance (m) to relevant exposure)	Distance to kerb of nearest road (N/A if not applicable)	Worst-case Location ?	2011		
			X	Y					relevant background concentration	receptor correction for roadside tubes (Bias adjusted mean used)	receptor correction for roadside tubes (Annualised Bias adjusted mean used)
44N	Copt Oak Cross Roads	roadside	448147	312961	3	NO_2	Y	3	18.45	30.79	32.86
45N	Outside Corner Farm Copt Oak	roadside	448119	312920	4	NO_2	Y	27	18.45	26.07	27.26
HBBC 15	Copt Oak Road	Roadside	448139	312922		NO_2	N	6	18.45	29.02	30.78
HBBC 16	Whitwick Road Copt Oak	Roadside	448163	312927		NO_2	N	15	18.45	25.15	26.37

6 Conclusions and Proposed Actions

It has been established that most of Copt Oak is not exceeding the Annual mean air quality standard for NO_2.

It is possible that the Annual mean air quality is being exceeded at Corner Farm within North West Leicestershire and The Lodge within the Hinckley and Bosworth Borough.

North West Leicestershire District Council was therefore justified in its original declaration of the AQMA.

6.1 Proposed Actions

- Amend the AQMA to revoke the AQMA at receptors not believed to be exceeding the annual mean air quality standard so that it covers Corner Farm. A Draft order is attached as Appendix B
- Inform Hinckley and Bosworth Borough Council that we believe that a property within their district may be exceeding the annual mean air quality standard for NO_2.
- Publish as action plan outlining how North West Leicestershire District Council will address the AQMA.

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8 Appendices

Appendix A DMRB inputs

Link number	Distance from link centre to receptor (m)																			Traffic flow & speed		Traffic composition						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20				Vehicles <3.5t GVW (LDV)			Vehicles>3.5t GVW (HDV)			
	End Cottage Whitwick Road 08n	Rear The Lodge	Front The Lodge	Leycroft Cottage	Rear Of End Cotage	Rear Corner Farm	Front Corner Farm	Old Vicarage 1	Old Vicarage 2	Old School 1	09n Whitwick Rd Copt Oak	32n M1 Bridge Copt Oak	33n 34n Monitoring Station Copt Oak	44n Copt Oak Cross Roads	45n Outside Corner Farm Copt Oak	Hbbc 15 Copt Oak Road	Hbbc 16 Whitwick Road Copt Oak	Old School 2	Corner Of Copt Oak Road 1	Corner Of Copt Oak Road 2	AADT (combined, veh/day)	Annual average speed (km/h)	Road type (A,B,C,D)	% passen-ger cars	% light goods vehicles	Total % LDV	% buses and coaches	% rigid HGV	% articulated HGV	Total % HDV
1	88	83	100	105	97	40	80	115	120	138	63	7	88	112	98	116	137	144	126		53,718	110	a			83.7				16.3
2	107	103	120	123	116	60	100	134	138	159	81	25	106	131	117	133	156	163	145		52,028	110	a			83.7				16.3
3	71	30	15	45	75	65	27	163	182	39	129	170	87	20	7	7	25	32	16		6,104	50	b			94.6				5.4
4	70	37	20	42	72	83	47	157	176	30	127	170	85	18	38	20	3	20	7		6,564	50	b			97.6				2.4
5	41	32	19	22	34	106	50	89	107	15	86	136	43	7	46	34	29	27	30		12,334	50	b			96.3				3.7
6	35	90	85	52	26	128	120	64	84	60	7	7	19	70	118	110	98	81	103		9,297	50	b			97.1				2.9
7	60	102	98	63	48	148	129	40	39	67	87	134	51	81	130	119	105	86	111		11,124	50	b			96.6				3.4

Background concentrations for 2011					
CO (mg/m^3)	Benzene ($\mu g/m^3$)	1,3-butadiene ($\mu g/m^3$)	NO_x ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)	PM_{10} ($\mu g/m^3$)
0	0	0	33.942814	22.088882	0

Appendix B Draft AQMA amendment order

ENVIRONMENT ACT 1995 PART IV Section 83(2) (b)

THE NORTH WEST LEICESTERSHIRE DISTRICT COUNCIL

AIR QUALITY MANAGEMENT AREA (nitrogen dioxide) AMENDMENT ORDER 2013 (No.1) Order

By an Order dated 30th July 2009 – North West Leicestershire District Council ("the Council") made the North West Leicestershire District Council Air Quality Management Area Order 2009 (No. 1) ("the 2009 Order")

The Council is satisfied that as a result of it's 2012 Air Quality Further Assessment of Annual Mean Air Quality Standard at Copt Oak, it appears that the Annual Mean Air Quality Standard is being exceeded at Corner Farm Copt Oak Road.

In using it's authority conferred under Section 83(2) of the Environment Act 1995, the Council make the following Order varying the North West Leicestershire District Council Air Quality Management Area Order 2008 (No. 1) as follows;

1. The Order Known as the North West Leicestershire District Council Air Quality Management Area Order 2009 (No. 1) shall be amended as follows.
2. Paragraph 2 be amended to read as follows:

   The area comprises the village of Copt Oak encompassing 4 properties:

   - 4 properties which comprise Corner Farm

   The area extends from the district boundary east to the M1 for the length of Copt Oak Road around 'Corner Farm' thereto shown shaded in blue on the attached Map 01 be declared to be an Air Quality Management Area ("the designated area") for the pollutant nitrogen dioxide (NO_2). The maps are deposited at the offices of the Council.

3. The Map attached to “the 2009 Order” be replaced with the attached Map 01
4. The Map attached to “the 2009 Order” be named Map 01
5. This order shall come into force on < insert Date>.

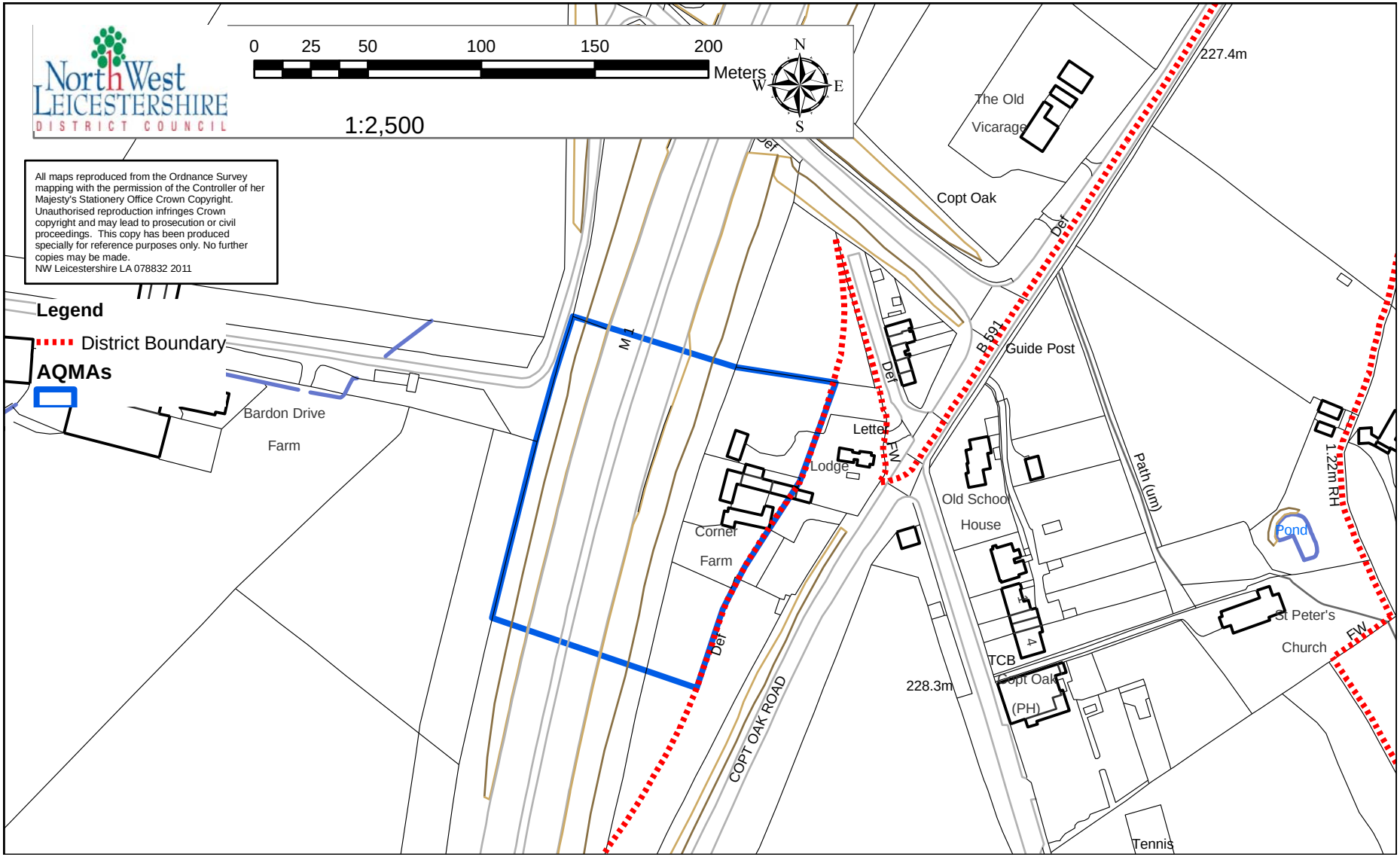
Signed: _____

Steve Bambrick

Director of Services

Date:

Map 01 AQMA Extent



Appendix C Diffusion Tube Data overview 2004 - 2011

	Tube location				Our Tube No.	Pollutant monitored	In AQMA ?	Is monitoring collocated with a Continuous Analyser (Y/N)	Relevant Exposure? (Y/N with distance (m) to relevant exposure)	Distance to kerb of nearest road (N/A if not applicable)	Worst-case Location ?	BAF							
												0.98	1.1	1.01	0.99	0.94	0.9	1.06	1.06
			Y	X								2004	2005	2006	2007	2008	2009	2010	2011
08N	End Cottage Copt Oak	rural	448138	313012	8	NO_2	Y	N	0	N/A	N					29.90	29.02	33.76	31.27
09N	warren hill rd COPT OAK	rural	448120	313066	9	NO_2	Y	N	N	N/A	N	35.23	**44.49**	**40.11**	**44.31**	**41.58**	**42.68**	**48.06**	**42.22**
32N	M1 Bridge Copt Oak	other	448082	313100	30	NO_2	N	N	N	N/A	Y						**58.28**	**71.21**	**50.79**
33N	Monitoring station Copt Oak (1)	other	448124	313048	5	NO_2	Y	Y	N	N/A	Y							**38.76**	31.18
34N	monitoring station Copt oak (2)	other	448124	313048	10	NO_2	Y	Y	N	N/A	Y							**40.16**	28.27
44N	copt oak cross roads	roadside	448147	312961	3	NO_2	Y	N	3	2.3	N								**36.51**
45N	outside corner farm copt oak	roadside	448119	312920	4	NO_2	Y	N	27	4.3	N								**38.79**
HBBC 15	Copt Oak Road	roadside	448139	312922	N/A	NO_2	N	N	6	2	Y								**36.71**
HBBC 16	Whitwick Road Copt Oak	roadside	448163	312927	N/A	NO_2	N	N	15	2	Y								34.33

façade correction - fall-off in nitrogen dioxide concentrations with distance from road See Box 2.3 pg 2-6 of LAQM.TG(09)	receptor correction for roadside tubes (Annualised Bias adjusted mean used)							26.53	30.36	32.86
	receptor correction for roadside tubes (Bias adjusted mean used)		Not Roadside	Not Roadside	Not Roadside	Not Roadside	Not Roadside	25.12	28.35	30.79
	relevant background concentration		18.45	18.45	18.45	18.45	18.45	13.05	13.05	18.45
	ound conce ntratio n grid referen	Y	312500	312500	312500	312500	312500	313500	313500	312500
		X	447500	447500	447500	447500	447500	443500	443500	447500
annualisation (see Box 3.2 pg 3-4 of TG(09) where annual data coverage for a site is <75% site has been excluded	annualised bias adjusted mean (Bias adjusted mean x R_a)	june-dec						**41.07**	33.47	**36.51**
		jan-may								
		Mar - Dec								
		Jan - Feb								
	Ratio (annual mean / period mean)	june-dec	1.027	1.052	0.909	1.072	1.098			
		jan-may	0.964	0.935	1.163	0.914	0.889			
		Mar - Dec	1.031	1.035	0.956	1.114	1.075			
		Jan - Feb	0.868	0.857	1.295	0.661	0.741			
	period mean	june-dec	28.71	37.86	52.71	27.43	24.29			
		jan-may	30.60	42.60	41.20	32.20	30.00			
		Mar - Dec	28.60	38.50	50.10	26.40	24.80			
		Jan - Feb	34.00	46.50	37.00	44.50	36.00			
Standard deviation			3.90	5.59	14.84	10.83	8.75	9.38	6.89	4.69
% Annual Data coverage			100.0%	100.0%	100.0%	100.0%	100.0%	41.7%	50.0%	58.3%
% Monitoring Period Data Coverage			100.0%	100.0%	100.0%	100.0%	100.0%	71.4%	85.7%	100.0%
length of monitoring period (months)			12	12	12	12	12	7	7	7
1.06	No of results		12	12	12	12	12	5	6	7
BIAS =	Bias Adjusted Mean		31.27	**42.22**	**50.79**	31.18	28.27	**38.16**	31.09	33.92
MEAN			29.50	39.83	47.92	29.42	26.67	36.00	29.33	32.00
Measurement Period (ugm^{-3})		12	31	37	32	28	30	23	23	31
		11	34	46	69	35	33		42	41
		10	24	32	67	29	21	34	31	32
		9	30	33	50	34	22	43	27	34
		8	28	37	41	19	21	33	24	26
		7	30	43	50	20	17	47	29	31
		6	24	37	60	27	26			29
		5	25	33	68	9	18			
		4	27	43	34	27	31			
		3	33	44	30	36	29			
		2	35	47	37	37	23			
		1	33	46	37	52	49			
Worst-case Location ?			N	N	Y	Y	Y	N	N	N
Distance to kerb of nearest road (N/A if not applicable)			N/A	N/A	N/A	N/A	N/A	1.9	3	2.3
Relevant Exposure? (Y/N with distance (m) to relevant exposure)			0	N	N	N	N	16	2.4	3
Is monitoring collocated with a Continuous Analyser (Y/N)			N	N	N	Y	Y	N	N	N
In AQMA ?			Copt oak	Copt oak	N	Copt oak	Copt oak	Coalville	Coalville	Copt oak
Pollutant monitored			NO_2	NO_2	NO_2	NO_2	NO_2	NO_2	NO_2	NO_2
Our Tube No.			8	9	30	5	10	1	2	3
Grid Reference	Y		313012	313066	313100	313029	313029	314114	313642	312961
	X		448138	448120	448082	448144	448144	443613	443675	448147
Location Type			Rural	Rural	Other	Other	Other	Roadside	Roadside	Roadside
location			End Cottage Copt Oak	Whitwick Rd Copt Oak	M1 Bridge Copt Oak	Monitoring station Copt Oak (1)	monitoring station Copt oak (2)	lamppost A511 W of broomleys junc	Direction Sign Bardon Rd/A511 RBT	copt oak cross roads
Site details			96689 - NWLeicestershire 08N	86690 - NWLeicestershire 09N	86742 - NWLeicestershire 32N	86942 - NWLeicestershire 33N	86943 - NWLeicestershire 34N	9???? - NWLeicestershire 42N	9???? - NWLeicestershire 43N	9???? - NWLeicestershire 44N

façade correction - fall-off in nitrogen dioxide concentrations with distance from road See Box 2.3 pg 2-6 of LAQM.TG(09)	receptor correction for roadside tubes (Annualised Bias adjusted mean used)		27.26	30.78	26.37
	receptor correction for roadside tubes (Bias adjusted mean used)		26.07	29.02	25.15
	relevant background concentration		18.45	18.45	18.45
	ound conce ntratio n grid referen	Y	312500	312500	312500
		X	447500	447500	447500
annualisation (see Box 3.2 pg 3-4 of TG(09) where annual data coverage for a site is <75% site has been excluded	annualised bias adjusted mean (Bias adjusted mean x R_a)	june-dec	**38.79**	**36.71**	34.33
		jan-may			
		Mar - Dec			
		Jan - Feb			
	Ratio (annual mean / period mean)	june-dec			
		jan-may			
		Mar - Dec			
		Jan - Feb			
	period mean	june-dec			
		jan-may			
		Mar - Dec			
		Jan - Feb			
Standard deviation			5.51	7.91	6.27
% Annual Data coverage			58.3%	66.7%	66.7%
% Monitoring Period Data Coverage			100.0%	100.0%	88.9%
length of monitoring period (months)			7	8	9
1.06	No of results		7	8	8
BIAS =	Bias Adjusted Mean		**36.04**	34.11	31.89
MEAN			34.00	45.48	42.53
Measurement Period (ugm^{-3})		12	32	49	50
		11	45	55	41
		10	32	54	49
		9	32	50	49
		8	28	41	41
		7	37	43	40
		6	32	31	32
		5		41	39
		4			
		3			
		2			
		1			
Worst-case Location ?			N	Y	Y
Distance to kerb of nearest road (N/A if not applicable)			4.3	2	2
Relevant Exposure? (Y/N with distance (m) to relevant exposure)			27	6	15
Is monitoring collocated with a Continuous Analyser (Y/N)			N	N	N
In AQMA ?			Copt oak	N	N
Pollutant monitored			NO_2	NO_2	NO_2
Our Tube No.			4	N/A	N/A
Grid Reference	Y		312920	312922	312927
	X		448119	448139	448163
Location Type			Roadside	Roadside	Roadside
location			outside corner farm copt oak	Copt Oak Road	Whitwick Road Copt Oak
Site details			9???? - NWLeicestershire 45N	HBBC 15	HBBC 16