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9.1 INTRODUCTION

9.1.1 This report has been prepared by Air Quality Consultants Ltd on behalf of Haymarket Media Group. This report describes the potential air quality impacts associated with the proposed residential development site on Broom Road in the London Borough (LB) of Richmond upon Thames.

9.1.2 The proposed development will include the erection of part four/part five/part six/part seven storey buildings to provide residential flats, erection of 12 three storey houses to Broom Road frontage and the use of Weir Cottage for residential purposes. It lies within an Air Quality Management Area (AQMA) declared by the LB of Richmond upon Thames for exceedences of the annual mean objectives for nitrogen dioxide and PM_{10} and the 24-hour mean objective for PM_{10}.

Scope of Assessment

9.1.3 The development will result in a change to traffic on the local roads, which may impact on air quality at existing residential properties. The new residential properties will also be subject to the impacts of road traffic emissions from the adjacent road network. The main air pollutants of concern related to traffic emissions are nitrogen dioxide and fine particulate matter (PM_{10} and $PM_{2.5}$).

9.1.4 There is also the potential for the construction activities to impact upon both existing and new properties. The main pollutants of concern related to construction activities are dust and PM_{10}.

9.1.5 This report describes existing local air quality conditions (2012), and the predicted air quality in the future assuming that the proposed development does, or does not proceed. The assessment of traffic-related impacts focuses on 2016, which is the anticipated year of opening. The assessment of construction dust impacts focuses on the anticipated duration of the works.

9.1.6 This report has been prepared taking into account all relevant local and national guidance and regulations, and follows a methodology agreed with the LB of Richmond upon Thames.

Data Collection Methodology

Consultation

9.1.7 The assessment follows a methodology agreed with the LB of Richmond upon Thames via a telephone discussion between John Coates (Special Protection Officer at LB of Richmond upon Thames) and Caroline Odbert (Air Quality Consultants) held on 10 October 2013 and subsequent emails with Carol Lee (Special Protection Officer at LB of Richmond upon Thames) on the 11 and 15 October 2013.

Existing Conditions

9.1.8 Existing sources of emissions within the study area have been defined using a number of approaches. Industrial and waste management sources that may affect the area have been identified using Defra's Pollutant Release and Transfer Register (Defra, 2013a) and the Environment Agency's website 'what's in your backyard' (Environment Agency, 2013). Local sources have also been identified through discussion with the LB of Richmond upon Thames's Special Projects Team, as well as through examination of the Council's Air Quality Review and Assessment reports.

9.1.9 Information on existing air quality has been obtained by collating the results of monitoring carried out by the local authority. This covers nearby sites used to provide context for the assessment. The background concentrations across the study area have been defined using the national pollution maps published by (Defra, 2013b). These cover the whole country on a 1x1 km grid.

Road Traffic Impacts

Sensitive Locations

9.1.10 Concentrations of nitrogen dioxide, PM_{10} and $PM_{2.5}$ have been predicted at a number of locations both within, and close to, the proposed development. Receptors have been identified to represent worst-case exposure within these locations. When selecting these receptors, particular attention has been paid to assessing impacts close to junctions, where traffic may become congested, and where there is a combined effect of several road links. The receptors have been located on the façades of the properties closest to the sources.

9.1.11 Eighteen existing residential properties have been identified as receptors for the assessment. An additional nine receptor locations have been identified within the new development, which represent exposure to existing sources. These locations are described in Table 9.1 and are shown in Figure 9.1. In addition, concentrations have been modelled at the diffusion tube monitoring sites located at Strawberry Vale (Tube 8) and High Street Teddington (Tube 45), in order to verify the modelled results (see Appendix 9.1 for verification method).

Table 9.1: Description of Receptor Locations

Receptor	Description
Existing Properties	
Receptor 1	17 Broom Road
Receptor 2	1 Broom Road
Receptor 3	7 Ferry Road
Receptor 4	1 Kingston Road
Receptor 5	1 Ferry Road
Receptor 6	6 Broom Road
Receptor 7	5-8 Barons Court
Receptor 8	76 Broom Road
Receptor 9	42 St. Winifreds Rd
Receptor 10	1 St. Winifreds Rd
Receptor 11	84 Manor Road
Receptor 12	69 Manor Road
Receptor 13	2 Manor Road
Receptor 14	23-44 High Street
Receptor 15	163 High Street
Receptor 16	128-130 High Street
Receptor 17	118 Kingston Road
Receptor 18	Anchorage Boathouse
Proposed Receptors	
Receptor A	Proposed Houses E1-E2 (Ground to Second Floor)
Receptor B	Proposed Houses E5-E6 (Ground to Second Floor)
Receptor C	Proposed Houses E7-E8 (Ground to Second Floor)
Receptor D	Proposed Houses E11-E12 (Ground to Second Floor)
Receptor E	Proposed Flat Block D (Ground to Third Floor)
Receptor F	Weir Cottage (Ground and First Floor)
Receptor G	Proposed Flat Block C (Ground to Fifth Floor)
Receptor H	Proposed Flat Block A (Ground to Third Floor)
Receptor I	Proposed Flat Block B (Ground to Sixth Floor)

Assessment Scenarios

9.1.12 Predictions of nitrogen dioxide, PM_{10} and $PM_{2.5}$ concentrations have been carried out for a base year (2012), and the proposed year of opening (2016). For 2016, predictions have been made assuming both that the development does proceed (With Scheme), and does not proceed (Without Scheme). A further 2016 sensitivity test has been carried out for nitrogen dioxide that involves assuming no reduction in emission factors for road traffic from the baseline year. This is to address the issue identified by Defra (Carslaw et al., 2011) that road traffic emissions have not been declining as expected (see later section on uncertainty). Nitrogen dioxide concentrations in 2016 are thus presented for two scenarios: 'With Emissions Reduction' and 'Without Emissions Reduction'.

9.1.13 In addition, a further scenario has been included to predict annual mean concentrations of nitrogen dioxide, PM_{10} and $PM_{2.5}$, as well as days with PM_{10}> 50 $\mu g/m^3$ for a baseline scenario "Without the studios".

Modelling Methodology

9.1.14 Concentrations have been predicted for the baseline and future year using the ADMS-Roads dispersion model. Details of the model inputs and the model verification are provided in Appendix 9.1, together with the method used to derive current and future year background nitrogen dioxide concentrations.

Construction Impacts

Sensitive Locations

9.1.15 Locations sensitive to dust emitted during construction will be places where members of the public are regularly present. Residential properties and commercial operations close to the site will be most sensitive to construction dust.

Assessment Approach

9.1.16 It is very difficult to quantify emissions of dust from construction activities. It is thus common practice to provide a qualitative assessment of potential impacts, making reference to the assessment criteria set out in Appendix 9.2.

9.2 POLICY CONTEXT

National Planning Policy

9.2.1 The Air Quality Strategy published by the Department for Environment, Food, and Rural Affairs (Defra) provides the policy framework (Defra, 2007) for air quality management and assessment in the UK. It sets out air quality standards and objectives for key air pollutants, which are designed to protect human health and the environment. It also sets out how the different sectors: industry, transport and local government, can contribute to achieving the air quality objectives. Local authorities are seen to play a particularly important role. The strategy describes the Local Air Quality Management (LAQM) regime that has been established, whereby every authority has to carry out regular reviews and assessments of air quality in its area to identify whether the objectives have been, or will be, achieved at relevant locations, by the applicable date. If this is not the case, the authority must declare an Air Quality Management Area (AQMA), and prepare an action plan which identifies appropriate measures that will be introduced in pursuit of the objectives.

9.2.2 The National Planning Policy Framework (NPPF) (NPPF, 2012) introduced in March 2012 now sets out planning policy for the UK in one place. It replaces the majority of the previous Planning Policy Statements, including PPS23 on Planning and Pollution Control. The NPPF contains advice on when air quality should be a material consideration in development control decisions. Existing, and likely future, air quality should be taken into account, as well as the EU limit values or national objectives for pollutants, the presence of any AQMAs and the appropriateness of both the development for the site, and the site for the development.

9.2.3 The NPPF places a general presumption in favour of sustainable development, stressing the importance of local development plans, and states that the planning system should perform an environmental role to minimise pollution. One of the twelve core planning principles notes that planning should "contribute to…reducing pollution". To prevent unacceptable risks from air pollution, planning decisions should ensure that new development is appropriate for its location. The NPPF states that the effects of pollution on health and the sensitivity of the area and the development should be taken into account.

9.2.4 The need for compliance with any statutory air quality limit values and objectives is stressed, and the presence of AQMAs must be accounted for in terms of the cumulative impacts on air quality from individual sites in local areas. New developments in AQMAs should be consistent with local air quality action plans.

Regional Planning Policy

The London Plan

9.2.5 The London Plan 2011 (GLA, 2011) sets out the spatial development strategy for London. It brings together all relevant strategies, including those relating to air quality.

9.2.6 Policy 7.14, 'Improving Air Quality', addresses the spatial implications of the Mayor's Air Quality Strategy and how development and land use can help achieve its objectives. It recognises that Boroughs should have policies in place to reduce pollutant concentrations, having regard to the Mayor's Air Quality Strategy. Further details of the London Plan in relation to planning decisions are provided in Appendix 9.3.

The Mayor's Air Quality Strategy

9.2.7 The revised Mayor's Air Quality Strategy (MAQS) was published in December 2010 (GLA, 2010). The overarching aim of the Strategy is to reduce pollution

concentrations in London to achieve compliance with the EU limit values as soon as possible. The Strategy commits to the continuation of measures identified in the 2002 MAQS, and sets out a series of additional measures. These additional measures and the role of the Low Emission Zone are described in Appendix 9.3.

Local Planning Policy

Local Transport Plan

9.2.8 The LB of Richmond upon Thames Second Local Implementation Plan for Transport (London Borough of Richmond upon Thames, 2011) includes two objectives that relate to air quality:

"Objective 2. To improve the local environment and quality of life for all residents of Richmond; and

Objective 4. Enhancing transport choice and reducing congestion"

Local Policies

9.2.9 The LB of Richmond upon Thames Core Strategy (London Borough of Richmond upon Thames, 2009) was adopted in April 2009, and within this there is one policy which refers to air quality. Policy CP1 for Sustainable Development states:

"1.D Reducing environmental impact

…Local environmental impacts of development with respect to factors such as noise, air quality and contamination should be minimised".

Air Quality Action Plan

9.2.10 The LB of Richmond upon Thames has declared an AQMA for exceedences of the annual mean nitrogen dioxide and PM_{10} objectives and the 24-hour mean

PM_{10} objective, which covers the whole Borough. The Council has since developed an Air Quality Action Plan (London Borough of Richmond upon Thames, 2000). This focuses on measures to be adopted at three different levels: London wide, Borough wide and locally and includes measures to encourage travel choice to reduce emissions and encourage use of public transport, manage HGV movements, encourage the use of alternative fuel vehicles and traffic management policies. The LB of Richmond upon Thames is currently in the process of updating its Air Quality Action Plan.

Assessment Criteria

Health Criteria

9.2.11 The Government has established a set of air quality standards and objectives to protect human health. The 'standards' are set as concentrations below which effects are unlikely even in sensitive population groups, or below which risks to public health would be exceedingly small. They are based purely upon the scientific and medical evidence of the effects of an individual pollutant. The 'objectives' set out the extent to which the Government expects the standards to be achieved by a certain date. They take account of economic efficiency, practicability, technical feasibility and timescale. The objectives for use by local authorities are prescribed within the Air Quality (England) Regulations, 2000, Statutory Instrument 928 (2000) and the Air Quality (England) (Amendment) Regulations 2002, Statutory Instrument 3043 (2002).

9.2.12 The objectives for nitrogen dioxide and PM_{10} were to have been achieved by 2005 and 2004 respectively, and continue to apply in all future years thereafter. The $PM_{2.5}$ objective is to be achieved by 2020. Measurements across the UK have shown that the 1-hour nitrogen dioxide objective is unlikely to be exceeded where the annual mean concentration is below 60 μg/m3 (Defra, 2009). Therefore, 1-hour nitrogen dioxide concentrations will only be considered if the annual mean concentration is above this level.

9.2.13 The objectives apply at locations where members of the public are likely to be regularly present and are likely to be exposed over the averaging period of the

objective. Defra explains where these objectives will apply in its Local Air Quality Management Technical Guidance (Defra, 2009). The annual mean objectives for nitrogen dioxide and PM_{10} are considered to apply at the façades of residential properties, schools, hospitals etc.; they do not apply at hotels. The 24-hour objective for PM_{10} is considered to apply at the same locations as the annual mean objective, as well as in gardens of residential properties and at hotels. The 1-hour mean objective for nitrogen dioxide applies wherever members of the public might regularly spend 1-hour or more, including outdoor eating locations and pavements of busy shopping streets.

9.2.14 The European Union has also set limit values for nitrogen dioxide, PM_{10} and $PM_{2.5}$. Achievement of these values is a national obligation rather than a local one (Directive 2008/50/EC of the European Parliament and of the Council, 2008). The limit values for nitrogen dioxide are the same levels as the UK objectives, but applied from 2010 (The Air Quality Standards Regulations (No. 1001), 2010). The limit values for PM_{10} and $PM_{2.5}$ are also the same level as the UK statutory objectives, but applied from 2005 for PM_{10} and will apply from 2015 for $PM_{2.5}$.

9.2.15 The relevant air quality criteria for this assessment are provided in Table 9.2.

Table 9.2: Air Quality Criteria for Nitrogen Dioxide, PM_{10} and $PM_{2.5}$

Pollutant	Time Period	Objective
Nitrogen Dioxide	1-hour Mean	200 μg/m^3 not to be exceeded more than 18 times a year
	Annual Mean	40 μg/m^3
Fine Particles (PM_{10})	24-hour Mean	50 μg/m^3 not to be exceeded more than 35 times a year
	Annual Mean	40 μg/m^3
Fine Particles ($PM_{2.5}$) [a]	Annual Mean	25 μg/m^3

[a] The $PM_{2.5}$ objective, which is to be met by 2020, is not in Regulations and there is no requirement for local authorities to meet it. The EU limit value is the same, but is to be met by 2015.

Construction Dust Criteria

9.2.16 There are no formal assessment criteria for dust. In the absence of formal criteria, the approach developed by the Institute of Air Quality Management[1] (IAQM) (2012a) has therefore been used. Full details of this approach are provided in Appendix 9.2.

Descriptors for Air Quality Impacts and Assessment of Significance

Operational Significance

Health

9.2.17 There is no official guidance in the UK on how to describe air quality impacts, nor how to assess their significance. The approach developed by the IAQM (Institute of Air Quality Management, 2009), and incorporated in Environmental Protection UK's (EPUK) guidance document on planning and air quality (Environmental Protection UK, 2010), has therefore been used. This approach includes elements of professional judgement. Full details of this approach are provided in Appendix 9.4, with the professional experience of the consultants preparing the report set out in Appendix 9.5.

9.2.18 The descriptors used within this assessment have been adapted from the criteria in the IAQM guidance, as outlined in Appendix 9.4 to provide consistency with the remainder of the Environmental Statement.

Construction Dust Significance

9.2.19 In the absence of official guidance, the approach developed by the IAQM (Institute of Air Quality Management, 2012a) to assess the significance of construction dust has been used. This approach includes elements of professional judgement. Full details of this approach are provided in Appendix

[1] The IAQM is the professional body for air quality practitioners in the UK.

9.2, with the professional experience of the consultants preparing the report set out in Appendix 9.5.

9.2.20 Again to provide consistency with the remainder of the Environmental Statement the descriptors in the IAQM guidance have been adapted as outlined in Appendix 9.2.

9.3 BASELINE CONDITIONS

9.3.1 The proposed development site is located in the east of the Teddington area of the LB of Richmond upon Thames. The site is bounded by Broom Road to the south and the River Thames to the north. It currently consists of the Haymarket offices and the former Teddington Studios. There is existing residential to the southeast, south and west.

Industrial Sources

9.3.2 A search of the UK Pollutant Release and Transfer Register (Defra, 2013a) and Environment Agency's 'what's in your backyard' (Environment Agency, 2013) websites did not identify any significant industrial or waste management sources that are likely to affect the proposed development, in terms of air quality.

Air Quality Review and Assessment

9.3.3 The LB of Richmond upon Thames has investigated air quality within its area as part of its responsibilities under the LAQM regime. In December 2000 an AQMA was declared across the whole borough for exceedences of the nitrogen dioxide and PM_{10} objectives.

Local Air Quality Monitoring

9.3.4 There are four automatic monitoring stations in operation within the LB of Richmond upon Thames. The Teddington AURN urban background site is the closest and is located approximately 1.5 km to the southwest of the development site. The Council also operates a number of nitrogen dioxide monitoring sites using diffusion tubes prepared and analysed by Gradko Environmental (using the 50% TEA in acetone method). There are four diffusion tube monitoring sites within 1 km of the proposed development site. Results for the years 2007 to 2012 are summarised in Table 9.3 and the monitoring locations for the diffusion tubes are shown in Figure 9.2.

Table 9.3: Summary of Nitrogen Dioxide (NO_2) Monitoring (2007-2012)

Site No.	Site Type	Location	2007	2008	2009	2010	2011	2012
Automatic Monitor – Annual Mean (µg/m^3)								
TD0	UB	Ntl Physical Lab	28.4	24.6	22.0	24.0	21.3	35.6
Objective			**40**					
Automatic Monitor – No. of Hours > 200µg/m^3								
TD0	UB	Ntl Physical Lab	0	0	0	0	0	0
Objective			**18**					
Diffusion Tubes – Annual Mean (µg/m^3)								
8	K	Strawberry Vale (Clive Road)	39	37	37	38	30	34
45	K	High St. (post office)	**54**	**51**	**49**	**48**	**44**	**43**
47	K	Causeway	**51**	**48**	**47**	**49**	33	40
RUT 4	R	Elmfield House, Waldegrave Rd.	30	32	30	29	29	40
Objective			**40**					

9.3.5 Concentrations have exceeded the annual mean nitrogen dioxide objective in all years at the High Street (45) diffusion tube site, and at the Causeway

diffusion tube site from 2007 to 2010. Concentrations at the other sites have been below the annual mean objective in all years presented. In January 2012 the RUT4 diffusion tube was moved closer to the kerb (it is now 0.5 m from the kerb), which would explain the significant increase in measured annual mean concentrations in 2012. The concentrations at the Strawberry Vale site are considered to be the most representative of concentrations across the proposed development site as this tube is located on a similar road to the proposed site.

9.3.6 Concentrations at the High Street (Tube 45) show a downward trend from 2007 to 2012. However, this is not apparent at the other monitoring sites presented where there is no clear trend in the monitoring results. This contrasts with the expected decline due to the progressive introduction of new vehicles operating to more stringent standards. The implications of this are discussed in Section 9.4 of this chapter.

9.3.7 There are no monitors measuring PM_{10} concentrations in close proximity to the development site. $PM_{2.5}$ concentrations, however, are monitored at the Teddington AURN urban background Site. Results for the years 2008 to 2012 are summarised in Table 9.4 and show that concentrations were well below the European limit value for the years. There are no clear trends in the $PM_{2.5}$ monitoring results for the last four years.

Table 9.4: Summary of $PM_{2.5}$ Automatic Monitoring (2007-2012)[a]

Site No.	Site Type	Location	2008	2009	2010	2011	2012
Automatic Monitor – Annual Mean (µg/m^3)							
TD0	UB	Ntl Physical Lab	20.0	13.2	14.4	17.4	13.6
Objective			**25[a]**				

[a] The $PM_{2.5}$ objective, which is to be met by 2020, is not in Regulations and there is no requirement for local authorities to meet it. The EU limit value is the same, but is to be met by 2015.

Background Concentrations

9.3.8 In addition to these locally measured concentrations, estimated background concentrations in the study area have been determined for 2012 and the opening year 2016 (Table 9.5). In the case of nitrogen dioxide, two sets of

future-year backgrounds are presented to take into account uncertainty in future year vehicle emission factors. The derivation of background concentrations is described in Appendix 9.1. The background concentrations are all well below the objectives.

9.3.9 The concentrations of nitrogen dioxide measured at the Teddington AURN urban background site in 2012 are higher than those estimated in the national pollution maps and significantly higher than those measured in previous years. The reason for this was investigated with the site operators, but no explanation is currently available. The 2012 value for this urban background site is considered anomalous and instead the estimated background values in Table 9.5 have been used in the modelling. This was agreed with the LB of Richmond upon Thames.

Table 9.5: Estimated Annual Mean Background Pollutant Concentrations in 2012 and 2016 (µg/m^3)

Year		NO_2	PM_{10}	$PM_{2.5}$
2012[a]	516500,171500 (Development site)	28.0	18.0	13.0
	515500,170500 (Urban background site)	24.9	16.8	12.2
2016 – Without Reductions in Traffic Emissions [b]	516500,171500 (Development site)	26.4	n/a	n/a
	515500,170500 (Urban background site)	23.7	n/a	n/a
2016 – With Reductions in Traffic Emissions [c]	516500,171500 (Development site)	24.3	17.0	12.0
	515500,170500 (Urban background site)	21.7	16.0	11.3
Objectives		**40**	**40**	**25**

n/a = not applicable

[a] This assumes that road vehicle emission factors in 2012 remain the same as in 2010 (See Appendix 9.1).

[b] This assumes that road vehicle emission factors in 2016 remain the same as in 2010.

[c] This assumes that road vehicle emission factors reduce between 2012 and 2016 at the current 'official' rates.

Baseline Dispersion Model Results

9.3.10 Baseline concentrations of nitrogen dioxide, PM_{10} and $PM_{2.5}$ have been modelled at each of the existing receptor locations (see Figure 9.1 and Table 9.1). The results, which cover both existing (2012) and future year (2016) baseline (Without Scheme) are set out in Table 9.6, Table 9.7 and Table 9.8. The future baseline for nitrogen dioxide covers the two scenarios: with the official reductions in vehicle emission factors and without these reductions. The modelled road components of nitrogen oxides concentrations have been adjusted by a factor of 2.86, which was derived during the model verification process, and the total NO_2 has been adjusted by a secondary verification factor of 0.99 (see Appendix 9.1 for details of the model verification).

Table 9.6: Modelled Annual Mean Baseline Concentrations of Nitrogen Dioxide (µg/m^3) at Existing Receptors

Receptor	2012	2016 Without Scheme	
		With 'Official' Emissions Reduction [a]	Without Emissions Reduction [b]
R1	34.2	29.5	33.1
R2	37.0	31.8	35.9
R3	35.8	30.7	34.5
R4	**45.5**	38.9	**44.4**
R5	**47.6**	**41.2**	**46.4**
R6	35.1	30.1	33.8
R7	31.0	26.7	29.6
R8	31.0	26.8	29.7
R9	30.0	25.9	28.5
R10	**43.0**	36.2	**41.6**
R11	39.9	33.7	38.5
R12	**46.4**	39.1	**45.1**
R13	39.2	33.2	37.8
R14	**43.9**	36.9	**42.6**
R15	**41.0**	34.4	39.7
R16	35.1	29.8	33.6

R17	37.5	31.7	36.1
R18	33.9	29.3	32.8
Objectives	**40**		

[a] This assumes that road vehicle emission factors reduce between 2012 and 2016 at the current 'official' rates.

[b] This assumes that road vehicle emission factors in 2016 remain the same as in 2012.

Table 9.7: Modelled Baseline Concentrations of PM_{10} (µg/m^3) at Existing Receptors

Receptor	PM_{10} [a]			
	Annual Mean (µg/m^3)		No. Days >50 µg/m^3	
	2012	2016 Without Scheme	2012	2016 Without Scheme
R1	18.9	17.9	2	1
R2	19.3	18.3	3	2
R3	19.1	18.0	2	1
R4	20.4	19.2	4	2
R5	21.0	19.8	5	3
R6	19.0	17.9	2	1
R7	18.4	17.4	2	1
R8	18.4	17.4	2	1
R9	18.3	17.3	2	1
R10	20.2	19.0	4	2
R11	19.7	18.6	3	2
R12	20.8	19.6	4	3
R13	19.6	18.5	3	2
R14	20.2	19.0	4	2
R15	19.7	18.6	3	2
R16	18.9	17.9	2	1
R17	19.4	18.3	3	2
R18	18.9	17.9	2	1
Objectives	**35**			

[a] The numbers of days with PM_{10} concentrations greater than 50 µg/m^3 have been estimated from the relationship with the annual mean concentration described in LAQM.TG(09) (Defra, 2009).

Table 9.8: Modelled Baseline Concentrations of $PM_{2.5}$ (µg/m^3) at Existing Receptors

Receptor	Annual Mean (µg/m^3)	
	2012	2016 Without Scheme
R1	13.6	12.6
R2	13.9	12.8
R3	13.7	12.7
R4	14.6	13.4
R5	15.0	13.7
R6	13.7	12.6
R7	13.3	12.3
R8	13.3	12.3
R9	13.2	12.2
R10	14.4	13.3
R11	14.1	13.0
R12	14.8	13.6
R13	14.0	12.9
R14	14.4	13.2
R15	14.1	13.0
R16	13.6	12.6
R17	13.9	12.8
R18	13.6	12.6
Objective	**25**	

2012 Baseline

9.3.11 The predicted annual mean concentrations of nitrogen dioxide are above the annual mean objective in 2012 at six existing receptors which are in close proximity to Ferry Road and Kingston Road. PM_{10} and $PM_{2.5}$ concentrations are all below the relevant objectives and limit values in 2012 at all receptors.

2016 Baseline With 'Official' Emission Reduction

9.3.12 The predicted annual mean concentrations of nitrogen dioxide are below the annual mean objective in 2016 at all receptor locations except for R5 (1 Ferry Road). All of the predictions for PM_{10} and $PM_{2.5}$ are well below the objectives (or limit values).

2016 Baseline Without Emission Reduction

9.3.13 Assuming no reduction in vehicle emissions the predicted annual mean concentrations of nitrogen dioxide exceed the annual mean objective at five of the existing receptor locations in 2016, close to Ferry Road and Kingston Road.

9.3.14 These results are consistent with the conclusions of the LB of Richmond upon Thames in the outcome of its air quality review and assessment work

9.4 PREDICTING THE IMPACTS OF DEVELOPMENT

Construction Impacts

9.4.1 The construction works will give rise to a risk of dust impacts during demolition, earthworks and construction, as well as from trackout of dust and dirt by vehicles onto the public highway. There are various sensitive receptors that may be affected by dust, including residential properties, and less sensitive commercial premises. There are no sensitive ecological receptors that might be affected.

Demolition

9.4.2 There will be a requirement to demolish buildings with a total volume of more than 50,000 m^3. The demolition phase is expected to take six months to complete. The method of demolition has not yet been decided. There will be fewer than 10 receptors within 20 m of these buildings; however, there will be up to 50 dwellings and commercial properties between 20-100 m of the

demolition area, and over 300 dwellings, commercial premises, a doctor's surgery and a children's nursery between 100-350 m. The dust emission class for the demolition is considered to be *large*.

Earthworks

9.4.3 The site covers over 10,000 m^2 and most of this will be subject to earthworks, involving removal of the foundations of the demolished buildings and breaking up of a paved area. There will be fewer than 10 receptors within 20 m of these buildings; however, there will be up to 50 dwellings and commercial properties between 20-100 m of the earthworks area, and over 300 dwellings, commercial premises, a doctor's surgery and a children's nursery between 100-350 m. The earthworks will last around 24 months and dust will arise mainly from the vehicles travelling over unpaved ground and from the handling of dusty materials. The dust emission class for the earthworks is considered to be *large.*

Construction

9.4.4 The construction will involve a total building volume of over 100,000 m^3. Dust will arise from vehicles travelling over unpaved ground, the handling and storage of dusty materials, and from the cutting of concrete. There will be fewer than 10 receptors within 20 m of these buildings; however, there will be up to 50 dwellings and commercial properties between 20-100 m of the construction area, and over 300 dwellings, commercial premises, a doctor's surgery and a children's nursery between 100-350 m. The construction will take place over a two-year period. The dust emission class for the construction is considered to be *large.*

Trackout

9.4.5 The number of vehicles accessing the site, which may track out dust and dirt is likely to be under 25 lorry movements per day. There are a small number of properties lying within 20 m of the public highway within 50 m of the site

entrance/exit, which may be affected by dust. The dust emission class for trackout is considered to be *small.*

Risk and Significance

9.4.6 Using the criteria in Appendix 9.2 the risk categories for the four construction activities, without mitigation, are judged to be as set out in Table 9.9.

Table 9.9: Summary of Risk of Effects Without Mitigation

Source	Dust Soiling	Ecological effects	PM_{10} effects
Demolition	High Risk Site	None	High Risk Site
Earthworks	High Risk Site	None	High Risk Site
Construction	High Risk Site	None	High Risk Site
Trackout	Medium Risk Site	None	Medium Risk Site

9.4.7 The sensitivity of the areas around the site to dust from the four sources is judged to be as shown in Table 9.10, together with a summary of the factors used to classify the sensitivity of the area.

Table 9.10: Sensitivity of the Area

Human receptors		Ecological receptors	
Sensitivity of area	**Factors for Classification of Sensitivity**	**Sensitivity of area**	**Factors for Classification of Sensitivity**
Demolition			
Medium (Dust) **Low (PM_{10})**	Suburban or edge of town area. Fewer than 10 receptors within 20 m. Local PM_{10} concentrations well below the objectives (less than 75%).	**Low**	No designations.
Earthworks			
Medium (Dust) **Low (PM_{10})**	Suburban or edge of town area. Fewer than 10 receptors within 20 m. Local PM_{10} concentrations well below the objectives (less than 75%).	**Low**	No designations.
Construction			
Medium (Dust) **Low (PM_{10})**	Suburban or edge of town area. Fewer than 10 receptors within 20 m. Local PM_{10} concentrations well below the objectives (less than 75%).	**Low**	No designations.
Trackout			
Medium (Dust) **Low (PM_{10})**	Suburban or edge of town area. Fewer than 10 receptors within 20 m. Local PM_{10} concentrations well below the objectives (less than 75%).	**Low**	No designations.

9.4.8 On this basis the significance of dust effects without mitigation will be as set out in Table 9.11, using the criteria in Appendix 9.2.

Table 9.11: Summary Significance Table Without Mitigation [a]

Source	Dust soiling effects	Ecological effects	PM_{10} effects
Demolition	Moderate adverse	None	Low adverse
Earthworks	Moderate adverse	None	Low adverse
Construction	Moderate adverse	None	Low adverse
Trackout	Low adverse	None	Neutral
Overall significance	**Moderate adverse**		

[a] The descriptors have been adapted to provide consistency within the ES as outlined in Appendix 9.2.

Road Traffic Impacts

9.4.9 Predicted annual mean concentrations of nitrogen dioxide, PM_{10} and $PM_{2.5}$, as well as days with PM_{10} >50 µg/m^3, are set out in Table 9.12, Table 9.13 and Table 9.14 for both the "Without Scheme" and "With Scheme" scenarios. These tables also describe the impacts at each receptor using the impact descriptors given in Appendix 9.4. For nitrogen dioxide, results are presented for two scenarios to reflect current uncertainty in Defra's future-year vehicle emission factors.

9.4.10 For information, the predicted annual mean concentrations of nitrogen dioxide, PM_{10} and $PM_{2.5}$, as well as days with PM_{10}> 50 µg/m^3 for the baseline scenario "Without the studios" and "With Scheme" Scenario are provided in Appendix 9.6. These tables also describe the impacts at each receptor using the impact descriptors given in Appendix 9.4.

Nitrogen Dioxide With 'Official' Emissions Reduction

9.4.11 The annual mean nitrogen dioxide concentrations are below the objective at all receptors, apart from receptor R5 (1 Ferry Road), however, the exceedence of the objective at this receptor occurs both without and with the proposed development. This receptor is within the AQMA.

9.4.12 The magnitudes of change are all *imperceptible* and thus the impacts are *neutral* at all receptors.

Nitrogen Dioxide Without Emissions Reduction

9.4.13 Assuming no reduction in emissions, the annual mean nitrogen dioxide concentrations are below the objective at all receptors, apart from receptors R4, R5, R10, R12 and R14 (in close proximity to Ferry Road and Kingston Road) again, however, this occurs both without the development. These receptors are all within the AQMA.

9.4.14 The magnitudes of change are all *imperceptible* and the impacts are *neutral* at all receptors.

PM_{10} and $PM_{2.5}$

9.4.15 The annual mean PM_{10} and $PM_{2.5}$ concentrations are well below the objectives at all receptors, with or without the scheme, as are the numbers of days with PM_{10} concentrations above 50µg/m^3.

9.4.16 The magnitude of change are *imperceptible* at all receptors. Coupled with the concentrations all being well below the objective, the impacts are thus described as *neutral*.

Table 9.12: Predicted Impacts on Annual Mean Nitrogen Dioxide Concentrations in 2016 (µg/m^3)

Receptor	With 'Official' Emissions Reduction [a]			Without Emissions Reduction [b]		
	Without Scheme	With Scheme	Impact Descriptor[c]	Without Scheme	With Scheme	Impact Descriptor[c]
R1	29.5	29.5	Neutral	33.1	33.1	Neutral
R2	31.8	31.8	Neutral	35.9	35.9	Neutral
R3	30.7	30.6	Neutral	34.5	34.4	Neutral
R4	38.9	38.9	Neutral	**44.4**	**44.3**	Neutral
R5	**41.2**	**41.0**	Neutral	**46.4**	**46.2**	Neutral
R6	30.1	30.1	Neutral	33.8	33.8	Neutral
R7	26.7	26.7	Neutral	29.6	29.6	Neutral
R8	26.8	26.8	Neutral	29.7	29.7	Neutral
R9	25.9	25.9	Neutral	28.5	28.5	Neutral
R10	36.2	36.1	Neutral	**41.6**	**41.5**	Neutral
R11	33.7	33.6	Neutral	38.5	38.5	Neutral
R12	39.1	39.0	Neutral	**45.1**	**45.0**	Neutral
R13	33.2	33.1	Neutral	37.8	37.8	Neutral
R14	36.9	37.0	Neutral	**42.6**	**42.8**	Neutral
R15	34.4	34.5	Neutral	39.7	39.8	Neutral
R16	29.8	29.8	Neutral	33.6	33.7	Neutral
R17	31.7	31.7	Neutral	36.1	36.0	Neutral
R18	29.3	29.2	Neutral	32.8	32.8	Neutral
Objective	**40**		-	**40**		-

[a] This assumes that road vehicle emission factors reduce between 2012 and 2016 at the current 'official' rates.

[b] This assumes that road vehicle emission factors in 2016 remain the same as in 2012.

[c] The descriptors have been adapted to provide consistency within as outlined in Appendix 9.2.

Table 9.13: Predicted PM_{10} Impacts in 2016 (µg/m^3)

Receptor	Annual Mean (µg/m^3)			Days with PM_{10} > 50 µg/m^3 [a]		
	Without Scheme	With Scheme	Impact Descriptor	Without Scheme	With Scheme	Impact Descriptor
R1	17.9	17.9	Neutral	1	1	Neutral
R2	18.3	18.3	Neutral	2	2	Neutral
R3	18.0	18.0	Neutral	1	1	Neutral
R4	19.2	19.2	Neutral	2	2	Neutral
R5	19.8	19.7	Neutral	3	3	Neutral
R6	17.9	17.9	Neutral	1	1	Neutral
R7	17.4	17.4	Neutral	1	1	Neutral
R8	17.4	17.4	Neutral	1	1	Neutral
R9	17.3	17.3	Neutral	1	1	Neutral
R10	19.0	19.0	Neutral	2	2	Neutral
R11	18.6	18.6	Neutral	2	2	Neutral
R12	19.6	19.6	Neutral	3	3	Neutral
R13	18.5	18.5	Neutral	2	2	Neutral
R14	19.0	19.0	Neutral	2	2	Neutral
R15	18.6	18.6	Neutral	2	2	Neutral
R16	17.9	17.9	Neutral	1	1	Neutral
R17	18.3	18.2	Neutral	2	2	Neutral
R18	17.9	17.9	Neutral	1	1	Neutral
Objective	**40**		-	**35**		-

[a] The numbers of days with PM_{10} concentrations greater than 50 µg/m^3 have been estimated from the relationship with the annual mean concentration described in LAQM.TG(09) (Defra, 2009).

[b] The descriptors have been adapted to provide consistency within as outlined in Appendix 9.2.

Table 9.14: Predicted $PM_{2.5}$ Impacts in 2016 (µg/m^3)

Receptor	Annual Mean (µg/m^3)		
	Without Scheme	With Scheme	Impact Descriptor
R1	12.6	12.6	Neutral
R2	12.8	12.8	Neutral
R3	12.7	12.7	Neutral
R4	13.4	13.4	Neutral
R5	13.7	13.7	Neutral
R6	12.6	12.6	Neutral
R7	12.3	12.3	Neutral
R8	12.3	12.3	Neutral
R9	12.2	12.2	Neutral
R10	13.3	13.3	Neutral
R11	13.0	13.0	Neutral
R12	13.6	13.6	Neutral
R13	12.9	12.9	Neutral
R14	13.2	13.3	Neutral
R15	13.0	13.0	Neutral
R16	12.6	12.6	Neutral
R17	12.8	12.8	Neutral
R18	12.6	12.6	Neutral
Objective	**25**		-

[a] The descriptors have been adapted to provide consistency within as outlined in Appendix 9.2.

9.4.17 Predicted concentrations of both PM_{10} and $PM_{2.5}$ remain well below the objectives in 2016, whether the proposed scheme proceeds or not. There are some exceedences of the annual mean nitrogen dioxide concentrations assuming both a reduction in vehicle emissions and no reduction in emissions. This however occurs both without and with the proposed scheme.

Impacts on the Development

9.4.18 The modelled impacts of the existing and development generated traffic sources on air quality conditions for residents occupying the new residential units in the proposed development are set out in Table 9.15 for Receptors A to

I (see Table 9.1 and Figure 9.1 for receptor locations). The results represent concentrations at the ground-floor level. Concentrations for the remainder of the floors within the proposed development are presented for information in Appendix 9.6.

Table 9.15: Predicted Concentrations of Nitrogen Dioxide (NO_2), PM_{10} and $PM_{2.5}$ (µg/m^3) in 2016 for New Receptors in the Development Site

Receptor	Annual Mean NO_2 (µg/m^3)		PM_{10} (µg/m^3) [a]		$PM_{2.5}$ (µg/m^3)
	With 'Official' Emissions Reduction [b]	Without Emissions Reduction [c]	Annual Mean	No. Days >50 µg/m^3	Annual Mean
A	29.7	33.4	17.9	1	12.6
B	29.4	33.0	17.9	1	12.6
C	28.7	32.1	17.8	1	12.5
D	28.5	31.9	17.7	1	12.5
E	28.7	32.1	17.8	1	12.5
F	29.4	32.9	17.9	1	12.6
G	26.4	29.2	17.4	1	12.3
H	26.9	29.8	17.4	1	12.3
I	26.1	28.8	17.3	1	12.2
Objectives	**40**		**40**	**35**	**25**

[a] The numbers of days with PM_{10} concentrations greater than 50 µg/m^3 have been estimated from the relationship with the annual mean concentration described in LAQM.TG (09) (Defra, 2009).

[b] This assumes that road vehicle emission factors reduce between 2012 and 2016 at the current 'official' rates.

[c] This assumes that road vehicle emission factors in 2016 will remain the same as in 2012.

9.4.19 All the values are below the objectives. Air quality for future residents within the development will thus be acceptable.

Uncertainty in Road Traffic Modelling Predictions

9.4.20 There are many components that contribute to the uncertainty of modelling predictions. The model used in this assessment is dependent upon the traffic data that have been input, which will have inherent uncertainties associated with them. There are then additional uncertainties, as the model is required to

simplify real-world conditions into a series of algorithms. An important stage in the process is model verification, which involves comparing the model output with measured concentrations (see Appendix 9.1). Because the model has been verified and adjusted, there can be reasonable confidence in the prediction of current year (2012) concentrations.

9.4.21 Predicting pollutant concentrations in a future year will always be subject to greater uncertainty. For obvious reasons, the model cannot be verified in the future, and it is necessary to rely on a series of projections provided by DfT and Defra as to what will happen to traffic volumes, background pollutant concentrations, and vehicle emissions. A disparity between the road transport emission projections and measured annual mean concentrations of nitrogen oxides and nitrogen dioxide has been identified by Defra (Carslaw et al., 2011). This is evident across the UK, although the effect appears to be greatest in inner London; there is also considerable inter-site variation. Whilst the emission projections suggested that both annual mean nitrogen oxides and nitrogen dioxide concentrations should have fallen by around 15-25% over the past 6 to 8 years, at many monitoring sites levels have remained relatively stable, or have even shown a slight increase. This pattern is mirrored in the monitoring data assembled for this study, as set out in Paragraph 9.3.6.

9.4.22 This disparity led to a detailed review of the emission factors and fleet mix for UK conditions, and in July 2012, Defra issued a revised Emissions Factors Toolkit (ETFv5.1.3). This has since been updated to version EFTv5.2c, which has undergone some further, more minor, revisions. The new EFT utilises revised nitrogen oxides emissions factors and also incorporates revised vehicle fleet composition data (Defra, 2012). The new EFT goes some way to addressing the disparity between air quality measurements and emissions, but does not fully address it, and it is recognised that the forecast reductions may still be optimistic in the near-term (i.e. the next five years or so).

9.4.23 The reason for the disparity is thought to relate to the on-road performance of modern diesel vehicles. New vehicles registered in the UK have to meet progressively tighter European type approval emissions categories, referred to as "Euro" standards. While the nitrogen oxides emissions from newer vehicles should be lower than those from equivalent older vehicles, the on-road

performance of some modern diesel vehicles is often no better than that of earlier models (Carslaw et al., 2011). The best current evidence is that, where previous standards have had limited on-road success, the 'Euro VI' and 'Euro 6' standards that new vehicles will have to comply with from 2013/152 will achieve the expected on-road improvements, as, for the first time, they will require compliance with the World Harmonized Test Cycle, which better represents real-world driving conditions and includes a separate slow-speed cycle for heavy duty vehicles.

9.4.24 As noted above, the new forecast reductions in nitrogen oxides emissions may still be optimistic in the near-term. To account for this uncertainty, a sensitivity test has been conducted assuming that the future (2016) road traffic emissions per vehicle are unchanged from 2012 values. The predictions within this sensitivity test are likely to be over-pessimistic, as new, lower-emission Euro VI and Euro 6 vehicles will be on the road from 2013/15; by 2016 it is forecast that there will be a roughly 30-50% penetration of Euro VI HDVs and a roughly 15-20% penetration of Euro 6 LDVs. These new vehicles are expected to deliver real on-road reductions in nitrogen oxides emissions.

Significance of Operational Air Quality Impacts

9.4.25 The operational air quality impacts are judged to have no effect on existing receptors. This professional judgement is made in accordance with the methodology set out in Appendix 9.4 taking into account the factors set out in Table 9.16, and also taking into account the uncertainty over future projections of traffic-related nitrogen dioxide concentrations, which may not decline as rapidly as expected. The latter has been addressed by giving consideration to both sets of modelled results for nitrogen dioxide; those with and without reductions in traffic emissions. It is to be expected that concentrations will fall in the range between the two sets of results, although by 2016 the impacts are likely to be closer to the 'with reduction' results than the 'without reduction' results.

[2] Euro VI refers to heavy duty vehicles, while Euro 6 refers to light duty vehicles. The timings for meeting the standards vary with vehicle type and whether the vehicle is a new model or existing model.

9.4.26 More specifically, the judgement that the air quality impacts will have no effect takes account of the assessment that although nitrogen dioxide concentrations are predicted to remain above the objective at some receptors, PM_{10} and $PM_{2.5}$ concentrations will be below the relevant objective and the impacts are predicted to be neutral for all pollutants.

Table 9.16: Factors taken into Account in Determining the Overall Significance of the Scheme on Local Air Quality

Factors	Outcome of Assessment
Number of people affected by increases and/or decreases in concentrations and a judgement on the overall balance.	For all receptors modelled the increase in concentrations will be *imperceptible*.
The number of people exposed to levels above the objective or limit value, where new exposure is being introduced.	No exposure above the objectives or limit values introduced.
The magnitude of the changes and the descriptions of the impacts at the receptors.	The impacts at the receptors are all *neutral*.
Whether or not an exceedence of an objective or limit value is predicted to arise in the study area where none existed before or an exceedence area is substantially increased.	No new areas of exceedence of the objective are predicted.
Uncertainty, including the extent to which worst-case assumptions have been made.	The inclusion of the two scenarios for nitrogen dioxide covers the uncertainty over vehicle emission factors. The actual concentrations in 2016 are likely to be closer to the with emissions reduction scenario.
The extent to which an objective or limit value is exceeded.	The annual mean nitrogen dioxide objective is exceeded slightly in the 'with emissions reductions' scenario at one existing receptor and slightly at two and marginally at three receptors in the without emissions reduction scenario. These exceedences occur however both without and with the proposed development.

Table 9.17: Summary of Impacts before Mitigation

Air Quality	Description of Impact	Geographical Importance	Impact	Nature	Significance Before Mitigation
Construction Impacts	Elevated levels of dust soiling and PM_{10} concentrations during: Demolition; Eartworks; Construction; and Trackout	**Local**	Adverse	Short Term	Moderate
Operational Impacts	Changed exposure to air pollutants from motor vehicles at existing residential properties	**Local**	Neutral	Long Term	No Effect

KEY:

Geographical Level of Importance	Impact	Nature of Impact	Significance
National	Adverse	Long Term	Significant
Regional	Neutral	Short Term	Moderate
Sub-Regional	Beneficial		Low
District			No Effect
Local			

9.5 MITIGATION

Construction

9.5.1 Measures to mitigate dust emissions will be required during the construction phase of the development in order to reduce impacts upon nearby residential properties.

9.5.2 The site has been identified as a *Medium* to *High* Risk site as set out in Table 9.9. The GLA Best Practice Guidance (GLA, 2006) describes best practice measures that should be employed, as appropriate, to reduce the impact of a *medium to high* risk site. However, more comprehensive guidance has been published by IAQM on mitigation measures to control dust and air emissions

(Institute of Air Quality Management, 2012b), and on monitoring during demolition and construction (Institute of Air Quality Management, 2012c). This reflects best practice experience, and has been used to draw up a generic set of mitigation measures. These measures are described in Appendix 9.7. These will not all be relevant to the works being carried out, but should be used, as appropriate, to specify the measures required. Mitigation should be straightforward, as most of the necessary measures are routinely employed as 'good practice' on construction sites.

9.5.3 The mitigation measures should to be written into a dust management plan (DMP). For major sites the DMP may be integrated into a Code of Construction Practice or the Construction Environmental Management Plan, and may require monitoring.

9.5.4 Where mitigation measures rely on water, it is expected that only sufficient water will be applied to damp down the material. There should not be any excess to potentially contaminate local watercourses.

Completed Development

9.5.5 The assessment has demonstrated that the scheme will not cause any exceedences of the air quality objectives in areas where they are not currently exceeded. Mitigation measures to reduce pollutant emissions from road traffic are principally being delivered in the longer term by the introduction of more stringent emissions standards, largely via European legislation. It is not considered appropriate to propose further mitigation measures for this scheme.

9.6 RESIDUAL IMPACTS

Construction

9.6.1 Table 9.18 provides an overall summary table of the residual effects of dust and PM_{10} during construction, with mitigation in place.

Table 9.18: Summary Significance Table With Mitigation

Source	Dust soiling effects	Ecological effects	PM_{10} effects
Demolition	No effect	None	No effect
Earthworks	No effect	None	No effect
Construction	No effect	None	No effect
Trackout	No effect	None	No effect
Overall significance	**No effect**		

[a] The descriptors have been adapted to provide consistency within as outlined in Appendix 9.2.

9.6.2 With mitigation in place, there is no effect expected of dust impacts during the construction phase.

Completed Development

9.6.3 The residual impacts will be the same as those identified in Section 9.5.

Table 9.19 : Summary of Residual Impacts

Topic Area (Air Quality)	Description of Impact	Geographical Importance	Impact	Nature	Significance after Mitigation
Construction Impacts	Elevated levels of dust soiling and PM_{10} concentrations during: Demolition; Eartworks; Construction; and Trackout	**L**	Neutral	Short Term	No Effect
Operational Impacts	Changed exposure to air pollutants from motor vehicles at existing residential properties	**L**	Neutral	Long Term	No Effect

KEY:

Geographical Level of Importance	Impact	Nature of Impact	Significance
National	Adverse	Long Term	Significant
Regional	Neutral	Short Term	Moderate
Sub-Regional	Beneficial		Low
District			No Effect
Local			

9.7 CUMULATIVE IMPACTS

9.7.1 There are no known committed developments in the area with the potential for cumulative impacts on air quality during either the construction of or the operation of the completed development.

9.8 SUMMARY AND CONCLUSIONS

9.8.1 The air quality impacts associated with the construction and operation of the proposed housing development at Broom Road in the LB of Richmond upon Thames have been assessed. Existing conditions within the study area show poor air quality, with concentrations of nitrogen dioxide exceeding the annual mean objective along Ferry Road and Kingston Road to the south of the development site. An AQMA has been declared for the whole Borough.

9.8.2 The operational impacts of traffic emissions associated with the development have been assessed. Concentrations have been modelled for 18 worst-case receptors, representing existing properties where impacts are expected to be greatest. In addition, the impacts of traffic emissions from local roads on air quality for future residents have been assessed at nine worst-case locations within the new development itself. In the case of nitrogen dioxide, the modelling has been carried out assuming both that vehicle emissions decrease (using 'official' emission factors), and that they do not decrease in future years. This is to allow for current uncertainty over emission factors for nitrogen oxides that has been identified by Defra (Carslaw, et al., 2011).

9.8.3 It is concluded that concentrations of PM_{10} and $PM_{2.5}$ will remain below the objectives at all existing receptors in 2016, whether the scheme is developed or not.

9.8.4 In the case of nitrogen dioxide, the annual mean concentrations remain above the objective at one receptor R5, both with or without the scheme, assuming that vehicle emissions reduce between 2012 and 2016, and to be above at five receptors, both with or without the scheme, assuming that vehicle emissions do not reduce over this period.

9.8.5 The proposed scheme will lead to imperceptible changes in concentrations of nitrogen dioxide, PM_{10} and $PM_{2.5}$ at all existing receptors, and the impacts will all be neutral.

9.8.6 The impacts of local traffic on the air quality for residents living in the proposed development have been shown to be acceptable at the worst-case locations assessed, with concentrations being well below the air quality objectives.

9.8.7 The overall operational air quality impacts of the development are judged to have no effect. This conclusion, which takes account of the uncertainties in future projections, in particular for nitrogen dioxide, is based on the impacts all being *neutral*.

9.8.8 The construction works have the potential to create dust. During construction it will therefore be necessary to apply a package of mitigation measures to minimise dust emission. With these measures in place, there is considered to be no effect of expected of dust impacts at existing off-site properties.

9.8.9 The proposed development is consistent with the NPPF. Furthermore, the scheme does not conflict with the requirements of Policy CP1 of the Core Strategy, nor does it conflict with, or render unworkable, any elements of the Air Quality Action Plan.

9.9 REFERENCES

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9.10 GLOSSARY

AADT	Annual Average Daily Traffic
ADMS-Roads	Atmospheric Dispersion Modelling System
AQMA	Air Quality Management Area
AURN	Automatic Urban and Rural Network
Defra	Department for Environment, Food and Rural Affairs
DfT	Department for Transport
DMP	Dust Management Plan
EFT	Emissions Factor Toolkit
EPUK	Environmental Protection UK
Exceedence	A period of time when the concentration of a pollutant is greater than the appropriate air quality objective. This applies to specified locations with relevant exposure
HDV	Heavy Duty Vehicles (> 3.5 tonnes)
HGV	Heavy Goods Vehicle
IAQM	Institute of Air Quality Management
LAEI	London Atmospheric Emissions Inventory
LAQM	Local Air Quality Management
LB	London Borough

LDF	Local Development Framework
LDV	Light Duty Vehicles (<3.5 tonnes)
LEZ	Low Emission Zone
µg/m^3	Micrograms per cubic metre
MAQS	Mayor's Air Quality Strategy
NO	Nitric oxide
NO_2	Nitrogen dioxide
NOx	Nitrogen oxides (taken to be NO_2 + NO)
NPPF	National Planning Policy Framework
Objectives	A nationally defined set of health-based concentrations for nine pollutants, seven of which are incorporated in Regulations, setting out the extent to which the standards should be achieved by a defined date. There are also vegetation-based objectives for sulphur dioxide and nitrogen oxides
PM_{10}	Small airborne particles, more specifically particulate matter less than 10 micrometres in aerodynamic diameter
$PM_{2.5}$	Small airborne particles less than 2.5 micrometres in aerodynamic diameter
Standards	A nationally defined set of concentrations for nine pollutants below which health effects do not occur or are minimal
TEA	Triethanolamine – used to absorb nitrogen dioxide