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Appendix C2: Construction Phase Dust Assessment Methodology

ENGINEERING CONSULTING

Document approval

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Contents

1 Introduction

This Appendix presents the methodology for the assessment of construction phase dust impacts which is based on the approach outlined within the Institute of Air Quality Management (IAQM) document 'Guidance on the assessment of dust from demolition and construction' (February 2014). This guidance sets out the methodology for assessing the air quality impacts of construction and demolition and identifies good practice for mitigating and managing air quality impacts.

The assessment is based on the risk of a construction site giving rise to dust impacts and the sensitivity of the surrounding area. The risk of dust emissions from a construction site causing loss of amenity and / or health or ecological effects is related to:

- The activities being undertaken (demolition, number of vehicles and plant etc.);
- The duration of these activities;
- The size of the Site;
- The meteorological conditions (wind speed, direction and rainfall);
- The proximity of receptors to the activity;
- The adequacy of the mitigation measures applied to reduce or eliminate dust; and
- The sensitivity of the receptors to dust.

The quantity of dust emitted is related to the area of land being worked and the level of construction activities, in terms of the nature, magnitude and duration of those activities. The wind direction, wind speed and rainfall at the time when a construction activity is taking place will also influence whether there is likely to be a dust impact. Atmospheric conditions which promote adverse impacts can occur in any direction from a site. However, adverse impacts are more likely to occur downwind of the prevailing wind direction and / or close to the worked areas. Impacts are also more likely to occur during drier periods as rainfall acts as a natural dust suppressant.

Activities are divided into four types to reflect their different potential impacts. These are:

1. Demolition;
2. Earthworks;
3. Construction; and
4. Trackout.

"Trackout" is a less well-known term, and is defined by the IAQM as "The transport of dust and dirt from the construction/ demolition site onto the public road network, where it may be deposited and then re-suspended by vehicles using the network.

The approach considers three separate dust effects:

1. Annoyance due to dust deposition;
2. Harm to ecological receptors; and
3. The risk of health effects due to significant increase in exposure to PM_{10} (particulate matter with a diameter less than 10 µm).

2 Methodology

The first stage is to determine whether the impact can be screened out as 'negligible', or whether a more detailed assessment is required. The IAQM recommends that the developer would normally be required to undertake a detailed assessment where there is:

- A human receptor within 350 m of the boundary of the Site;
- An ecological receptor within 50 m of the boundary of the Site; or
- A human or ecological receptor within 50 m of the route(s) used by construction vehicles on the public highway, up to 500 m from the Site entrance(s).

A human receptor, in this context, is any location where a person may experience the annoyance effects of airborne dust or dust deposition or suffer exposure to PM_{10} over a period of time relevant to the Air Quality Assessment Levels (AQALs) detailed in Table 2 of Appendix C3 – Emissions Modelling. These include:

- Residential dwellings;
- Schools;
- Hospitals;
- Care homes;
- Hotels;
- Gardens (where relevant public exposure is likely i.e. excluding extremities of gardens or front gardens); and
- Sensitive commercial premises including; vehicle showrooms, food manufacturers; and electronics manufacturers.

Ecological receptors should include statutory and non-statutory designated sites.

If a detailed assessment is required, the second stage is to assess the risk of dust effects arising. A site is allocated to a risk category based on two factors; dust emission magnitude; and the sensitivity of the area. These factors are combined to give the risk of dust impact in the absence of any mitigation measures.

The third stage is to define appropriate, site-specific, mitigation measures. The final stage is to determine whether significant effects are likely. For almost all construction activities, the aim should be to prevent significant effects on receptors through the use of effective mitigation. Experience has shown that this is normally possible.

3 Assessment Criteria

For developments where a detailed assessment is required, a risk category is determined based on two factors;

1. The scale and nature of the works, which determines the potential dust emission magnitude (Table 1); and
2. the sensitivity of the area (Table 2 to Table 7).

These factors are combined to give the risk of dust impacts (Table 8) in the absence of any mitigation measures.

3.1 Dust emission magnitude

The dust emission magnitude is based on the scale of the anticipated works and should be classified as small, medium or large. The following are example of how the potential dust emissions magnitude for different activities can be defined as set out in the IAQM guidance:

Table 1: Dust Emission Magnitude Criteria

Magnitude	Description
Demolition Activities	
Large	total building volume > 50,000 m³, potentially dusty construction material (i.e. concrete), on-site crushing and screening, demolition activities > 20 m above ground level
Medium	total building volume 20,000 - 50,000 m³, potentially dusty construction material, demolition activities 10 – 20 m above ground level
Small	total building volume < 20,000 m³, construction material with low potentially for dust release (i.e. metal cladding or timber), demolition activities <10m above ground level, demolition during wetter months
Earthworks	
Large	total size area > 10,000 m², potentially dusty soil type (e.g. clay, which will be prone to suspension when dry due to 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 size area 2,500 – 10,000 m², moderately dusty soil type (i.e. silt), 5 – 10 heavy earth moving vehicles active at any one time, formation of bunds 4 – 8m in height, total material moved 20,000 – 100,000 tonnes
Small	total size area < 2,500 m², soil type with large grain size (i.e. 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 Activities	
Large	total building volume > 100,000 m³, piling, on site concrete batching, sandblasting
Medium	total building volume 25,000 – 100,000 m³, potentially dusty construction material (e.g. concrete), piling, on site concrete batching

Magnitude	Description
Small	total building volume < 25,000 m³, construction material with low potential for dust release (e.g. metal cladding or timber)
Trackout	
Large	> 50 HDV (> 3.5 t) trips in any one day, potentially dusty surface material (e.g. high clay content), unpaved road length > 100 m
Medium	10 – 50 HDV (> 3.5 t) trips in any one day, moderately dusty surface material (e.g. high clay content), unpaved road length 50 – 100 m
Small	< 10 HDV (> 3.5 t) trips in any one day, surface material with low potential for dust release, unpaved road length < 50 m

Source: Section 7.2, Guidance on the assessment of dust from demolition and construction, IAQM (2014)

Only receptors within 50 m of the routes(s) used by vehicles on the public highway and up to 500 m from the Site entrance(s) are considered to be at risk from the effects of dust from trackout.

3.2 Sensitivity of the area

The sensitivity of the area takes 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 PM_{10}, the local background concentration; and
- site-specific factors, such as whether there are natural shelters, such as trees or other vegetation, to reduce the risk of wind-blown dust.

The type of receptors at different distances from the site boundary or, if known, from the dust generating activities, should be included. Consideration should also be given to the number of `human receptors'. Exact counting of the number of `human receptors' is not required. Instead the guidance recommends that judgement is used to determine the receptors (a residential unit is one receptor) within each distance band.

There is no unified sensitivity classification scheme that covers the different potential effects on property, human health and ecological receptors. However, the following guidance is provided on the sensitivity of different types of receptors. For the sensitivity of people and their property to soiling, it is recommended that professional judgement is used to identify where on the spectrum between high and low sensitivity a receptor lies, taking into account the principles presented in Table 2.

Table 2: Sensitivity of People to Dust Soiling Effects

Sensitivity	Justification
High	• Users can reasonably expect an enjoyment of a high level of amenity; or • The appearance, aesthetics or value of their property would be diminished by dust deposition; or • 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.

Sensitivity	Justification
	Indicative examples include dwellings, museums 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, aesthetic or value of their property could be diminished by dust deposition; or • The people or property would not reasonably be expected to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land. Indicative examples include parks and places of work.
Low	• The enjoyment of amenity would not reasonably be expected; or • Property would not reasonably be expected to be diminished in appearance, aesthetics or value by dust deposition; 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. Indicative examples include playing fields, farmland (unless commercially-sensitive horticultural), footpaths, short-term car parks and roads.

Source: Box 6, Guidance on the assessment of dust from demolition and construction, IAQM (2014)

For the sensitivity of people to the health effects of PM_{10} the IAQM guidance recommends that there are three sensitivities based on whether or not the receptor is likely to be exposed to elevated concentrations over a 24-hour period as presented in Table 3.

Table 3: Sensitivity of People to Heath Effects of PM_{10}

Sensitivity	Justification
High	• Locations where members of the public are exposed over a time period relevant to the air quality objective for PM_{10} (in the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day). Indicative examples include residential properties. Hospitals, schools and residential care homes should also be considered as having equal sensitivity to residential areas for the purposes of this assessment.
Medium	• Locations where the people exposed are workers, and exposure is over a time period relevant to the air quality objective for PM_{10} (in the case of the 24- hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day). Indicative examples include office and shop workers, but will generally not include workers occupationally exposed to PM_{10}, as protection is covered by Health and Safety at Work legislation.

Sensitivity	Justification
Low	• Locations where human exposure is transient. Indicative examples include public footpaths, playing fields, parks and shopping streets

Source: Box 7, Guidance on the assessment of dust from demolition and construction, IAQM (2014)

Table 4 provides an example of possible sensitivities of receptors to ecological effects.

Table 4: Sensitivity of Receptors to Ecological Effects

Sensitivity	Justification
High	• Locations with an international or national designation and the designated features may be affected by dust deposition; or • Locations where there is a community of a particularly dust sensitive species such as vascular species included in the Red Data List for Great Britain. Indicative examples include a Special Area of Conservation (SAC) designated for acid heathlands or a local site designated for lichens adjacent to the demolition of a large site containing concrete (alkali) buildings.
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. Indicative example is a Site of Special Scientific Interest (SSSI) with dust sensitive features.
Low	• Locations with a local designation where the features may be affected by dust deposition. Indicative example is a local Nature Reserve with dust sensitive features.

Source: Box 8, Guidance on the assessment of dust from demolition and construction, IAQM (2014)

Table 5, Table 6 and Table 7 show how sensitivity of the area should be determined for dust deposition, human health and ecosystem impacts respectively. The sensitivity of the area is then derived for construction, earthworks and trackout.

Table 5: Sensitivity of the Area to Dust and Soiling Impacts on People and Property

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

Source: Table 2, Guidance on the assessment of dust from demolition and construction, IAQM (2014)

Table 6: Sensitivity of the Area to Human Health Impacts

Receptor Sensitivity	Annual Mean PM_{10} Conc.	No. of Receptors	Distance from the Source (m)				
			<20	<50	<100	<200	<350
High	>32 µg/m³	>100	High	High	High	Medium	Low
		10-100	High	High	Medium	Low	Low
		1-10	High	Medium	Low	Low	Low
	28 -32 µg/m³	>100	High	High	Medium	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	High	Medium	Low	Low	Low
	24 - 28 µg/m³	>100	High	Medium	Low	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	<24 µg/m³	>100	Medium	Low	Low	Low	Low
		10-100	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Medium	>32 µg/m³	>10	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	28 – 32 µg/m³	>10	Medium	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	24 - 28 µg/m³	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	<24 µg/m³	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Low	-	>1	Low	Low	Low	Low	Low

Source: Table 3, Guidance on the assessment of dust from demolition and construction, IAQM (2014)

Table 7: Sensitivity of the Area to Ecological Impacts

Receptor Sensitivity	Distance from the Source (m)	
	<20	<50
High	High	Medium
Medium	Medium	Low
Low	Low	Low

Source: Table 4, Guidance on the assessment of dust from demolition and construction, IAQM (2014)

3.3 Risk of dust impacts

The dust magnitude and sensitivity of the area are then combined using the following matrices to determine the risk of impacts with no mitigation applied. For the cases where the risk category is

'negligible', no mitigation measures beyond those required by accepted best practice would be necessary.

Table 8: Risk of Dust Impacts – Level of Mitigation Required

Sensitivity of 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

Source: Tables 6-9, Guidance on the assessment of dust from demolition and construction, IAQM (2014)

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