07 Air Quality

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Introduction

7.1 This Chapter of the ES provides an assessment of the potential impact on local air quality as a result of the Proposed Development. In particular, it presents the potential impact associated with heating plant emissions attributed to the Proposed Development once operational. It also considers the potential emissions from construction plant and dust generation during the construction works. Where necessary, control and mitigation measures are proposed to minimise, or remove identified significant air quality impacts.

7.2 The ES Chapter also discusses the suitability of the application site for the intended end use (as described in ***Chapter 5: The Proposed Development***) and whether the design of the application site adequately avoids causing air quality issues onsite.

7.3 This assessment and ES Chapter has been produced by URS Infrastructure & Environment UK Limited (URS).

Legislation and Planning Policy Context

National Legislation

7.4 The principal air quality legislation within the United Kingdom is the Air Quality Standards Regulations 2010 (Ref. 7-1), which transposes the EU Directives into national legislation through a single consolidated statutory instrument. In addition, the Environment Act 1995 (Ref. 7-2) requires the Government to produce a national air quality strategy for England, Scotland, Wales and Northern Ireland (Ref. 7-3) containing standards, objectives, and measures for improving ambient air quality and to keep the policies identified below under review. It also requires that Local Authorities undertake a tiered appraisal of air quality within their borough to establish compliance or non-compliance with the targets established in the Air Quality Strategy. Where the objectives are likely to be exceeded, the Local Authority must designate an Air Quality Management Area (AQMA) and establish an Action Plan for the region, which outlines measures to achieve the objectives.

7.5 The current assessment criteria applicable to the protection of human health and Local Air Quality Management (LAQM) are presented in Table 7-1. Pollutant concentrations are expressed in mass (micrograms) per cubic metre of air (µg/m^3) and apply to outdoor locations where people are regularly present and not to occupational, indoor, or in-vehicle exposure.

Table 7-1 National Air Quality Strategy Objectives (µg/m^3)

Pollutant	Objective	Averaging period	Not to be exceeded more than
Nitrogen dioxide (NO_2)	200	1 hour	18 times per year (i.e. 99.8th percentile)
	40	Annual	Not applicable
Particulate matter (PM_{10})	40	Annual	Not applicable
	50	24 hour	35 times per year (i.e. 90.4.th percentile)
Particulate matter ($PM_{2.5}$)	25	Annual	Not applicable
Carbon monoxide (CO)	10,000	8-hour	0 times per year (i.e. 100th percentile)
Benzene	5	Annual	Not applicable
1,3 butadiene	2.25	Annual	Not applicable
Polycyclic aromatic hydrocarbons (PAH) (ng/m^3)	0.25	Annual	Not applicable
Lead	0.5	Annual	Not applicable
Sulphur dioxide (SO_2)	266	15 minute	35 times per year (i.e. 99.9th percentile)

Regional Planning Policy

7.6 The National Planning Policy Framework (NPPF) (Ref. 7-4) states that: *"The planning system should contribute to and enhance the natural and local environment by… preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability…".*

7.7 The NPPF also defines 'Pollution' as *"Anything that affects the quality of land, air, water or soils, which might lead to an adverse impact on human health, the natural environment or general amenity. Pollution can arise from a range of emissions, including smoke, fumes, gases, dust, steam, odour, noise and light"*.

7.8 The impact of a development on the achievement of such policies and plans may be a material consideration for planning authorities. The NPPF states, *"Planning policies should sustain compliance with and contribute towards EU limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and the cumulative impacts on air quality from individual sites in local areas. Planning decisions should ensure that any new development in Air Quality Management Areas is consistent with the local air quality action plan".*

7.9 The NPPF is accompanied by Technical Guidance to the National Planning Policy Framework (NPPF-TG) (Ref. 7-5). The NPPF-TG does not include any specific guidance for the assessment of air quality impacts from mixed use developments, but does provide some broader guidance on assessments of dust impacts in relation to mineral workings and these are citied in the methodology of this assessment.

Local Planning Policy

7.10 Local planning policy constitutes the Local Development Framework (Ref. 7-6) which comprises of the Core Strategy and supporting Development Policies.

7.11 The Core Strategy (Ref. 7-7) highlights the need to promote higher standards of air quality within the borough.

7.12 LBC's Development Policy DP32 (Ref. 7-8) states that air quality assessments are required where development could potentially cause significant harm to air quality. It also states that mitigation measures are expected for developments that are located in areas of poor air quality.

7.13 LBC produced the 2009-2012 Air Quality Action Plan (AQAP) (Ref. 7-9), which identifies actions and mitigating measures necessary to improve air quality in the borough. The AQAP requires developers to adopt measures to reduce transport emissions and the long term air quality impacts of any heating and power plant. The Clean Air Action Plan 2013-15 is currently out to public consultation.

Assessment Methodology

7.14 This section presents the methodology used to assess the potential impacts to air quality associated with the Proposed Development.

7.15 In order to predict pollutant concentrations of each study pollutant an atmospheric dispersion modelling study has been undertaken using the ADMS-Roads model, version 3.1, developed by Cambridge Environmental Research Consultants Limited (CERC) specifically for road traffic emissions studies in the UK. Consideration has also been given to the likely (potential) impacts upon air quality associated with the proposed heating and power plant associated with the operational Proposed Development, though it was not deemed necessary to model this emission source, as discussed later in this Chapter.

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7.16 In addition, a risk based assessment has been undertaken to determine the potential impacts arising from dust generation and plant exhaust emissions during the construction phase.

Study Pollutants

7.17 Vehicle and combustion plant emissions comprise a complex mixture of organic and inorganic substances. Of these emissions, assessment criteria (for the protection of human health) exist for several pollutants, the most relevant of which are listed in Table 7-1.

7.18 These pollutants are currently regulated because of their known or suspected deleterious impacts upon human health, and because historically, relatively high concentrations have been recorded within and downwind of urban centres.

7.19 It was not considered necessary to undertake an assessment of lead, following its removal from petrol fuels, or SO_2 emissions due to the introduction of low sulphur diesel and the relatively insignificant sulphur content of petrol and natural gas fuels. Furthermore none of the local authorities that have designated AQMA's within the UK did so due to an exceedance of CO, benzene, PAH, $PM_{2.5}$, or 1,3-butadiene objectives. These pollutants are expected to easily comply with the Air Quality Strategy objectives at the application site, and it was therefore not considered necessary to assess these further.

7.20 LBC's most recent Air Quality Action Plan confirms that NO_2 and PM_{10} are the two pollutants of most concern within the Borough. These remaining study pollutants are briefly discussed below in terms of their known health impacts.

- **Particulate Matter** – Health based assessment criteria focuses on the fine 'PM_{10}' and '$PM_{2.5}$', size fractions, which are predominately generated in urban atmospheres through the combustion of fossil fuels. PM_{10} is defined as particulate matter with an aerodynamic diameter of less than 10 microns. Although the health impacts of fine particulate matter are currently the subject of much research, exposure to increased levels are consistently associated with respiratory and cardiovascular illness and mortality; and
- **Nitrogen Dioxide and Oxides of Nitrogen (NO_X)** – Formed as a by-product of the high temperature combustion of fossil fuels (such as petrol and diesel) by the oxidation of nitrogen in the air. NO_X primarily comprises of nitrogen oxide (NO), but also contains NO_2. Once emitted into the air, the former can be oxidised in the atmosphere to produce further NO_2. It is the NO_2 compound that is associated with health impacts, which can affect lung function and airway responsiveness, and may also increase reactivity to natural allergens.

Meteorological Conditions

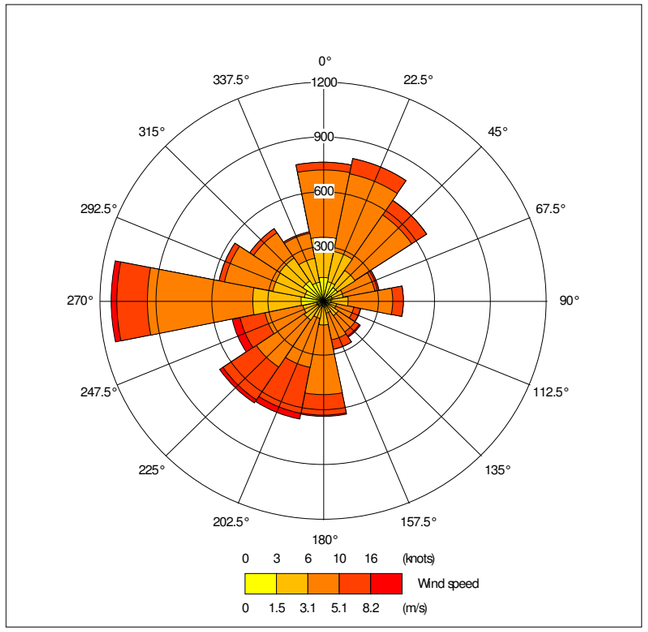
7.21 Local meteorological conditions strongly influence the dispersion of pollutants and are taken into account in the ADMS-Roads model.

7.22 Comparing five previous years of meteorological data from London Heathrow Airport, 2010 data represents a 'worst-case' scenario in terms of meteorological impacts on air quality and has therefore been used in the assessment.

7.23 The meteorological data was allocated a surface roughness of 0.5 in the model to reflect its airport location, and the study area was given a surface roughness of 1.5 and a Monin-Obukhov length (mixing height) of 100m, which is considered representative of urban areas typical of the application site. This is to take account of the greater air resistance caused by buildings in urban areas, which can affect the dispersion of pollutants.

7.24 Analysis of the chosen meteorological data demonstrates that the application site is typically subject to a south westerly wind, though the prevailing win in 2010 was westerly. A wind rose is presented in Figure 7-1.

Figure 7-1 Wind Rose, 2010



Modelling Baseline Conditions

7.25 In order to determine Baseline Concentrations local traffic emissions have been considered in the baseline model using ADMS-Roads model.

7.26 Traffic flows have been derived from 2011 traffic counts provided by the Department for Transport (DfT) Annual Average Daily Traffic (AADT) website (Ref. 7-10). It has been assumed that there will be zero natural traffic growth in LBC between 2013 and the anticipated year of opening, which is 2018, in line with the aims of the Mayor's Transport Strategy for Inner City London.

7.27 Table 7-2 presents the AADT flows along the local road network, presented in terms of the number of Light Duty Vehicles (LDVs) (e.g. cars, motorcycles and light goods vehicles less than 3.5 tonnes) and Heavy Duty Vehicles (HDVs) (e.g. coaches, buses and HGVs greater than 3.5 tonnes).

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Table 7-2 Baseline AADT Flows

Location	Light Vehicles	Heavy Duty Vehicles*	Total Vehicles
A40	3,239	75	3,314
A401	16,523	2,076	18,599
A4200 Southampton Row	20,715	3,197	23,912
Bloomsbury Way (West of the A40)	14,241	2,533	16,774
Bloomsbury Way (Between A40 and A4200)	16,688	2,211	18,899
Bloomsbury Way (East of A4200)	11,002	2,458	13,460
High Holburn West	14,521	19,65	16,486
High Holburn East	18,203	679	18,882
Kingsway	26,985	4,261	31,246
Proctor Street	14,701	2,149	16,850

**Heavy Duty Vehicles (HDVs) are 3.5 tonnes in weight or more (i.e. Heavy Goods Vehicles, buses and coaches)*

7.28 The traffic speeds used in the modelling assessment have been based on estimates taken from Transport for London's '2011 Travel in London Report', from which the average vehicle speeds on roads in Inner City London are shown as 20 kilometres per hour (kph) (Ref. 7-11).

7.29 The Defra LAQM NO_X to NO_2 conversion tool (Ref. 7-12) has been used to convert the modelled NO_X concentrations in the ADMS Roads modelling tool to NO_2.

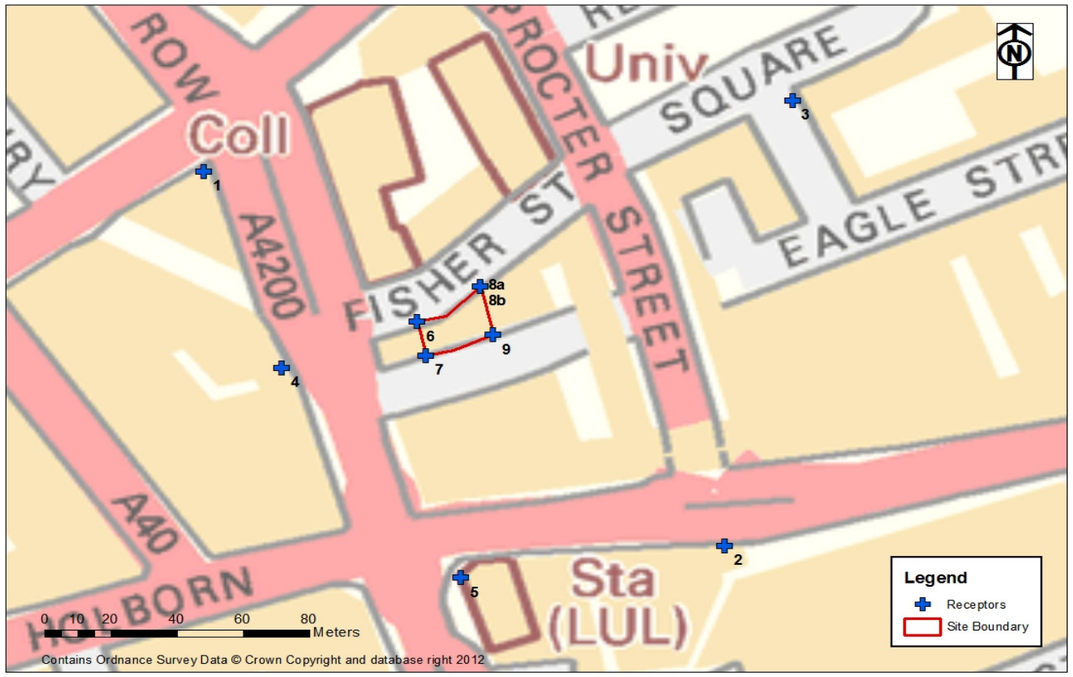
Receptor Points

7.30 Within the ADMS-Roads model, a specified sensitive receptor point (such as residential housing) may be chosen at which modelled concentrations of each pollutant can be calculated. Due to the high built up commercial and residential mix around the local area, a conservative approach of assigning receptors at worst-case locations on façades of buildings adjacent to the most affected roads and busy road junctions has been adopted.

7.31 Figure 7-2 illustrates the receptor locations, as described below. All receptors are located at ground level unless stated otherwise.

- Receptor 1 (530456, 181655) – Possible offsite existing residential receptor on the junction between Southampton Row and Bloomsbury Way.
- Receptor 2 (530612, 181530) - Possible offsite existing residential receptor on A40 High Holburn.
- Receptor 3 (530632, 181680) – Offsite existing residential receptor on Red Lion Square.
- Receptor 4 (530480, 181590) – Possible offsite existing residential receptor on Southampton Row.
- Receptor 5 (530534, 181518) - Possible offsite existing residential receptor on the junction between A40 High Holburn and Kingsway.
- Receptor 6 (530519, 181605) – Future onsite residential receptor, located on the northwest corner of the application site, 10m above ground level (the lowest height of residential dwellings).
- Receptor 7 (530521, 181594) - Future onsite residential receptor, located on the southwest corner of the application site, 10m above ground level.
- Receptor 8a (530538, 181617) - Future onsite residential receptor, located on the northeast corner of the application site.
- Receptor 8b (530538, 181617) - Future onsite residential receptor, located on the northeast corner of the application site, 10m above ground level.
- Receptor 9 (530542, 181601) - Future onsite residential receptor, located on the southeast corner of the application site, 10m above ground level.

Figure 7-2 Location of Modelled Receptors and Indicative Application Site Boundary



Significance Criteria

7.32 The assessment of potential air quality impacts and their significance has been completed for the construction and operational phases of the Proposed Development.

7.33 The significance of an impact is a factor of both the magnitude of the change caused by the Proposed Development and the absolute concentrations in relation to the air quality objective. Particular significance is given to a change that takes the concentration from below to above the objective or vice versa because of the importance ascribed to the objectives in assessing local air quality

7.34 The risk of dust being generated by each construction activity in sufficient quantities to cause annoyance and/or health impacts has been assessed using the criteria outlined in the IAQM's 'Guidance on the Assessment of the Impacts of Construction on Air Quality and Determination of their Significance' (Ref. 7-13).

7.35 The assessment of the operation of the Proposed Development has been based on the criteria outlined in the Environmental Protection UK (EPUK) publication 'Development Control: Planning for Air Quality (2010 Update) (Ref 7-14).

7.36 Both of the above criteria have been modified slightly to incorporate the criteria used within the Crossrail ES, where significance to local air quality is defined as:

7.37 Not significant (NSig) - the change in ground level concentrations does not result in the air quality objective or limit value to be equalled or exceeded, and is an 'imperceptible' or 'small' magnitude of change; or is a 'medium' magnitude of change if concentrations with the Proposed Development remain less than 75% of the air quality objective (on the basis that this would not hinder the implementation of an Air Quality Action Plan by the relevant local authority).

7.38 Significant (Sig) - the increase in ground level concentrations results in the relevant air quality objective or limit value being equalled or exceeded and where the increase is such that the implementation of an Air Quality Action Plan by the relevant local authority would be prejudiced (i.e. a 'small' or 'medium' magnitude of change); or a medium magnitude of change is predicted where concentrations are between 75 - 90% of the objective (and therefore is considered significant due to the scale of change despite concentrations not exceeding the Air Quality Strategy objectives); or a 'large' magnitude of change is expected (except where this is classified as PSig);

7.39 Particularly Significant (PSig) – where an AQMA has not currently been declared, if the increase in ground level concentrations results in a 'large' magnitude of change and therefore particularly inhibits the implementation of an Air Quality Action Plan.

Criteria for Assessing Construction Dust Risk

7.40 The Crossrail ES assessment methodology and criteria used a 'dust nuisance score' (calculated by multiplying the weighted dust raising potential with the weighted sensitive receptor counts, defined as:

- Low Dust Risk Score (<10,000), considered to be NSig;
- Medium Dust Risk Score (10,000 - 200,000), considered to be Sig; and
- High Dust Risk Score (>200,000), considered to be PSig.

7.41 This weighted score approach has been replaced with, the now industry standard, IAQM guidance approach which categorises risk as low to very high based on two factors: the scale and nature of the works plus the proximity of receptors to the application site.

7.42 To assess the risk of the construction phase, the sensitivity of the application site and its surroundings is determined using professional judgement, taking into account the following factors: background concentrations, population density and length of construction works. The criteria used for this risk assessment is shown in Table 7-3.

Table 7-3: Construction Phase Sensitivity

Sensitivity of Surrounding Area	Examples
Very High	Very densely populated area. More than 100 dwellings within 20m. Local PM_{10} concentrations exceed the objective. Contaminated buildings present. Very sensitive receptors (e.g. oncology units). Works continuing in area of the application site for more than a year. European designated ecologically sensitive site.
High	Highly densely populated area. 10-100 dwellings within 20m of application site. Local PM_{10} concentrations just below the objective (e.g. 36-40 µg/m^3). Commercially sensitive horticultural land present or Naturally Designated Ecologically sensitive site.
Medium	Suburban or edge of town area. Less than 10 dwellings within 20m. Local PM_{10} concentrations below the objective (30-36 µg/m^3). Locally designated ecologically sensitive site.
Low	Rural area or no dwellings within 20m. Local PM_{10} concentrations well below objectives (<30 µg/m^3). Wooded area between application site and receptors. No ecological designations

7.43 Table 7-4 presents the significance of the likely impacts of the dust generated by the construction phase, which is a combination of the risk level of the application site and the sensitivity of the area during construction works. The *'Risk of Application Site Giving Rise to Dust Impacts'* bands are also determined using the IAQM guidance and professional judgement. These impacts assume best practice site controls are in place.

Table 7-4: Significance of Construction Impacts

Sensitivity of Surrounding Area	Risk of Application Site Giving Rise to Dust Impacts		
	High	Medium	Low
Very High	Sig	Sig	Nsig
High		Nsig	
Medium	Nsig		
Low			

Criteria for Assessing Impact to Local Air Quality

7.44 Table 7-5 presents criteria for the determination of the 'magnitude of change', based on the absolute change in pollutant concentrations. URS has also added criteria for the short-term NO_2 objective to the EPUK guidance, in particular to assess the significance of power and heating plant emissions on this objective. The descriptions of impacts used within this chapter adhere with the Environment Agency's Horizontal Guidance Note (H1) (Ref. 7-15). The descriptors allow for changes in concentration to be more significant when above the objective.

Table 7-5 Definition of Impact Magnitude for Changes in Pollutant Concentrations

Magnitude of Change	Annual Mean NO_2/PM_{10}	Days PM_{10} > 50 µg/m^3	Short-term NO_2 (1 hr 99.8th percentile)
Large	> 4 µg/m^3	> 4 days	> 40 µg/m^3
Medium	2 – 4 µg/m^3	2 – 4 days	20 – 40 µg/m^3
Small	0.4 – 2 µg/m^3	1 – 2 days	10 – 20 µg/m^3
Imperceptible	< 0.4 µg/m^3	< 1 day	< 10 µg/m^3

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7.45 Table 7-6 presents the significance of impacts associated with magnitude of change relative to the Air Quality Strategy objectives.

Table 7-6 Significance of Impacts (Applicable to both Adverse and Beneficial Impacts)

		Magnitude of Change (Adverse or Beneficial)			
		Imperceptible	**Small**	**Medium**	**Large**
Concentration relative to Objectives	**Above Standard With Proposed Development (>40 µg/m³ or >35 days)**	NSig	Sig	Sig	PSig
	Just Below Standard With Proposed Development (36- 40 µg/m³ or 32 - 35 days, i.e. 90 - 100% of objective)				Sig
	Below Standard With Proposed Development (30- 36 µg/m³ or 26 - 32 days, i.e. 75 - 90% of objective)		NSig	Sig	Sig
	Well Below Standard with Proposed Development (<30 µg/m³ or <26 days, i.e. <75% of objective)			NSig	

Baseline Conditions

Overview

7.46 Local air quality is a combination of background air quality, which is representative of the general levels of pollution in the area away from busy roads and industrial activity (in parks and quiet residential areas, for example), and added emissions from local emission sources. The statutory review and assessment of local air quality within LBC resulted in the entire borough being declared an AQMA. Consequently, large parts of the borough are likely to still exceed Air Quality Strategy objectives.

Local Monitoring Data

7.47 There are a number of background air quality automatic monitoring stations located within a reasonable distance of the application site on which to determine the baseline air quality conditions. The latest automatic monitoring data available is from 2012; however, this data has not been ratified. On comparison the 2012 data indicated similar air pollutant levels to the 2011 ratified data. Both the 2011 and 2012 data has been included for reference.

7.48 For comparison, background air quality data for NO_2, PM_{10}, $PM_{2.5}$ and NO_X was also obtained from the Defra background maps (British National Grid Reference 530500, 181500).

7.49 LBC has 24 diffusion tube stations monitoring ambient NO_2 concentrations. These include both urban and roadside diffusion tube monitoring tube stations with reasonable distance of the application site.

7.50 Table 7-7 summarises the monitoring data that exists within 2km of the application site.

Table 7-7 Local Monitoring Data, (µg/m³)

Station Name	Station Type	Site Type	Location from Application Site	Concentrations (µg/m3)							
				NO_2		NO_X		PM_{10}		$PM_{2.5}$	
				2011	2012	2011	2012	2011	2012	2011	2012
Camden – Bloomsbury	Automatic Monitoring Station	UB	579m	49.9	44.1	78.9	-	22.5	18.8	17.4	16.5
Camden – Shaftesbury Avenue	Automatic Monitoring Station	R	574m	75.5	71.2	158.5	162.6	31.6	28.8	-	-
City of London 1 – Senator House	Automatic Monitoring Station	UB	1.8km	50.7	49.9	79.3	78.4	-	-	-	-
CA21 – Bloomsbury Street*	Diffusion Tube	R	571m	41.0	-	-	-	-	-	-	-
CA14 Russell Square Gardens*	Diffusion Tube	UB	595m	44.0	-	-	-	-	-	-	-
CA6 – Wakefield Gardens*	Diffusion Tube	UB	831m	34.0	-	-	-	-	-	-	-
Defra Background Map 331	Background maps	UB	110m	-	56.4	-	116.4	-	24.1	-	17.3

**Corrected using LBC's 2010 bias adjustment factor 0.96*

UB = Urban Background; R = Roadside

7.51 The two urban background automatic monitoring stations show similar mean annual NO_2 concentrations, both relative to each other and between 2011 and 2012 – approximately 45-50 µg/m³. The Defra Background Maps estimate a slightly higher concentration of 56.4 µg/m³.for 2012. In contrast the background diffusion tube stations report NO_2 concentrations of 34.0 to 44.0 µg/m³. The roadside monitoring stations reveal greater NO_2 concentrations due to the impact of local road traffic emissions.

7.52 The background PM_{10} concentrations were recorded as 22.5 µg/m³ at Camden – Bloomsbury in 2011 and 18.8 µg/m³ in 2012. The Defra Background Maps record a slightly higher concentration of 24.1 µg/m³. The concentrations recorded at the roadside automatic monitoring station is higher, due to the influence of nearby traffic.

7.53 The automatic monitoring station (Camden – Bloomsbury) reports $PM_{2.5}$ concentrations of 17.4 µg/m³. in 2011 and 16.5 µg/m³ in 2012. The Defra background maps show a similar $PM_{2.5}$ concentration of 17.3 µg/m³.

7.54 In order to maintain a conservative approach to the assessment, it was deemed prudent to use the data presented from the Defra Background Maps for the background concentrations in this assessment. This may overestimate local concentrations slightly.

7.55 In light of recent debate about whether air quality in London is improving as forecast, it has been conservatively assumed that there will be no change in background concentrations between 2010 and the anticipated year of opening, which is expected to be 2018. This is considered a worst-case approach, based on a publication by Defra (Ref. 7-15) advising that background concentrations and vehicle emissions have remained relatively stable since 2002-2004 and are likely to continue to do so until about 2016 (when a new vehicle standard comes into effect).

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7.56 The modelled background concentrations used in this assessment are presented in Table 7-8, and are therefore considered valid for all assessment scenarios, being representative of both the pre-Crossrail and post-Crossrail baseline conditions.

Table 7-8 Background Air Quality Data used in the Assessment (µg/m^3)

Pollutant	Background Concentrations	Objective	Averaging period
NO_2	56.4	40	Annual
NO_X	116.4	-	-
PM_{10}	24.1	40	Annual
$PM_{2.5}$	17.3	25	Annual

Modelled Baseline Conditions

7.57 Table 7-9 presents the modelled present-day (2013) ground level pollutant concentrations, incorporating 2012 background concentrations, 2011 traffic flows and 2013 emission factors.

Table 7-9 Modelled Baseline Air Quality Concentrations, 2013 (µg/m^3)

Receptors	Pollutant			
	NO_2	PM_{10}		$PM_{2.5}$
1	71.7	25.9	15 days	18.5
2	77.2	26.7	17 days	19.0
3	60.1	24.5	11 days	17.6
4	66.9	25.3	13 days	18.1
5	75.2	26.4	16 days	18.8
6	61.1	24.6	12 days	17.6
7	61.1	24.6	12 days	17.6
8a	63.1	24.9	12 days	17.8
8b	60.9	24.6	11 days	17.6
9	60.9	24.6	11 days	17.6
Objective	**40**	**40**	**50**	**25**
Averaging period	**Annual Mean**	**Annual Mean**	**35 / year < 50 µg/m^3**	**Annual Mean**

7.58 Mean annual NO_2 concentrations are expected to exceed the Air Quality Strategy objective at all receptors. This is mainly due to the high background concentration, which is expected to already exceed the objective before even considering local traffic emissions. Local traffic emissions do however contribute an additional 4-20 µg/m^3 to mean annual NO_2 concentrations.

7.59 As mean annual NO_2 concentrations exceed 60µg/m^3 (the threshold indicator above which LAQM.TG(09) suggests the short-term objective might be exceeded) concentrations are expected to exceed the short term objective of 200µg/m^3 at roadside receptor points.

7.60 Mean annual and daily PM_{10} objectives and annual $PM_{2.5}$ concentrations are expected to currently be easily met at the modelled receptor points.

7.61 Table 7-10 presents the modelled 2018 baseline pollutant concentrations, incorporating 2012 background concentrations, 2011 traffic flows and 2018 emission factors.

Table 7-10 Modelled Baseline Air Quality Concentrations, 2018 (µg/m^3)

Receptors	Pollutant			
	NO_2	PM_{10}		$PM_{2.5}$
1	67.2	25.6	14 days	18.2
2	71.4	26.3	16 days	18.7
3	58.9	24.4	11 days	17.5
4	63.8	25.1	13 days	17.9
5	69.9	26.1	15 days	18.5
6	59.6	24.5	11 days	17.6
7	59.6	24.5	11 days	17.6
8a	61.1	24.7	12 days	17.7
8b	59.5	24.5	11 days	17.6
9	59.5	24.5	11 days	17.6
Objective	**40**	**40**	**50**	**25**
Averaging period	**Annual Mean**	**Annual Mean**	**35 / year < 50 µg/m^3**	**Annual Mean**

7.62 Mean annual NO_2 concentrations decrease slightly by 2018 through slightly improved vehicle fleet composition though are still expected to easily exceed the Air Quality Strategy objective at all receptors in 2018, partly due to the conservative assumption that background concentration will remain unchanged.

7.63 Mean annual and daily PM_{10} objectives and annual $PM_{2.5}$ concentrations are expected to comply at all at the modelled receptor points.

Potential Impacts

Construction Phase

Construction Road Traffic Vehicles

7.64 The total number of HGVs accessing the construction site is not known at this stage. During the construction of another larger OSD at One Oxford Street, the peak number of HGVs was predicted to be 10 per day. Therefore, for the Proposed Development a lower number are anticipated.

7.65 The EPUK Planning for Air Quality document states that an air quality assessment is only necessary if the construction phase of a development results in an increase of traffic flows of 5% or more along a road with more than 5,000 AADT for a period of one year or more (i.e. an increase of 250 vehicles). The flows attributed to the Proposed Development easily comply with this criterion and hence it is not considered necessary to model the traffic flows associated with construction phase for this assessment.

7.66 The construction phase of the Proposed Development is likely to only result in a small increase in HGV traffic flows which are considered to be **not significant (NSig)**.

Dust Generation

7.67 The movement of building material, plant vehicles and equipment on-site generate exhaust emissions and airborne dust, which can increase long term PM_{10} concentrations and the number of days that PM_{10} concentrations exceed the objective.

7.68 The potential risk of dust generation activities from each stage of construction has been assessed using the IAQM guidance.

7.69 Based on Table 7-4 the sensitivity of the receptor is considered 'high', due to possibility of residential receptors within close proximity of the application site.

7.70 Taking into account that the construction activities associated with the Proposed Development are considered to be of low to medium risk according to the guidance, the significance of construction dust emissions is therefore considered **not significant (NSig)**.

7.71 Despite this, a number of mitigation measures have been recommended in Section 6 of this report to minimise dust emissions as far as practical.

Construction Plant Exhaust Emissions

7.72 With regards to the construction equipment, it is anticipated that there will be relatively few vehicles/plant present on-site at any one time, and the total number of vehicles used will be relatively small compared to background traffic levels in the area.

7.73 The potential impacts on pollutant concentrations typically range from Significant at the application site boundary, reducing to not significant within 15-20m.

7.74 It is expected that the impact associated with the Proposed Development will be less than this, due to the relatively small amount of construction works expected.

7.75 The nearest existing receptor is approximately 35m from the boundary of the application site. Considerable dispersion of pollutants occurs over this distance, which will lead to a significantly lower impact at this receptor than at the application site boundary. The impact at this receptor is therefore expected to be **not significant (NSig).**

7.76 Again, a series of mitigation measures to adhere with the Mayor of London Best Practice are presented later in this chapter to minimise the impact as far as reasonably possible.

Completed Development Impacts

Operational Road Traffic Vehicles

7.77 The Proposed Development does not have any parking facilities and hence is expected to lead to little or no change in local road trips. It was therefore considered not necessary to model the impact of operational traffic on ambient pollutant concentrations and the impact is considered to be **not significant (NSig)**.

Heating and Power Plant Emissions

7.78 Operational emissions will be associated with the proposed heating plant which is proposed to be served by ground source electrical heat pumps (GSHP) and a gas boiler. The GSHP will provide heating all year round and will be supplemented in peak conditions by the boiler.

7.79 The boiler exhausts will be discharged through a louver on the side of the building (horizontally), approximately 3-5m above ground level. The exhaust will be diluted using 'fresh' air drawn in from the surroundings.

7.80 The Fisher Street OSD at RIBA Stage C is currently not designed to a level of detail whereby the NOx emissions from space heating and hot water systems is addressed. However, it is anticipated that the developer will specify that the space heating and hot water systems used in the development are to dry NOx level ≤40 milligrams NO_X per kWh (mg/kWhr)).

7.81 The building in its current design comprises 1,814 m^2 of internal floor space, assuming the space heating demand is equal to or lower than the CIBSE Energy consumption benchmarks for existing buildings (Ref. 7-17) which for residential is 247 kilowatt hours per year (kWh/yr). The gives an annual space heating demand of 448,058kWh/yr, which can be serviced by a boiler below 40-60kW capacity.

7.82 Boilers typically emit around 40 milligrams NO_X per kWh; in order to avoid creating an impact on air quality at adjacent windows of residential dwellings and at ground level the louver vent will be designed to discharge no greater than 0.002mg/m^3 (2µg/m^3) NO_X. This corresponds with a 'small' magnitude of impact, which because concentrations of NO_2 currently exceed the objective, would be judged to be **significant (Sig)**, though it should be noted this corresponds to a 'Slight adverse' impact using the terminology provided by the original EPUK guidance.

Mitigation Measures

Mitigation during Construction

7.83 Construction dust is expected to only represent a nuisance to exposed human receptors in immediate proximity to the construction site and would be controlled through the application of a series of best practice measures.

7.84 This section presents the site specific mitigation suggested for 'medium risk' sites according to 'The Control of Dust and Emissions from Construction and Demolition: Best Practice Guidance' (Ref. 7-18), which shall be implemented as part of the Proposed Development in order to maintain the impact as not significant.

7.85 An Environmental Management Plan (EMP) will be prepared for the Proposed Development and agreed with LBC before any on-site works begin.

7.86 The list below presents a non-exhaustive typical best practice measures which would be adhered to in any EMP:

- Use of water as a dust suppressant where appropriate during dry weather;
- Skips shall be securely covered and drop heights minimised;
- The use (where appropriate) of catalytic converters;
- No vehicle engine idling;
- On-road vehicles to comply with national and EU emission standards;
- The regular maintenance of vehicle engines;
- No bonfires;
- Solid barriers on the construction site boundary;
- Trained and responsible manager on-site during working times to maintain logbook and carry out site inspections;
- Use enclosed chutes and covered skips;
- Regular vehicle cleaning; and
- All loads entering and leaving the construction site will be covered.

Mitigation for the Completed and Occupied Proposed Development

7.87 This section presents a list of some of the typical mitigation measures that will be implemented as part of the Proposed Development.

7 Air Quality

7.88 As noted in the Baseline section, pollutant concentrations are anticipated to exceed the NO_2 mean annual Air Quality Strategy objective within the application site and are expected to continue to exceed this objective for the foreseeable future. This is primarily due to the high background NO_2 concentrations at the application site and it is therefore not unique in the fact it exceeds the national Air Quality Strategy objectives.

7.89 The introduction of residents' onsite will not create a new AQMA (the whole borough is already designated an AQMA), nor will it extend the existing AQMA. The Proposed Development is therefore not expected to inhibit the Council in achieving its aims and objectives outlined in the LBC Air Quality Action Plan.

7.90 A series of mitigation measures have been considered to minimise the exposure of future inhabitants to elevated concentrations of NO_2. These are discussed in turn below:

- Avoiding residential dwellings in the areas of worst air quality (i.e. the ground floor), therefore avoiding introducing new sensitive receptors into the areas of worst air quality in the Proposed Development;
- Setting back the façade of the Proposed Development from Fisher Street - This would have been unviable for the Proposed Development and is undesirable from an urban design perspective, as well as offering relatively little benefit from an air quality perspective;
- A mechanical ventilation system with a centralised intake (drawing in air from a single location away from the road, such as the roof) - This was dismissed predominantly on the grounds of cost and logistics (i.e. it requires more ceiling space for piping between dwellings). It would also have led to only a small benefit to the internal air quality, given that the predicted concentrations at roof level are only 5% lower than along Fisher Street using ADMS-Roads (and still 30% above the national objective). A centralised mechanical ventilation system would have also increased the load on the power plant, in turn affecting the sustainability of the Proposed Development; and
- Carbon filters on the air intake system - This was dismissed for similar reasons. Although these can remove an estimated 75% of the NO_2, which would lead to the national objectives being met onsite, they are expensive to install, increase the load on the power plant, and require ongoing maintenance and filter replacement every 2 years. Opening windows in the summer for cooling would also bypass these filters, rendering them ineffective.

7.91 In summary, it was considered sufficient that the application site excludes residential dwellings on the ground floor, which avoids introducing new sensitive receptors into the areas of worst air quality in the Proposed Development. This is considered sufficient from an air quality perspective and is considered to be in line with local and national planning policy and the aims and objectives outlined in the LBC Air Quality Action Plan.

7.92 It is also important to consider the heating plant emissions. These have been minimised through the energy strategy and use of natural gas fuel and will also incorporate:

- Appropriate design of the louvres to ensure adequate dispersion of pollutants and selection of equipment regarded as Best Available Technology (aspiring to meet the emissions criteria required under the BREEAM / Code for Sustainable Homes methodologies). In particular the exhaust system will need to be designed with sufficient dilution to avoid causing a 2 $\mu g/m^3$ increase at ground level or residential dwellings;
- Incorporation of low-NO_X optimisation of the gas boilers; and
- Regular inspection of the machinery, operation to the manufacturer's instructions, and ensuring that equipment is well maintained during operation.

Residual Impacts and Conclusions

7.93 Table 7-11 summarises residual impacts as reported in this assessment when taking into account the mitigation measures outlined earlier.

7.94 The construction impacts are generally considered to be not significant, localised and temporary in nature.

7.95 The impact of the heating/power plant associated with the operation of the Proposed Development is considered to be significant using the Crossrail methodology. This corresponds with a slight adverse impact when using the terminology provided in the original EPUK guidance.

7.96 It is anticipated that the pollutant concentrations will exceed the mean annual and short term NO_2 Air Quality Strategy objectives in 2013 and up to and including 2018, across the application site and surrounding area. This is the case both with and without the Proposed Development. It is important to note that the whole borough is currently designated an AQMA, and hence this Proposed Development would not introduce new residents into a location where air quality is significantly worse than other parts of the borough. The Proposed Development is not expected to extend the AQMA, either geographically or temporally and will be a similar situation to most of the Borough in 2018, when the Proposed Development is anticipated to be completed and occupied.

Table 7-11 Summary of Residual Impacts

Description	Nature of Impact	Geographical Scale	Significance
Demolition and Construction			
Increase in HGV movements during demolition and construction	Not significant	Local	Not significant (NSig)
Construction Site plant emissions	Not significant	Local	Not significant (NSig)
Impacts from Demolition and Construction Dust	Adverse; Temporary	Local	Not significant (NSig)
Completed and Occupied Proposed Development			
Changes in Traffic Movements from the operational Proposed Development	Not significant	Local	Not significant (NSig)
Heating plant emissions from the operational Proposed Development	Adverse; Long-term	Local	Significant (Sig)

References

Ref. 7-1 Her Majesties Stationary Office (HMSO); (2010). The Air Quality Standards Regulations, Statutory Instrument No. 1001.

Ref. 7-2 HMSO; (1995).The Environment Act.

Ref. 7-3 Department for Environment Food and Rural Affairs (DEFRA), (2007); The Air Quality Strategy for England, Scotland, Wales and Northern Ireland (Volume 1).

Ref. 7-4 Department for Communities and Local Government (2012) National Planning Policy Framework (NPPF).

Ref. 7-5 Department for Communities and Local Government (2012) Technical Guidance to the NPPF.

Ref. 7-6 London Borough of Camden (LBC) (2010), Local Development Framework

Ref. 7-7 LBC (2010), Core Strategy 2010-2025

Ref. 7-8 LBC (2010), Development Policy DP32

Ref. 7-9 LBC (2009), Air Quality Action Plan 2009-2012

Ref. 7-10 DEFRA (2007); LAQM Support Background Maps. http://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html

Ref. 7-11 Department for Transport (2011), Transport Statistics: Traffic Counts, http://www.dft.gov.uk/traffic-counts/

7 Air Quality

Ref. 7-12 DEFRA, (2009); NO2 from NOx Calculator for Modelling Emissions from Roads. http://laqm1.defra.gov.uk/review/tools/monitoring/calculator.php.

Ref. 7-13 IAQM (2012); Guidance on the Assessment of the Impacts of Construction on Air Quality and Determination of their Significance

Ref. 7-14 Environmental Protection UK (EPUK) document, (2010); Update 'Development Control: Planning for Air Quality.

Ref. 7-15 Environment Agency (2010); Technical Guidance Note 1: H1 Guidance.

Ref. 7-16 DEFRA (2010) Memo – a forecast of background concentrations

Ref. 7-17 The Chartered Institution of Building Services Engineers (2004) Energy efficiency in buildings CIBSE Guide F

Ref. 7-18 Mayor of London, (2006); The control of dust and emissions from construction and demolition Best Practice Guidance.