Chapter 12 Air quality

Introduction

12.1 The EIA scoping exercise identified the potential effects of the proposed development on local air quality as being of secondary importance and focused on the following issues:

- the generation of dust during the construction phase
- traffic-related emissions associated with the proposed development during the construction and post construction phase.

12.2 These issues suggest that the following pollutants might be of concern:

- nitrogen dioxide (NO_2)
- particulate matter (PM_{10})
- dust.

Background

Nitrogen dioxide (NO_2)

12.3 During the combustion of fuel in vehicle engines, atmospheric and fuel nitrogen (N_2) is partially oxidised via a series of complex chemical reactions, to form nitric oxide (NO). When emitted into the atmosphere, NO mixes with oxygen (O_2) to form NO_2. Some NO_2 is also formed during combustion and it therefore exists as both a primary and a secondary pollutant. Exposure to elevated short-term or long-term concentrations of NO_2 can give rise to respiratory problems.

Particulate matter (PM_{10})

12.4 Fine particulate matter PM_{10} is a complex mixture of organic and inorganic substances present in the atmosphere in either solid or liquid form. It relates to particulate matter with a diameter of less than 10μm. The size of the particles is an important specification as particles of this magnitude penetrate deeper into the respiratory system and as a result can potentially be the cause of serious health effects. The PM_{10} classification consists of three components:

- primary sources which result from fuel combustion, traffic and power generation
- secondary sources which result from chemical reactions in the air, mainly nitrates and sulphates
- coarse particles comprising emissions from re-suspended dusts from road traffic, construction works, demolition activities, mineral extraction processes, windblown dusts and soils, sea salt and biological particles.

12.5 In urban areas road traffic emissions, especially from diesel exhausts, are generally the greatest local source of emissions of fine particulate matter.

Legislation and policy

12.6 The National Air Quality Strategy (NAQS) for England, Scotland, Wales and Northern Ireland (2000) sets out the latest and most relevant health-based objectives for managing local air quality. The strategy was first published in 1997 then revised in January 2000; it was designed to fulfil the requirements of the Environment Act 1995, which set out policies for managing ambient air quality. The strategy and its addendum (February 2003) have been adopted into UK policy as the Air Quality Regulations 2000 and the Air Quality (Amendment) Regulations 2002 respectively. The objectives of the NAQS are based on the recommendations of the government's Expert Panel on Air Quality Standards (EPAQS) and the European 'Daughter Directives'. The various Daughter Directives implement the Framework Directive for the Assessment and Management of Air Quality (96/62/EC).

12.7 The NAQS objectives consist of ambient air quality concentrations for eight pollutants. Seven of the pollutants have been prescribed in the Air Quality Regulations for the purpose of local air quality management (LAQM). These include carbon monoxide (CO), NO_2, benzene, 1,3-butadiene, PM_{10}, sulphur dioxide (SO_2) and lead (Pb). LAQM does not include objectives for ozone (O_3) due to its transboundary nature.

12.8 Figure 12.1 indicates the NAQS objectives for NO_2 and PM_{10}, the two pollutants most closely related to road traffic emissions, which have been identified as being the principal source of any effects on air quality arising from the proposed development.

Air quality objective		Date to be achieved by
Concentration	Measured as	
Nitrogen dioxide (NO_2)		
200μg/m^3 Not to be exceeded more than 18 times per year	1 hour mean	31 Dec 2005
40μg/m^3	Annual mean	31 Dec 2005
Particulate matter (PM_{10})(Gravimetric European method)		
50μg/m^3 Not to be exceeded more than 35 times per year	24 hour mean	31 Dec 2004
40μg/m^3	Annual mean	31 Dec 2004
50μg/m^3 Not to be exceeded more than 7 times per year***	24 hour mean	31 Dec 2010
20μg/m^3 ***	Annual mean	31 Dec 2010
*** These are provisional figures, not yet included in the regulations. While this means that an AQMA cannot be declared if these figures are likely to be reached, they are nevertheless an important consideration for local authorities.		

Figure 12.1 Summary of the objectives of the UK Air Quality Strategy

Local air quality management (LAQM)

12.9 LAQM guidance was published in March 2000 to help local authorities review and assess the current, and likely future air quality, as required by Part IV of the Environment Act 1995.

12.10 Where a local authority considers that one or more of the air quality objectives prescribed in the regulations is unlikely to be met by the due dates, it must declare an Air Quality Management Area (AQMA), covering the area where the problem is expected. AQMAs

allow the local authority to develop an Air Quality Action Plan (AQAP) to deliver improved air quality in the relevant area.

Dust

12.11 Currently, the only statutory limits for dust are in relation to exposure in workplace atmospheres, for example, the Health and Safety Executive publication EH40/01. Dust can be controlled as a statutory nuisance under Part III of the Environmental Protection Act 1990, for which the Environmental Health Department of the local authority is responsible. Under Part IV of the Environmental Act 1995, local authorities have to ensure that dust emissions from construction sites within their areas are adequately controlled.

Methodology

12.12 The air quality assessment for the proposed development has examined the implications of the construction and operational phases of the development. The assessment has identified the different key activities and related pollutants that have the potential to affect the local air quality. Figure 12.2 identifies the data sources utilised in formulating this assessment.

The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, DETR, 2000
Air Quality Regulations, 2000
Air Quality (England) Amendment Regulations, 2002
Local Air Quality Management, Technical Guidance, LAQM. TG(03), Defra, 2003
Design Manual for Roads and Bridges v1.02
Quality of Urban Air Review Group, Third report, DoE, 1996
Transport Assessment conducted by WSP
Quality of Urban Air Review Group, Third report, DoE, 1996
National Air Quality Information Archive (NAQIA) www.airquality.co.uk
Air Quality Strategy Objective Concentrations www.airquality.co.uk/archive/laqm/information.php?info=objectives
Air Quality Limit Values Regulations 2003 www.hmso.gov.uk/si/si2003/20032121.htm
Control of dust from construction and demolition, BRE,2003
Controlling particles, vapour and noise pollution from construction sites Part 1: Pre-project planning and effective management, BRE 2003. Part 2: Site preparation, demolition, earthworks and landscaping, BRE 2003. Part 3: Haulage routes, vehicles and plant, BRE 2003. Part 4: Materials handling, storage, stockpiles, spillage and disposal, BRE 2003. Part 5: Fabrication processes and internal and external finishes, BRE 2003.
Baughan, C.J. (1980) Nuisance from road construction: a study at the A31 Poulner Lane Diversion, Ringwood: TRRL Supplementary Report 562. In: DMRB , 1994
Cherwell District Council website www.cherwell-dc.gov.uk
Air Quality Strategy May 2004, Progress Report, Environmental Health Unit, Cherwell District Council
Air Quality Strategy 2003, Updating and Screening Assessment, environmental Health Unity, Cherwell District Council

Figure 12.2 Data sources and references

Baseline

Desk based assessment

Review and assessment

12.13 Cherwell District Council (CDC) has completed the first round air quality review and assessment. The second round of this review has commenced through the production of CDC's Updating and Screening Assessment (USA). This assessment updates the Stage 1 and Stage 2 review and assessments previously undertaken for all pollutants identified in the Air Quality Regulations. Where a significant risk of exceedence is identified for a pollutant it will be necessary to proceed to a detailed assessment. The USA for Cherwell did not identify any exceedences for pollutants included in the Regulations and therefore the council is not considering any designation of AQMAs.

12.14 Air quality assessments are designed to determine the incremental increases in pollution concentrations at surrounding sensitive receptors that may arise from a proposal. Once calculated, the resulting concentrations are compared with air quality criteria such as the NAQS objectives.

12.15 In order for predictions to be made, it is essential first to understand the current air quality conditions in the vicinity of the proposed site. This is established through a number of key steps, which are:

- determining background concentrations from the National Air Quality Information Archive (NAQIA) for 1km x 1km grid squares provided by Netcen.
- retrieving air quality data from local monitoring programmes
- comparing results with other sources of pollutant monitoring data for verification, such as diffusion tube and automated analyser results.

Netcen data for site background

12.16 The NAQIA is a national database that identifies and predicts air quality concentrations for 1km x 1km grid squares across the UK. These are based on 2001 measured values and they provide values for an array of pollutants and future years. Twelve grid squares were chosen that are representative of the proposed development site's area and the location of identified sensitive receptors. Following the guidance provided in LAQM.TG(03), mapped data were used to calculate NO_2 and PM_{10} concentrations for the current year 2005, and the opening year 2014.

Air quality monitoring

Cherwell District Council's monitoring results

12.17 The second phase of the data gathering process is obtaining sampled air quality data. This assessment uses ambient air quality monitoring data from CDC, which currently undertakes regular NO_2 monitoring at three locations in Bicester.

12.18 The sites are an urban background monitoring site at Tamarisk Gardens (approximately 2.5km north of the site), and roadside monitoring locations at Market Square (approximately 1km east of the site) and Queens Avenue (approximately 0.5km north-east of the site).

Predictive modelling

12.19 Once the monitoring data and background pollutant concentrations have been reviewed, the Design Manual for Roads and Bridges (DMRB 1.02) model is used. The model is a screening tool used to highlight if air quality is likely to be significantly affected and hence determine if any further detailed assessment is required with more sophisticated predictive tools.

12.20 The DMRB is used for predicting air quality concentrations that result from changes in traffic flow and composition. Its calculations are derived from input data such as sensitive receptor location, distance from busy roads or junctions and composition of traffic, such as percentage of HGV vehicles. The air quality input data comprise background concentrations from the year of interest, such as those determined by NAQIA in the desk-top assessment.

12.21 By its nature the DMRB screening model tends to overestimate its predictions, therefore in order to obtain predictions that are more in line with sampled data, a model validation process is usually undertaken especially if predicted concentrations are close to the NAQS objective limits.

12.22 The validation of the DMRB predictions is carried out by comparing the findings with ratified monitoring data such as diffusion tube monitoring data from the local authority. If the model uses the 1km x 1km background Netcen data (NAQIA data) from 2005 and includes current traffic data from the 2005 traffic assessment, the 'predicted values' should correspond with the ratified 2005 diffusion tube sampled data and therefore represents the 'current baseline' scenario. The difference between the diffusion tube data and the DMRB prediction and represents a factor by which further findings of the DMRB should be multiplied.

12.23 No additional diffusion tube monitoring was considered necessary for this assessment because:

- no AQMA has been declared or is likely to be declared by CDC
- data from CDC showed low concentrations of NO_2 and PM_{10} at roadside monitoring points
- the traffic assessment showed only small increases in traffic flows.

12.24 Figure 12.3 shows the sources of input data utilised in this DMRB screening assessment.

Data and source of guidance	Air quality field concentrations	Traffic	Receptor information and identification
Diffusion tubes monitoring carried out by CDC	√	-	-
Site and desktop surveys	-	-	√
LAQM Technical Guidance	-	-	√
1km x 1km grid background mapped netcen data (Air Quality Information Archive)	√	-	-
Transport Assessment for SW Bicester development proposals (WSP 2005)	-	√	-

Figure 12.3 Sources of DMRB v1.02 data inputs

Construction dust assessment

12.25 The prediction of dust emissions generated during construction is very imprecise. Therefore, it is common practice to provide a qualitative assessment based on experience elsewhere, and to focus on mitigation measures to minimise emissions. The qualitative assessment of the impacts associated with dust releases during the construction phase has been undertaken using guidance published by the Building Research Establishment (BRE) in 2003. Within this guidance, a range of absolute values and incremental values over existing dust deposition rates are described; values of between two and three times the baseline deposition rate are recommended as being the trigger for a nuisance complaint.

12.26 Dust comprises particles of material of between 1 and 75μm (microns) in diameter. The heavier >30μm fraction is commonly regarded as dust and due to their larger mass, the particles do not remain suspended for long periods. The distance travelled by suspended dust depends on many factors. However, the majority of dust will be deposited in the area immediately surrounding the source (within 100m). The slightly smaller fraction (10μm to 30μm) may travel up to 500m and the smallest fraction (and smallest percentage of the total dust) <10μm can travel up to a kilometre. Due to the wide range of conditions in which construction activities may occur, the use of an absolute value limit is difficult to determine and is considered inappropriate. Therefore an increase over the baseline deposition rate has been adopted as the most appropriate criterion for the purposes of this assessment.

12.27 To assist with the qualitative assessment, it has been assumed that the zone of potential effects generated by un-abated dust emissions during construction is limited to within 100m of the proposed development site. For this reason, the assessment has focused on receptors within 100m of the following construction activities:

- soil excavation and earth removal
- preparation of the building foundations
- movement of HGVs over exposed soil.

12.28 The assessment has addressed the following scenarios:

- current baseline 2005
- future baseline 2014 (without development)
- 2014 scenario (with development).

Sensitivity of receptor

12.29 Technical guidance document (LAQM.TG(03)) describes in detail typical locations where consideration should be given to pollutants defined in the NAQS. Generally, the guidance suggests that all locations 'where members of the public are regularly present' should be considered. At such locations, members of the public will be exposed to air pollution over the time that they are present, and the most suitable averaging period of the pollutant needs to be used for the assessment.

12.30 For instance, on a footpath, where exposure will be transient (for the duration of passage along that path) comparison with short-term standard (i.e. 15-minute mean or 1-hour mean) may be relevant. In a school, or adjacent to a private dwelling, however, where exposure may be for longer periods, comparison with a long-term (such as 24-hour or annual mean) standard may be most appropriate. In general terms, long-term standards are lower than short-term standards owing to the chronic health effects associated with exposure to low level pollution for long periods of time.

Assessment of significance

12.31 The significance of potential air quality effects has been determined from a two-stage process developed by Terence O'Rourke, which incorporates criteria from best practice techniques and expert knowledge. Effect significance is derived from measures of the sensitivity (or importance) of the receptors potentially affected and the magnitude (or scale) of effect.

12.32 The first stage requires the sensitivity of the potentially affected receptors and the magnitude of change to be determined. The categories for the sensitivity of receptors and the magnitude of changes are defined in figures 12.4 and 12.5 respectively. There are no known published standard criteria for determining the significance of air quality effects. NAQS objectives for NO_2, PM_{10} and the BRE recommended threshold for changes in dust deposition rates are used as a guide in this assessment.

12.33 Figure 12.4 categorises the sensitivity of the different air quality and dust receptors between high, medium, low and negligible, depending on their characteristics. Figure 12.5 represents both the changes to the local air quality and dust emissions. The first two rows in figure 12.5 represent changes in air pollutants, taking into account the changes in the baseline and the air quality capacity. The air quality capacity represents the proximity of the baseline levels to the AQS objectives. The third row reflects the magnitude of change in dust that could constitute a nuisance.

12.34 The second stage involves comparing the measures of magnitude and sensitivity to determine the potential significance. In determining whether an effect on a receptor is significant, reference has been made to a range of criteria relating to the nature of the receptors and the predicted magnitude of change. The significance of an effect is determined by comparing the two measures with the determination of significance matrix figure 12.6.

Baseline

Sources of air pollution

12.35 This assessment focuses on the effect of the proposal on the existing baseline local air quality. In order to determine current and future baseline concentrations, it is important to identify the different sources of air pollution within the area, which are likely to affect the site and surrounding sensitive receptors. Existing sources are separated into two types: industrial and non-industrial activities.

Industrial source

12.36 There are no industrial sources of air pollution that may influence the ambient air quality on the proposed site.

Non-industrial sources

12.37 The main non-industrial source of air pollution around the site consists of traffic and transport-related emissions. The busiest road near the site is the A41, which forms part of the route from the city centre south-west out of town. This A-road will form a junction with two of the site access roads. The other road that will provide access to the site is Middleton Stoney Road, which borders the northern limit of the site.

12.38 The south-western part of the site lies approximately 1km from the M40 motorway. Motorways, due to the large number of vehicles they carry, will influence the air quality within this distance. This motorway is the largest contributor of air contaminants in the vicinity of the site and therefore has a significant effect on the background air quality levels used in this assessment.

Proposal-related sources

12.39 The construction phase will contribute to local emissions through heavy construction vehicles travelling to and from the site and the movement of heavy vehicles on site. The contribution will be in the form of NO_2, PM_{10} and fugitive dust. The last is likely to constitute the largest contribution during this phase if suitable mitigation and adequate dust suppression measures are not implemented.

12.40 The post-construction phase is likely to have a greater influence on air quality in Bicester and the immediate vicinity of the site, through vehicles associated with up to 1,585 new residential dwellings, schools, and other community amenities.

Sensitivity of receptors

12.41 The potential air quality effects expected to arise from the proposals were examined separately for the construction and operational phases. Sensitive receptors were identified within the vicinity of the proposed development site following guidance as set out in LAQM.TG4(00).

Construction

Dust deposition

12.42 Large particulate matter (>30μm) from unmitigated construction works has an airborne range of approximately 100m (ODPM 2003). This zone represents a potential worst-case pre-mitigation scenario. The receptors within this area include the following:

- the residential properties along the A4030
- the playing fields to the north west of the site
- the service station on the A41 (west of roundabout)
- Pingle Brook.

12.43 The residential receptors are considered to have a high sensitivity to dust loadings, due to the amount of time spent by residents at the premises and outside.

12.44 The playing fields and the service station on the A41 are considered to have a negligible to low sensitivity to dust loadings given the short duration of the time the public may be exposed, and the temporary nature of any elevated dust levels.

12.45 Many potential secondary effects are attributable to dust deposition in small surface water bodies. The severity of the effects depends largely on the amount of dust suspended and the dimensions and flow rates of the water body. Dust deposition can cause turbidity, which in turn reduces light penetration and can have a detrimental effect on riparian and aquatic fauna and flora, and ultimately water quality. According to figure 12.4, receptor sensitivity is dependent upon the type of habitats they provide and the degree of geographic importance of the species within them. Pingle Brook is considered to have a negligible to low sensitivity as this stream is of local importance.

Construction traffic

12.46 The construction traffic at the proposed site may have effects on air quality at certain roadside receptors. The proposed delivery and construction vehicle routes to the site will determine the extent of these effects. Routing will be planned in order to minimise any potential disruption to new and existing communities.

12.47 The traffic chapter of this ES should be reviewed for further details, however, it is envisaged that the initial stage of construction will require a haul road from the site accessing Middleton Stoney Road, while the latter stages will access the site from the A41. There will be some access requirements at an additional point on Middleton Stoney Road, which lies just west of the Villiers Road junction. This small access will be required for construction of a small number of residential dwellings. This will also be an access point during the post-construction phase. The residential properties along the A41, and both east and west of the Villiers Road junction on Middleton Stoney Road have been identified as sensitive receptors of high sensitivity during this phase.

12.48 Bicester Town community football ground has also been identified as a receptor of medium sensitivity due to its location on the corner of the A4030 and the A41. The football ground is considered to have a medium sensitivity to change, due to the relatively short duration of exposure that members of the public may experience.

12.49 The service station on the western side of the roundabout on the A41 will be influenced by changes in traffic flows along this dual carriageway. The relative exposure to members of the public is likely to be short, and therefore the receptor is attributed a negligible to low sensitivity to changes in air quality.

Post-construction

12.50 Those roadside receptors identified in the construction phase are also relevant for this phase. In addition to these, receptors adjacent to routes that access the centre of Bicester, such as King's End and Queens Avenue, have been included. Those selected are residential properties, with a high sensitivity to changes in air quality. The Bicester Community Hospital is also located along this section of the local highway network and is considered to have a high sensitivity to changes in air quality.

12.51 A caravan park east of the A41 has been attributed a medium sensitivity. This is due to its relatively short distance from the busy dual carriageway and the likelihood of increases in traffic flows along this route.

12.52 Sensitive receptors to the south west of the site have been include, due to the predicted changes in future transport movements that will result from the proposal. The residential dwellings and Chesterton Church of England primary school have therefore been included in the assessment as they are directly adjacent to the main road through Chesterton. These, and Bignell Lodge located on the A4095, are identified as receptors with high sensitivity to changes in air quality.

12.53 All receptors identified above and the phase and pollutant to which they are sensitive, are outlined in figure 12.7. Their positions in relation to the proposed site is shown on figure 12.8.

Receptor	Type of air pollutant			Sensitivity
	Dust	PM_{10}	NO_2	
R1: Residential properties along Middleton Stoney Road.	✓ C	✓ C/PC	✓ C/PC	High
R2: Services at west roundabout on A41 (Oxford Road)	✓ C	✓ C/PC	✓ C/PC	Low - negligible
R3: Bicester Town Community Football Club	✓ C	✓ C/PC	✓ C/PC	Medium
R4: Bicester Community Hospital, King's End	-	✓ PC	✓ PC	High
R5: Bignell Lodge residential property on A4095 west of the site	-	✓ C/PC	✓ C/PC	High
R6: Residential properties on Queens Avenue	-	✓ PC	✓ PC	High
R7: Residential properties on thoroughfare in Chesterton, Alchester Road	-	✓ C/PC	✓ C/PC	High
R8: Caravan site to south-east adjacent to A41 (Oxford Road)	-	✓ C/PC	✓ C/PC	Medium
R9: Chesterton Church of England Primary School	-	✓ PC	✓ PC	High
R10: Residences on Shakespeare Drive	-	✓ PC	✓ PC	High
R11: Pingle Brook, north-east surface water	✓ C	-	-	Low - negligible
C = construction phase PC = post construction phase				

Figure 12.7 Importance / sensitivity of receptors

Local air quality

12.54 The baseline information for this assessment has been derived from two different sources. These sources are:

- Netcen background air quality concentration data obtained from the NAQIA
- field data from Cherwell council diffusion tube monitoring programme.

12.55 In order to provide a robust assessment of air quality at the site, the Netcen background data have been used primarily for the predictive work, with the CDC monitoring data used for indicative comparisons.

Netcen data

Current baseline

12.56 The data provided by Netcen for the NAQIA form the starting point for this assessment. They present predicted background levels of various pollutants at 1km x 1km grid squares across the UK. 'Background' is defined as ambient pollutant concentrations that do not include the influence of specific traffic-related emissions.

12.57 Figure 12.9 shows the 12, 1km x 1km grid squares that are considered representative of the proposed development's location. Alongside these grid squares are concentrations for each of the pollutants examined in this assessment. 2005 represents the current year and 2014 the opening year of the proposal.

12.58 The progressive decrease in background concentration with time is attributed to expected improvements in fuel and fuel-efficiency technology for the automobile industry.

Diffusion tube monitoring programme

NO_2

12.59 A summary of the CDC NO_2 diffusion tube monitoring results is shown in figure 12.10. The results show fluctuating concentrations of NO_2 across the four years of monitoring, with those for 2005 dropping from 2004 and staying below the NAQS objective limit of 40μg/m^3.

Location	2002*	2003*	2004	2005*
Market Place (roadside results)	32.8	35.6	34.6	28.7
Queens Avenue (roadside results)	35.7	41.4	32.4	29.7
Tamarisk Gardens (background)	20.8	22.1	20.4	18.4
Queens Avenue Automatic analyser	-	-	-	not available at time of writing
NAQS objective 40μg/m^3 (31/12/05) * indicative results only as mean includes some missing data				

Figure 12.10 Annual mean adjusted field sampling results from CDC NO_2 survey for comparison with AURN sampling data. (μg/m^3).

12.60 The Queens Avenue monitoring location is of particular interest to this assessment as it represents the closest monitoring position to the proposed site. However, the fact that it

represents a roadside position (a distance of 3m to the road's centre) means that it shows a worst case in terms of air quality and therefore should only be used as an indicative comparison to the modelled data.

PM_{10}

12.61 The council does not undertake any PM_{10} monitoring within Bicester. However, there are no point sources of PM_{10} pollution on or near the site or within the proposal itself. The main contributions are expected to be from the traffic travelling on the local road network, with background levels being influenced by the M40 motorway to the west.

Dust

12.62 The BRE guidance document provides mean background dust deposition rates for 'outskirts' of towns of 59mg/m^2/day. This is considered representative of the south west Bicester site, and has therefore been taken as the baseline dust concentration for the site in the absence of specific dust monitoring.

Future baseline

12.63 The predicted baseline concentrations represent those that are expected in future years in the absence of the proposals. In the impact analysis of air quality, this parallel assessment of 'with development' and 'without development' enables a clear indication to be given of the effect that the proposed development will have on ambient air quality at the sensitive receptors.

12.64 The data in figure 12.9 provided by Netcen for the NAQIA provided a valuable stage in this assessment. The progressive decrease in background concentration is attributed to expected improvements in fuel and fuel-efficiency technology for the automobile industry. These data are inputted into the DMRB model with the predicted traffic increase for that year, the output results from the model represent concentrations for the future baseline (without development scenario) as shown in figure 12.11.

12.65 The baseline scenarios represent the ambient concentrations for the designated pollutants without the development proposals being constructed. Figure 12.11 shows a distinct trend of falling concentrations for NO_2 and PM_{10}.

12.66 The monitoring conducted by CDC on Queens Avenue represents a roadside location and therefore a 'worst-case' concentration for the location. The sensitive receptors chosen for this air quality assessment, particularly receptor 4 (hospital) and receptor 6 (residences) are 9m and 13m from the centre of the road respectively, and therefore not directly comparable to the findings of CDC.

Sensitive receptors	NO_2		PM_{10}	
	2005	2014	2005	2014
R1	25.1	19.3	19.4	18.0
R2	28.2	21.2	20.3	18.4
R3	30.2	22.7	21.6	19.0
R4	34.3	24.9	23.7	19.4
R5	27.2	20.5	19.2	17.8
R6	32.8	23.9	23.1	19.2
R7	26.2	19.8	19.0	17.8
R8	29.7	22.0	20.7	18.5
R9	25.7	19.5	18.8	17.7
R10	26.3	20.0	19.1	17.9

Figure 12.11 Baselines without development for all years of assessment as determined by the DMRB v1.02 air quality screening model (results in $\mu g/m^3$)

12.67 The CDC concentration recorded at Queens Avenue for 2005 was 29.7$\mu g/m^3$, whilst those for receptors 4 and 6 shown in figure 12.11 were predicted marginally higher with 34.3$\mu g/m^3$ and 32.8$\mu g/m^3$ respectively. This difference shows that the DMRB does overestimate its predictions. When used as a screening tool, the DMRB's overprediction is acceptable, provided that the predicted concentrations are comfortably within the NAQS objective limits.

Potential effects

Construction

Traffic

12.68 Construction phase traffic movements are generated by delivery of plant, machinery, construction materials, and the removal of any waste that will not be reused on site.

12.69 The construction traffic movements set out in the traffic chapter of this ES show that the percentage increase in transport movements is negligible and will not significantly contribute to traffic volumes or traffic emissions, relative to the surrounding road network. As a result, the subsequent potential effects on sensitive receptors due to changes in ambient concentrations of NO_2 and PM_{10} are considered negligible.

Dust

12.70 Based on the generic estimates of baseline deposition rates presented in the BRE guidance, the significance criterion adopted for deposition rates that might lead to complaints of annoyance is in the order of twice the baseline deposition rate. A trigger range of 118 $mg/m^2/day$ is proposed as the limit over which significant adverse effects might occur.

12.71 The sensitivity of receptors identified in figure 12.7 to dust deposition ranges from negligible to high. As the proposals are likely to give rise to a negligible change in magnitude of dust deposition, the significance of effect on these sensitive receptors can also be considered to be negligible.

Post-construction

Traffic

NO_2

12.72 NO_2 does not have a relevant NAQS objective concentration beyond 2005; however, figure 12.12 shows that the 2005 limit of 40µg /m^3 was not breached for any of the results determined by the DMRB model.

12.73 The proposals include modification of the existing local transport network, which will re-route some existing traffic away from current hotspots. The transport chapter should be consulted for further details, but for the purposes of the air quality assessment the reduction in predicted traffic volumes along the Oxford Road and the A4095 will improve the local NO_2 pollutant concentrations.

2014 NO_2				
Sensitive receptor	Baseline	With development	% change (absolute)	% change in remaining NAQS objective capacity
R1	19.3	19.5	1.4	1.3
R2	21.2	21.9	3.5	3.9
R3	22.7	23.3	2.6	-3.4
R4	24.9	24.4	-2.0	-3.2
R5	20.5	20.0	-2.2	-2.3
R6	23.9	23.5	-1.9	-2.8
R7	19.8	19.9	0.3	0.3
R8	22.0	22.3	1.5	1.9
R9	19.5	19.6	-0.4	0.4
R10	20.0	20.2	1.0	1.0

Figure 12.12 Resulting NO_2 change between baseline and 'with development' scenario for 2014 (concentrations in µg/m^3).

12.74 All 'absolute percentage' changes shown in figure 12.12 were below 10% and therefore negligible in accordance with figure 12.5. A negligible change in magnitude means that no significant effects are predicted.

12.75 The 'percentage change in remaining capacity', which represents the change in remaining 'headspace' between the baseline and the NAQS objective limit, showed a less than 10% difference and therefore negligible in magnitude; no significant effects are predicted.

PM_{10}

12.76 In 2010 the NAQS objective concentrations for PM_{10} are provisionally set at 20µg/m^3. No limit is applied for years beyond 2010 so this limit is be used in this assessment. The results presented in figure 12.13 show a decrease in concentrations for four of the ten receptors identified, with none exceeding this provisional limit.

12.77 Those receptors that experience the largest change in pollutant concentration are receptors R4 and R6. The 'absolute percentage change' above the baseline for all receptors was of negligible magnitude; the largest change to be experienced was by R4 with an improvement of 0.7%.

12.78 The predicted 'percentage change in remaining capacity' for PM_{10} was greatest for R3, R4, and R6 with 13%, 25% and 15% change respectively. The magnitude of change is considered small for these receptors in accordance with figure 12.5. R4 and R6 show a small decrease in PM_{10} concentrations while R3 shows a small increase. When the small magnitude of change is combined with the high sensitivity of the receptor it results in a moderate significance of effect as set out in figure 12.6.

12.79 These results however, should be interpreted with caution, the absolute change is considered a better guide in this case to reflect the impact on the receptor because all receptors are predicted to experience a change of less than 1%.

2014 PM_{10}				
Sensitive receptor	Baseline	With development	% change (absolute)	% change in remaining NAQS objective capacity
R1	18.0	18.0	-0.1	-0.5
R2	18.4	18.4	0.4	4.2
R3	19.0	19.2	0.7	13.4
R4	19.4	19.3	-0.7	-25.5
R5	17.8	17.8	-0.4	-3.3
R6	19.2	19.1	-0.6	-14.8
R7	17.8	17.8	0	0
R8	18.5	18.6	0.4	5.5
R9	17.7	17.7	0	0
R10	17.9	17.9	0.2	1.9
Note R1,R3,R5,R7,R9 and R10 show no difference between baseline and 'with development' concentrations, this is due to rounding, the calculated % changes incorporate the 2nd decimal place in their calculations.				

Figure 12.13 Resulting PM_{10} change between baseline and 'with development' scenario for 2014 (concentrations in $\mu g/m^3$).

12.80 If the 'absolute percentage change' in NO_2 and PM_{10} concentration is used to guide the interpretation of the assessment, then the negligible change in magnitude results in negligible significance of effects for each of the sensitive receptors. The predicted concentrations of NO_2 are well below the limit of $40\mu g/m^3$ while for PM_{10} they are below but close to the provisional limit of $20\mu g/m^3$. Despite this close proximity for PM_{10}, it is concluded that the resulting predicted significance of effects should remain as negligible. This is because of the following factors:

i. The DMRB model is a screening model and tends to overestimate in its predictions, therefore actual concentrations in 2014 are more likely to be lower than those presented here.

ii. There is no regulatory concentration for PM_{10} in the opening year of the proposal. The 2010 limit used here is provisional only and requires further review. Currently there would be no regulatory action required if the 20μg/m^3 was indeed breached.

iii. The largest changes represent improvements in air quality at the relevant receptors, due to the modifications of the road network, the change in routing, speeds of vehicles.

Mitigation

Construction

Dust

12.81 It is not considered likely that the construction activities as proposed will give rise to significant daily dust deposition once dust suppression mitigation measures have been employed (figure 12.14).

12.82 The mitigation measures shown in figure 12.14 have been taken from the BRE guidance documents noted in figure 12.2. Measures are set out for the suppression of dust through five phases of construction practices:

- pre-project planning
- site preparation, demolition, earthworks and landscaping
- haulage routes, vehicles and plant
- materials handling storage, stockpiles, spillage and disposal
- fabrication processes and internal / external finishes.

12.83 The documents draw their recommendations from cases where the techniques have been found to be effective, though it is acknowledged that they have not been validated under controlled conditions.

Completed earthworks shall be covered or vegetated as soon as is practicable.
Vehicles carrying loose aggregate and workings shall be sheeted at all times.
Slopes of stockpiles and mounds must be at an angle no greater than the natural angle of repose of the material, the stockpiles / mounds must not have sharp changes in shape.
Short-term storage mounds and stockpiles may be enclosed or kept under sheeting. Prevention of wind borne dust from these mounds may also be achieved through suitable and sufficient water sprays, wind barriers, protective fences of similar size and height to the mound.
Design controls for construction equipment and appropriately designed vehicles for materials handling shall be used.
Suitable wetting of soil surfaces shall be carried out during the earth moving activities on the proposed development site to minimise soil loss through airborne dust, this may be done through the use of a water bowser, or static sprinklers. Early hard surfacing of internal roads will also aid in minimising dust re-suspension on site.
Regular inspection and, if necessary, cleaning of local highways and site boundaries, to check for dust deposits shall be carried out (and dust removed if necessary).
Wheel-washing devices shall be used at the proposed development site exits to minimise transfer of dust and particulate material onto surrounding highways.
All construction plant and equipment shall be maintained in good working order and not left running when not in use.
No unauthorised burning of any material shall be carried out anywhere on the proposed development site
Construction vehicle access arrangements shall be designed to avoid sensitive streets or narrow, congested roads.
Material deliveries and vehicle access to the proposed development sites shall be timed to avoid the need to queue outside the site prior to opening or whilst other deliveries are completed.
Timing and phasing of construction activities plus contact details of relevant offices shall be published, to facilitate the raising of concerns should they arise.

Figure 12.14 Construction dust mitigation measures

12.84 Close liaison with CDC will be maintained throughout the construction phase, in order to facilitate awareness and to deal with complaints should they arise.

Post-construction

12.85 Modification of the local transport network, changes to vehicle speeds and traffic composition that form part of the proposals, result in an improvement in air quality for four of the ten sensitive receptors identified in this assessment. All absolute changes in both NO_2 and PM_{10} concentrations were found to be negligible and no mitigation measures for the post-construction period are considered necessary.

Residual effects

12.87 No residual effects for air quality are predicted to result from this development.

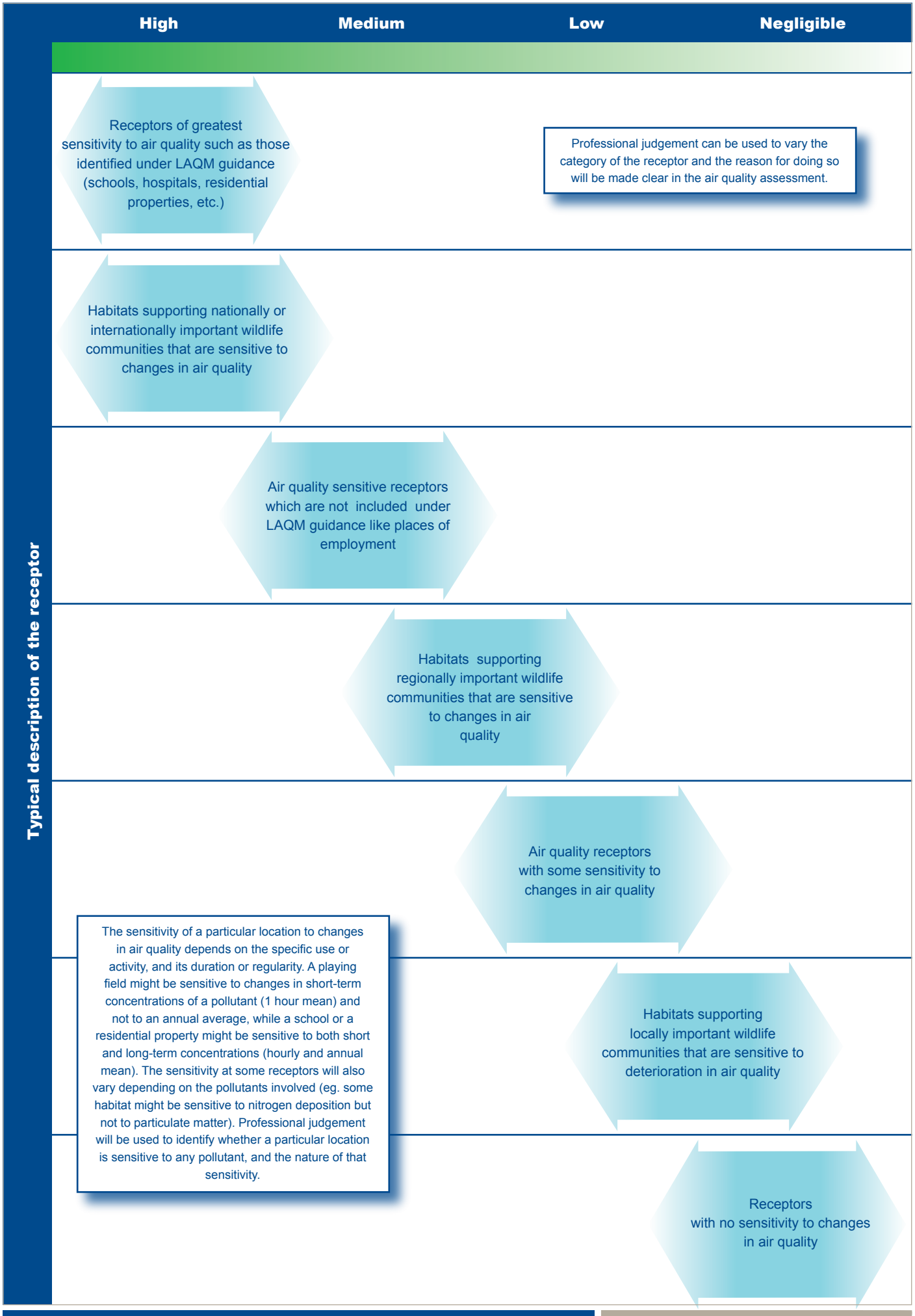


Figure 12.4 Air quality: sensitivity or importance of receptor

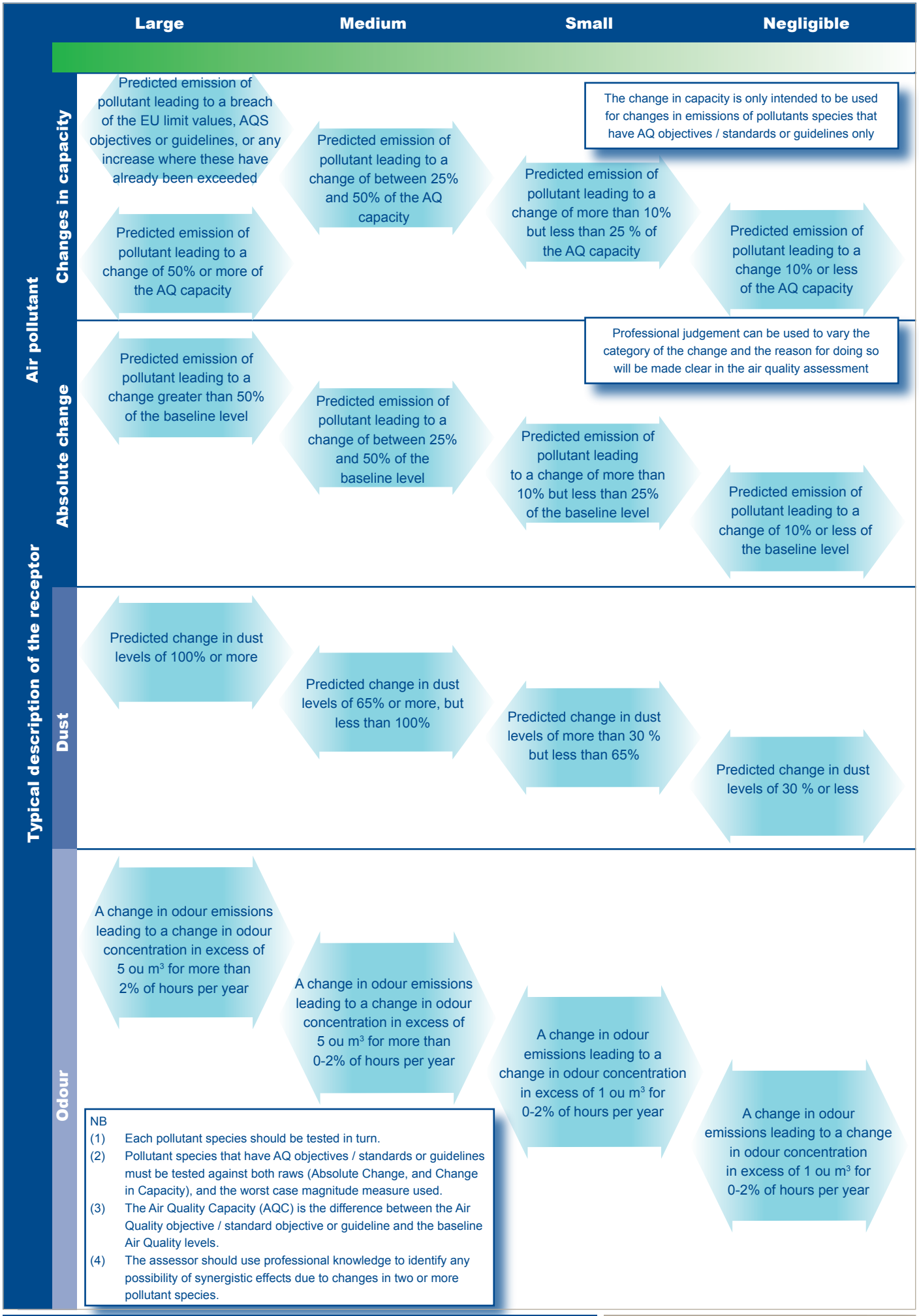
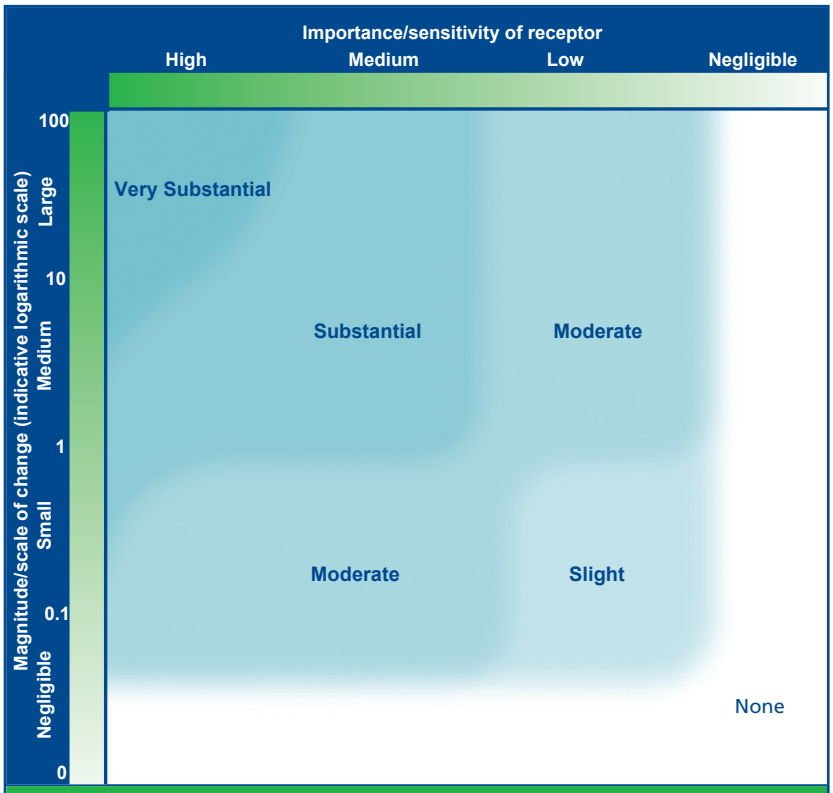


Figure 12.5 Air quality: magnitude of change



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