A9.1 Modelling Methodology

Background Concentrations

A9.1.1 The background concentrations across the study area have been defined using the national pollution maps published by Defra (2013a). These cover the whole country on a 1x1 km grid and are published for each year from 2010 until 2025. The maps include the influence of emissions from a range of different sources; one of which is road traffic. As noted in Paragraph 9.4.21, there are some concerns that Defra may have over-predicted the rate at which road traffic emissions of nitrogen oxides will fall in the future. The maps currently in use were verified against measurements made during 2010 at a large number of automatic monitoring stations and so there can be reasonable confidence that the maps are representative of conditions during 2010. Similarly, there is reasonable confidence that the reductions which Defra predicts from other sectors (e.g. rail) will be achieved.

A9.1.2 In order to calculate background nitrogen dioxide and nitrogen oxides concentrations in 2012, it is assumed that there was no reduction in the road traffic component of backgrounds between 2010[1] and 2012. This has been done using the source-specific background nitrogen oxides maps provided by Defra (2013a). For each grid square, the road traffic component has been held constant at 2010 levels, while 2012 values have been taken for the other components. Nitrogen dioxide concentrations have then been calculated using the background nitrogen dioxide calculator which Defra (2013a) publishes to accompany the maps. The result is a set of 'adjusted 2012 background' concentrations.

A9.1.3 As an additional step, the background maps have been calibrated against national measurements made as part of the AURN during 2012. The published background maps were calibrated against 2010 monitoring data. 2010 was identified as a 'high pollution' year, as a result the background maps may over predict the local background concentrations. Therefore, a comparison between the 2012 annual mean nitrogen dioxide concentration at all background monitoring sites within the AURN and the background mapped concentrations has been carried out (see Figure A9.1). Based on the 62 sites with more than 75% data capture for 2012, the maps over-predict the background concentrations by 1.9%, on average. This has been allowed for in production of the calibrated 'adjusted' 2012 background concentrations.

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[1] This approach assumes that has been no reduction in emissions per vehicle but also that traffic volumes have remained constant. This is not the same as the assumption made for dispersion modelling, in which emissions per vehicle are held constant while traffic volumes are assumed to change year on year. Overall, this discrepancy is unlikely to influence the overall conclusions of the assessment.

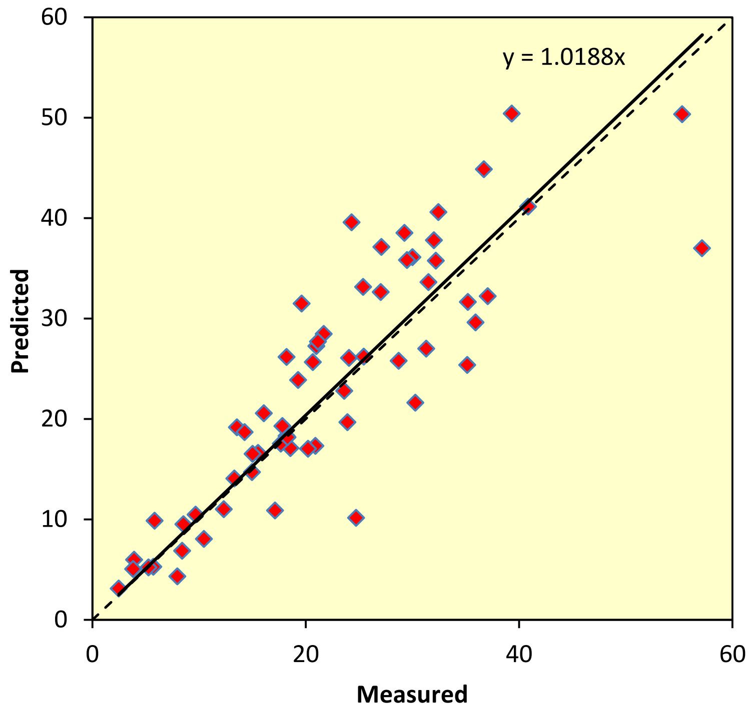

Figure A9.1: Predicted Mapped versus Measured Concentrations at AURN Background Sites in 2012

A9.1.4 Two separate sets of 2016 background nitrogen dioxide concentrations have been used for the future-year assessment. The 2016 background 'without emissions reduction' has been calculated using the same approach as described for the 2012 data: the road traffic component of background nitrogen oxides has been held constant at 2010 values, while 2016 data are taken for the other components. Nitrogen dioxide has then been calculated using Defra's background nitrogen dioxide calculator. This has been adjusted by a national factor of 0.9815 for the background calibration, as described in Paragraph A9.1.3. The 2016 background 'with emissions reduction' assumes that Defra's revised predicted reductions occur from 2012 onward. This dataset has been derived first by calculating the ratio of the unadjusted mapped value for 2016 to the unadjusted mapped value for 2012. This ratio has then been applied to the adjusted [calibrated] 2012 value (as derived in Paragraph A9.1.2).

A9.1.5 For PM_{10} and $PM_{2.5}$, there is no strong evidence that Defra's predictions are unrealistic and so the year-specific mapped concentrations have been used in this assessment.

<u>Model Inputs</u>

Roads

A9.1.6 Predictions have been carried out using the ADMS-Roads dispersion model (v3.1). The model requires the user to provide various input data, including emissions from each section of road, and the road characteristic (including road width and street canyon height, where applicable). Vehicle emissions have been calculated based on vehicle flow, composition and speed using the Emission Factor Toolkit (Version 5.2c) published by Defra (Defra 2012). For nitrogen dioxide future-year concentrations have been predicted once using year-specific emission factors from the EFT and once using emission factors for 2012[2] which is the year for which the model has been verified.

A9.1.7 The model has been run using the full year of meteorological data that corresponds to the most recent set of nitrogen dioxide monitoring data (2012). The meteorological data has been taken from the monitoring station located at Heathrow Airport, which is considered suitable for this area.

A9.1.8 AADT flows, speeds (taking into account the proximity to a junction), and vehicle fleet composition data have been provided by SBA. These were derived from weekday counts, which may over-predict annual average flows. Traffic data for Manor Road have been taken from the London Atmospheric Emissions Inventory (LAEI) (GLA, 2013). Traffic speeds for this link were based on those presented in the LAEI, taking into account the proximity to a junction. The traffic data used in this assessment are summarised in Table A9.1.1.

Table A9.1.1: Summary of Traffic Data used in the Assessment (AADT)

Road Link	2012	2016 (Without Scheme)	2016 (Without Scheme and Existing)	2016 (With Scheme)
Ferry Road	8,509	8,565	8,473	8,773
Kingston Road	14,501	14,595	14,475	14,507
Broom Road	3,902	4,183	4,122	4,173
St. Winifreds Road	586	628	567	618
Manor Road/Strawberry Vale	14,899	14,996	14,640	14,818

A9.1.9 Diurnal flow profiles for the traffic have been derived from the national diurnal profiles published by DfT (DfT, 2011).

A9.1.10 Figure A9.2 shows the road network included within the model and defines the study area.

2 i.e. combining current-year emission factors with future-year traffic data.

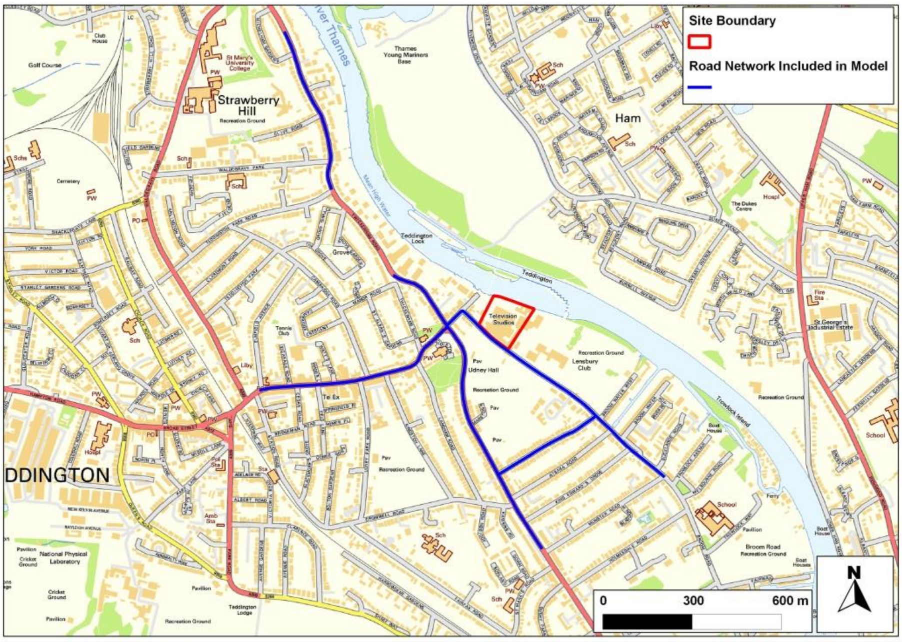

Figure A9.2: Modelled Road Network

Contains Ordnance Survey data © Crown copyright and database right 2013

Model Verification

A9.1.11 In order to ensure that ADMS-Roads accurately predicts local concentrations, it is necessary to verify the model against local measurements. The verification methodology is described below.

A9.1.12 Most nitrogen dioxide (NO_2) is produced in the atmosphere by reaction of nitric oxide (NO) with ozone. It is therefore most appropriate to verify the model in terms of primary pollutant emissions of nitrogen oxides (NO_x = NO + NO_2). The model has been run to predict the annual mean NO_x concentrations during 2012 at the Strawberry Vale (DT8) and High Street, Teddington (DT45) diffusion tube monitoring sites. Concentrations have been modelled at 2.5 m, the height of the monitors.

A9.1.13 The model output of road-NO_x (i.e. the component of total NO_x coming from road traffic) has been compared with the 'measured' road-NO_x. Measured road-NO_x was calculated from the measured NO_2 concentrations and the predicted background NO_2 concentration using the NO_x from NO_2 calculator available on the Defra LAQM Support website (Defra, 2013b).

A9.1.14 A primary adjustment factor was determined as the slope of the best-fit line between the 'measured' road contribution and the model derived road contribution, forced through zero (Figure A9.3). This factor was then applied to the modelled road-NO_x concentration for each receptor to provide adjusted modelled road-NO_x concentrations. The total nitrogen dioxide concentrations were then determined by combining the adjusted modelled road-NO_x

concentrations with the predicted background NO_2 concentration within the NO_x from NO_2 calculator. A secondary adjustment factor was finally calculated as the slope of the best-fit line applied to the adjusted data and forced through zero (Figure A9.4).

A9.1.15 The following primary and secondary adjustment factors have been applied to all modelled nitrogen dioxide data:

- Primary adjustment factor : 2.861
- Secondary adjustment factor: 0.993

A9.1.16 The results imply that the model was under-predicting the road-NO_x contribution. This is a common experience with this and most other models. The final NO_2 adjustment is minor.

A9.1.17 Figure A9.5 compares final adjusted modelled total NO_2 at each of the monitoring sites, to measured total NO_2, and shows a 1:1 relationship.

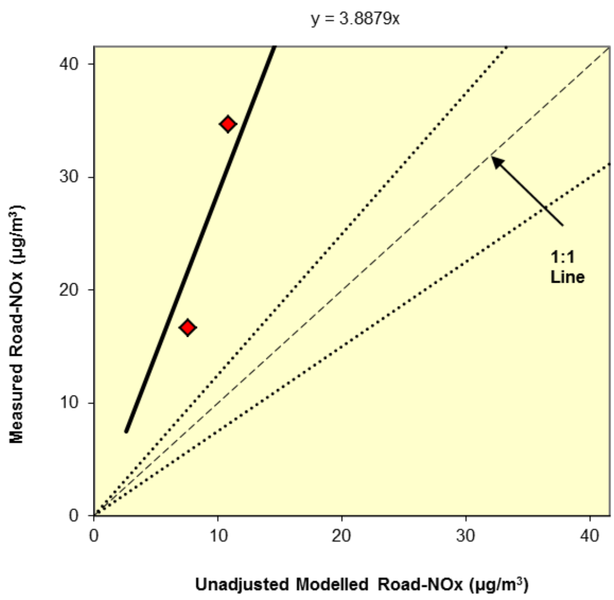

Figure A9.3: Comparison of Measured Road NOx to Unadjusted Modelled Road NOx Concentrations. The dashed lines show ± 25%.

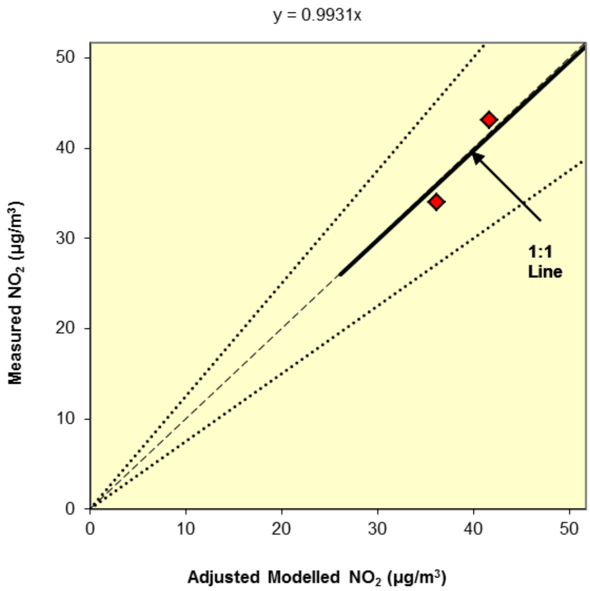

Figure A9.4: Comparison of Measured Total NO_2 to Primary Adjusted Modelled Total NO_2 Concentrations. The dashed lines show ± 25%.

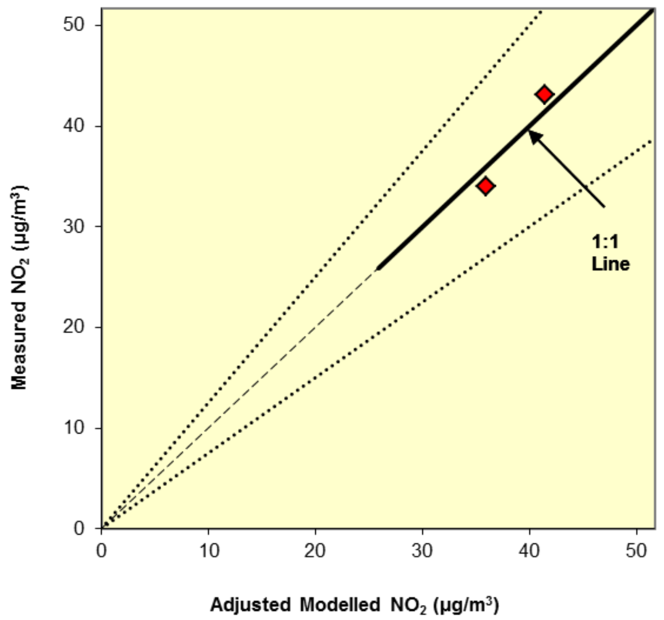

Figure A9.5: Comparison of Measured Total NO_2 to Final Adjusted Modelled Total NO_2 Concentrations. The dashed lines show ± 25%.

PM_{10} and $PM_{2.5}$

A9.1.18 There are no nearby roadside PM_{10} or $PM_{2.5}$ monitors. It has therefore not been possible to verify the model for PM_{10} or $PM_{2.5}$. The model outputs of road-PM_{10} and road-$PM_{2.5}$ have therefore been adjusted by applying the primary adjustment factor calculated for road NO_x.

Model Post-processing

Nitrogen oxides and nitrogen dioxide

A9.1.19 The model predicts road-NO_x concentrations at each receptor location. These concentrations have then been adjusted using the primary adjustment factor, which, along with the background NO2, is processed through the NO_x from NO_2 calculator available on the Defra LAQM Support website (Defra, 2013b). The traffic mix within the calculator was set to "All London traffic", which is considered suitable for the study area. The calculator predicts the component of NO_2 based on the adjusted road-NO_x and the background NO_2. This is then adjusted by the secondary adjustment factor to provide the final predicted concentrations.

PM_{10} and $PM_{2.5}$

A9.1.20 The number of exceedences of 50 µg/m^3 as a 24-hour mean PM_{10} concentration has been calculated from the adjusted-modelled total annual mean concentration following the relationship advised by (Defra, 2009):

$$A = -18.5 + 0.00145\,B^3 + 206/B$$

where A is the number of exceedences of 50 μg/m^3 as a 24-hour mean PM_{10} concentration and B is the annual mean PM_{10} concentration. The relationship is only applied to annual mean concentrations greater than 16.5 μg/m^3, below this concentration, the number of 24-hour exceedences is assumed to be zero.

A9.2 Construction Dust Assessment Criteria

Assessment Procedure

A9.2.1 The criteria developed by IAQM divide the activities on construction sites into four types to reflect their different potential impacts. These are:

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

A9.2.2 The assessment procedure is split into four steps summarised below:

STEP 1: Screen the Need for a Detailed Assessment

A9.2.3 An assessment is required where there are sensitive receptors within 350 m of the boundary of the site and/or within 100 m of the route(s) used by construction vehicles on the public highway, up to 500 m from the site entrance(s).

A9.2.4 Where the need for a more detailed assessment is screened out, it can be concluded that the level of risk is negligible.

STEP 2: Assess the Risk of Dust Effects Arising

A9.2.5 The risk of dust effects is determined by:

- the scale and nature of the works, which determines the risk of dust arising; and
- the proximity of sensitive receptors.

A9.2.6 The risk categories assigned to the site are different for each of the four potential sources of dust (demolition, earthworks, construction and trackout).

Demolition

A9.2.7 The potential dust emission classes for demolition are as follows:

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; and

Small: Total building volume <20,000 m^3, construction material with low potential for dust release (e.g. metal cladding or timber), demolition activities <10 m above ground, demolition during wetter months.

A9.2.8 The potential dust emission class determined above should be used in the matrix in Table A9.2.1 to determine the **demolition risk category** with no mitigation applied based on the distance to the nearest receptors.

Table A9.2.1: Risk Category from Demolition Activities

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

[a] These distances are from the dust emission source. Where this is not known then the distance should be from the site boundary. The risk is based on the distance to the nearest receptor.

Earthworks and Construction

A9.2.9 The potential dust emission classes for earthworks are as follows:

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; and

Small: Total site area <2,500 m^2, soil type with large grain size (e.g. sand), <5 heavy earth moving vehicles active at any one time, formation of bunds <4 m in height, total material moved <10,000 tonnes, earthworks during wetter months.

A9.2.10 The potential dust emission classes for construction are as follows:

Large: Total building volume >100,000 m^3, piling, on site concrete batching; sandblasting

Medium: Total building volume 25,000 m^3 – 100,000 m^3, potentially dusty construction material (e.g. concrete), piling, on site concrete batching; and

Small: Total building volume <25,000 m^3, construction material with low potential for dust release (e.g. metal cladding or timber).

A9.2.11 These potential dust emission classes should then be used in the matrix in Table A9.2.2 to determine the earthworks risk category and the construction risk category with no mitigation applied.

Table A9.2.2: Risk Category from Earthworks and Construction Activities

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

a These distances are from the dust emission source. Where this is not known then the distance should be from the site boundary. The risk is based on the distance to the nearest receptor.

Trackout

A9.2.12 The potential dust emission classes for trackout are as follows:

Large: >100 HDV (>3.5t) trips in any one day, potentially dusty surface material (e.g. high clay content), unpaved road length >100 m;

Medium: 25-100 HDV (>3.5t) trips in any one day, moderately dusty surface material (e.g. high clay content), unpaved road length 50 m – 100 m; and

Small / Medium: <25 HDV (>3.5t) trips in any one day, surface material with low potential for dust release, unpaved road length <50 m.

A9.2.13 These potential dust emission classes should be used in Table A9.2.3 to determine the risk category for trackout with no mitigation applied.

Table A9.2.3: Risk Category from Trackout

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

[a] For trackout the distance is from the roads used by construction traffic.

A9.2.14 There is an extra dimension to the assessment of trackout, as the distance over which it might occur depends on the site. As general guidance, significant trackout may occur up to 500 m from large sites, 200 m from medium sites and 50 m from small sites, as measured from the site exit. These distances assume no site-specific mitigation.

A9.2.15 The 'distance to receptor' in Table A9.2.3 relates to the distance from the road where mud may be deposited. Therefore in determining the risk from trackout, both distances need to be taken into account.

STEP 3: Identify the Need for Site-specific Mitigation

A9.2.16 Having determined the risk categories for each of the four activities it is possible to determine the site-specific measures to be adopted. These measures will be related to whether the site is a low, medium or high risk site.

STEP 4: Define Effects and their Significance

A9.2.17 The significance is determined using professional judgement, taking account of the factors that define the sensitivity of the surrounding area and the overall pattern of potential risks set out within the risk effects summary table. The sensitivity of the area is defined as very high, high, medium and low based on the criteria in Table A9.2.4.

Table A9.2.4: Examples of Factors Defining Sensitivity of an Area

Sensitivity of area	Examples	
	Human receptors	Ecological receptors[a]
Very high	• Very densely populated area. • More than 100 dwellings within 20 m. • Local PM_{10} concentrations exceed the objective. • Contaminated buildings present. • Very sensitive receptors (e.g. oncology units). • Works continuing in one area of the site for more than one year.	European Designated site.
High	• Densely populated area. • 10-100 dwellings within 20 m of site. • Local PM_{10} concentrations close to the objective (e.g. annual mean 36-40 μg/m^3). • Commercially sensitive horticultural land within 20 m.	Nationally Designated site.
Medium	• Suburban or edge of town area. • Less than 10 receptors within 20 m. • Local PM_{10} concentrations below the objective (e.g. annual mean 30-36 μg/m^3).	Locally designated site.
Low	• Rural area; industrial area • No receptors within 20 m • Local PM_{10} concentrations well below the objectives (less than 75%) • Wooded area between site and receptors	No designations.

[a] Only if there are habitats that might be sensitive to dust

A9.2.19 The sensitivity of the area surrounding the construction / demolition site is combined with the risk of the site giving rise to dust effects to define the significance of the effects for each of the four activities (demolition, earthworks, construction and trackout) using Table A9.2.5 for the baseline without mitigation and Table A9.2.6 when mitigation is applied.

Table A9.2.5: Significance of Effects for Each Activity Without Mitigation.

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

Table A9.2.6: Significance of Effects for Each Activity With Mitigation.

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

A9.2.20 The final step is to determine the overall significance of the effects arising from the construction phase of a proposed development. This is based on professional judgement but takes into account of the significance of the effects for each of the four activities.

Adaption for Environmental Statement

A9.2.21 The descriptors within the IAQM guidance have been adapted to provide consistency with the remainder of the Environmental Statement as outlined in Table A9.2.7 and Table A9.2.8.

Table A9.2.7: Impact Descriptors used within Environmental Statement

Impact Within IAQM Guidance	Equivalent Within Environmental Statement
Substantial	**Adverse or Beneficial**
Moderate	**Adverse or Beneficial**
Slight	Adverse or Beneficial
Negligible	**Neutral**

Table A9.2.8: Significance Criteria used within Environmental Statement

Significance Within IAQM Guidance	Equivalent Within Environmental Statement
Major	**Significant**
Moderate	**Moderate**
Minor	**Low**
Insignificant	**No Effect**

A9.3 Extracts from the London Plan and Mayor's Air Quality Strategy, and Description of the Low Emission Zone (LEZ)

London Plan

A9.3.1 The London Plan sets out the following points in relation to planning decisions:

"Development proposals should:

a) minimise increased exposure to existing poor air quality and make provision to address local problems of air quality (particularly within AQMAs or where development is likely to be used by large numbers of those particularly vulnerable to poor air quality, such as children or older people) such by design solutions, buffer zones or steps to promote greater use of sustainable transport modes through travel plans (see Policy 6.3);

b) promote sustainable design and construction to reduce emissions from the demolition and construction of buildings following the best practice guidance in the GLA and London Councils "The control, of dust and emissions form construction and demolition";

c) be at least "air quality neutral" and not lead to further deterioration of existing poor air quality (such as areas designated as Air Quality Management Areas (AQMAs));

d) ensure that where provision needs to made to reduce emissions from a development, these usually are made on site. Where it can be demonstrated that on-sire provision is impractical or inappropriate, and that it is possible to put in place measures having clearly demonstrated equivalent air quality benefits, planning obligations or planning conditions should be used as appropriate to ensure this, whether on a scheme by scheme basis or through joint area-based approaches;

e) where the development requires a detailed air quality assessment and biomass boilers are included, the assessment should forecast pollutant concentrations. Permission should only be granted if no adverse air quality impacts from the biomass boiler are identified."

The Mayor's Air Quality Strategy

A9.3.2 The Mayor's Air Quality Strategy commits to the continuation of measures identified in the 2002 MAQS, and sets out a series of additional measures, including:

Policy 1 – Encouraging smarter choices and sustainable travel;

Measures to reduce emissions from idling vehicles focusing on buses, taxis, coaches, taxis, PHVs and delivery vehicles;

Using spatial planning powers to support a shift to public transport;

Supporting car free developments.

Policy 2 – Promoting technological change and cleaner vehicles:

Supporting the uptake of cleaner vehicles.

Policy 4 – Reducing emissions from public transport:

Introducing age limits for taxis and PHVs.

Policy 5 – Schemes that control emissions to air:

Implementing Phases 3 and 4 of the LEZ from January 2012

Introducing a NOx emissions standard (Euro IV) into the LEZ for Heavy Goods Vehicles (HGVs), buses and coaches, from 2015.

Policy 7 – Using the planning process to improve air quality:

Minimising increased exposure to poor air quality, particularly within AQMAs or where a development is likely to be used by a large number of people who are particularly vulnerable to air quality;

Ensuring air quality benefits are realised through planning conditions and section 106 agreements and Community Infrastructure Levy.

Policy 8 – Creating opportunities between low to zero carbon energy supply for London and air quality impacts:

Applying emissions limits for biomass boilers across London;

Requiring an emissions assessment to be included at the planning application stage.

Low Emission Zone (LEZ)

A9.3.3 A key measure to improve air quality in Greater London is the Low Emission Zone (LEZ). This entails charges for vehicles entering Greater London not meeting certain emissions criteria, and affects older, diesel-engined lorries, buses, coaches, large vans, minibuses and other specialist vehicles derived from lorries and vans. The LEZ was introduced on 4th February 2008, and was phased in through to January 2012. From January 2012 a standard of Euro IV was implemented for lorries and other specialist diesel vehicles over 3.5 tonnes, and buses and coaches over 5 tonnes. Cars and lighter Light Goods Vehicles (LGVs) are excluded. The third phase of the LEZ, which applies to larger vans, minibuses and other specialist diesel vehicles, was also implemented in January 2012. As set out in the 2010 MAQS, a NO_x emissions standard (Euro IV) will be included into the LEZ for HGVs, buses and coaches, from 2015.

A9.4 Impact Descriptors and Assessment of Significance

A9.4.1 There is no official guidance in the UK on how to describe the nature of air quality impacts, nor how to assess their significance. The approach developed by the Institute of Air Quality Management[3] (Institute of Air Quality Management, 2009), and incorporated in Environmental Protection UK's guidance document on planning and air quality (Environmental Protection UK, 2010), has therefore been used. This involves three distinct stages: the application of descriptors for magnitude of change; the description of the impact at each sensitive receptor; and then the assessment of overall significance of the scheme.

Impact Descriptors

A9.4.2 The definition of ***impact magnitude*** is solely related to the degree of change in pollutant concentrations, expressed in microgrammes per cubic metre, but originally determined as a percentage of the air quality objective. ***Impact description*** takes account of the impact magnitude and of the absolute concentrations and how they relate to the air quality objectives or other relevant standards. The descriptors for the magnitude of change due to the scheme are set out in Table A9.4.2, while Table A9.4.2 sets out the impact descriptors. These tables have been designed to assist with describing air quality impacts at each specific receptor. They apply to the pollutants relevant to this scheme and the objectives against which they are being assessed.

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3 The IAQM is the professional body for air quality practitioners in the UK.

Table A9.4.1: Definition of Impact Magnitude for Changes in Ambient Pollutant Concentrations

Magnitude of Change	Annual Mean NO_2/PM_{10}	No. days with PM_{10} concentration greater than 50 µg/m^3	Annual Mean $PM_{2.5}$
Large	Increase/decrease ≥4 µg/m^3	Increase/decrease >4 days	Increase/decrease ≥2.5 µg/m^3
Medium	Increase/decrease 2 - <4 µg/m^3	Increase/decrease 3 or 4 days	Increase/decrease 1.25 - <2.5 µg/m^3
Small	Increase/decrease 0.4 - <2 µg/m^3	Increase/decrease 1 or 2 days	Increase/decrease 0.25 - <1.25 µg/m^3
Imperceptible	Increase/decrease <0.4 µg/m^3	Increase/decrease <1 day	Increase/decrease <0.25 µg/m^3

Table A9.4.2: Air Quality Impact Descriptors for Changes to Annual Mean Nitrogen Dioxide, PM_{10} and $PM_{2.5}$ Concentrations and Changes to Number of Days with PM_{10} Concentration Greater than 50 µg/m^3 at a Receptor [a]

Absolute Concentration [b] in Relation to Objective/Limit Value	Change in Concentration/day [c]		
	Small	**Medium**	**Large**
Above Objective/Limit Value [d]	Slight	Moderate	Substantial
Just Below Objective/Limit Value [e]	Slight	Moderate	Moderate
Below Objective/Limit Value [f]	Negligible	Slight	Slight
Well Below Objective/Limit Value [g]	Negligible	Negligible	Slight

a Criteria have been adapted from the published criteria to remove overlaps at transitions.

b The 'Absolute Concentration' relates to the 'With-Scheme' air quality where there is an increase in concentrations and to the 'Without-Scheme' air quality where there is a decrease in concentrations.

c Where the Impact Magnitude is *Imperceptible*, then the Impact Description is *Negligible*.

d 'Above': >40 µg/m^3 annual mean NO_2 or PM_{10}, >25 µg/m^3 annual mean $PM_{2.5}$, or >35 days with PM_{10} > 50 µg/m^3.

e 'Just below': >36 – ≤40 µg/m^3 of annual mean NO_2 or PM_{10}, >22.5 - ≤25 µg/m^3 annual mean $PM_{2.5}$, or >32 – ≤35 days with PM_{10} >50 µg/m^3.

f 'Below': >30 – ≤36 µg/m^3 of annual mean NO_2 or PM_{10}, >18.75 - ≤22.5 µg/m^3 annual mean $PM_{2.5}$, or >26 – ≤32 days with PM_{10} >50 µg/m^3.

g 'Well below': ≤30 µg/m^3 annual mean NO_2 or PM_{10}, ≤18.75 µg/m^3 annual mean $PM_{2.5}$, or ≤26 days with PM_{10} >50 µg/m^3.

Assessment of Significance

A9.4.3 There is no official guidance in the UK on how to assess the significance of air quality impacts of existing sources on a new development. The approach developed by the Institute of Air Quality Management[4] (Institute of Air Quality Management, 2009), and incorporated in Environmental Protection UK's guidance document on planning and air quality (Environmental Protection UK, 2010), has therefore been used. The guidance is that the assessment of significance should be based on professional judgement, with the overall air quality impact of the scheme described as either, *insignificant*, *minor*, *moderate* or *major*. In drawing this conclusion, the factors set out in Table should be taken into account. A summary of the professional experience of the staff contributing to this assessment is provided in Appendix A9.5.

Table A9.4.3: Factors Taken into Account in Determining Air Quality Significance

Factors
Number of people affected by increases and/or decreases in concentrations and a judgement on the overall balance.
The number of people exposed to levels above the objective or limit value, where new exposure is being introduced.
The magnitude of the changes and the descriptions of the impacts at the receptors using the criteria set out in Table and Table .
Whether or not an exceedence of an objective or limit value is predicted to arise in the study area where none existed before or an exceedence area is substantially increased.
Whether or not the study area exceeds an objective or limit value and this exceedence is removed or the exceedence area is reduced.
Uncertainty, including the extent to which worst-case assumptions have been made.
The extent to which an objective or limit value is exceeded, e.g. an annual mean NO_2 of 41 $\mu g/m^3$ should attract less significance than an annual mean of 51 $\mu g/m^3$.

Adaption for Environmental Statement

A9.2.22 The descriptors within the IAQM guidance have been adapted to provide consistency with the remainder of the Environmental Statement as outlined in Table A9.4.4 and Table A9.4.5.

4 The IAQM is the professional body for air quality practitioners in the UK.

Table A9.4.4: Impact Descriptors used within Environmental Statement

Impact Within IAQM Guidance	Equivalent Within Environmental Statement
Substantial	**Adverse or Beneficial**
Moderate	**Adverse or Beneficial**
Slight	Adverse or Beneficial
Negligible	**Neutral**

Table A9.4.5: Significance Criteria used within Environmental Statement

Significance Within IAQM Guidance	Equivalent Within Environmental Statement
Major	**Significant**
Moderate	**Moderate**
Minor	**Low**
Insignificant	**No Effect**

A9.5 Professional Experience

Prof. Duncan Laxen, BSc (Hons) MSc PhD MIEnvSc FIAQM

Prof Laxen is the Managing Director of Air Quality Consultants, a company which he founded in 1993. He has over forty years' experience in environmental sciences and has been a member of Defra's Air Quality Expert Group and the Department of Health's Committee on the Medical Effects of Air Pollution. He has been involved in major studies of air quality, including nitrogen dioxide, lead, dust, acid rain, PM_{10}, $PM_{2.5}$ and ozone and was responsible for setting up the UK's urban air quality monitoring network. Prof Laxen has been responsible for appraisals of all local authorities' air quality Review & Assessment reports and for providing guidance and support to local authorities carrying out their local air quality management duties. He has carried out air quality assessments for power stations; road schemes; ports; airports; railways; mineral and landfill sites; and residential/commercial developments. He has also been involved in numerous investigations into industrial emissions; ambient air quality; indoor air quality; nuisance dust and transport emissions. Prof Laxen has prepared specialist reviews on air quality topics and contributed to the development of air quality management in the UK. He has been an expert witness at numerous Public Inquiries, published over 70 scientific papers and given numerous presentations at conferences. He is a Fellow of the Institute of Air Quality Management.

Dr Ben Marner, BSc (Hons) PhD CSci MIEnvSc MIAQM

Dr Marner is a Technical Director with AQC, and has thirteen years' relevant experience in the field of air quality. He has been responsible for air quality and greenhouse gas assessments of road schemes, rail schemes, airports, power stations, waste incinerators, commercial developments and residential developments in the UK and abroad. He has been an expert witness at several public inquiries, where he has presented evidence on health-related air quality impacts, the impacts of air quality on sensitive ecosystems, and greenhouse gas impacts. He has extensive experience of using detailed dispersion models, as well as contributing to the development of modelling best practices. Dr Marner has arranged and overseen air quality monitoring surveys, as well as contributing to Defra guidance on harmonising monitoring methods. He has been responsible for air quality review and assessments on behalf of numerous local authorities. He has also developed methods to predict nitrogen deposition fluxes on behalf of the Environment Agency, provided support and advice to the UK Government's air quality review and assessment helpdesk, Transport Scotland, Transport for London, and numerous local authorities. He is a Member of the Institute of Air Quality Management.

Caroline Odbert, BA (Hons) MSc MIEnvSc MIAQM

Ms Odbert is a Senior Consultant with AQC with over four years' relevant experience. She is involved in the preparation of air quality assessments for a range of development projects. She has been responsible for a wide range of air quality projects covering impact assessments for new residential and commercial developments, local air quality management, ambient air quality monitoring of nitrogen dioxide and sulphur dioxide and the assessment of nuisance odours. She has extensive modeling experience for road traffic and has worked with a variety of clients to provide expert air quality services and advice, including local authorities, planners, developers and process operators. She is a Member of the Institute of Air Quality Management.

Full CVs are available at www.aqconsultants.co.uk.

A9.6 Additional Model Results

Baseline Without Studios

A9.6.1 Predicted annual mean concentrations of nitrogen dioxide, PM_{10} and $PM_{2.5}$, as well as days with PM_{10} >50 μg/m^3, are set out in Table A9.6.1, Table A9.6.2 and Table A9.6.3 for both the baseline "Without Studios" and "With Scheme" scenarios. For nitrogen dioxide, results are presented for two scenarios to reflect current uncertainty in Defra's future-year vehicle emission factors.

Table A9.6.1: Predicted Impacts on Annual Mean Nitrogen Dioxide Concentrations in 2016 (μg/m3)

Receptor	With 'Official' Emissions Reduction [a]			Without Emissions Reduction [b]		
	Without Studios	With Scheme	Impact Descriptor	Without Studios	With Scheme	Impact Descriptor
R1	29.4	29.5	Neutral	33.0	33.1	Neutral
R2	31.7	31.8	Neutral	35.8	35.9	Neutral
R3	30.6	30.6	Neutral	34.4	34.4	Neutral
R4	38.8	38.9	Neutral	44.2	44.3	Neutral
R5	**40.9**	**41.0**	Neutral	**46.0**	**46.2**	Neutral
R6	30.0	30.1	Neutral	33.7	33.8	Neutral
R7	26.7	26.7	Neutral	29.6	29.6	Neutral
R8	26.8	26.8	Neutral	29.6	29.7	Neutral
R9	25.8	25.9	Neutral	28.5	28.5	Neutral
R10	36.1	36.1	Neutral	**41.5**	**41.5**	Neutral
R11	33.6	33.6	Neutral	38.4	38.5	Neutral
R12	39.0	39.0	Neutral	45.0	45.0	Neutral
R13	33.1	33.1	Neutral	37.7	37.8	Neutral
R14	36.8	37.0	Neutral	**42.5**	**42.8**	Neutral
R15	34.4	34.5	Neutral	39.6	39.8	Neutral
R16	29.7	29.8	Neutral	33.6	33.7	Neutral
R17	31.7	31.7	Neutral	36.0	36.0	Neutral
R18	29.2	29.2	Neutral	32.7	32.8	Neutral
Objective	**40**		-	**40**		-

[a] Descriptors used are based on those used within the Environmental Statement and have been adapted from those descriptors outlined in Appendix 9.2.

Table A9.6.2: Predicted PM_{10} Impacts in 2016 (µg/m3)

Receptor	Annual Mean (µg/m^3)			Days with PM_{10} > 50 µg/m^3 [a]		
	Without Studios	With Scheme	Impact Descriptor	Without Studios	With Scheme	Impact Descriptor
R1	17.9	17.9	Neutral	1	1	Neutral
R2	18.3	18.3	Neutral	2	2	Neutral
R3	18.0	18.0	Neutral	1	1	Neutral
R4	19.2	19.2	Neutral	2	2	Neutral
R5	19.7	19.7	Neutral	3	3	Neutral
R6	17.9	17.9	Neutral	1	1	Neutral
R7	17.4	17.4	Neutral	1	1	Neutral
R8	17.4	17.4	Neutral	1	1	Neutral
R9	17.3	17.3	Neutral	1	1	Neutral
R10	19.0	19.0	Neutral	2	2	Neutral
R11	18.6	18.6	Neutral	2	2	Neutral
R12	19.5	19.6	Neutral	3	3	Neutral
R13	18.5	18.5	Neutral	2	2	Neutral
R14	19.0	19.0	Neutral	2	2	Neutral
R15	18.6	18.6	Neutral	2	2	Neutral
R16	17.9	17.9	Neutral	1	1	Neutral
R17	18.2	18.2	Neutral	2	2	Neutral
R18	17.9	17.9	Neutral	1	1	Neutral
Objective	**40**		-	**35**		-

[a] Descriptors used are based on those used within the Environmental Statement and have been adapted from those descriptors outlined in Appendix 9.2.

Table A9.6.3: Predicted $PM_{2.5}$ Impacts in 2016 (µg/m3)

Receptor	Annual Mean (µg/m^3)		
	Without Scheme	With Scheme	Impact Descriptor
R1	12.6	12.6	Neutral
R2	12.8	12.8	Neutral
R3	12.6	12.7	Neutral
R4	13.4	13.4	Neutral
R5	13.7	13.7	Neutral
R6	12.6	12.6	Neutral
R7	12.3	12.3	Neutral
R8	12.3	12.3	Neutral
R9	12.2	12.2	Neutral
R10	13.2	13.3	Neutral
R11	13.0	13.0	Neutral
R12	13.6	13.6	Neutral
R13	12.9	12.9	Neutral
R14	13.2	13.3	Neutral
R15	13.0	13.0	Neutral
R16	12.5	12.6	Neutral
R17	12.8	12.8	Neutral
R18	12.6	12.6	Neutral
Objective	**25**		-

[a] Descriptors used are based on those used within the Environmental Statement and have been adapted from those descriptors outlined in Appendix 9.2.

A9.6.2 Predicted concentrations of both PM_{10} and $PM_{2.5}$ remain well below the objectives in 2016, whether the proposed scheme proceeds or not. There are some exceedences of the annual mean nitrogen dioxide concentrations assuming both a reduction in emissions and no reduction in emissions. This however occurs both without and with the proposed scheme.

Additional Floors of Proposed Development

A9.6.3 Predicted concentrations of nitrogen dioxide, PM_{10} and $PM_{2.5}$ on the upper floors of the proposed development are set out in Table A9.6.4.

Table A9.6.4: Predicted Concentrations of Nitrogen Dioxide (NO_2), for New Receptors on the Upper Floors of the Development Site

Receptor	Annual Mean NO_2 ($\mu g/m^3$)											
	With 'Official' Emissions Reduction [a]						Without Emissions Reduction [b]					
	1F	2F	3F	4F	5F	6F	1F	2F	3F	4F	5F	6F
A	28.3	27.0	-	-	-	-	31.5	30.0	-	-	-	-
B	28.0	26.9	-	-	-	-	31.3	29.8	-	-	-	-
C	27.5	26.5	-	-	-	-	30.6	29.3	-	-	-	-
D	27.4	26.4	-	-	-	-	30.4	29.1	-	-	-	-
E	27.7	26.7	26.1	-	-	-	30.8	29.6	28.8	-	-	-
F	28.2	-	-	-	-	-	31.5	-	-	-	-	-
G	26.3	26.0	25.8	25.5	25.3	-	29.0	28.7	28.4	28.1	27.8	-
H	26.7	26.4	26.1	-	-	-	29.6	29.2	28.8	-	-	-
I	26.0	25.9	25.7	25.5	25.3	25.2	28.7	28.5	28.3	28.0	27.8	27.6
Objective	40											

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

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

Table A9.6.4: Predicted Concentrations of PM_{10} in 2016 for New Receptors on the upper floors of the Development Site

Receptor	PM_{10} ($\mu g/m^3$) [a]											
	Annual Mean						No. Days >50 $\mu g/m^3$					
	1F	2F	3F	4F	5F	6F	1F	2F	3F	4F	5F	6F
A	17.7	17.5	-	-	-	-	1	1				
B	17.6	17.4	-	-	-	-	1	1				
C	17.6	17.4	-	-	-	-	1	1				
D	17.5	17.4	-	-	-	-	1	1				
E	17.6	17.4	17.3	-	-	-	1	1	1			
F	17.7	-	-	-	-	-	1					
G	17.4	17.3	17.3	17.2	17.2	=	1	1	1	1	1	-
H	17.4	17.4	17.3	-	-	-	1	1	1	-	-	-
I	17.3	17.3	17.3	17.2	17.2	17.2	1	1	1	1	1	1
Objectives	40						35					

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

Table A9.6.4: Predicted Concentrations of $PM_{2.5}$ in 2016 for New Receptors on the upper floors of the Development Site

Receptor	$PM_{2.5}$ ($\mu g/m^3$)					
	Annual Mean					
	1F	2F	3F	4F	5F	6F
A	12.4	12.3	-	-	-	-
B	12.4	12.3	-	-	-	-
C	12.4	12.3	-	-	-	-
D	12.4	12.3	-	-	-	-
E	12.4	12.3	12.2	-	-	-
F	12.4	-	-	-	-	-
G	12.2	12.2	12.2	12.2	12.2	-
H	12.3	12.3	12.2	-	-	-
I	12.2	12.2	12.2	12.2	12.2	12.1
Objectives	40		40	35		25

A9.6.4 All the values are below the objectives. Air quality for future residents within the development will thus be acceptable.

A9.7 Construction Mitigation

A9.7.1 The following is a list of generic dust control measures provided by the Institute of Air Quality Management (Institute of Air Quality Management, 2012b). These will not all be relevant to the works being carried out, but should be used, as appropriate, to specify the measures required.

Communications

- Implement a stakeholder communications plan that includes community engagement before and during work on site; and
- Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environmental manager/engineer or the site manager.

Dust Management Plan

- Implement a Dust Management Plan (DMP) approved by the Local Authority which documents the mitigation measures to be applied, and the procedures for their implementation and management.

Site Management

- Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken. Make the complaints log available to the local authority when asked;' and
- Record any exceptional incidents that cause dust and/or air emissions, either on- or off- site, and the action taken to resolve the situation in the log book.

Monitoring

- Undertake daily on-site and off-site inspection where receptors (including roads) are nearby, to monitor dust, record inspection results, and make available the log to the local Authority when asked;
- When activities with a high potential to produce dust are being carried out, and during prolonged dry or windy conditions, increase the frequency of inspections;
- Carry out regular dust soiling checks of surfaces such a street furniture, cars and window sills within 100m of site boundary;
- Implement a monitoring scheme for dust deposition/flux consistent with IAQM guidance. Agree monitoring locations and Site Action Levels with the Local Authority; and

- Implement a scheme for real-time continuous PM_{10} monitoring consistent with IAQM guidance. Agree monitoring locations and Site Action Levels with the Local Authority.

Preparing and maintaining the site

- Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible. Use intelligent screening where possible – e.g. locating site offices between potentially dusty activities and the receptors;
- Erect solid screens or barriers around the site boundary;
- Avoid site runoff of water or mud;
- Keep site fencing, barriers and scaffolding clean;
- 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; and
- Depending on the duration that stockpiles will be present and their size - cover, seed, fence or water to prevent wind whipping.

Operating vehicle/machinery and sustainable travel

- 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; and
- 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;
- Use enclosed chutes, conveyors and covered skips, where practicable; and
- 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

- Only use registered waste carriers to take waste off-site; and
- Avoid bonfires and burning of waste materials.

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 in a small areas during work and not all at once.

Measures Specific to Construction

- Avoid scabbling, 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; and
- 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.

Measures Specific to Trackout

- Use water-assisted dust sweeper(s) on the access and local roads, to remove, as soon as practicable any material tracked out of the site. This may require the sweeper being continuously in use;
- Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport;
- 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;

- Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as practicable;
- Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site); and
- 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. This can be in the form or a static drive through facility or a manually operated power jet.