TECHNICAL APPENDIX C.1 - AIR QUALITY STANDARDS & OBJECTIVES

Air Quality Objectives currently included in the Air Quality Regulations 2000 and (Amendment) Regulations 2002 for the purpose of Local Air Quality Management (LAQM)

Pollutant	Applies to	Standard		Objective		EU AQ Daughter Directive
		Concentration	Measured as	Annual exceedences allowed	Target date	
Benzene (C_6H_6)	All UK	16.25µg/m^3	running annual mean		31.12.2003	
	England and Wales	5µg/m^3	annual mean		31.12.2010	As standard. target: 01.01.2010
	Scotland	3.25µg/m^3	running annual mean		31.12.2010	
1,3-Butadiene (C_4H_6)	All UK	2.25µg/m^3	running annual mean		31.12.2003	
Carbon monoxide (CO)	All UK	10mg/m^3	maximum daily running 8 hour mean		31.12.2003	As standard. target: 01.01.2005
Lead (Pb)	All UK	0.5µg/m^3	annual mean		31.12.2004	As standard. target: 01.01.2005[8]
	All UK	0.25µg/m^3	annual mean		31.12.2008	
Nitrogen dioxide (NO_2)	All UK	200µg/m^3	1 hour mean	18	31.12.2005	As objective. target: 01.01.2010
	All UK	40µg/m^3	annual mean		31.12.2005	As standard. target: 01.01.2010
Particulate Matter (PM_{10}) (gravimetric)[1]	All UK	40µg/m^3	annual mean		31.12.2004	As standard. target: 01.01.2005
	All UK	50µg/m^3	24 hour mean	35	31.12.2004	As objective. target: 01.01.2005
	Scotland	50µg/m^3	24 hour mean	7	31.12.2010	As objective. target: 01.01.2010
	Scotland	18µg/m^3	annual mean		31.12.2010	
Sulphur dioxide (SO_2)	All UK	266µg/m^3	15 minute mean	35	31.12.2005	
	All UK	350µg/m^3	1 hour mean	24	31.12.2004	As objective. target: 01.01.2005
	All UK	125µg/m^3	24 hour mean	3	31.12.2004	

Provisional Air Quality Objectives currently NOT included in the Air Quality Regulations 2000 and (Amendment) Regulations 2002 for the purpose of Local Air Quality Management (LAQM)

Pollutant	Applies to	Standard		Objective		EU AQ Daughter Directive
		Concentration	Measured as	Annual exceedences allowed	Target date	
Polycyclic aromatic hydrocarbons (PAHs)[2]	All UK	0.25ng/m^3 B[a]P[3]	annual mean		31.12.2010	
Particulate Matter ($PM_{2.5}$) (gravimetric)[1,2]	UK (except Scotland)	25µg/m^3	annual mean	-	2020	As standard Target 2010
	Scotland	12µg/m^3	annual mean	-	2020	25µg/m^3 Target 2015
	UK urban areas	Target of 15% reduction in concentrations at urban background	annual mean	-	Between 2010 and 2020	Target 20% reduction in concentrations at urban background Target Between 2010 and 2020

Other Air Quality Strategy Objectives

Pollutant	Applies to	Standard		Objective		EU AQ Daughter Directive
		Concentration	Measured as	Annual exceedences allowed	Target date	
For the protection of human health						
Ozone (O_3)[4]	All UK	100µg/m^3	maximum daily running 8 hour mean	10	31.12.2005	As objective; but 25 annual exceedences target: 01.01.2010
For the protection of vegetation and ecosystems[5]						
Nitrogen oxides (NO_X)[6]	All UK	30µg/m^3	annual mean		31.12.2000[7]	As standard. target: 19.07.2001
Sulphur dioxide (SO_2)	All UK	20µg/m^3	annual mean		31.12.2000[7]	
		20µg/m^3	winter mean (1 October to 31 March)		31.12.2000[7]	

Explanation

ng/m^3 = nanogram per cubic metre;

$\mu g/m^3$ = microgram per cubic metre;

mg/m^3 = milligrams per cubic metre (i.e. microgram per cubic meter x 1,000);

1 Measured using the European gravimetric transfer sampler or equivalent.

2 Objective to be set in regulations in the future.

3 Concentration of Benzo[a]pyrene (B[a]P) to be measured as a marker for the total mixture of PAHs.

4 The objective for this pollutant is provisional and must be tackled at a national level due to its trans-boundary nature.

5 Only applies to those parts of the UK > 20km from an agglomeration; and > 5km from Part A processes, motorways and built up areas of > 5,000 people.

6 Assuming NO_X is taken as NO_2.

7 These objectives have successfully been achieved.

8 Also an EU AQ Directive Limit Value of $1\mu g/m^3$ to be achieved by 01.01.2010 in the immediate vicinity (1000 m) of certain named industrial sources situated on sites contaminated by decades of industrial activities.

The Air Quality Strategy states that further review and assessment and consultation in relation to air quality will be a rolling process, with additional revisions to the objectives for selected pollutants as appropriate, or where there is new evidence in relation to the effects of pollutants on health or ecosystems. New pollutants may be introduced through future reviews.

TECHNICAL APPENDIX C.2 – CONSULTATION RESPONSE FROM CDC

Rochfort nee Miller, Joanna

From:	Sean Gregory <Sean.Gregory@Cherwell-DC.gov.uk>
Sent:	25 July 2012 20:53
To:	Rochfort nee Miller, Joanna
Subject:	RE: SW Bicester Phase 1 - Additional 100 Units
Attachments:	2010 Bicester NO2 STATS.pdf; 2009 Bicester NO2 STATS.pdf

Hi Jo,

Given the changes to the guidance since the last assessment was undertaken, an updated air quality assessment would be required to demonstrate the suitability of this development, especially given the additional units. I can confirm that the in the absence of an authoritative semi- quantitative screening model such as dmrb, the proposed detailed assessment using ADMS roads will be acceptable.

I have sent locations of the monitoring locations we have around Bicester in my previous email and 2011 monitoring data. I can confirm that verifying the model using our 2011 data will be acceptable. The 2009 and 2010 monitoring data is attached for your reference. I can confirm Brize Norton will be acceptable source of met data.

Best regards

Sean

Sean Gregory
Environmental Protection Officer
Public Protection and Development Management
Cherwell District Council
Ext: 1622
Direct Dial: 01295 221622
mail to: sean.gregory@cherwell-dc.gov.uk
www.cherwell.gov.uk

From: Rochfort nee Miller, Joanna [mailto:joanna.rochfort@wspgroup.com]
Sent: 19 July 2012 14:20
To: Sean Gregory
Cc: Rachmann-Davies, Stefanie
Subject: SW Bicester Phase 1 - Additional 100 Units

Hi Sean,

Please find outlined below, a summary of our conversation/ further information for your consideration, to enable a decision regarding the proposed methodology.

Background

The Proposed Development Site has Outline Planning Permission (06/00967/OUT) for 1,585 dwellings, a health village, commercial space, a hotel, a local centre, two schools, formal and informal open space and a Perimeter Road linking the A41 to Middleton Stoney Road at the Howes Lane junction. However, the Applicant (Countryside Properties) wishes to construct a further 100 dwellings on the Site by increasing the density of the proposed dwellings

CDC has requested that a new Environmental Impact Assessment is undertaken to accompany a Section 73 planning application being submitted for the site and has requested that this includes consideration of the additional 100 units on air quality.

Changes in Traffic Flows

As discussed, the % changes in traffic are small (see Table 1 below) and below than the 5% threshold.

Link	Location on link	% Change
1	Perimeter Road (south of Middleton Stoney Road)	0.79%
2	Perimeter Road (west of A41))	2.61%
3	Middleton Stoney Road (east of Perimeter Road)	1.70%
4	Middleton Stoney Road (west of Oxford Road)	0.45%
5	A41 (south of Oxford Road)	0.11%
6	Oxford Road (north of A41)	0.06%
7	Middleton Stoney Road (west of Perimeter Road)	0.23%
8	A41 (south of the Perimeter Road)	0.52%
9	Kings End/ Queens Avenue	0.28%
10	A41 (east of Oxford Road)	0.14%
11	A4095 Howes Lane	0.27%

On this basis I would be grateful if you could confirm whether a quantitative assessment (i.e. dispersion modelling) is required? I would note that the previous assessment was undertaken using LAQM.TG(03) as oppose to LAQM.TG(09) and that DEFRA has published both new emissions factors and background concentrations since the previous assessment was undertaken.

Methodology should quantitative assessment be required

The air quality assessment undertaken for Phase 1 was undertaken using the DMRB screening methodology. However, the new emissions factors published by DEFRA have yet to be incorporated into this screening tool. Therefore, if quantitative assessment is required, we are proposing to undertaken the assessment using the detailed dispersion model ADMS Roads (using 2011 met data from Brize Norton). This assessment would focus on the road links where the greatest % increases in traffic flows are predicted:

- Perimeter Road (south of Middleton Stoney Road)
- Perimeter Road (west of A41))
- Middleton Stoney Road (east of Perimeter Road)

Whilst we understand that recent monitoring indicates exceedences of the AQS objective for annual mean NO_2 have occurred in the vicinity of Kings End/Queens Avenue, the additional 100 units are only anticipated to cause 49 additional movements per day along this link (around 2 per hour) and therefore we are proposing not to model air quality at sensitive receptors along this link.

Please note, we are proposing to verify the AQ modelling using the results of diffusion tube monitoring in the vicinity of Kings End/Queens Avenue for 2011.

Data required

I would be grateful if you could provide:

- Monitoring data for Bicester for 2009 – 2011;
- Grid references, height above ground and distance to road for each of the tubes.

I would be grateful if you could confirm your thoughts regarding the proposed methodology/provide the relevant data at your earliest convenience.

Many thanks, in advance,

Joanna Rochfort (née Miller) Msc AIEMA MIAQM
Senior Consultant
WSP Environment & Energy

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TECHNICAL APPENDIX C.3 - SUMMARY OF IAQM CONSTRUCTION PHASE IMPACT ASSESSMENT PROCEDURE

Step 1 – Screening the need for a Detailed Assessment

An assessment will normally be required where there are sensitive receptors within 350m of the site boundary and/or within 100m of the route(s) used by construction vehicles on the public highway, up to 500m from the site entrance(s). Where the need for a more detailed assessment is screened out, it can be concluded that the level of risk is "negligible".

Step 2 – Assess the Risk of Dust Effects Arising

The tables below show the risk categories for the potential dust and PM_{10} impacts from demolition; earthworks; general construction activities and trackout. They assume that no mitigation measures are applied and are dependent on the available information on the construction phase and professional judgement. The risk categories should be used as guidance for determining the level of mitigation that must be applied.

Demolition

The following are examples of the potential dust emission classes (note that not all the criteria need to be met for a particular class). Other criteria may be used if justified in the assessment:

- Large: Total building volume >50 000 m^3 potentially dusty construction material (e.g. concrete), on-site crushing and screening, demolition activities >20 m above ground level;
- Medium: Total building volume 20 000 m^3 – 50 000m^3, potentially dusty construction material, demolition activities 10-20 m above ground level; and
- Small: Total building volume <20 000 m^3, construction material with low potential for dust release (e.g. metal cladding or timber), demolition activities <10m above ground, demolition during wetter months.

The potential dust emission class determined above should be used in the matrix in Table A to determine the demolition risk category with no mitigation applied (high, low or medium risk) based on the distance to the nearest receptors. This varies depending on the different effects under consideration.

Table A: Risk Category from Demolition Activities

Distance to nearest receptor (m) [(a)]		**Dust Emission Class**		
Dust Soiling and PM_{10}	**Ecological**	**Large**	**Medium**	**Small**
<20	-	High Risk Site	High Risk Site	Medium Risk Site
20 – 100	<20	High Risk Site	Medium Risk Site	Low Risk Site
100 – 200	20 - 40	Medium Risk Site	Low Risk Site	Low Risk Site
200 - 350	40 - 100	Medium Risk Site	Low Risk Site	Negligible

(a) Distance from dust emission source. Where this is not known then the distance should be taken from the site boundary. The risk is based on the distance to the nearest receptor.

Earthworks and Construction Activities

The following are examples of the potential dust emission classes (note that not all the criteria need to be met for a particular class). Other criteria may be used if justified in the assessment:

Earthworks

- Large: Total site area >10 000 m^2, potentially dusty soil type (e.g. clay, which will be prone to suspension when dry due to small particle size), >10 heavy earth moving vehicles active at any one time, formation of bunds >8 m in height, total material moved >100 000 tonnes;
- Medium: Total site area 2 500 m^2 – 10 000 m^2, moderately dusty soil type (e.g. silt), 5-10 heavy earth moving vehicles active at any one time, formation of bunds 4 m - 8 m in height, total material moved 20 000 tonnes – 100 000 tonnes; and,
- Small: Total site area <2 500 m^2, soil type with large grain size (e.g. sand), <5 heavy earth moving vehicles active at any one time, formation of bunds <4 m in height, total material moved <10 000 tonnes, earthworks during wetter months.

Construction Activities

- Large: Total building volume >100 000 m^3, piling, on site concrete batching, sandblasting
- Medium: Total building volume 25 000 m^3 – 100 000 m^3, potentially dusty construction material (e.g. concrete), piling, on site concrete batching; and
- Small: Total building volume <25 000 m^3, construction material with low potential for dust release (e.g. metal cladding or timber).

The potential dust emission class determined above should be used in the matrix in Table B to determine the earthworks and construction activities risk categories with no mitigation applied (high, low or medium risk) based on the distance to the nearest receptors.

Table B: Risk Category from Earthworks & Construction Activities

Distance to nearest receptor (m) [(a)]		**Dust Emission Class**		
Dust Soiling and PM_{10}	**Ecological**	**Large**	**Medium**	**Small**
<20	-	High Risk Site	High Risk Site	Medium Risk Site
20 – 50	-	High Risk Site	Medium Risk Site	Low Risk Site
50 – 100	<20	Medium Risk Site	Medium Risk Site	Low Risk Site
100 – 200	20 - 40	Medium Risk Site	Low Risk Site	Negligible
200 - 350	40 - 100	Low Risk Site	Low Risk Site	Negligible

(a) Distance from dust emission source. Where this is not known then the distance should be taken from the site boundary. The risk is based on the distance to the nearest receptor.

Trackout

Factors which determine the magnitude class are vehicle size, vehicle speed, vehicle numbers, geology and duration. As with all other potential sources, professional judgement must be applied when classifying trackout into one of the magnitude categories. Only receptors within 100 m of the route(s) used by vehicles on the public highway and up to 500 m from the site entrance(s) are considered to be at risk and the risk classification distances shown below reflect this.

The following are examples of the potential dust emission classes (note that not all the criteria need to be met for a particular class); other criteria may be used if justified in the assessment:

- Large: >100 HDV (>3.5t) trips in any one day, potentially dusty surface material (e.g. high clay content), unpaved road length >100m;
- Medium: 25-100 HDV (>3.5t) trips in any one day, moderately dusty surface material (e.g. high clay content), unpaved road length 50m – 100m; and
- Small / Medium: <25 HDV (>3.5t) trips in any one day, surface material with low potential for dust release, unpaved road length <50m.

These numbers are for vehicles that leave the site after moving over unpaved ground, where they will accumulate mud and dirt that can be tracked out onto the public highway.

These potential dust emission classes should be used in Table C to determine the trackout risk category with no mitigation applied.

Table C: Risk Category from Trackout

Distance to nearest receptor (m) [(a)]		**Dust Emission Class**		
Dust Soiling and PM_{10}	**Ecological**	**Large**	**Medium**	**Small**
<20	-	High Risk Site	Medium Risk Site	Medium Risk Site
20 – 50	<20	Medium Risk Site	Medium Risk Site	Low Risk Site
50 – 100	20 – 100	Low Risk Site	Low Risk Site	Negligible
(a) For the trackout the distance is from the roads used by construction traffic.				

There is an extra dimension to the assessment of trackout, as the distance over which it might occur depends on the site. As general guidance, significant trackout may occur up to 500m from large sites, 200m from medium sites and 50m from small sites, as measured from the site exit. These distances assume no site-specific mitigation.

The 'distance to receptor' in Table C relates to the distance from the road where mud may be deposited. Therefore in determining the risk from trackout, both distances need to be taken into account.

Step 3 – Identify the need for Site Specific Mitigation

Having determined the risk categories for each of the four activities it is possible to determine the site-specific measures to be adopted. These measures will be related to whether the site is a low, medium or high risk site.

Step 4 – Define Effects and their Significance

The significance is best determined using professional judgement, taking account of the factors that define the sensitivity of the surrounding area and the overall pattern of potential risks. The sensitivity of the area needs to be defined.

The sensitivity of the area surrounding the construction / demolition site is combined with the risk of the site giving rise to dust effects (from Step 2) to define the significance of the effects for each of the four activities (demolition, earthworks, construction and trackout).

The preference in the IAQM Guidance is to only assign significance to the impact with mitigation. The residual effects for most sites will be negligible as shown in Table D overleaf.

Table D: Significance of Effects of Each Activity with Mitigation

Sensitivity of surrounding area	Risk of site giving rise of dust effects		
	High	**Medium**	**Low**
Very High	Slight adverse	Slight adverse	Negligible
High	Negligible	Negligible	Negligible
Medium	Negligible	Negligible	Negligible
Low	Negligible	Negligible	Negligible

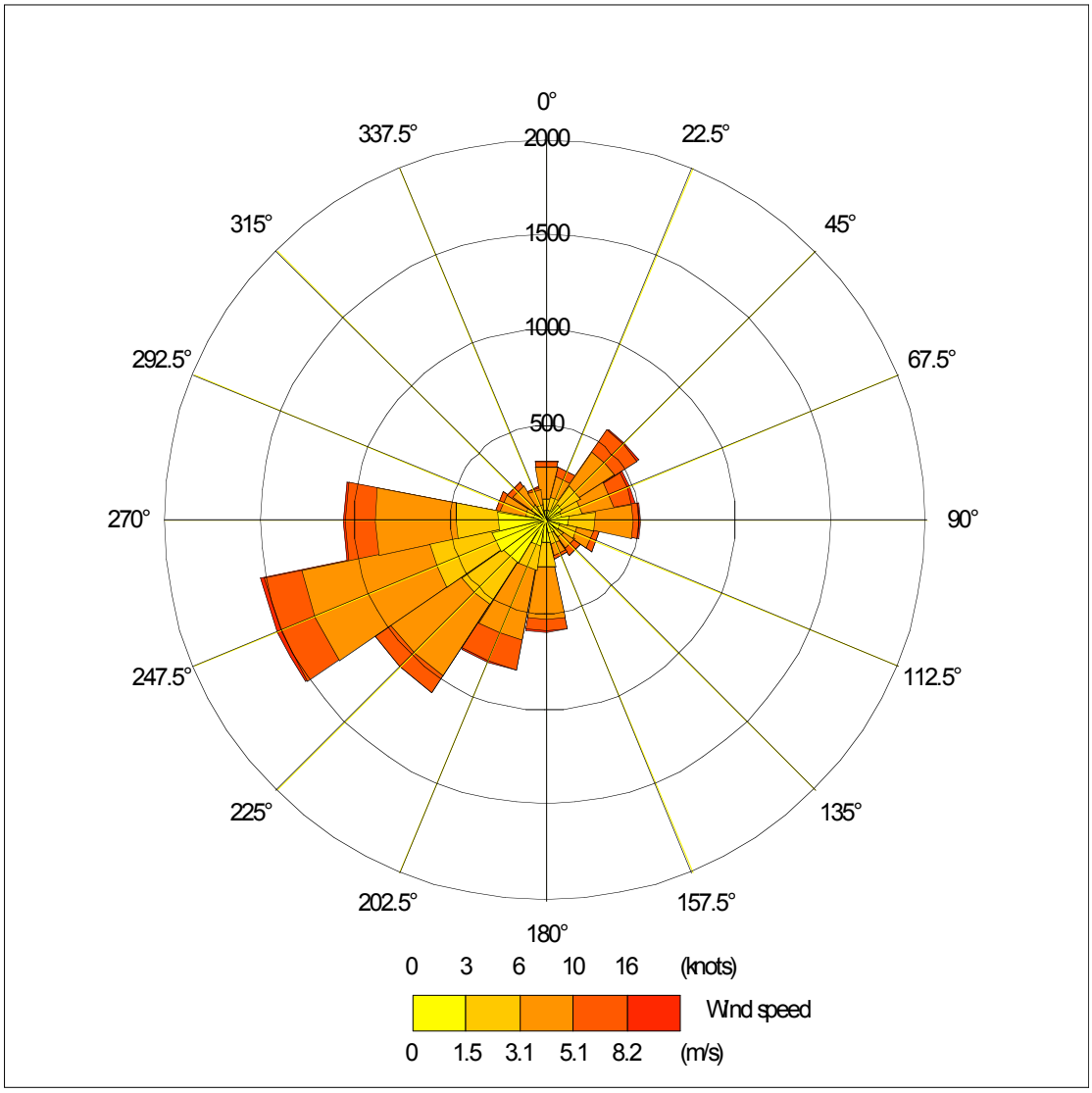
When assessment of the significance of the effects without mitigation is required, the recommended significance criteria in Table E should be used.

Table E: Significance of Effects of Each Activity without Mitigation

Sensitivity of surrounding area	Risk of site giving rise of dust effects		
	High	**Medium**	**Low**
Very High	Substantial adverse	Moderate adverse	Moderate adverse
High	Moderate adverse	Moderate adverse	Slight adverse
Medium	Moderate adverse	Slight adverse	Negligible
Low	Slight adverse	Negligible	Negligible

The final step is to determine the overall significance of the effects arising from the construction phase of a proposed development. This will be based on professional judgement but should take account of the significance of the effects for each of the four activities.

TECHNICAL APPENDIX C.4 – WINDROSE FOR BRIZE NORTON 2011



TECHNICAL APPENDIX C.5 – TRAFFIC DATA USED IN THE ASSESSMENT

2011 Verification

Link	Vehicles		HGV %	Speed	Emission factors (g/s/km)	
	AADT	AAHT		kph	NO_X	PM_{10}
Oxford Road (north of A41) Queue 1	21,364	890	7%	24	0.239	0.014
Oxford Road (north of A41)	21,364	890	7%	48	0.163	0.012
Oxford Road (north of A41) Queue 2	21,364	890	7%	24	0.239	0.014
Oxford Road (north of A41) Wide	21,364	890	7%	24	0.239	0.014
A41 (south of Oxford Road) Queue	34,908	1,455	13%	24	0.565	0.027
A41 (east of Oxford Road) Queue	30,228	1,260	13%	24	0.489	0.024
A41 (east of Oxford Road)	30,228	1,260	13%	96	0.277	0.021
Kings End/ Queens Avenue Queue	16,053	669	7%	24	0.180	0.010
Kings End/ Queens Avenue	16,053	669	7%	48	0.122	0.009
Perimeter Road (south of Middleton Stoney Road) Queue	0	0	13%	24	0.000	0.000
Perimeter Road (south of Middleton Stoney Road)	0	0	13%	80	0.000	0.000
Perimeter Road (west of A41)	0	0	13%	80	0.000	0.000
A41 (south of the Perimeter Road)	45,231	1,885	13%	112	0.452	0.033
Perimeter Road (west of A41) Queue	0	0	13%	24	0.000	0.000
A41 (south of Oxford Road)	34,908	1,455	13%	112	0.349	0.026
A41 (south of the Perimeter Road) Queue	45,231	1,885	13%	24	0.732	0.035
Middleton Stoney Road (west of Perimeter Road) Queue	5,443	227	7%	24	0.061	0.004
Middleton Stoney Road (west of Perimeter Road)	5,443	227	7%	80	0.036	0.003
Middleton Stoney Road (east of Perimeter Road) Queue 1	6,867	286	7%	24	0.077	0.004
Middleton Stoney Road (east of Perimeter Road)	6,867	286	7%	80	0.045	0.004
Middleton Stoney Road (west of Oxford Road) Queue 2	9,149	381	7%	24	0.102	0.006
Middleton Stoney Road (west of Oxford Road)	9,149	381	7%	80	0.061	0.005
A4095 Howes Lane	14,388	599	13%	72	0.130	0.010
A41 (south of Oxford Road) Queue	34,908	1,455	13%	24	0.565	0.027
Middleton Stoney Road (east of Perimeter Road) Q2	6,867	286	7%	24	0.077	0.004
Middleton Stoney Road (west of Oxford Road) Queue 2	9,149	381	7%	24	0.102	0.006

2012 Baseline

Link	Vehicles		HGV %	Speed	Emission factors (g/s/km)	
	AADT	AAHT		kph	NO_X	PM_{10}
Oxford Road (north of A41) Queue 1	19,680	820	7%	24	0.213	0.012
Oxford Road (north of A41)	19,680	820	7%	48	0.141	0.011
Oxford Road (north of A41) Queue 2	19,680	820	7%	24	0.213	0.012
Oxford Road (north of A41) Wide	19,680	820	7%	24	0.213	0.012
A41 (south of Oxford Road) Queue	32,039	1,335	13%	24	0.502	0.024
A41 (east of Oxford Road) Queue	30,228	1,260	13%	24	0.474	0.022
A41 (east of Oxford Road)	30,228	1,260	13%	96	0.254	0.020
Kings End/ Queens Avenue Queue	16,053	669	7%	24	0.174	0.010
Kings End/ Queens Avenue	16,053	669	7%	48	0.115	0.009
Perimeter Road (south of Middleton Stoney Road) Queue	15,501	646	13%	24	0.243	0.012
Perimeter Road (south of Middleton Stoney Road)	15,501	646	13%	80	0.126	0.010
Perimeter Road (west of A41)	2,965	124	13%	80	0.024	0.002
A41 (south of the Perimeter Road)	45,231	1,885	13%	112	0.417	0.032
Perimeter Road (west of A41) Queue	2,965	124	13%	24	0.047	0.002
A41 (south of Oxford Road)	32,039	1,335	13%	112	0.295	0.022
A41 (south of the Perimeter Road) Queue	45,231	1,885	13%	24	0.709	0.034
Middleton Stoney Road (west of Perimeter Road) Queue	5,443	227	7%	24	0.059	0.003
Middleton Stoney Road (west of Perimeter Road)	5,443	227	7%	80	0.033	0.003
Middleton Stoney Road (east of Perimeter Road) Queue 1	7,921	330	7%	24	0.086	0.005
Middleton Stoney Road (east of Perimeter Road)	7,921	330	7%	80	0.048	0.004
Middleton Stoney Road (west of Oxford Road) Queue 2	9,134	381	7%	24	0.099	0.006
Middleton Stoney Road (west of Oxford Road)	9,134	381	7%	80	0.056	0.005
A4095 Howes Lane	14,388	599	13%	72	0.119	0.009
A41 (south of Oxford Road) Queue	32,039	1,335	13%	24	0.502	0.024
Middleton Stoney Road (east of Perimeter Road) Q2	7,921	330	7%	24	0.086	0.005
Middleton Stoney Road (west of Oxford Road) Queue 2	9,134	381	7%	24	0.099	0.006

2019 'Without the Proposed Development'

Link	Vehicles		HGV %	Speed	Emission factors (g/s/km)	
	AADT	AAHT		kph	NO_X	PM_{10}
Oxford Road (north of A41) Queue 1	25,702	1,071	7%	24	0.135	0.012
Oxford Road (north of A41)	25,702	1,071	7%	48	0.084	0.012
Oxford Road (north of A41) Queue 2	25,702	1,071	7%	24	0.135	0.012
Oxford Road (north of A41) Wide	25,702	1,071	7%	24	0.135	0.012
A41 (south of Oxford Road) Queue	45,449	1,894	13%	24	0.311	0.025
A41 (east of Oxford Road) Queue	30,228	1,260	13%	24	0.207	0.016
A41 (east of Oxford Road)	30,228	1,260	13%	96	0.103	0.016
Kings End/ Queens Avenue Queue	16,053	669	7%	24	0.084	0.008
Kings End/ Queens Avenue	16,053	669	7%	48	0.053	0.007
Perimeter Road (south of Middleton Stoney Road) Queue	17,807	742	13%	24	0.122	0.010
Perimeter Road (south of Middleton Stoney Road)	17,807	742	13%	80	0.056	0.009
Perimeter Road (west of A41)	7,208	300	13%	80	0.023	0.004
A41 (south of the Perimeter Road)	45,231	1,885	13%	112	0.181	0.024
Perimeter Road (west of A41) Queue	7,208	300	13%	24	0.049	0.004
A41 (south of Oxford Road)	45,449	1,894	13%	112	0.182	0.024
A41 (south of the Perimeter Road) Queue	45,231	1,885	13%	24	0.310	0.024
Middleton Stoney Road (west of Perimeter Road) Queue	5,443	227	7%	24	0.029	0.003
Middleton Stoney Road (west of Perimeter Road)	5,443	227	7%	80	0.015	0.002
Middleton Stoney Road (east of Perimeter Road) Queue 1	9,939	414	7%	24	0.052	0.005
Middleton Stoney Road (east of Perimeter Road)	9,939	414	7%	80	0.027	0.005
Middleton Stoney Road (west of Oxford Road) Queue 2	12,072	503	7%	24	0.063	0.006
Middleton Stoney Road (west of Oxford Road)	12,072	503	7%	80	0.033	0.006
A4095 Howes Lane	14,388	599	13%	72	0.046	0.007
A41 (south of Oxford Road) Queue	45,449	1,894	13%	24	0.311	0.025
Middleton Stoney Road (east of Perimeter Road) Q2	9,939	414	7%	24	0.052	0.005
Middleton Stoney Road (west of Oxford Road) Queue 2	12,072	503	7%	24	0.063	0.006

2019 'With the Proposed Development'

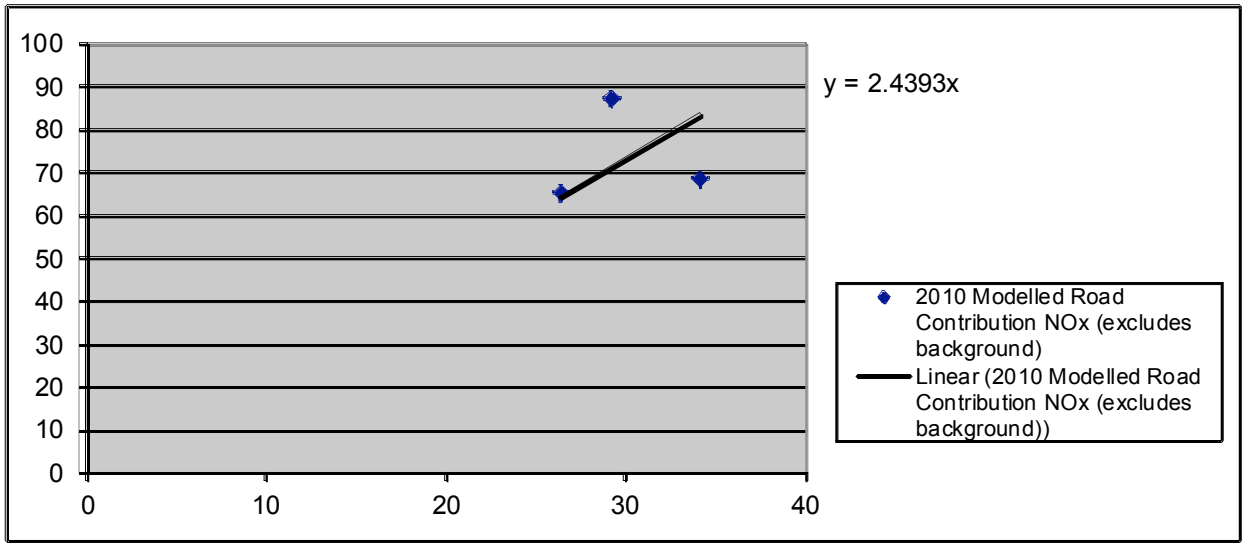
Link	Vehicles		HGV %	Speed	Emission factors (g/s/km)	
	AADT	AAHT		kph	NO_X	PM_{10}
Oxford Road (north of A41) Queue 1	25,718	1,072	7%	24	0.135	0.012
Oxford Road (north of A41)	25,718	1,072	7%	48	0.085	0.012
Oxford Road (north of A41) Queue 2	25,718	1,072	7%	24	0.135	0.012
Oxford Road (north of A41) Wide	25,718	1,072	7%	24	0.135	0.012
A41 (south of Oxford Road) Queue	45,498	1,896	13%	24	0.311	0.025
A41 (east of Oxford Road) Queue	30,270	1,261	13%	24	0.207	0.016
A41 (east of Oxford Road)	30,270	1,261	13%	96	0.103	0.016
Kings End/ Queens Avenue Queue	16,099	671	7%	24	0.085	0.008
Kings End/ Queens Avenue	16,099	671	7%	48	0.053	0.007
Perimeter Road (south of Middleton Stoney Road) Queue	17,946	748	13%	24	0.123	0.010
Perimeter Road (south of Middleton Stoney Road)	17,946	748	13%	80	0.057	0.009
Perimeter Road (west of A41)	7,396	308	13%	80	0.023	0.004
A41 (south of the Perimeter Road)	45,467	1,894	13%	112	0.182	0.024
Perimeter Road (west of A41) Queue	7,396	308	13%	24	0.051	0.004
A41 (south of Oxford Road)	45,498	1,896	13%	112	0.182	0.024
A41 (south of the Perimeter Road) Queue	45,467	1,894	13%	24	0.311	0.025
Middleton Stoney Road (west of Perimeter Road) Queue	5,456	227	7%	24	0.029	0.003
Middleton Stoney Road (west of Perimeter Road)	5,456	227	7%	80	0.015	0.002
Middleton Stoney Road (east of Perimeter Road) Queue 1	10,109	421	7%	24	0.053	0.005
Middleton Stoney Road (east of Perimeter Road)	10,109	421	7%	80	0.028	0.005
Middleton Stoney Road (west of Oxford Road) Queue 2	12,126	505	7%	24	0.064	0.006
Middleton Stoney Road (west of Oxford Road)	12,126	505	7%	80	0.033	0.006
A4095 Howes Lane	14,427	601	13%	72	0.046	0.007
A41 (south of Oxford Road) Queue	45,498	1,896	13%	24	0.311	0.025
Middleton Stoney Road (east of Perimeter Road) Q2	10,109	421	7%	24	0.053	0.005
Middleton Stoney Road (west of Oxford Road) Queue 2	12,126	505	7%	24	0.064	0.006

TECHNICAL APPENDIX C.6 – VERIFICATION CALCULATIONS

NO_2

Model verification has been undertaken following the methodology specified in Annex 3 of the Technical Guidance LAQM.TG(09). The NO_x:NO_2 calculator available from DEFRA's website was used to calculate the roadside NO_x component of the annual mean NO_2 concentrations measured at the diffusion tube sites summarised in the table below. A correction factor of 2.4 was obtained during the verification process. This factor has been applied to the modelled Road-NOx contribution before addition of the appropriate background concentration to determine total predicted annual mean NO_2 concentrations.

Monitoring Site	Type	2011 Monitored Annual Mean NO_2 Conc. ($\mu g/m^3$)	Background NO_2	Monitored Road-NO_x ($\mu g/m^3$)	Modelled Road NO_x ($\mu g/m^3$)	Ratio
Kings End North	Diffusion Tube	43.9	16.45	68.66	34.14	2.01
Kings End South	Diffusion Tube	49.5	16.45	87.16	29.20	2.99
Kings Road/Queens Avenue	Diffusion Tube	42.9	16.45	65.55	26.34	2.49



PM_{10}

Local monitoring data is not available for concentrations of PM_{10}; as such final modelling results for this pollutant have been verified using the factor calculated for adjusting the modelled NO_x roads concentrations. This approach is considered to be appropriate according to guidance given in LAQM.TG(09).

TECHNICAL APPENDIX C.7 – SIGNIFICANCE CRITERIA USED IN THE 2006 ES

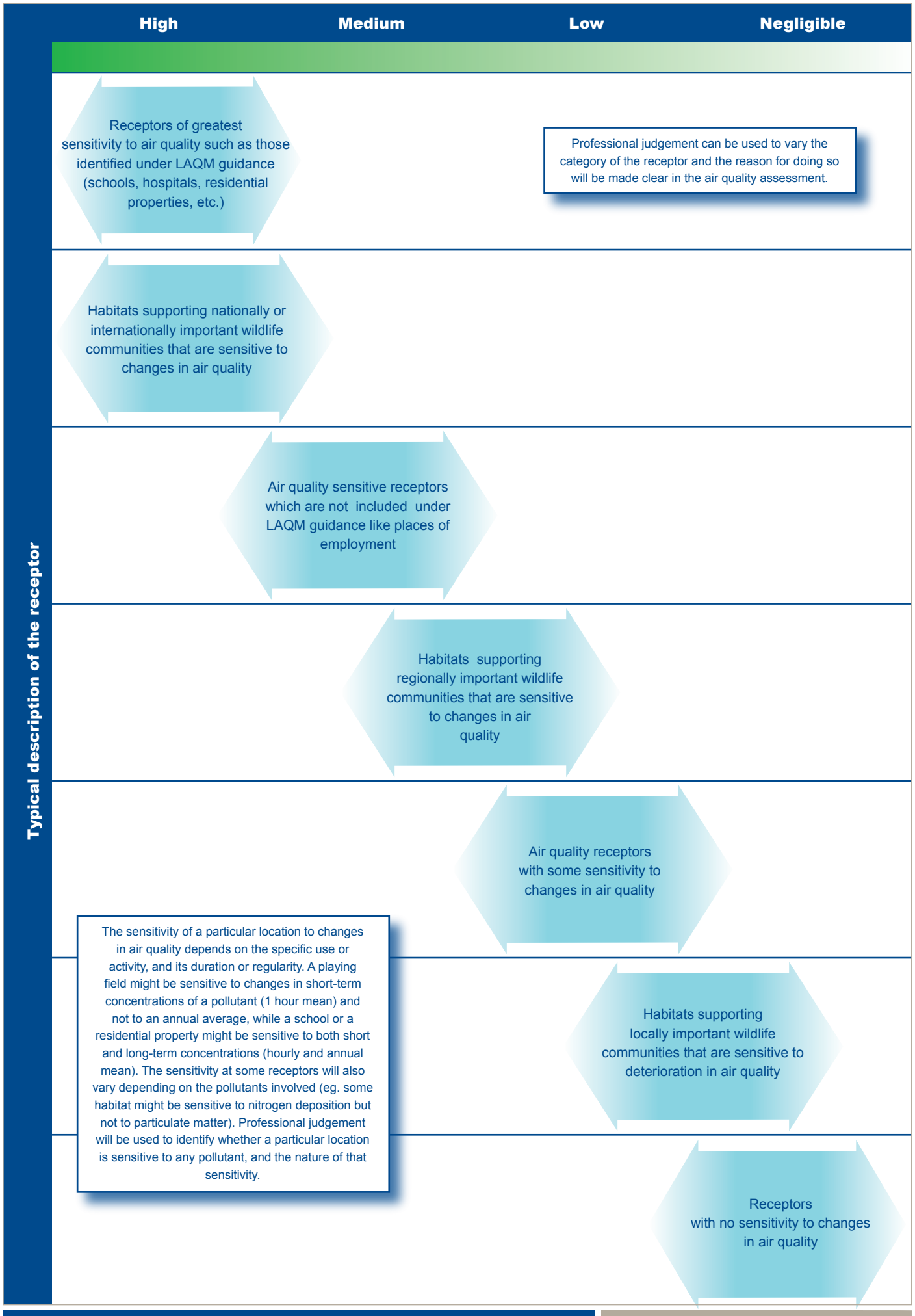


Figure 12.4 Air quality: sensitivity or importance of receptor

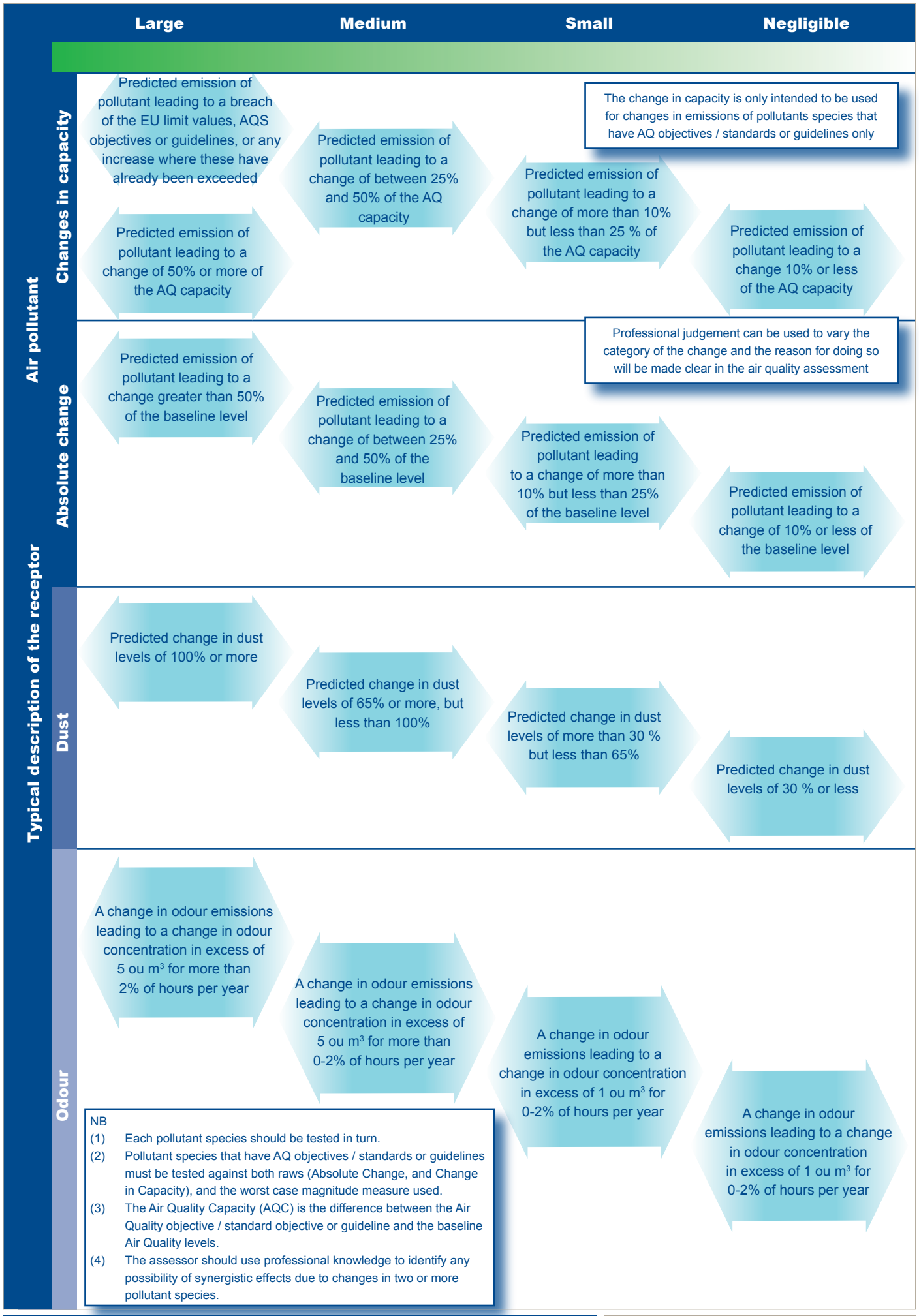
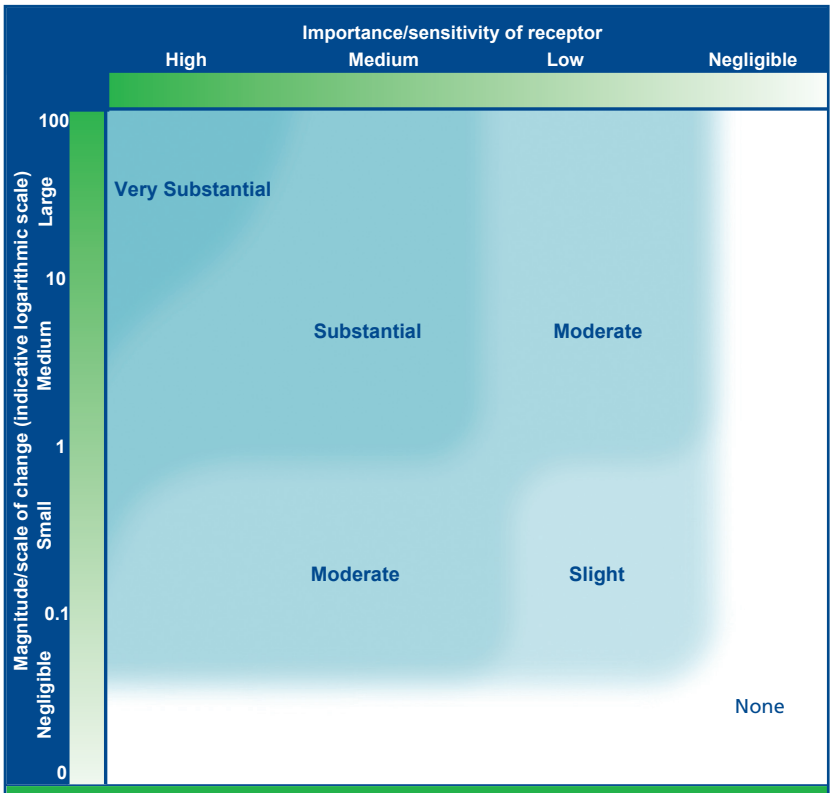


Figure 12.5 Air quality: magnitude of change



Very substantial:
The proposal will result in a large predicted change in the levels of pollutant compared to the baseline, or a large change of the AQ Capacity on the most sensitive receptors. Also, any increase in levels that would exceed AQS, AQO or guidelines, or any increase where those have already been exceeded.

Substantial:
The proposal will result in a large or medium predicted change in the level of pollutant on receptors liable to prolonged exposure or regionally important wildlife communities that are sensitive to deterioration in air quality. Also, a predicted large/medium change in the Air Quality Capacity.

Moderate:
The proposals will result in a large or medium change in level of pollutant and/or a predicted medium change in the AQ Capacity on receptors with some sensitivity to changes in air quality. Also small changes in the level of pollution over the baseline or changes in the Air Quality Capacity on receptors more sensitive to changes in air quality.

Slight:
The proposals will result in a low-level change in pollution and/or the AQ capacity on receptors with some sensitivity to changes in air quality.

Not significant:
There is no predicted significant change over the baseline conditions nor the AQ capacity.

Figure 12.6 Air quality significance matrix

TECHNICAL APPENDIX C.8 – ASSESSMENT SIGNIFICANCE CRITERIA

The following criteria relate to changes in annual mean NO_2/PM_{10} concentrations and 24-hour mean PM_{10} concentrations resulting from the Proposed Development.

ANNUAL MEAN NO_2 AND PM_{10} CONCENTRATIONS

Significance criteria	Definition
NEUTRAL	The development causes no change in concentrations.
NEGLIGIBLE IMPACT	The development gives rise to a IMPERCEPTIBLE change in concentrations or; The development gives rise to a SMALL change in concentrations and predicted concentrations are below 36μg/m^3; or The development gives rise to a MEDIUM change in concentrations and predicted concentrations are below 30μg/m^3.
A SLIGHT ADVERSE IMPACT	The development gives rise to a SMALL increase in concentrations and predicted concentrations with the development in place are above 36μg/m^3; or The development gives rise to a MEDIUM increase in concentrations and predicted concentrations with the development in place are between 30-36μg/m^3; or The development gives rise to a LARGE increase in concentrations and predicted concentrations with the development in place are less than 36μg/m^3.
A MODERATE ADVERSE IMPACT	The development gives rise to a MEDIUM increase in concentrations and predicted concentrations with the development in place are above 36μg/m^3; or The development gives rise to a LARGE increase in concentrations and predicted concentrations with the development in place are between 36-40μg/m^3.
A SUBSTANTIAL ADVERSE IMPACT	The development gives rise to a LARGE increase in concentrations and predicted concentrations with the development in place exceed the objective level of 40μg/m^3.
A SLIGHT BENEFICIAL IMPACT	The development gives rise to a SMALL decrease in concentrations and predicted concentrations without the development in place are above 36μg/m^3; or The development gives rise to a MEDIUM decrease in concentrations and predicted concentrations without the development in place are between 30-36μg/m^3; or The development gives rise to a LARGE decrease in concentrations and predicted concentrations without the development in place are less than 36μg/m^3.
A MODERATE BENEFICIAL IMPACT	The development gives rise to a MEDIUM decrease in concentrations and predicted concentrations without the development in place are above 36μg/m^3; or The development gives rise to a LARGE decrease in concentrations and predicted concentrations without the development in place are between 36-40μg/m^3.
A SUBSTANTIAL BENEFICIAL IMPACT	The development gives rise to a LARGE decrease in concentrations and predicted concentrations without the development in place exceed the objective level of 40μg/m^3.

Where the magnitude of change in concentration for annual mean NO_2 and PM_{10} has been defined as follows:

- An IMPERCEPTIBLE change is a change of <0.4μg/m^3;
- A SMALL change is a change of less than 0.4 – 2μg/m^3;
- A MEDIUM change is a change of 2 - 4μg/m^3; and
- A LARGE change is a change of > 4μg/m^3.

DAILY MEAN PM_{10} CONCENTRATIONS

Significance criteria	Definition
NEUTRAL	The development causes no change in the number of days of exceedence.
NEGLIGIBLE IMPACT	The development gives rise to a IMPERCEPTIBLE change in the number of days of exceedence; or The development gives rise to a SMALL change and the predicted number of days of exceedence is below 32 days; or The development gives rise to a MEDIUM change and the predicted number of days of exceedence is below 26 days.
A SLIGHT ADVERSE IMPACT	The development gives rise to a SMALL increase and the predicted number of days of exceedence is above 32 days; or The development gives rise to a MEDIUM increase and the predicted number of days of exceedence is between 26 and 32 days; or The development gives rise to a LARGE increase and the predicted number of days of exceedence is below 32 days.
A MODERATE ADVERSE IMPACT	The development gives rise to a MEDIUM increase and the predicted number of days of exceedence is above 32 days; or The development gives rise to a LARGE increase and the predicted number of days of exceedence is between 32 and 35 days.
A SUBSTANTIAL ADVERSE IMPACT	The development gives rise to a LARGE increase and the number of days of exceedence with the development in place is above 35 days.
A SLIGHT BENEFICIAL IMPACT	The development gives rise to a SMALL decrease and the predicted number of days of exceedence without the development is above 32 days; or The development gives rise to a MEDIUM decrease and the predicted number of days of exceedence without the development is between 26 and 32 days; or The development gives rise to a LARGE decrease and the predicted number of days of exceedence without the development is between 32 and 35 days.
A MODERATE BENEFICIAL IMPACT	The development gives rise to a MEDIUM decrease and the predicted number of days of exceedence without the development is above 32 days; or The development gives rise to a LARGE decrease and the predicted number of days of exceedence without the development is between 32 and 35 days.
A SUBSTANTIAL BENEFICIAL IMPACT	The development gives rise to a LARGE decrease and the number of days of exceedence without the development in place is above 35 days.

Where the magnitude of change is defined as the number of days of exceedence of a daily mean PM10 concentration of 50µg/m^3:

- An IMPERCEPTIBLE change is a change of < 1 day;
- A SMALL change is a change of 1- 2 days;
- A MEDIUM change is a change of 2 - 4 days; and
- A LARGE change is a change of > 4 days.

TECHNICAL APPENDIX C.9 – ASSESSMENT RESULTS

NO_2 annual mean	ug/m^3	Source
Objective (ug/m^3)	40.00	AQS 2007

		2012 Baseline	2019 With the Proposed Development				
Receptor number	Receptor Name / Description	2012 Baseline	2019 Without Development	2019 With the Proposed Development	Change	Change	Significance
1	25 Tubb Close	26.32	22.30	22.31	+0.01	Imperceptible	Negligible
2	35 Middleton Stoney	23.47	20.31	20.32	+0.01	Imperceptible	Negligible
3	16 Goodwood Close	21.59	19.00	19.00	+0.00	Imperceptible	Negligible
4	6 St Marys Close	29.03	24.17	24.18	+0.01	Imperceptible	Negligible
5	10 Ray Road	30.34	24.83	24.86	+0.03	Imperceptible	Negligible
6	Farm on the A41 Oxford Road	**42.37**	34.60	34.60	+0.00	Imperceptible	Negligible
7	Little Chef/Garage on Oxford Road	**43.89**	35.00	35.01	+0.01	Imperceptible	Negligible
8	Sports Club & Rifle Club	39.95	32.44	32.52	+0.08	Imperceptible	Negligible
9	63 Shannon Road	24.30	20.28	20.45	+0.17	Imperceptible	Negligible
10	94 Isis Avenue	33.14	25.04	25.15	+0.11	Imperceptible	Negligible
11	37 Shannon Avenue	23.32	19.86	19.99	+0.13	Imperceptible	Negligible

PM_{10} annual mean	ug/m^3	Source
Objective (ug/m^3)	40.00	AQS 2007

		2012 Baseline	2019 With the Proposed Development			
Receptor number	Receptor Name / Description	2012 Baseline	2019 Without Development	2019 With the Proposed Development	Change	Significance
1	25 Tubb Close	18.61	19.05	19.05	No change	Neutral
2	35 Middleton Stoney	18.05	18.33	18.33	No change	Neutral
3	16 Goodwood Close	17.68	17.86	17.86	No change	Neutral
4	6 St Marys Close	19.16	19.71	19.71	No change	Neutral
5	10 Ray Road	19.13	19.42	19.42	No change	Neutral
6	Farm on the A41 Oxford Road	22.56	22.97	22.97	No change	Neutral
7	Little Chef/Garage on Oxford Road	20.56	20.49	20.49	No change	Neutral
8	Sports Club & Rifle Club	20.38	20.56	20.56	No change	Neutral
9	63 Shannon Road	18.23	18.61	18.61	No change	Neutral
10	94 Isis Avenue	19.20	18.97	18.97	No change	Neutral
11	37 Shannon Avenue	17.89	18.10	18.10	No change	Neutral

PM_{10} daily mean	ug/m^3	Source
Objective (ug/m^3)	50 not to be exceeded more than 35 times a year	AQS 2007

		2012 Baseline	2019 With the Proposed Development			
Receptor number	Receptor Name / Description	2012 Baseline	2019 Without Development	2019 With the Proposed Development	Change	Significance
1	25 Tubb Close	2	2	2	No change	Neutral
2	35 Middleton Stoney	1	2	2	No change	Neutral
3	16 Goodwood Close	1	1	1	No change	Neutral
4	6 St Marys Close	2	3	3	No change	Neutral
5	10 Ray Road	2	3	3	No change	Neutral
6	Farm on the A41 Oxford Road	7	8	8	No change	Neutral
7	Little Chef/Garage on Oxford Road	4	4	4	No change	Neutral
8	Sports Club & Rifle Club	4	4	4	No change	Neutral
9	63 Shannon Road	2	2	2	No change	Neutral
10	94 Isis Avenue	2	2	2	No change	Neutral
11	37 Shannon Avenue	1	1	1	No change	Neutral