

Appendix: Air Quality

Annex 1: Construction Dust Assessment Procedure

Annex 2: EPUK & IAQM Planning for Air Quality Guidance

Annex 3: Professional Experience

Annex 4: Modelling Methodology

Annex 5: 'Air Quality Neutral'

Annex 6: Construction Mitigation

Annex 7: Policy Context

Annex 8: Air Quality Positive Statement

Annex 9: References

Annex 10: Glossary



Document Control

Client	Trium Environmental Consulting LLP	Principal Contact	Lucy Turner
---------------	------------------------------------	--------------------------	-------------

Job Number	J10/12746A/10
-------------------	---------------

Report Prepared By:	Jack Buckley and Dr Denise Evans
----------------------------	----------------------------------

Document Status and Review Schedule

Report No.	Date	Status	Reviewed by
J10/12746A/10/1/F1	13 October 2021	Final	Laurence Caird (Associate Director)

**Technical Appendices:
Southwark, Vinegar Yard**

October 2021



Experts in air quality management & assessment

This report has been prepared by Air Quality Consultants Ltd on behalf of the Client, taking into account the agreed scope of works. Unless otherwise agreed, this document and all other Intellectual Property Rights remain the property of Air Quality Consultants Ltd.

In preparing this report, Air Quality Consultants Ltd has exercised all reasonable skill and care, taking into account the objectives and the agreed scope of works. Air Quality Consultants Ltd does not accept any liability in negligence for any matters arising outside of the agreed scope of works. The Company operates a formal Quality Management System, which is certified to ISO 9001:2015, and a formal Environmental Management System, certified to ISO 14001:2015.

When issued in electronic format, Air Quality Consultants Ltd does not accept any responsibility for any unauthorised changes made by others.

When printed by Air Quality Consultants Ltd, this report will be on Evolve Office, 100% Recycled paper.



Air Quality Consultants Ltd
 23 Coldharbour Road, Bristol BS6 7JT Tel: 0117 974 1086
 119 Marylebone Road, London NW1 5PU Tel: 020 3873 4780
aqc@aqconsultants.co.uk

Registered Office: 23 Coldharbour Road, Bristol BS6 7JT
 Companies House Registration No: 2814570

A1 Construction Dust Assessment Procedure

A1.1 The criteria developed by IAQM (2016), upon which the GLA's guidance is based, divide the activities on construction sites into four types to reflect their different potential impacts. These are:

- demolition;
- earthworks;
- construction; and
- trackout.

A1.2 The assessment procedure includes the four steps summarised below:

STEP 1: Screen the Need for a Detailed Assessment

A1.3 An assessment is required where there is a human receptor within 350 m of the boundary of the site and/or within 50 m of the route(s) used by construction vehicles on the public highway, up to 500 m from the site entrance(s), or where there is an ecological receptor within 50 m of the boundary of the site and/or within 50 m of the route(s) used by construction vehicles on the public highway, up to 500 m from the site entrance(s).

A1.4 Where the need for a more detailed assessment is screened out, it can be concluded that the level of risk is *negligible* and that any effects will be 'not significant'. No mitigation measures beyond those required by legislation will be required.

STEP 2: Assess the Risk of Dust Impacts

A1.5 A site is allocated to a risk category based on two factors:

- the scale and nature of the works, which determines the potential dust emission magnitude (Step 2A); and
- the sensitivity of the area to dust effects (Step 2B).

A1.6 These two factors are combined in Step 2C, which is to determine the risk of dust impacts with no mitigation applied. The risk categories assigned to the site may be different for each of the four potential sources of dust (demolition, earthworks, construction and trackout).

Step 2A – Define the Potential Dust Emission Magnitude

A1.7 Dust emission magnitude is defined as either 'Small', 'Medium', or 'Large'. The IAQM guidance explains that this classification should be based on professional judgement, but provides the examples in Table A1.1.

Table A1.1: Examples of How the Dust Emission Magnitude Class May be Defined

Class	Examples
Demolition	
Large	Total building volume >50,000 m ³ , potentially dusty construction material (e.g. concrete), on site crushing and screening, demolition activities >20 m above ground level
Medium	Total building volume 20,000 m ³ – 50,000 m ³ , potentially dusty construction material, demolition activities 10-20 m above ground level
Small	Total building volume <20,000 m ³ , construction material with low potential for dust release (e.g. metal cladding or timber), demolition activities <10 m above ground, demolition during wetter months
Earthworks	
Large	Total site area >10,000 m ² , potentially dusty soil type (e.g. clay, which will be prone to suspension when dry to due small particle size), >10 heavy earth moving vehicles active at any one time, formation of bunds >8 m in height, total material moved >100,000 tonnes
Medium	Total site area 2,500 m ² – 10,000 m ² , moderately dusty soil type (e.g. silt), 5-10 heavy earth moving vehicles active at any one time, formation of bunds 4 m – 8 m in height, total material moved 20,000 tonnes – 100,000 tonnes
Small	Total site area <2,500 m ² , soil type with large grain size (e.g. sand), <5 heavy earth moving vehicles active at any one time, formation of bunds <4 m in height, total material moved <10,000 tonnes, earthworks during wetter months
Construction	
Large	Total building volume >100,000 m ³ , piling, on site concrete batching; sandblasting
Medium	Total building volume 25,000 m ³ – 100,000 m ³ , potentially dusty construction material (e.g. concrete), piling, on site concrete batching
Small	Total building volume <25,000 m ³ , construction material with low potential for dust release (e.g. metal cladding or timber)
Trackout ^a	
Large	>50 HDV (>3.5t) outward movements in any one day, potentially dusty surface material (e.g. high clay content), unpaved road length >100 m
Medium	10-50 HDV (>3.5t) outward movements in any one day, moderately dusty surface material (e.g. high clay content), unpaved road length 50 m – 100 m
Small	<10 HDV (>3.5t) outward movements in any one day, surface material with low potential for dust release, unpaved road length <50 m

^a These numbers are for vehicles that leave the site after moving over unpaved ground.

Step 2B – Define the Sensitivity of the Area

A1.8 The sensitivity of the area is defined taking account of a number of factors:

- the specific sensitivities of receptors in the area;
- the proximity and number of those receptors;
- in the case of PM₁₀, the local background concentration; and
- site-specific factors, such as whether there are natural shelters to reduce the risk of wind-blown dust.

A1.9 The first requirement is to determine the specific sensitivities of local receptors. The IAQM guidance recommends that this should be based on professional judgment, taking account of the principles in Table A1.2. These receptor sensitivities are then used in the matrices set out in

A1.10 Table A1.3 and Table A1.4 to determine the sensitivity of the area. Finally, the sensitivity of the area is considered in relation to any other site-specific factors, such as the presence of natural shelters etc., and any required adjustments to the defined sensitivities are made.

Step 2C – Define the Risk of Impacts

A1.11 The dust emission magnitude determined at Step 2A is combined with the sensitivity of the area determined at Step 2B to determine the *risk* of impacts with no mitigation applied. The IAQM guidance provides the matrix in Table A1.5 as a method of assigning the level of risk for each activity.

STEP 3: Determine Site-specific Mitigation Requirements

A1.12 The IAQM guidance provides a suite of recommended and desirable mitigation measures which are organised according to whether the outcome of Step 2 indicates a low, medium, or high risk. The list provided in the IAQM guidance has been used as the basis for the requirements set out in Appendix A6.

STEP 4: Determine Significant Effects

A1.13 The IAQM guidance does not provide a method for assessing the significance of effects before mitigation, and advises that pre-mitigation significance should not be determined. With appropriate mitigation in place, the IAQM guidance is clear that the residual effect will normally be ‘not significant’.

A1.14 The IAQM guidance recognises that, even with a rigorous dust management plan in place, it is not possible to guarantee that the dust mitigation measures will be effective all of the time, for instance under adverse weather conditions. The local community may therefore experience occasional, short-term dust annoyance. The scale of this would not normally be considered sufficient to change the conclusion that the effects will be ‘not significant’.

Table A1.2: Principles to be Used When Defining Receptor Sensitivities

Class	Principles	Examples
Sensitivities of People to Dust Soiling Effects		
High	users can reasonably expect enjoyment of a high level of amenity; or the appearance, aesthetics or value of their property would be diminished by soiling; and the people or property would reasonably be expected to be present continuously, or at least regularly for extended periods, as part of the normal pattern of use of the land	dwellings, museum and other culturally important collections, medium and long term car parks and car showrooms
Medium	users would expect to enjoy a reasonable level of amenity, but would not reasonably expect to enjoy the same level of amenity as in their home; or the appearance, aesthetics or value of their property could be diminished by soiling; or the people or property wouldn't reasonably be expected to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land	parks and places of work
Low	the enjoyment of amenity would not reasonably be expected; or there is property that would not reasonably be expected to be diminished in appearance, aesthetics or value by soiling; or there is transient exposure, where the people or property would reasonably be expected to be present only for limited periods of time as part of the normal pattern of use of the land	playing fields, farmland (unless commercially-sensitive horticultural), footpaths, short term car parks and roads
Sensitivities of People to the Health Effects of PM₁₀		
High	locations where members of the public may be exposed for eight hours or more in a day	residential properties, hospitals, schools and residential care homes
Medium	locations where the people exposed are workers, and where individuals may be exposed for eight hours or more in a day.	may include office and shop workers, but will generally not include workers occupationally exposed to PM ₁₀
Low	locations where human exposure is transient	public footpaths, playing fields, parks and shopping streets
Sensitivities of Receptors to Ecological Effects		
High	locations with an international or national designation and the designated features may be affected by dust soiling; or locations where there is a community of a particularly dust sensitive species	Special Areas of Conservation with dust sensitive features
Medium	locations where there is a particularly important plant species, where its dust sensitivity is uncertain or unknown; or locations with a national designation where the features may be affected by dust deposition	Sites of Special Scientific Interest with dust sensitive features
Low	locations with a local designation where the features may be affected by dust deposition	Local Nature Reserves with dust sensitive features

Table A1.3: Sensitivity of the Area to Dust Soiling Effects on People and Property ¹

Receptor Sensitivity	Number of Receptors	Distance from the Source (m)			
		<20	<50	<100	<350
High	>100	High	High	Medium	Low
	10-100	High	Medium	Low	Low
	1-10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low

¹ For demolition, earthworks and construction, distances are taken either from the dust source or from the boundary of the site. For trackout, distances are measured from the sides of roads used by construction traffic. Without mitigation, trackout may occur from roads up to 500 m from sites with a *large* dust emission magnitude, 200 m from sites with a *medium* dust emission magnitude and 50 m from sites with a *small* dust emission magnitude, as measured from the site exit. The impact declines with distance from the site, and it is only necessary to consider trackout impacts up to 50 m from the edge of the road.

Table A1.4: Sensitivity of the Area to Human Health Effects ¹

Receptor Sensitivity	Annual Mean PM ₁₀	Number of Receptors	Distance from the Source (m)				
			<20	<50	<100	<200	<350
High	>32 µg/m ³	>100	High	High	High	Medium	Low
		10-100	High	High	Medium	Low	Low
		1-10	High	Medium	Low	Low	Low
	28-32 µg/m ³	>100	High	High	Medium	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	High	Medium	Low	Low	Low
	24-28 µg/m ³	>100	High	Medium	Low	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	<24 µg/m ³	>100	Medium	Low	Low	Low	Low
		10-100	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Medium	>32 µg/m ³	>10	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	28-32 µg/m ³	>10	Medium	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	24-28 µg/m ³	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
<24 µg/m ³	>10	Low	Low	Low	Low	Low	
	1-10	Low	Low	Low	Low	Low	
Low	-	>1	Low	Low	Low	Low	Low

Table A1.5: Defining the Risk of Dust Impacts

Sensitivity of the Area	Dust Emission Magnitude		
	Large	Medium	Small
Demolition			
High	High Risk	Medium Risk	Medium Risk
Medium	High Risk	Medium Risk	Low Risk
Low	Medium Risk	Low Risk	Negligible
Earthworks			
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible
Construction			
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible
Trackout			
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Low Risk	Negligible
Low	Low Risk	Low Risk	Negligible

A2 EPUK & IAQM Planning for Air Quality Guidance

A2.1 The guidance issued by EPUK and IAQM (Moorcroft and Barrowcliffe et al, 2017) is comprehensive in its explanation of the place of air quality in the planning regime. Key sections of the guidance not already mentioned above are set out below.

Air Quality as a Material Consideration

“Any air quality issue that relates to land use and its development is capable of being a material planning consideration. The weight, however, given to air quality in making a planning application decision, in addition to the policies in the local plan, will depend on such factors as:

- the severity of the impacts on air quality;
- the air quality in the area surrounding the proposed development;
- the likely use of the development, i.e. the length of time people are likely to be exposed at that location; and
- the positive benefits provided through other material considerations”.

Recommended Best Practice

A2.2 The guidance goes into detail on how all development proposals can and should adopt good design principles that reduce emissions and contribute to better air quality management. It states:

“The basic concept is that good practice to reduce emissions and exposure is incorporated into all developments at the outset, at a scale commensurate with the emissions”.

A2.3 The guidance sets out a number of good practice principles that should be applied to all developments that:

- include 10 or more dwellings;
- where the number of dwellings is not known, residential development is carried out on a site of more than 0.5 ha;
- provide more than 1,000 m² of commercial floorspace;
- are carried out on land of 1 ha or more.

A2.4 The good practice principles are that:

- New developments should not contravene the Council’s Air Quality Action Plan, or render any of the measures unworkable;
- Wherever possible, new developments should not create a new “street canyon”, as this inhibits pollution dispersion;

- Delivering sustainable development should be the key theme of any application;
- New development should be designed to minimise public exposure to pollution sources, e.g. by locating habitable rooms away from busy roads;
- The provision of at least 1 Electric Vehicle (EV) “rapid charge” point per 10 residential dwellings and/or 1000 m² of commercial floorspace. Where on-site parking is provided for residential dwellings, EV charging points for each parking space should be made available;
- Where development generates significant additional traffic, provision of a detailed travel plan (with provision to measure its implementation and effect) which sets out measures to encourage sustainable means of transport (public, cycling and walking) via subsidised or free-ticketing, improved links to bus stops, improved infrastructure and layouts to improve accessibility and safety;
- All gas-fired boilers to meet a minimum standard of <40 mgNO_x/kWh;
- Where emissions are likely to impact on an AQMA, all gas-fired CHP plant to meet a minimum emissions standard of:
 - Spark ignition engine: 250 mgNO_x/Nm³;
 - Compression ignition engine: 400 mgNO_x/Nm³;
 - Gas turbine: 50 mgNO_x/Nm³.
- A presumption should be to use natural gas-fired installations. Where biomass is proposed within an urban area it is to meet minimum emissions standards of 275 mgNO_x/Nm³ and 25 mgPM/Nm³.

A2.5 The guidance also outlines that offsetting emissions might be used as a mitigation measure for a proposed development. However, it states that:

“It is important that obligations to include offsetting are proportional to the nature and scale of development proposed and the level of concern about air quality; such offsetting can be based on a quantification of the emissions associated with the development. These emissions can be assigned a value, based on the “damage cost approach” used by Defra, and then applied as an indicator of the level of offsetting required, or as a financial obligation on the developer. Unless some form of benchmarking is applied, it is impractical to include building emissions in this approach, but if the boiler and CHP emissions are consistent with the standards as described above then this is not essential”.

A2.6 The guidance offers a widely used approach for quantifying costs associated with pollutant emissions from transport. It also outlines the following typical measures that may be considered to offset emissions, stating that measures to offset emissions may also be applied as post assessment mitigation:

- Support and promotion of car clubs;
- Contributions to low emission vehicle refuelling infrastructure;
- Provision of incentives for the uptake of low emission vehicles;
- Financial support to low emission public transport options; and
- Improvements to cycling and walking infrastructures.

Screening

Impacts of the Local Area on the Development

“There may be a requirement to carry out an air quality assessment for the impacts of the local area’s emissions on the proposed development itself, to assess the exposure that residents or users might experience. This will need to be a matter of judgement and should take into account:

- *the background and future baseline air quality and whether this will be likely to approach or exceed the values set by air quality objectives;*
- *the presence and location of Air Quality Management Areas as an indicator of local hotspots where the air quality objectives may be exceeded;*
- *the presence of a heavily trafficked road, with emissions that could give rise to sufficiently high concentrations of pollutants (in particular nitrogen dioxide), that would cause unacceptably high exposure for users of the new development; and*
- *the presence of a source of odour and/or dust that may affect amenity for future occupants of the development”.*

Impacts of the Development on the Local Area

A2.7 The guidance sets out two stages of screening criteria that can be used to identify whether a detailed air quality assessment is required, in terms of the impact of the development on the local area. The first stage is that you should proceed to the second stage if any of the following apply:

- 10 or more residential units or a site area of more than 0.5 ha residential use; and/or
- more than 1,000 m² of floor space for all other uses or a site area greater than 1 ha.

A2.8 Coupled with any of the following:

- the development has more than 10 parking spaces; and/or
- the development will have a centralised energy facility or other centralised combustion process.

A2.9 If the above do not apply then the development can be screened out as not requiring a detailed air quality assessment of the impact of the development on the local area. If they do apply then you proceed to stage 2, which sets out indicative criteria for requiring an air quality assessment. The stage 2 criteria relating to vehicle emissions are set out below:

- the development will lead to a change in LDV flows of more than 100 AADT within or adjacent to an AQMA or more than 500 AADT elsewhere;
- the development will lead to a change in HDV flows of more than 25 AADT within or adjacent to an AQMA or more than 100 AADT elsewhere;
- the development will lead to a realigning of roads (i.e. changing the proximity of receptors to traffic lanes) where the change is 5m or more and the road is within an AQMA;
- the development will introduce a new junction or remove an existing junction near to relevant receptors, and the junction will cause traffic to significantly change vehicle acceleration/deceleration, e.g. traffic lights or roundabouts;
- the development will introduce or change a bus station where bus flows will change by more than 25 AADT within or adjacent to an AQMA or more than 100 AADT elsewhere; and
- the development will have an underground car park with more than 100 movements per day (total in and out) with an extraction system that exhausts within 20 m of a relevant receptor.

A2.10 The criteria are more stringent where the traffic impacts may arise on roads where concentrations are close to the objective. The presence of an AQMA is taken to indicate the possibility of being close to the objective, but where whole authority AQMAs are present and it is known that the affected roads have concentrations below 90% of the objective, the less stringent criteria are likely to be more appropriate.

A2.11 On combustion processes (including standby emergency generators and shipping) where there is a risk of impacts at relevant receptors, the guidance states that:

“Typically, any combustion plant where the single or combined NO_x emission rate is less than 5 mg/sec is unlikely to give rise to impacts, provided that the emissions are released from a vent or stack in a location and at a height that provides adequate dispersion. As a guide, the 5 mg/s criterion equates to a 450 kW ultra-low NO_x gas boiler or a 30kW CHP unit operating at <95mg/Nm³.”

In situations where the emissions are released close to buildings with relevant receptors, or where the dispersion of the plume may be adversely affected by the size and/or height of adjacent buildings (including situations where the stack height is lower than the receptor) then consideration will need to be given to potential impacts at much lower emission rates.

Conversely, where existing nitrogen dioxide concentrations are low, and where the dispersion conditions are favourable, a much higher emission rate may be acceptable”.

A2.12 Should none of the above apply then the development can be screened out as not requiring a detailed air quality assessment of the impact of the development on the local area, provided that professional judgement is applied; the guidance importantly states the following:

“The criteria provided are precautionary and should be treated as indicative. They are intended to function as a sensitive ‘trigger’ for initiating an assessment in cases where there is a possibility of significant effects arising on local air quality. This possibility will, self-evidently, not be realised in many cases. The criteria should not be applied rigidly; in some instances, it may be appropriate to amend them on the basis of professional judgement, bearing in mind that the objective is to identify situations where there is a possibility of a significant effect on local air quality”.

A2.13 Even if a development cannot be screened out, the guidance is clear that a detailed assessment is not necessarily required:

“The use of a Simple Assessment may be appropriate, where it will clearly suffice for the purposes of reaching a conclusion on the significance of effects on local air quality. The principle underlying this guidance is that any assessment should provide enough evidence that will lead to a sound conclusion on the presence, or otherwise, of a significant effect on local air quality. A Simple Assessment will be appropriate, if it can provide this evidence. Similarly, it may be possible to conduct a quantitative assessment that does not require the use of a dispersion model run on a computer”.

A2.14 The guidance also outlines what the content of the air quality assessment should include, and this has been adhered to in the production of this chapter.

Assessment of Significance

A2.15 The guidance recommends that the assessment of significance should be based on professional judgement, with the overall air quality impact of the development described as either ‘significant’ or ‘not significant’. In drawing this conclusion, the following factors should be taken into account:

- the existing and future air quality in the absence of the development;
- the extent of current and future population exposure to the impacts;
- the influence and validity of any assumptions adopted when undertaking the prediction of impacts;
- the potential for cumulative impacts and, in such circumstances, several impacts that are described as ‘slight’ individually could, taken together, be regarded as having a significant effect for the purposes of air quality management in an area, especially where it is proving difficult to reduce concentrations of a pollutant. Conversely, a ‘moderate’ or ‘substantial’

impact may not have a significant effect if it is confined to a very small area and where it is not obviously the cause of harm to human health; and

- the judgement on significance relates to the consequences of the impacts; will they have an effect on human health that could be considered as significant? In the majority of cases, the impacts from an individual development will be insufficiently large to result in measurable changes in health outcomes that could be regarded as significant by health care professionals.

A2.16 The guidance is clear that other factors may be relevant in individual cases. It also states that the effect on the residents of any new development where the air quality is such that an air quality objective is not met will be judged as significant. For people working at new developments in this situation, the same will not be true as occupational exposure standards are different, although any assessment may wish to draw attention to the undesirability of the exposure.

A2.17 A judgement of the significance should be made by a competent professional who is suitably qualified. A summary of the professional experience of the staff contributing to this assessment is provided in Appendix A3.

A3 Professional Experience

Laurence Caird, MEarthSci CSci MEnvSc MIAQM

Mr Caird is an Associate Director with AQC, with 16 years' experience in the field of air quality including the detailed assessment of emissions from road traffic, airports, heating and energy plant, and a wide range of industrial sources including the thermal treatment of waste. He has experience in ambient air quality monitoring for numerous pollutants using a wide range of techniques and is also competent in the monitoring and assessment of nuisance odours and dust. Mr Caird has worked with a variety of clients to provide expert air quality services and advice, including local authorities, planners, developers and process operators. He is a Member of the Institute of Air Quality Management and is a Chartered Scientist.

Dr Denise Evans, BSc (Hons) PhD MEnvSc MIAQM

Dr Evans is an Associate Director with AQC, with more than 21 years' relevant experience. She has prepared air quality review and assessment reports for local authorities, and has appraised local authority air quality assessments on behalf of the UK governments, and provided support to the Review and Assessment helpdesk. She has extensive modelling experience, completing air quality and odour assessments to support applications for a variety of development sectors including residential, mixed use, urban regeneration, energy, commercial, industrial, and road schemes, assessing the effects of a range of pollutants against relevant standards for human and ecological receptors. Denise also has experience of completing assessments for the purposes of Permit applications. She has acted as an Expert Witness and is a Member of the Institute of Air Quality Management.

Jack Buckley, BSc (Hons) MSc AMEnvSc AMIAQM

Mr Buckley is a Consultant with AQC with four years' experience in the field of air quality. Prior to joining AQC in June 2019, he worked as a Consultant at Capita, where he gained experience in the assessment of air quality impacts for a range of projects, including road and rail infrastructure schemes, residential developments and industrial facilities sizes. He has experience in producing air quality assessments for EIA schemes, using qualitative and quantitative methods, including ADMS-Roads and air quality neutral calculations, and has undertaken diffusion tube monitoring studies. Prior to joining Capita, Jack completed a BSc (Hons) in Chemistry and an MSc in Environmental Science and Management, with both dissertations investigating the performance of low-cost air quality sensors. He is an Associate Member of both the Institute of Air Quality Management and the Institution of Environmental Sciences.

A4 Modelling Methodology

Model Inputs

- A4.1 The impacts of emissions from the proposed emergency backup generators have been predicted using the ADMS-5 dispersion model. ADMS-5 is a new generation model that incorporates a state-of-the-art understanding of the dispersion processes within the atmospheric boundary layer. The model has been run to predict the process contribution of the proposed plant emissions to annual mean concentrations of nitrogen oxides, and the 100th and 99.79th percentiles of 1-hour mean nitrogen oxides concentrations. Emission parameters input to the model are presented in Table A4.1.
- A4.2 The 2,500 kVA capacity business backup generator plant proposed to be installed into the Proposed Development will each have an assumed net fuel input of 5,179 kW, which is equivalent to a fuel consumption of 521.5 litres per hour of diesel oil. These generators will have a NO_x emission rate of 2,925.4 mg/kWh and a PM emission rate of 9.1 mg/kWh. The 250 kVA capacity life-safety generator plant will have an assumed net fuel input of 558 kW, which is equivalent to a fuel consumption of 56.2 litres per hour of diesel oil. This generator will have a NO_x emission rate of 3,505 mg/kWh and a PM emission rate of 122.7 mg/kWh. Sweco UK Limited has advised that both the business backup and life-safety generator plant will operate for fewer than four hours per year for testing purposes (10 minute test per month, plus up to two hours annually).
- A4.3 The diesel wet riser and sprinkler pumps will have assumed net fuel inputs of 428.5 kW and 339 kW, equivalent to fuel consumptions of 43.1 litres per hour and 34.1 litres per hour respectively. These generators will both have an assumed NO_x emission rate of 4000 mg/kWh, whilst the PM emission rates will be 300 mg/kWh and 200 mg/kWh for the wet riser and sprinkler pumps respectively. Both generators will operate for 52 hours per year for testing purposes (weekly testing of up to an hour).
- A4.4 Emissions from all plant will rise to roof level in dedicated flues. The exhaust volume flow rates for the plant have been calculated based on the complete combustion of the assumed diesel oil composition in Table A4.2.

Table A4.1: Plant Specifications and Modelled Emissions and Release Conditions

Parameter	Value
3 x 2,500 kVA Capacity Business Backup Generator	
Specified Flue Internal Diameter (m)	0.7
Specified Exhaust Mass Flow Rate (kg/h)	12,554.9
Calculated Actual Exhaust Volume Flow (m ³ /s)	7.31
Calculated Exit Velocity (m/s)	19.0
Specified Exhaust O ₂ Content (%)	5.0
Specified Exhaust H ₂ O Content (% v/v)	0.0
Specified Net Fuel Input (kW)	5,179
Calculated Gross Fuel Input (kW)	5,527
Specified NO _x Emission Rate (mg/Nm ³)	2,925
Calculated NO _x Emission Rate (g/s)	4.865
Specified PM Emission Rate (mg/kWh)	9.1
Calculated PM Emission Rate (g/s)	0.015
Specified Exhaust Temperature (°C)	465.8
Flue Locations (x,y)	533067.55, 179947.32 533068.21, 179946.98 533068.85, 179946.64
250 kVA Life Safety Generator	
Specified Flue Internal Diameter (m)	0.3
Specified Exhaust Mass Flow Rate (kg/h)	1,045
Calculated Actual Exhaust Volume Flow (m ³ /s)	0.667
Calculated Exit Velocity (m/s)	9.437
Specified Net Fuel Input (kW)	558
Calculated Gross Fuel Input (kW)	595.5
Specified NO _x Emission Rate (mg/kWh)	3,505
Calculated NO _x Emission Rate (g/s)	0.195
Specified PM Emission Rate (mg/kWh)	122.7
Calculated PM Emission Rate (g/s)	0.007
Specified Exhaust Temperature (°C)	537
Flue Location (x,y)	533068.42, 179944.94
135 kVA Wet Riser Pump	
Specified Flue Internal Diameter (m)	0.15
Specified Exhaust Mass Flow Rate (kg/h)	864
Calculated Actual Exhaust Volume Flow (m ³ /s) ^b	0.589
Calculated Exit Velocity (m/s)	33.34
Specified Net Fuel Input (kW)	428.5
Calculated Gross Fuel Input (kW)	457.3

Specified NOx Emission Rate (mg/kWh)	4,000
Calculated NOx Emission Rate (g/s)	0.12
Specified PM Emission Rate (mg/kWh)	300
Calculated PM Emission Rate (g/s)	0.009
Specified Exhaust Temperature (°C)	592
Flue Location (x,y)	533068.84, 179945.75
141 kVA Sprinkler Pump	
Specified Flue Internal Diameter (m)	0.15
Specified Exhaust Mass Flow Rate (kg/h)	453.2
Calculated Actual Exhaust Volume Flow (m³/s) ^b	0.329
Calculated Exit Velocity (m/s)	18.61
Specified Net Fuel Input (kW)	339
Calculated Gross Fuel Input (kW)	361.8
Specified NOx Emission Rate (mg/kWh)	4,000
Calculated NOx Emission Rate (g/s)	0.126
Specified PM Emission Rate (mg/kWh)	200
Calculated PM Emission Rate (g/s)	0.006
Specified Exhaust Temperature (°C)	649
Flue Location (x,y)	533068.63, 179945.34

Note: Orange highlighted cells contain the values entered into the model. The number of significant figures presented should not be taken to represent the accuracy of the information used.

Table A4.2: Typical Diesel Fuel Composition

Elemental Component	Diesel Oil
Carbon	86.5%
Hydrogen	13.2%
Oxygen	0.3%
Net Calorific Value (LHV) (MJ/kg)	42.82
Gross Calorific Value (HHV) (MJ/kg)	45.70
HHV/LHV	1.07
Liquid Density @ 15°C (kg/m³)	835

A4.5 Entrainment of the plume into the wake of the buildings (the so-called building downwash effect) has been taken into account in the model. The building dimensions and flue location have been obtained from drawings provided by KPF. The location of the flues are shown in Figure A4.1 along with the modelled buildings and their heights. The flues have been modelled at a height of 94.74 m (1 m above the rooftop external plant enclosure).

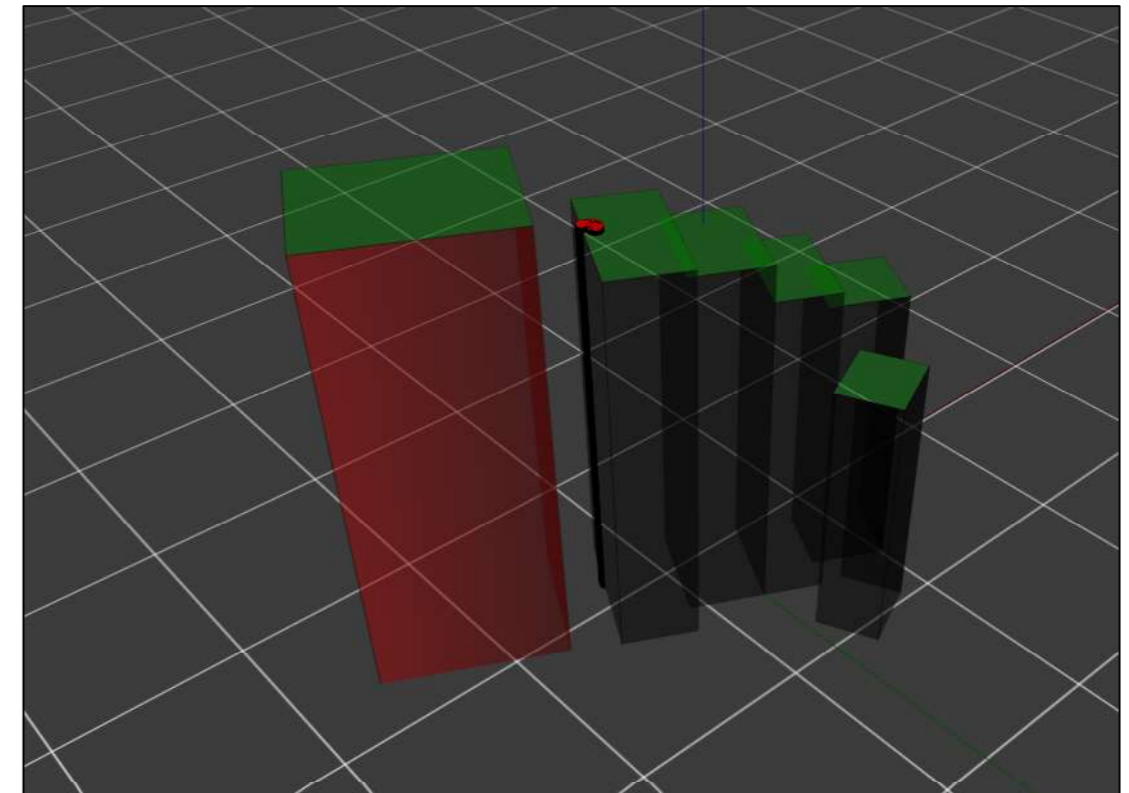


Figure A4.1: Flue Locations & Modelled Buildings

A4.6 Hourly sequential meteorological data from London City for the years 2017-2019 have been used in the model. The London City meteorological monitoring station is located at London City Airport, approximately 9.7 km to the east of the Proposed Development. It is deemed to be the nearest monitoring station representative of meteorological conditions in the vicinity of the Proposed Development; both the Proposed Development and the London City Airport meteorological monitoring station are located in Greater London where they will be influenced by the effects of inland meteorology in urban topography. Wind roses for the site for the years 2017-2019 are provided in Figure A4.2.

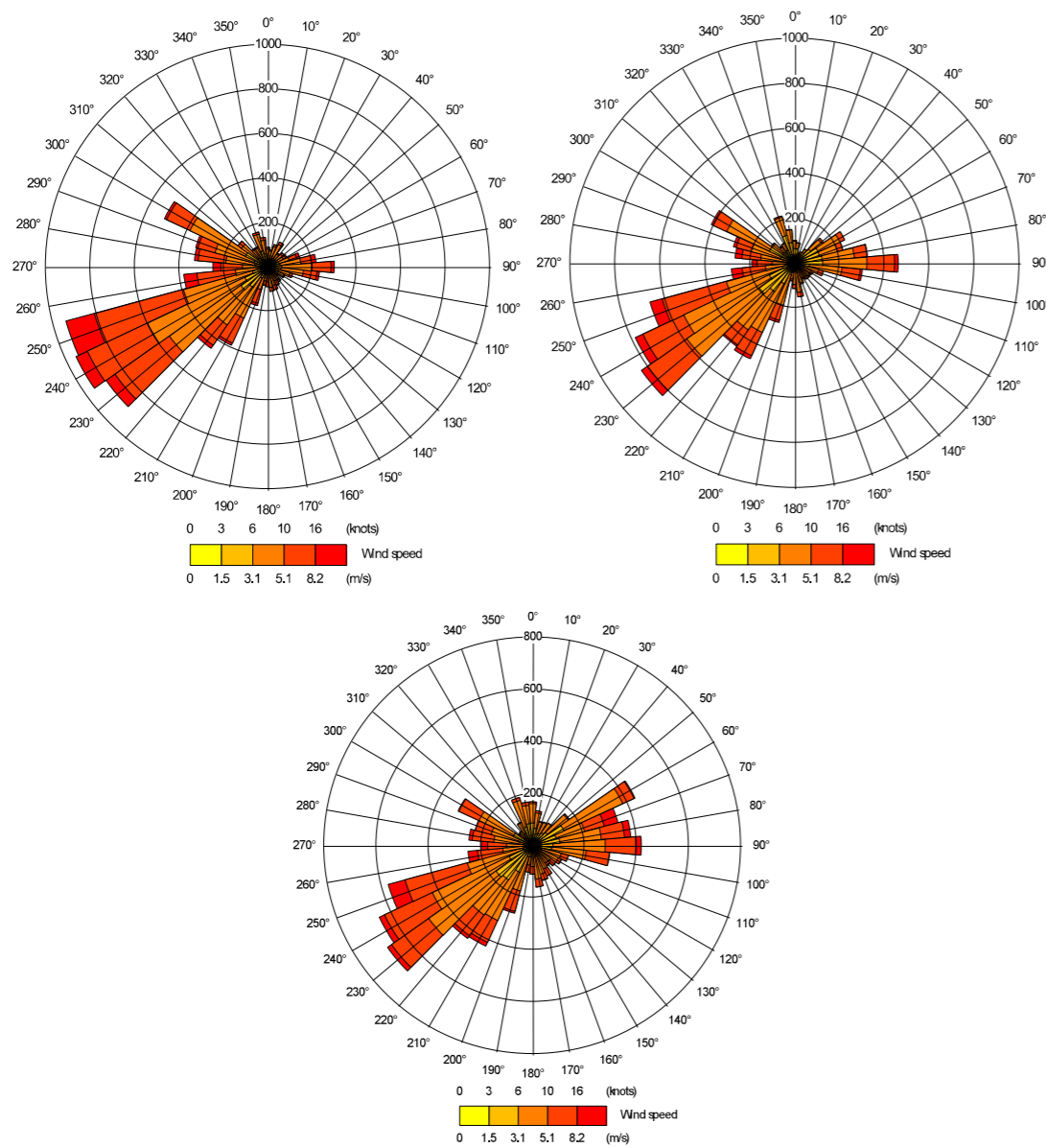


Figure A4.2: Wind Roses for 2017 (top left), 2018 (top right) and 2019 (bottom)

Model Post-processing

A4.7 Emissions from the generator plant will be predominantly in the form of nitrogen oxides (NO_x) and PM₁₀. ADMS-5 has been run to predict the contribution of the proposed generator emissions to annual mean concentrations of nitrogen oxides and PM, to the 100th and 99.79th percentiles of 1-hour mean nitrogen oxides concentrations, and to the 90.4th percentile of 24-hour mean PM₁₀ concentrations. For the initial screening of the process contributions, the approach recommended by the Environment Agency (2005) has been used to predict nitrogen dioxide concentrations, assuming that:

- annual mean NO₂ concentration = annual mean NO_x concentration multiplied by 0.7; and
- 99.79th percentile of 1-hour mean NO₂ concentrations = 99.79th percentile of 1-hour mean NO_x concentrations multiplied by 0.35.

A5 'Air Quality Neutral'

- A5.1 The GLA's SPG on Sustainable Design and Construction (GLA, 2014a), and its accompanying Air Quality Neutral methodology report (AQC, 2014), provide an approach to assessing whether a development is air quality neutral. The approach is to compare the expected emissions from the building energy use and the car use associated with the proposed development against defined emissions benchmarks for buildings and transport in London.
- A5.2 The benchmarks for heating and energy plant (termed 'Building Emissions Benchmarks' or 'BEBs') are set out in Table A5.1, while the 'Transport Emissions Benchmarks' ('TEBs') are set out in Table A5.2. In order to assess against the TEBs, it is necessary to combine the expected trip generation from the development with estimates of average trip length and average emission per vehicle. So as to ensure a consistent methodology, the report which accompanies the SPG (AQC, 2014) recommends that the information in Table A5.3 and Table A5.4 (upon which the TEBs are based) is used. Similarly, the information in Table A5.5 may be used if site-specific information are not available (AQC, 2014). For use classes other than A1, B1 and B3, trip lengths and average emissions per vehicle are not provided, thus the trip rates in Table A5.6 alone may be used to consider the air quality neutrality of a development. These have been derived from the Trip Rate Assessment Valid for London (TRAVL) database.

Table A5.1: Building Emissions Benchmarks (g/m² of Gross Internal Floor Area)

Land Use Class	NOx	PM ₁₀
Class A1	22.6	1.29
Class A3 - A5	75.2	4.32
Class A2 and Class B1	30.8	1.77
Class B2 - B7	36.6	2.95
Class B8	23.6	1.90
Class C1	70.9	4.07
Class C2	68.5	5.97
Class C3	26.2	2.28
D1 (a)	43.0	2.47
D1 (b)	75.0	4.30
Class D1 (c -h)	31.0	1.78
Class D2 (a-d)	90.3	5.18
Class D2 (e)	284	16.3

Table A5.2: Transport Emissions Benchmarks

Land use	CAZ ^a	Inner ^b	Outer ^b
NOx (g/m²/annum)			
Retail (A1)	169	219	249
Office (B1)	1.27	11.4	68.5
NOx (g/dwelling/annum)			
Residential (C3)	234	558	1553
PM₁₀ (g/m²/annum)			
Retail (A1)	29.3	39.3	42.9
Office (B1)	0.22	2.05	11.8
PM₁₀ (g/dwelling/annum)			
Residential (C3,C4)	40.7	100	267

^a Central Activity Zone.

^b Inner London and Outer London as defined in the LAEI (GLA, 2016b).

Table A5.3: Average Distance Travelled by Car per Trip

Land use	Distance (km)		
	CAZ	Inner	Outer
Retail (A1)	9.3	5.9	5.4
Office (B1)	3.0	7.7	10.8
Residential (C3)	4.3	3.7	11.4

Table A5.4: Average Road Traffic Emission Factors in London in 2010

Pollutant	g/vehicle-km		
	CAZ	Inner	Outer
NO _x	0.4224	0.370	0.353
PM ₁₀	0.0733	0.0665	0.0606

Table A5.5: Average Emissions from Heating and Cooling Plant in Buildings in London in 2010

	Gas (kg/kWh)		Oil (kg/kWh)	
	NO _x	PM ₁₀	NO _x	PM ₁₀
Domestic	0.0000785	0.00000181	0.000369	0.000080
Industrial/Commercial	0.000194	0.00000314	0.000369	0.000080

Table A5.6: Average Number of Trips per Annum for Different Development Categories

Land use	Number of Trips (trips/m ² /annum)		
	CAZ	Inner	Outer
A1	43	100	131
A3	153	137	170
A4	2.0	8.0	-
A5	-	32.4	590
B1	1	4	18
B2	-	15.6	18.3
B8	-	5.5	6.5
C1	1.9	5.0	6.9
C2	-	3.8	19.5
D1	0.07	65.1	46.1
D2	5.0	22.5	49.0
Number of Trips (trips/dwelling/annum)			
C3	129	407	386

A6 Construction Mitigation

A6.1 Table A6.1 presents a set of best-practice measures from the GLA guidance (GLA, 2014b) that should be incorporated into the specification for the works. These measures should be written into a Dust Management Plan. Some of the measures may only be necessary during specific phases of work, or during activities with a high potential to produce dust, and the list should be refined and expanded upon in liaison with the construction contractor when producing the Dust Management Plan.

Table A6.1: Best-Practice Mitigation Measures Recommended for the Works

Measure	Desirable	Highly Recommended
Site Management		
Develop and implement a stakeholder communications plan that includes community engagement before work commences on site		✓
Develop a Dust Management Plan (DMP)		✓
Display the name and contact details of person(s) accountable for air quality pollutant emissions and dust issues on the site boundary		✓
Display the head or regional office contact information		✓
Record and respond to all dust and air quality pollutant emissions complaints		✓
Make a complaints log available to the local authority when asked		✓
Carry out regular site inspections to monitor compliance with air quality and dust control procedures, record inspection results, and make an inspection log available to the Local Authority when asked		✓
Increase the frequency of site inspections by those accountable for dust and air quality pollutant emissions issues when activities with a high potential to produce dust and emissions are being carried out and during prolonged dry or windy conditions		✓
Record any exceptional incidents that cause dust and air quality pollutant emissions, either on or off the site, and ensure that the action taken to resolve the situation is recorded in the log book		✓
Hold regular liaison meetings with other high risk construction sites within 500 m of the site boundary, to ensure plans are co-ordinated and dust and particulate matter emissions are minimised. It is important to understand the interactions of the off-site transport/deliveries which might be using the same strategic road network routes		✓
Preparing and Maintaining the Site		
Plan the site layout so that machinery and dust-causing activities are located away from receptors, as far as is possible		✓
Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site		✓
Fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extensive period		✓
Avoid site runoff of water or mud		✓

Keep site fencing, barriers and scaffolding clean using wet methods		✓
Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below		✓
Cover, seed, or fence stockpiles to prevent wind whipping		✓
Carry out regular dust soiling checks of buildings within 100 m of site boundary and provide cleaning if necessary		✓
Provide showers and ensure a change of shoes and clothes are required before going off-site to reduce transport of dust	✓	
Put in place real-time dust and air quality pollutant monitors across the site and ensure they are checked regularly		✓
Agree monitoring locations with the Local Authority		✓
Where possible, commence baseline monitoring at least three months before work begins		✓
Operating Vehicle/Machinery and Sustainable Travel		
Ensure all on-road vehicles comply with the requirements of the London LEZ (and ULEZ)		✓
Ensure all Non-road Mobile Machinery (NRMM) comply with London's NRMM emission standards. Currently, NRMM used on any site within Greater London are required to meet Stage IIIA of EU Directive 97/68/EC (The European Parliament and the Council of the European Union, 1997) and its subsequent amendments as a minimum, while NRMM used on any site within the Central Activity Zone, Canary Wharf or one of London's Opportunity Areas are required to meet Stage IIIB of the Directive as a minimum. The proposed development is within an area where this stricter requirement applies. From January 2025, NRMM used anywhere in London will be required to meet stage IV, while from January 2030 the stage V standard will apply. From January 2040 only zero emission machinery will be allowed.		✓
Ensure all vehicles switch off engines when stationary – no idling vehicles		✓
Avoid the use of diesel- or petrol-powered generators and use mains electricity or battery-powered equipment where practicable		✓
Impose and signpost a maximum-speed-limit of 15 mph on surfaced and 10 mph on un-surfaced haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate)		✓
Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials		✓
Implement a Travel Plan that supports and encourages sustainable staff travel (public transport, cycling, walking, and car-sharing)		✓
Operations		
Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems		✓

Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate		✓
Use enclosed chutes, conveyors and covered skips		✓
Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate		✓
Ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods		✓
Waste Management		
Reuse and recycle waste to reduce dust from waste materials		✓
Avoid bonfires and burning of waste materials		✓
Measures Specific to Demolition		
Soft strip inside buildings before demolition (retaining walls and windows in the rest of the building where possible, to provide a screen against dust)		✓
Ensure water suppression is used during demolition operations.		✓
Avoid explosive blasting, using appropriate manual or mechanical alternatives		✓
Bag and remove any biological debris or damp down such material before demolition		✓
Measures Specific to Earthworks		
Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable		✓
Use Hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable		✓
Only remove the cover from small areas during work, not all at once		✓
Measures Specific to Construction		
Avoid scabbling (roughening of concrete surfaces), if possible		✓
Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place		✓
Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery		✓
For smaller supplies of fine powder materials ensure bags are sealed after use and stored appropriately to prevent dust	✓	
Measures Specific to Trackout		
Regularly use a water-assisted dust sweeper on the access and local roads, as necessary, to remove any material tracked out of the site		✓
Avoid dry sweeping of large areas		✓
Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport		✓

Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable;		✓
Record all inspections of haul routes and any subsequent action in a site log book;		✓
Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems or mobile water bowsers, and regularly cleaned;		✓
Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable);		✓
Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits;		✓
Access gates should be located at least 10 m from receptors, where possible; and		✓
Apply dust suppressants to locations where a large volume of vehicles enter and exit the construction site.		✓

A7 Policy Context

A7.1 All European legislation referred to in this report is written into UK law and remains in place, although there is uncertainty at this point in time as to who will enforce the requirements of some of this legislation.

Air Quality Strategy

A7.2 The Air Quality Strategy (Defra, 2007) published by the Department for Environment, Food, and Rural Affairs (Defra) and Devolved Administrations, provides the policy framework for air quality management and assessment in the UK. It provides 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.

The Environmental Permitting (England and Wales) (Amendment) Regulations 2018

A7.3 The Medium Combustion Plant Directive (MCPD) (The European Parliament and the Council of the European Union, 2015) regulates pollutant emissions from combustion plant with a rated input between 1 and 50 megawatts (MW_{th}) and was transposed into UK law in January 2018 through an amendment to the Environmental Permitting Regulations (2018). The legislation sets emission limits to be applied from December 2018 for new plant and from 2025 or 2030 for existing plant (depending on the rated input). In addition to addressing emissions from plant with a rated input of 1 to 50 MW_{th} , as required by the MCPD, the amendment also introduces emission limits on generator plant, regardless of their rated input. Generators whose sole purpose is maintaining power supply at a site during an on-site emergency, that are operated for the purpose of testing/maintenance for no more than 50 hours per year, will be exempt from the emission limits, but will be required to apply for an exemption with the regulating authority.

Clean Air Act 1993 & Environmental Protection Act

A7.4 Small combustion plant of less than 20 MW net rated thermal input are controlled under the Clean Air Act 1993 (1993). This requires the local authority to approve the chimney height. Plant which are smaller than 366 kW have no such requirement.

A7.5 Measures to ensure adequate dispersion of emissions from discharging stacks and vents are included in Technical Guidance Note D1 (Dispersion) (1993), issued in support of the Environmental Protection Act (1990).

Clean Air Strategy 2019

A7.6 The Clean Air Strategy (Defra, 2019) sets out a wide range of actions by which the UK Government will seek to reduce pollutant emissions and improve air quality. Actions are targeted at four main sources of emissions: Transport, Domestic, Farming and Industry. At this stage, there is no straightforward way to take account of the expected future benefits to air quality within this assessment.

Reducing Emissions from Road Transport: Road to Zero Strategy

A7.7 The Office for Low Emission Vehicles (OLEV) and Department for Transport (DfT) published a Policy Paper (DfT, 2018) in July 2018 outlining how the government will support the transition to zero tailpipe emission road transport and reduce tailpipe emissions from conventional vehicles during the transition. This paper affirms the Government's pledge to end the sale of new conventional petrol and diesel cars and vans by 2040, and states that the Government expects the majority of new cars and vans sold to be 100% zero tailpipe emission and all new cars and vans to have significant zero tailpipe emission capability by this year, and that by 2050 almost every car and van should have zero tailpipe emissions. It states that the Government wants to see at least 50%, and as many as 70%, of new car sales, and up to 40% of new van sales, being ultra-low emission by 2030.

A7.8 The paper sets out a number of measures by which Government will support this transition, but is clear that Government expects this transition to be industry and consumer led. The Government has since announced that the phase-out date for the sale of new petrol and diesel cars and vans will be brought forward to 2030 and that all new cars and vans must be fully zero emission at the tailpipe from 2035. If these ambitions are realised then road traffic-related NO_x emissions can be expected to reduce significantly over the coming decades, likely beyond the scale of reductions forecast in the tools utilised in carrying out this air quality assessment.

Planning Policy

National Policies

A7.9 The National Planning Policy Framework (NPPF) (2021) sets out planning policy for England. It states that the purpose of the planning system is to contribute to the achievement of sustainable development, and that the planning system has three overarching objectives, one of which (Paragraph 8c) is an environmental objective:

“to protect and enhance our natural, built and historic environment; including making effective use of land, improving biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy”.

A7.10 To prevent unacceptable risks from air pollution, Paragraph 174 of the NPPF states that:

“Planning policies and decisions should contribute to and enhance the natural and local environment by...preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air quality”.

A7.11 Paragraph 185 states:

“Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development”.

A7.12 More specifically on air quality, Paragraph 186 makes clear that:

“Planning policies and decisions should sustain and contribute towards compliance with relevant limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and Clean Air Zones, and the cumulative impacts from individual sites in local areas. Opportunities to improve air quality or mitigate impacts should be identified, such as through traffic and travel management, and green infrastructure provision and enhancement. So far as possible these opportunities should be considered at the plan-making stage, to ensure a strategic approach and limit the need for issues to be reconsidered when determining individual applications. Planning decisions should ensure that any new development in Air Quality Management Areas and Clean Air Zones is consistent with the local air quality action plan”.

A7.13 The NPPF is supported by Planning Practice Guidance (PPG) (Ministry of Housing, Communities & Local Government, 2019), which includes guiding principles on how planning can take account of the impacts of new development on air quality. The PPG states that:

“Defra carries out an annual national assessment of air quality using modelling and monitoring to determine compliance with Limit Values. It is important that the potential impact of new development on air quality is taken into account where the national assessment indicates that relevant limits have been exceeded or are near the limit, or where the need for emissions reductions has been identified”.

A7.14 Regarding plan-making, the PPG states:

“It is important to take into account air quality management areas, Clean Air Zones and other areas including sensitive habitats or designated sites of importance for biodiversity where there could be specific requirements or limitations on new development because of air quality”.

A7.15 The role of the local authorities through the LAQM regime is covered, with the PPG stating that a local authority Air Quality Action Plan *“identifies measures that will be introduced in pursuit of the objectives and can have implications for planning”*. In addition, the PPG makes clear that *“Odour and dust can also be a planning concern, for example, because of the effect on local amenity”*.

A7.16 Regarding the need for an air quality assessment, the PPG states that:

“Whether air quality is relevant to a planning decision will depend on the proposed development and its location. Concerns could arise if the development is likely to have an adverse effect on air quality in areas where it is already known to be poor, particularly if it could affect the implementation of air quality strategies and action plans and/or breach legal obligations (including those relating to the conservation of habitats and species). Air quality may also be a material consideration if the proposed development would be particularly sensitive to poor air quality in its vicinity”.

A7.17 The PPG sets out the information that may be required in an air quality assessment, making clear that:

“Assessments need to be proportionate to the nature and scale of development proposed and the potential impacts (taking into account existing air quality conditions), and because of this are likely to be locationally specific”.

A7.18 The PPG also provides guidance on options for mitigating air quality impacts, as well as examples of the types of measures to be considered. It makes clear that:

“Mitigation options will need to be locationally specific, will depend on the proposed development and need to be proportionate to the likely impact. It is important that local planning authorities work with applicants to consider appropriate mitigation so as to ensure new development is appropriate for its location and unacceptable risks are prevented”.

London-Specific Policies

The London Plan

A7.19 The London Plan (GLA, 2021) sets out an integrated economic, environmental, transport and social framework for the development of London over the next 20-25 years. The key policy relating to air quality is Policy SI1 on *Improving air quality*, Part B1 of which sets out three key requirements for developments:

“Development proposals should not:

- a) *lead to further deterioration of existing poor air quality*

- b) *create any new areas that exceed air quality limits, or delay the date at which compliance will be achieved in areas that are currently in exceedance of legal limits*

- c) *create unacceptable risk of high levels of exposure to poor air quality”.*

A7.20 The Policy then details how developments should meet these requirements, stating:

“In order to meet the requirements in Part 1, as a minimum:

- a) *development proposals must be at least Air Quality Neutral*

- b) *development proposals should use design solutions to prevent or minimise increased exposure to existing air pollution and make provision to address local problems of air quality in preference to post-design or retro-fitted mitigation measures*

- c) *major development proposals must be submitted with an Air Quality Assessment. Air quality assessments should show how the development will meet the requirements of B1*

- d) *development proposals in Air Quality Focus Areas or that are likely to be used by large numbers of people particularly vulnerable to poor air quality, such as children or older people should demonstrate that design measures have been used to minimise exposure”.*

A7.21 Part C of the Policy introduces the concept of Air Quality Positive for large-scale development, stating:

“Masterplans and development briefs for large-scale development proposals subject to an Environmental Impact Assessment should consider how local air quality can be improved across the area of the proposal as part of an air quality positive approach. To achieve this a statement should be submitted demonstrating:

- 1) *how proposals have considered ways to maximise benefits to local air quality, and*
- 2) *what measures or design features will be put in place to reduce exposure to pollution, and how they will achieve this.”*

A7.22 Regarding construction and demolition impacts, Part D of Policy SI1 of the London Plan states:

“In order to reduce the impact on air quality during the construction and demolition phase development proposals must demonstrate how they plan to comply with the Non-Road Mobile Machinery Low Emission Zone and reduce emissions from the demolition and construction of buildings following best practice guidance”.

A7.23 Part E of Policy SI1 states the following regarding mitigation and offsetting of emissions:

“Development proposals should ensure that where emissions need to be reduced to meet the requirements of Air Quality Neutral or to make the impact of development on local air quality

acceptable, this is done on-site. Where it can be demonstrated that emissions cannot be further reduced by on-site measures, off-site measures to improve local air quality may be acceptable, provided that equivalent air quality benefits can be demonstrated within the area affected by the development”.

A7.24 The explanatory text around Policy S11 of the London Plan states the following with regard to assessment criteria:

“The Mayor is committed to making air quality in London the best of any major world city, which means not only achieving compliance with legal limits for Nitrogen Dioxide as soon as possible and maintaining compliance where it is already achieved, but also achieving World Health Organisation targets for other pollutants such as Particulate Matter.

The aim of this policy is to ensure that new developments are designed and built, as far as is possible, to improve local air quality and reduce the extent to which the public are exposed to poor air quality. This means that new developments, as a minimum, must not cause new exceedances of legal air quality standards, or delay the date at which compliance will be achieved in areas that are currently in exceedance of legal limits. Where limit values are already met, or are predicted to be met at the time of completion, new developments must endeavour to maintain the best ambient air quality compatible with sustainable development principles.

Where this policy refers to ‘existing poor air quality’ this should be taken to include areas where legal limits for any pollutant, or World Health Organisation targets for Particulate Matter, are already exceeded and areas where current pollution levels are within 5 per cent of these limits”²

London Environment Strategy

A7.25 The London Environment Strategy was published in May 2018 (GLA, 2018a). The strategy considers air quality in Chapter 4; the Mayor’s main objective is to create a “zero emission London by 2050”. Policy 4.2.1 aims to “reduce emissions from London’s road transport network by phasing out fossil fuelled vehicles, prioritising action on diesel, and enabling Londoners to switch to more sustainable forms of transport”. The strategy sets a target to achieve, by 2030, the guideline value for PM_{2.5} which was set by the World Health Organisation (WHO) in 2005. An implementation plan for the strategy has also been published which sets out what the Mayor will do between 2018 and 2023 to help achieve the ambitions in the strategy.

Mayor’s Transport Strategy

A7.26 The Mayor’s Transport Strategy (GLA, 2018b) sets out the Mayor’s policies and proposals to reshape transport in London over the next two decades. The Strategy focuses on reducing car dependency and increasing active sustainable travel, with the aim of improving air quality and creating healthier

² The London Plan was developed based on a World Health Organisation guideline for PM_{2.5} of 10 µg/m³.

streets. It notes that development proposals should “be designed so that walking and cycling are the most appealing choices for getting around locally”.

GLA SPG: Sustainable Design and Construction

A7.27 The GLA’s SPG on Sustainable Design and Construction (GLA, 2014a) was revoked upon publication of the new London Plan, but it is understood that GLA still expects the emission standards set within it for gas-fired boilers, Combined Heat and Power (CHP) and biomass plant to be met. It is also currently the only published document that sets out guidance on how an ‘air quality neutral’ assessment should be undertaken.

GLA SPG: The Control of Dust and Emissions During Construction and Demolition

A7.28 The GLA’s SPG on The Control of Dust and Emissions During Construction and Demolition (GLA, 2014b) outlines a risk assessment based approach to considering the potential for dust generation from a construction site, and sets out what mitigation measures should be implemented to minimise the risk of construction dust impacts, dependent on the outcomes of the risk assessment. This guidance is largely based on the Institute of Air Quality Management’s (IAQM’s) guidance (IAQM, 2016), and it states that “the latest version of the IAQM Guidance should be used”.

Air Quality Focus Areas

A7.29 The GLA has identified 187 air quality Focus Areas in London. These are locations that not only exceed the EU annual mean limit value for nitrogen dioxide, but also have high levels of human exposure. They do not represent an exhaustive list of London’s air quality hotspot locations, but locations where the GLA believes the problem to be most acute. They are also areas where the GLA considers there to be the most potential for air quality improvements and are, therefore, where the GLA and Transport for London (TfL) will focus actions to improve air quality. The Proposed Development is located in close proximity to two air quality Focus Areas; ‘London Bridge at Borough High Street’ Focus Area (ID 153) and ‘Tower Bridge Road A100’ Focus Area (ID 156).

Local Transport Plan

A7.30 The Southwark Transport Plan identified how the LBS will improve travel to, within and from the borough. One of the plan’s eight transport objectives is to “reduce the impact of transport on the environment”; the plan states that “To improve the borough’s air quality, we will encourage the take up of sustainable travel and reduced reliance on private vehicles. We will consult on introducing emission based parking permits and continue to support the take up of new technologies including lower emission vehicles...”.

A7.31 Additionally, the Southwark Movement Plan (Southwark Council, 2019) sets out how LBS aims to improve peoples’ experience of travel to, within and around the borough through nine specific

missions and actions. Action 15 of the plan specifically targets a reduction in exposure to air pollution.

Local Policies

A7.32 The Local Plan currently comprises the Core Strategy and the Saved Southwark Plan policies (2007). The Core Strategy (Southwark Council, 2011) includes two policies that are directly relevant to air quality:

- Strategic Policy 13 'High Environmental Standards' states that "*Development will help us live and work in a way that respects the limits of the planet's natural resources, reduces pollution and damage to the environment... We will do this by...Setting high standards and supporting measures for reducing air...pollution and avoiding amenity and environmental problems that affect how we enjoy the environment in which we live and work...*"; and
- Strategic Policy 2 'Sustainable Transport' states that "*We will encourage walking, cycling and the use of public transport rather than travel by car. This will help create safe, attractive, vibrant and healthy places for people to live and work by reducing...pollution...*".

A7.33 The Saved Southwark Plan Policies (Southwark Council, 2007) include four policies that are directly relevant to air quality:

- Policy 1.7 'Development within town and local centres' states that "*Within the centres the LPA [Local Planning Authority] will permit developments providing a range of uses, including retail and services, leisure, entertainment and community, civic, cultural and tourism, residential and employment (Class B) uses, where the following criteria are met...the road network has sufficient capacity to take any additional servicing traffic generated by the proposal without causing adverse effects on...air quality...*";
- Policy 3.6 'Air Quality' states that "*Planning permission will not be granted for development that would lead to a reduction in air quality*"; and
- Policy 4.2 'Quality of Residential Accommodation' states that "*Planning permission will be granted for residential development, including dwellings within mixed-use schemes, provided that they...include high standards of...protection from pollution...*";
- Policy 5.2 'Transport Impacts' states that "*Planning permission will be granted for development unless...there is an adverse impact on transport networks for example through significant increases in transport or pollution...*".

A7.34 The LBS is currently in the process of developing a new Local Plan to replace the Core Strategy and the saved Southwark Plan policies. The proposed submission version of the New Southwark Plan (NSP) (Southwark Council, 2017a) includes four policies that are directly relevant to this assessment:

- SP6 'Cleaner, greener, safer' states that "*We will lead the way in making people feel safe, creating cleaner streets...This will be achieved through...improving ...air quality*";
- P45 states that "*Development should be permitted when it does not cause an unacceptable loss of amenity to present or future occupiers or users*";
- P60 'Trees' states that "*The selection and position of trees should improve air quality...*";
- P66 'Improving air quality' states that "*Development must:*
 - *Achieve or exceed air quality neutral standards; and*
 - *Address the impacts of poor air quality on building occupiers and public realm users by reducing exposure to and mitigating the effects of poor air quality. This must be achieved through design solutions that include:*
 - *Orientation and layout of buildings, taking into account vulnerable building occupiers, and public realm and amenity space users; and*
 - *Ventilation systems; and*
 - *Urban greening appropriate for providing air quality benefits proportionate to the scale of the development;*
 - *'Ultra low' NOx boilers where the development is not connected to a decentralised energy network; or*
 - *Appropriate abatement technologies to bring emissions within the equivalent of 'ultra low' NOx boiler emissions levels where decentralised energy networks are implemented or utilised.*
 - *Where air quality neutral standards are not met for buildings or transport, measures to offset any shortfall will be required, according to the following hierarchy:*
 - *i. On-site measures; then*
 - *ii. Off-site measures; then;*
 - *iii. Financial contributions to provide measures*".

A7.35 The LBS has developed two Supplementary Planning Documents (SPDs) that are relevant to air quality; the Sustainable Design and Construction SPD (Southwark Council, 2009) and the Draft Bankside, Borough and London Bridge SPD (Southwark Council, 2010). The Sustainable Design and Construction SPD provides guidance on how new development should be designed and built so that it has a positive impact on the environment. It considers air quality impacts in relation to building design, materials and mechanical systems, emissions from boiler systems and construction activity. It addresses these points by stating:

- “Development should maximise the use of passive design features that provide natural background ventilation...”;
- “Mechanical systems should only be used as a compliment to natural ventilation to ensure a constant standard of indoor air quality...Where mechanical systems are used, careful consideration will need to be given to ensure air intakes are positioned appropriately.”;
- “Low NOx burners should be used”;
- “Fuels and technology chosen for CHP and other energy systems should be of a high quality resulting in low air pollution. If bio-fuels are to be used, the preference is for biogases, such as methane and hydrogen and alcohol, or for systems that use a gasification process. Generally, large-scale community CHP systems are preferred as these are likely to be less polluting than the combined impact of individual boilers”;
- “As a last resort, technical measures such as filters may be required to keep polluting emissions at an acceptable level.”;
- “Polluting emissions from energy systems must not exceed the legal limits. A permit from the Environment Agency may be required. You may also need to get approval from the council’s Environmental Protection Team to burn permitted fuels”;
- “Construction sites should be carefully managed and maintained to...control dust...emissions...causing nuisance to surrounding properties. The type of machinery used, hours that construction occurs and the times that deliveries are made should be carefully managed so as to reduce impact”;
- “Planning conditions will be used to control impacts from the construction of new development. This may include restrictions on hours of operation and construction.”.

A7.36 The Draft Bankside, Borough and London Bridge SPD was put on hold in 2011. The draft document includes the following guidelines for development that are relevant to the Proposed Development in terms of air quality:

- “All development should:
 - ...Avoid polluting or damaging the ecology of the River Thames...
 - Explore opportunities to link into and develop local energy networks...”

A7.37 The LBS has also developed a guidance document for demolition and construction activities within the borough; the Technical Guidance for Demolition and Construction SPD (Southwark Council, 2016) was adopted by the Council in September 2016. The document identifies a number of impacts associated with demolition and construction activities (including air pollution), and sets out measures expected to be employed by developers and contractors undertaking demolition and construction works within LBS. In terms of dust control, the document makes reference to the GLA’s SPG, the

IAQM ‘Guidance on Air Quality Monitoring in the Vicinity of Demolition and Construction sites’ and the IAQM’s document for the ‘Assessment of Dust from Demolition and Construction’, and outlines a number of dust control measures. The document also requires the following:

- all major developments in Southwark are considered ‘high risk’. The highest level of dust control, including continuous monitoring of dust deposition, will be required to be employed at all times;
- continuous dust monitoring on all major sites in Southwark. In the absence of any other national control limit, the IAQM’s recommended site action levels are to be adopted;
- Non Road Mobile Machinery (NRMM) used on the site of any major development within Greater London will be required to meet Stage IIIA of EU Directive 97/68/EC as a minimum; and
- all Light Goods Vehicles (LDVs) and Heavy Duty Vehicles (HDVs) servicing sites must meet emission criteria Euro 6 / Euro VI.

Air Quality Action Plans

National Air Quality Plan

A7.38 Defra has produced an Air Quality Plan to tackle roadside nitrogen dioxide concentrations in the UK (Defra, 2017); a supplement to the 2017 Plan (Defra, 2018) was published in October 2018 and sets out the steps Government is taking in relation to a further 33 local authorities where shorter-term exceedances of the limit value were identified. Alongside a package of national measures, the 2017 Plan and the 2018 Supplement require those identified English Local Authorities (or the GLA in the case of London Authorities) to produce local action plans and/or feasibility studies. These plans and feasibility studies must have regard to measures to achieve the statutory limit values within the shortest possible time, which may include the implementation of a CAZ. There is currently no straightforward way to take account of the effects of the 2017 Plan or 2018 Supplement in the modelling undertaken for this assessment; however, consideration has been given to whether there is currently, or is likely to be in the future, a limit value exceedance in the vicinity of the proposed development. This assessment has principally been carried out in relation to the air quality objectives, rather than the EU limit values that are the focus of the Air Quality Plan.

Local Air Quality Action Plan

A7.39 The LBS has declared an AQMA (Southwark AQMA) as a result of exceedances of the annual mean nitrogen dioxide objective and the 24-hour mean PM₁₀ objective. Southwark AQMA encompasses the entire northern part of the borough, extending from Rotherhithe to Walworth and Camberwell and up to the boundary on the River Thames, and the Proposed Development lies within this area.

The LBS has since developed an Air Quality Strategy and Action Plan (Southwark Council, 2017b); this plan outlines actions that the LBS will undertake to improve air quality

A8 Air Quality Positive Statement

Measure	Summary of the Measure	Reason for Undertaking Measure	Expected Benefits	Assessment and Reporting			How Will This Measure Be Secured
				Methods	Quantitative	Qualitative	
Better design and reducing exposure							
Amenity areas and public space	The Proposed Development is well away from major roads and other pollution sources and delivers amenity areas that benefit from good air quality.	To minimise exposure of future users to poor air quality.	Future users will have access to amenity areas with good air quality.	Informed by air quality assessment with shows acceptable air quality across the site (concentrations below formal objectives).	N	Y	Secured through approved plans which show the amenity areas.
Building Emissions							
Energy Strategy	The principal heat generation for the Proposed Development will be from Air Source Heat Pumps (ASHPs). High energy efficient building fabric will be utilised to reduce carbon emissions and energy demand through good practice passive design measures.	The Energy Strategy sets out the rationale for the measures.	The selected option will meet the carbon emission targets set by the London Plan.	Energy Strategy	N	Y	Delivery is subject to s106 agreement.
Transport Emissions							
Pedestrian and Cycle Access	The Proposed Development will provide dedicated cycle and pedestrian access and include cycle parking that meets the requirements of Policy T5 of the London Plan.	To improve pedestrian and cycle connectivity.	Reduced emissions associated with increased walking and cycling, in particular for short journeys.	Framework Travel Plan	N	Y	Transport infrastructure secured by approved plans or conditions

A9 References

AQC (2014) Air Quality Neutral Planning Support Update: GLA 80371, Available: <http://www.aqconsultants.co.uk/getattachment/Resources/Download-Reports/GLA-AQ-Neutral-Policy-Final-Report-April-2014.pdf.aspx>.

Defra (2007) The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, Defra.

Defra (2018) Supplement to the UK plan for tackling roadside nitrogen dioxide concentrations. Retrieved from https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/746100/air-quality-no2-plan-supplement.pdf

Defra (2019) Clean Air Strategy 2019 Retrieved from <https://www.gov.uk/government/publications/clean-air-strategy-2019>

GLA (2014a) Sustainable Design and Construction Supplementary Planning Guidance, Available: <https://www.london.gov.uk/what-we-do/planning/implementing-london-plan/supplementary-planning-guidance/sustainable-design-and>.

GLA (2014b) The Control of Dust and Emissions from Construction and Demolition SPG, Available: <https://www.london.gov.uk/what-we-do/planning/implementing-london-plan/supplementary-planning-guidance/control-dust-and>.

GLA (2018a) London Environment Strategy, Available: <https://www.london.gov.uk/what-we-do/environment/london-environment-strategy>.

GLA (2018b) Mayor's Transport Strategy, Available: <https://www.london.gov.uk/sites/default/files/mayors-transport-strategy-2018.pdf>.

GLA (2021) The London Plan. Retrieved from <http://www.legislation.gov.uk/ukpga/1990/43/content>

IAQM (2016) Guidance on the Assessment of Dust from Demolition and Construction v1.1, Available: <http://iaqm.co.uk/guidance/>.

Ministry of Housing, Communities & Local Government (2019) Planning Practice Guidance, Available: <https://www.gov.uk/government/collections/planning-practice-guidance>.

Ministry of Housing, Communities and Local Government (2021) National Planning Policy Framework, Available: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/6077/2116950.pdf.

Moorcroft and Barrowcliffe et al (2017) Land-Use Planning & Development Control: Planning For Air Quality v1.2, IAQM, London, Available: <http://iaqm.co.uk/guidance/>.

Southwark Council. (2007). *Saved Southwark Plan Policies*, Available: <https://www.southwark.gov.uk/planning-and-building-control/planning-policy-and-transport-policy/development-plan/local-plan>

Southwark Council. (2009). *Sustainable Design and Construction: Supplementary Planning Document*

Southwark Council. (2010). *Bankside, Borough and London Bridge; Draft Supplementary Planning Document and Opportunity Area Planning Framework*.

Car Parking	The Proposed Development will be car free, with only one blue badge car parking space provided to meet policy requirements. The car free scheme will discourage the use of private cars and encourage the use of existing public transport options.	To facilitate a move towards car free lifestyle and promote the future use of local public transport provisions.	Minimising car parking provision will reduce the number of private car trips during the operation of the Proposed Development and therefore vehicle tailpipe emissions.	Framework Travel Plan	N	Y	Transport infrastructure secured by approved plans or conditions
-------------	---	--	---	-----------------------	---	---	--

Southwark Council. (2011). *Core Strategy*, Available: <https://www.southwark.gov.uk/planning-and-building-control/planning-policy-and-transport-policy/development-plan/local-plan>.

Southwark Council. (2016). *London Borough of Southwark Technical Guidance for Demolition and Construction*, Available: <https://www.southwark.gov.uk/environment/environmental-protection/construction>

Southwark Council. (2017a). *New Southwark Plan; Proposed Submission Version*.

Southwark Council. (2017b). *Air Quality Strategy and Action Plan*.

Southwark Council (2019). *Movement Plan*.

Technical Guidance Note D1 (Dispersion) (1993), HMSO.

The European Parliament and the Council of the European Union (2015) Directive 2015/2193/EU of the European Parliament and of the Council, Available: <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32015L2193>.

A10 Glossary

AADT	Annual Average Daily Traffic
ADMS-5	Atmospheric Dispersion Modelling System model for point sources
AQC	Air Quality Consultants
AQAL	Air Quality Assessment Level
AQMA	Air Quality Management Area
AURN	Automatic Urban and Rural Network
BEB	Building Emissions Benchmark
CAZ	Clean Air Zone
CEMP	Construction Environmental Management Plan
Defra	Department for Environment, Food and Rural Affairs
DfT	Department for Transport
DMP	Dust Management Plan
EFT	Emission Factor Toolkit
EPUK	Environmental Protection UK
Exceedance	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
EU	European Union
EV	Electric Vehicle
Focus Area	Location that not only exceeds the EU annual mean limit value for NO ₂ but also has a high level of human exposure
GIA	Gross Internal Floor Area
GLA	Greater London Authority
HDV	Heavy Duty Vehicles (> 3.5 tonnes)
HMSO	Her Majesty's Stationery Office
HGV	Heavy Goods Vehicle
IAQM	Institute of Air Quality Management
JAQU	Joint Air Quality Unit
kph	Kilometres Per hour

KW	Kilowatt
LAEI	London Atmospheric Emissions Inventory
LAQM	Local Air Quality Management
LB	London Borough
LDV	Light Duty Vehicles (<3.5 tonnes)
LEZ	Low Emission Zone
LGV	Light Goods Vehicle
µg/m³	Microgrammes per cubic metre
MCPD	Medium Combustion Plant Directive
NO	Nitric oxide
NO₂	Nitrogen dioxide
NO_x	Nitrogen oxides (taken to be NO ₂ + NO)
NPPF	National Planning Policy Framework
NRMM	Non-road Mobile Machinery
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
OLEV	Office for Low Emission Vehicles
PC	Process Contribution
PHV	Private Hire Vehicle
PM₁₀	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
PPG	Planning Practice Guidance
RDE	Real Driving Emissions
SCR	Selective Catalytic Reduction
SPG	Supplementary Planning Guidance
SPD	Supplementary Planning Document

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
TEB	Transport Emissions Benchmark
TfL	Transport for London
TRAVL	Trip Rate Assessment Valid for London
ULEZ	Ultra Low Emission Zone
WHO	World Health Organisation
ZEC	Zero Emission Capable