
Appendix 9.2 – Construction Dust Risk Assessment

1 Construction Dust Risk Assessment

Methodology

- 1.1 Dust is the generic term used to describe particulate matter in the size range 1-75 µm in diameter [1]. Particles greater than 75 µm in diameter are termed grit rather than dust. Dusts can contain a wide range of particles of different sizes. The normal fate of suspended (i.e. airborne) dust is deposition. The rate of deposition depends largely on the size of the particle and its density; together these influence the aerodynamic and gravitational effects that determine the distance it travels and how long it stays suspended in the air before it settles out onto a surface. In addition, some particles may agglomerate to become fewer, larger particles; whilst others react chemically.
- 1.2 The effects of dust are linked to particle size and two main categories are usually considered:
- PM₁₀ particles, those up to 10 µm in diameter, remain suspended in the air for long periods and are small enough to be breathed in and so can potentially impact on health; and
 - Dust, generally considered to be particles larger than 10 µm which fall out of the air quite quickly and can soil surfaces (e.g. a car, window sill, laundry). Additionally, dust can potentially have adverse effects on vegetation and fauna at sensitive habitat sites.
- 1.3 The IAQM *Guidance on the assessment of dust from demolition and construction* [2] sets out 350 m as the distance from the site boundary and 50 m from the site traffic route(s) up to 500 m of the entrance, within which there could potentially be nuisance dust and PM₁₀ effects on human receptors. For sensitive ecological receptors, the corresponding distances are 50 m in both cases. These distances are set to be deliberately conservative.
- 1.4 Concentration-based limit values and objectives have been set for the PM₁₀ suspended particle fraction, but no statutory or official numerical air quality criterion for dust annoyance has been set at a UK, European or World Health Organisation (WHO) level. Construction dust assessments have tended to be risk based, focusing on the appropriate measures to be used to keep dust impacts at an acceptable level.
- 1.5 The IAQM dust guidance aims to estimate the impacts of both PM₁₀ and dust through a risk-based assessment procedure. The IAQM dust guidance document states: *“The impacts depend on the mitigation measures adopted. Therefore the emphasis in this document is on classifying the risk of dust impacts from a site, which will then allow mitigation measures commensurate with that risk to be identified.”*
- 1.6 The IAQM dust guidance provides a methodological framework, but notes that professional judgement is required to assess effects: *“This is necessary, because the diverse range of projects that are likely to be subject to dust impact assessment means that it is not possible to be prescriptive as to how to assess the impacts. Also a wide range of factors affect the amount of dust that may arise, and these are not readily quantified.”*

1.7 Consistent with the recommendations in the IAQM dust guidance, a risk-based assessment has been undertaken for the development, using the well-established source-pathway-receptor approach:

- The dust impact (the change in dust levels attributable to the development activity) at a particular receptor will depend on the magnitude of the dust source and the effectiveness of the pathway (i.e. the route through the air) from source to receptor.
- The effects of the dust are the results of these changes in dust levels on the exposed receptors, for example annoyance or adverse health effects. The effect experienced for a given exposure depends on the sensitivity of the particular receptor to dust. An assessment of the overall dust effect for the area as a whole has been made using professional judgement taking into account both the change in dust levels (as indicated by the Dust Impact Risk for individual receptors) and the absolute dust levels, together with the sensitivities of local receptors and other relevant factors for the area.

Source

The IAQM dust guidance gives examples of the dust emission magnitudes for demolition, earthworks and construction activities and trackout. These example dust emission magnitudes are based on the site area, building volume, number of HDV movements generated by the activities and the materials used. These example magnitudes have been combined with details of the period of construction activities to provide the ranking for the source magnitude that is set out in Table 1.1.

Table 1.1 Risk Allocation – Source (Dust Emission Magnitude)

Features of the Source of Dust Emissions	Dust Emission Magnitude
<p>Demolition - building over 50,000 m³, potentially dusty construction material (e.g. concrete), on-site crushing and screening, demolition activities > 20 m above ground level.</p> <p>Earthworks – total site area over 10,000 m², potentially dusty soil type (e.g. clay), >10 heavy earth moving vehicles active at any one time, formation of bunds > 8 m in height, total material moved > 100,000 tonnes.</p> <p>Construction - total building volume over 100,000 m³, activities include piling, on-site concrete batching, sand blasting. Period of activities more than two years.</p> <p>Trackout – 50 HDV outwards movements in any one day, potentially dusty surface material (e.g. High clay content), unpaved road length > 100 m.</p>	Large
<p>Demolition - building between 20,000 to 50,000 m³, potentially dusty construction material and demolition activities 10 - 20 m above ground level.</p> <p>Earthworks – total site area between 2,500 to 10,000 m², moderately dusty soil type (e.g. silt), 5 – 10 heavy earth moving vehicles active at any one time, formation of bunds 4 - 8 m in height, total material moved 20,000 to 100,000 tonnes.</p> <p>Construction - total building volume between 25,000 and 100,000 m³, use of construction materials with high potential for dust release (e.g. concrete), activities include piling, on-site concrete batching. Period of construction activities between one and two years.</p> <p>Trackout – 10 - 50 HDV outwards movements in any one day, moderately dusty surface material (e.g. High clay content), unpaved road length 50 – 100 m.</p>	Medium

<p>Demolition - building less than 20,000 m³, construction material with low potential for dust release (e.g. metal cladding or timber), demolition activities < 10 m above ground, demolition during winter months.</p> <p>Earthworks – total site area less than 2,500 m². 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 winter months.</p> <p>Construction - total building volume below 25,000 m³, use of construction materials with low potential for dust release (e.g. metal cladding or timber). Period of construction activities less than one year.</p> <p>Trackout – < 10 HDV outwards movements in any one day, surface material with low potential for dust release, unpaved road length < 50 m.</p>	<p>Small</p>
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Pathway and Receptor - Sensitivity of the Area

Pathway means the route by which dust and particulate matter may be carried from the source to a receptor. The main factor affecting the pathway effectiveness is the distance from the receptor to the source. The orientation of the receptors to the source compared to the prevailing wind direction is a relevant risk factor for long-duration construction projects; however, short-term construction projects may be limited to a few months when the most frequent wind direction might be quite different, so adverse effects can potentially occur in any direction from the site.

As set out in the IAQM dust guidance, a number of attempts have been made to categorise receptors into high, medium and low sensitivity categories; however there is no unified sensitivity classification scheme that covers the quite different potential effects on property, human health and ecological receptors.

Table 1.2 and Table 1.3 sets out the IAQM basis for categorising the sensitivity of people and property to dust and PM₁₀ respectively. Table 1.4 sets out the basis for determining the sensitivity of ecological receptors to dust.

Table 1.2 Sensitivities of People and Property Receptors to Dust

Receptor	Sensitivity
<p>Principles:-</p> <ul style="list-style-type: none"> ▪ 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. <p>Indicative Examples:-</p> <ul style="list-style-type: none"> ▪ Dwellings. ▪ Museums and other culturally important collections. ▪ Medium and long-term car parks and car showrooms. 	<p>High</p>
<p>Principles:-</p> <ul style="list-style-type: none"> ▪ 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. 	<p>Medium</p>

Receptor	Sensitivity
Indicative Examples:- <ul style="list-style-type: none"> ▪ Parks. ▪ Places of work. 	
Principles:- <ul style="list-style-type: none"> ▪ 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. Indicative Examples:- <ul style="list-style-type: none"> ▪ Playing fields, farmland (unless commercially-sensitive horticultural). ▪ Footpaths and roads. ▪ Short-term car parks. 	Low

Table 1.3 Sensitivities of People and Property Receptors to PM₁₀

Receptor	Sensitivity
Principles:- <ul style="list-style-type: none"> ▪ Locations where members of the public are exposed over a time period relevant to the air quality objective (in the case of the 24-hour objective for PM₁₀, a relevant location would be one where individuals may be exposed for eight hours or more in a day). Indicative Examples:- <ul style="list-style-type: none"> ▪ Residential properties. ▪ Schools, hospitals and residential care homes. 	High
Principles:- <ul style="list-style-type: none"> ▪ Locations where the people exposed are workers and exposure is over a time period relevant to the air quality objective (in the case of the 24-hour objective for PM₁₀, a relevant location would be one where individuals may be exposed for eight hours or more in a day). Indicative Examples:- <ul style="list-style-type: none"> ▪ Office and shop workers (but generally excludes workers occupationally exposed to PM₁₀ as protection is covered by Health and Safety at Work legislation). 	Medium
Principles:- <ul style="list-style-type: none"> ▪ Locations where human exposure is transient exposure. Indicative Examples:- <ul style="list-style-type: none"> ▪ Public footpaths. ▪ Playing fields, parks. ▪ Shopping streets. 	Low

Table 1.4 Sensitivities of Ecological Receptors to Dust

Receptor	Sensitivity
Principles:- <ul style="list-style-type: none"> ▪ Locations with an international or national designation and the designated features may be affected by dust soiling; or 	High

Receptor	Sensitivity
<ul style="list-style-type: none"> 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:- <ul style="list-style-type: none"> Special Area of Conservation (SAC) designated for acid heathlands adjacent to the demolition of a large site containing concrete (alkali) buildings or for the presence of lichen. 	
Principles:- <ul style="list-style-type: none"> 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 Examples:- <ul style="list-style-type: none"> Site of Special Scientific Interest (SSSI) with dust sensitive features. 	Medium
Principles:- <ul style="list-style-type: none"> Locations with a local designation where the features may be affected by dust deposition. Indicative Examples:- <ul style="list-style-type: none"> A Local Nature Reserve with dust sensitive features 	Low

The IAQM methodology combines consideration of the pathway and receptor to derive the ‘sensitivity of the area’. Table 1.5, Table 1.6 and Table 1.7 show how the sensitivity of the area has been derived for this assessment.

Table 1.5 Sensitivity of the Area to Dust Soiling Effects on People and Property

Receptor Sensitivity	Number of Receptors ^a	Distance from the Source (m) ^b			
		<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

The sensitivity of the area has been derived for demolition, construction, earthworks and trackout.

a The total number of receptors within the stated distance has been estimated. Only the highest level of area sensitivity from the table has been recorded.

b For trackout, the distances have been measured from the side of the roads used by construction traffic. Without site-specific mitigation, trackout may occur from roads up to 500 m from large sites, 200 m from medium sites and 50 m from small sites, as measured from the site exit. The impact declines with distance from the site, and trackout impacts have only been considered up to 50 m from the edge of the road.

Table 1.6 Sensitivity of the Area to Human Health Impacts

Receptor Sensitivity	Annual Mean PM ₁₀ Concentration ^a	Number of Receptors ^{b, c}	Distance from the Source (m) ^d				
			<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
	< 28 µg.m ⁻³	>1	Low	Low	Low	Low	Low
Low	-	>1	Low	Low	Low	Low	Low

The sensitivity of the area has been derived for demolition, construction, earthworks and trackout.

a This refers to the background concentration derived from the assessment of baseline conditions later in this report. The concentration categories listed in this column apply to England, Wales and Northern Ireland but not to Scotland.

b The total number of receptors within the stated distance has been estimated. Only the highest level of area sensitivity from the table has been recorded.

c For high sensitivity receptors with high occupancy (such as schools or hospitals), the approximate number of occupants has been used to derive an equivalent number of receptors.

d For trackout, the distances have been measured from the side of the roads used by construction traffic. Without site-specific mitigation, trackout may occur from roads up to 500 m from large sites, 200 m from medium sites and 50 m from small sites, as measured from the site exit. The impact declines with distance from the site, and trackout impacts have only been considered up to 50 m from the edge of the road.

Table 1.7 Sensitivity of the Area to Ecological Impacts

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

The sensitivity of the area has been derived for demolition, construction, earthworks and trackout and for each designated site.

a Only the highest level of area sensitivity has been recorded.

The IAQM dust guidance lists the following additional factors that can potentially affect the sensitivity of the area and, where necessary, professional judgement has been used to adjust the sensitivity allocated to a particular area:

- any history of dust generating activities in the area;
- the likelihood of concurrent dust generating activity on nearby sites;
- any pre-existing screening between the source and the receptors;
- any conclusions drawn from analysing local meteorological data which accurately represent the area; and if relevant the season during which the works will take place;
- any conclusions drawn from local topography;
- duration of the potential impact, as a receptor may become more sensitive over time; and
- any known specific receptor sensitivities which are considered go beyond the classifications given in the table above.

The matrices in Table 1.8, Table 1.9, Table 1.10 and Table 1.11 have been used to assign the risk for each activity to determine the level of mitigation that should be applied. For those cases where the risk category is 'negligible', no mitigation measures are required beyond those mandated by legislation.

Table 1.8 Risk of Dust Impacts – Demolition

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Medium Risk
Medium	High Risk	Medium Risk	Low Risk
Low	Medium Risk	Low Risk	Negligible

Table 1.9 Risk of Dust Impacts – Earthworks

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

Table 1.10 Risk of Dust Impacts – Construction

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

Table 1.11 Risk of Dust Impacts – Trackout

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Low Risk	Negligible
Low	Low Risk	Low Risk	Negligible

- 1.8 The dust risk categories that have been determined for each of the four activities (demolition, earthworks, construction and trackout) have been used to define the appropriate site-specific mitigation measures based on those described in the IAQM dust guidance. The guidance states that provided the mitigation measures are successfully implemented, the resultant effects of the dust exposure will normally be “*not significant*”.
- 1.9 This assessment does not consider the air quality impacts of dust from any contaminated land or buildings. If contaminated land is identified on the application site, the impacts will be assessed in other technical discipline reports.

2 Dust Risk Assessment

- 2.1 Whilst no detailed construction phase information is currently available, the type of activities that could cause fugitive dust emissions are: demolition; earthworks; handling and disposal of spoil; wind-blown particulate material from stockpiles; handling of loose construction materials; and movement of vehicles, both on and off site.
- 2.2 The level and distribution of construction dust emissions will vary according to factors such as the type of dust, duration and location of dust-generating activity, weather conditions and the effectiveness of suppression methods.
- 2.3 The main effect of any dust emissions, if not mitigated, could be annoyance due to soiling of surfaces, particularly windows, cars and laundry. However, it is normally possible, by implementation of proper control, to ensure that dust deposition does not give rise to significant adverse effects, although short-term events may occur (for example, due to technical failure or exceptional weather conditions). The following assessment, using the IAQM methodology, predicts the risk of dust impacts and the level of mitigation that is required to control the residual effects to a level that is “not significant”.

Source

- 2.4 Buildings which are no longer fit for purpose would be demolished. Assuming that the volume of the buildings on site that would be demolished is between 20,000 m³ and 50,000 m³ the dust emission magnitude for the demolition phase is classified, using the IAQM dust guidance, as medium.
- 2.5 As the site area is more than 10 hectares (10,000 m²), the dust emission magnitude for the earthworks phase is classified as large.
- 2.6 Three buildings (the fabrication building, repair and fabrication building and light assembly building) will be constructed. The total volume of the three buildings will exceed 100,000 m³. As such, the dust emission magnitude for the construction phase is classified as large.
- 2.7 Assuming that the maximum number of outwards movements in any one day is above 50 HDVs, the dust emission magnitude for trackout would be classified as large.

Table 2.1 Dust Emission Magnitude for Demolition, Earthworks, Construction and Trackout

Demolition	Earthworks	Construction	Trackout
Medium	Large	Large	Large

Pathway and Receptor - Sensitivity of the Area

2.8 All demolition, earthworks and construction activities are assumed to occur within the site boundary. As such, receptors at distances within 20 m, 50 m, 100 m and 350 m of the site boundary have been identified and are illustrated in Figure 9.1 of Volume 1 of the Environmental Statement. The sensitivity of the area has been classified and the results are provided in Table 2.2 below.

Table 2.2 Sensitivity of the Surrounding Area for Demolition, Earthworks and Construction

Potential Impact	Sensitivity of the Surrounding Area	Reason for Sensitivity Classification
Dust Soiling	Medium	No highly sensitive receptors have been identified within 20 m of the site boundary. South Pembrokeshire Hospital is located immediately to the south (the nearest façade is between 20 and 50 m). The nearest residential dwellings are on Admiralty Way and Melville Terrace. (Table 1.5)
Human Health	Low	Although there are highly sensitive receptors in close proximity to the site boundary, the background PM ₁₀ concentration is 13.1 µg.m ⁻³ (Table 1.6)
Ecological	Medium	Pembrokeshire Marine Special Area of Conservation (SAC) and the Milford Haven Waterway Site of Special Scientific Interest (SSSI) are within 20 to 50 m of the site boundary on the west side.

2.9 The Dust Emission Magnitude for trackout is classified as large and trackout may occur on roads up to 500 m from the site. The major routes within 500 m of the site are Meyrick Owen Way, Commercial Row and Western Way. The sensitivity of the area has been classified and the results are provided in Table 2.3 below.

Table 2.3 Sensitivity of the Surrounding Area for Trackout

Potential Impact	Sensitivity of the Surrounding Area	Reason for Sensitivity Classification
Dust Soiling	High	Between 10 and 100 residential properties aligning the major routes (Table 1.5)
Human Health	Low	Between 10 and 100 residential properties (Table 1.5) Although there are highly sensitive receptors aligning the major routes, the background PM ₁₀ concentrations is 13.1 µg.m ⁻³ , well below 24 µg.m ⁻³ (Table 1.6).
Ecological	-	The major routes are more than 50 m from any sites designated for their ecological importance.

Overall Dust Risk

2.10 The Dust Emission Magnitude has been considered in the context of the Sensitivity of the Area (Tables 1.5 and 1.6) to give the Dust Impact Risk. Table 2.4 summarises the Dust Impact Risk for the four activities.

Table 2.4 Dust Impact Risk for Demolition, Earthworks, Construction and Trackout

Source	Demolition	Earthworks	Construction	Trackout
Dust Soiling	Medium	Medium	Medium	High
Human Health	Low	Low	Low	Low
Ecology	Medium	Medium	Medium	-
Risk	Medium	Medium	Medium	Medium

- 2.11 As set out above, the IAQM dust guidance document states: *“The impacts depend on the mitigation measures adopted. Therefore the emphasis in this document is on classifying the risk of dust impacts from a site, which will then allow mitigation measures commensurate with that risk to be identified.”*
- 2.12 The risk for each of the four activities is classified as medium. (Note: the IAQM dust guidance ‘highly recommended’ measures for medium and high risk trackout are identical). The risk for the site as a whole is classified as medium.
- 2.13 The mitigation measures appropriate to a medium risk site are set out in Chapter 9 (Volume 1 of the Environmental Statement).

Glossary

AADT	Annual Average Daily Traffic Flow
ADMS	Atmospheric Dispersion Modelling System
AQMA	Air Quality Management Area
AQS	Air Quality Strategy
Deposited Dust	Dust that has settled out onto a surface after having been suspended in air.
DMP	Dust Management Plan
Dust	Solid particles suspended in air or settled out onto a surface after having been suspended in air
Effect	The consequences of an impact, experienced by a receptor
EPUK	Environmental Protection UK
HGV	Heavy Goods Vehicle
IAQM	Institute of Air Quality Management
Impact	The change in atmospheric pollutant concentration and/or dust deposition. A scheme can have an 'impact' on atmospheric pollutant concentration but no effect, for instance if there are no receptors to experience the impact.
LGV	Light Goods Vehicle
R&A	Review and Assessment
Receptor	A person, their land or property and ecologically sensitive sites that may be affected by air quality.
Risk	The likelihood of an adverse event occurring
Trackout	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 vehicle using the network

References

- 1 British Standard Institute (1983) BS 6069:Part 2:1983, ISO 4225-1980 Characterization of air quality. Glossary
- 2 IAQM (2014) Guidance on the assessment of dust from demolition and construction