3FMProject

Bringing Dublin Port To 2040

Environmental Impact Assessment Report

Appendix 10.3

Volume 3 Part 6

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Third & Final Masterplan Project

Introduction

The main air quality impacts that may arise during demolition and construction activities are:

1. **dust deposition, resulting in the soiling of surfaces;**
2. **visible dust plumes, which are evidence of dust emissions;**
3. **elevated PM_{10} concentrations, as a result of dust generating activities on site; and**
4. **an increase in concentrations of airborne particles and nitrogen dioxide due to exhaust emissions from diesel powered vehicles and equipment used on site (non-road mobile machinery) and vehicles accessing the site[1].**

The most common impacts are dust soiling and increased ambient PM_{10} concentrations due to dust arising from activities on the site. Dust soiling will arise from the deposition of dust in all size fractions. The ambient dust relevant to health outcomes will be that measured as PM_{10}, although most of this will be in the coarse ($PM_{2.5-10}$) fraction, rather than the $PM_{2.5}$ fraction. Research undertaken in the USA[2] suggests that 85% to 90% by weight of the fugitive dust emissions of PM_{10} from construction sites are $PM_{2.5-10}$ and 10% to 15% are in the $PM_{2.5}$ fraction.

There are other potential impacts, such as the release of heavy metals, asbestos fibres or other pollutants during the demolition of certain buildings, such as former chemical works, or the removal of contaminated soils. The release of certain fungal spores during the demolition of old buildings can also give rise to specific concerns if immune-compromised people are likely to be exposed, for example close to an oncology unit of a hospital. These issues need to be considered on a site by site basis, and are not covered by this Guidance.

Experience of assessing the exhaust emissions from on-site plant (also known as non-road mobile machinery or NRMM) and site traffic suggests that they are unlikely to make a significant impact on local air quality, and in the vast majority of cases they will not need to be quantitatively assessed. For site plant and on-site traffic, consideration should be given to the number of plant/vehicles and their operating hours and locations to assess whether a significant effect is likely to occur. For site traffic on the public highway, if it cannot be scoped out (for example by using the EPUK's criteria), then it should be assessed using the same methodology and significance criteria as operational traffic impacts. The impacts of exhaust emissions from on-site plant and site traffic are not considered further in this Guidance.

Receptors

Human Receptor

A 'human receptor', refers to any location where a person or property may experience the adverse effects of airborne dust or dust soiling[3], or exposure to PM over a time period relevant to the air quality objectives, as defined in the Government's technical guidance for Local Air Quality Management[4]. In terms of annoyance effects, this will most commonly relate to dwellings, but may also refer to other premises such as buildings housing cultural heritage collections (e.g. museums and galleries), vehicle showrooms, food manufacturers, electronics manufacturers, amenity areas and horticultural operations (e.g. salad or soft-fruit production). Care should be taken to ensure that the assessment takes into account whether exposure will arise in practice (e.g. computer chip manufacture is sensitive to dust and so premises are likely to have extensive dust filtering equipment and exposure may therefore not be increased).

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[1] *In the UK the maximum permitted sulphur content of fuels used in road and off-road applications is 10 ppm, and therefore sulphur dioxide is no longer a significant pollutant from these sources.*

[2] *Background Document for Revisions to Fine Fraction Ratios Used for AP-42 Fugitive Dust Emission Factors Prepared by Midwest Research Institute (Chatten Cowherd, MRI Project Leader), For Western Governors' Association Western Regional Air Partnership (WRAP), MRI Project No. 110397, Finalized November 1, 2006.*

[3] *Occupational settings are relevant in terms of annoyance effects.*

[4] *Local Air Quality Management Technical Guidance LAQM. TG(09), Defra, February 2009.*

Ecological Receptor

An 'ecological receptor' refers to any sensitive habitat affected by dust soiling. This includes the direct impacts on vegetation[5] or aquatic ecosystems of dust deposition, and the indirect impacts on fauna (e.g. on foraging habitats). For locations with a statutory designation, e.g. Special Areas of Conservation (SACs) and Areas of Special Scientific Interest (ASSIs), consideration should be given as to whether the particular site is sensitive to dust and this will depend on why it has been designated. Some non-statutory sites (i.e. local wildlife sites) and/or locations with very specific sensitivities may also be considered if appropriate. The inclusion or exclusion of sites should be justified in the assessment.

Dust from construction sites deposited on vegetation may create ecological stress within the local plant community. During long dry periods dust can coat plant foliage adversely affecting photosynthesis and other biological functions. Rainfall removes the deposited dust from foliage and can rapidly leach chemicals into the soil. Plant communities near short-term works are likely to recover within a year of the dust soiling stress ceasing. However, large scale construction sites may give rise to dust deposition over an extended period of time and adversely affect vascular plants. For example cement dust deposited on leaves can increase the surface alkalinity, which in turn can hydrolyse lipid and wax components, penetrate the cuticle, and denature proteins, finally causing the leaf to wilt[6].

Limestone dust coating of lichen has been shown to damage its photosynthetic apparatus[7]. These types of damage over a long period have the potential to change plant community structure and function. Noticeable effects include the increase in ruderal and pioneer plant communities.

Risk of Dust Emissions

The risk of dust emissions from a demolition/construction site causing loss of amenity and/or health or ecological impacts is related to:

1. **the activities being undertaken (demolition, number of vehicles and plant etc.);**
2. **the duration of these activities;**
3. **the size of the site;**
4. **the meteorological conditions (wind speed, direction and rainfall);**
5. **the proximity of receptors to the activities;**
6. **the adequacy of the mitigation measures applied to reduce or eliminate dust; and**
7. **the sensitivity of the receptors to dust.**

The quantity of dust emitted from construction operations will be related to the area of land being worked, and the level of construction activity (nature, magnitude and duration). Emissions from construction vehicles passing over unpaved ground can be particularly important. These will be related to the silt content of the soil (defined by the US Environmental Protection Agency as particles smaller than 75 micrometres [μm] in diameter), as well as the speed and weight of the vehicle, the soil moisture content, the distance covered and the frequency of vehicle movements.

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[5] *A Farmer, 1993, The Effects of Dust on Vegetation - A Review, Environmental Pollution 79, 63-75.*

[6] *Guderian R. 1986. Terrestrial ecosystems: particulate deposition. In: Air Pollutants and Their Effects on the Terrestrial Ecosystem (Legge AH, Krupa SV, eds). Advances in Environmental Science and Technology, Vol. 18. 339-363, Wiley, New York, USA.*

[7] *Arianoutsou M, Lanaras T, Zaharopoulou A. 1993. Influence of dust from a limestone quarry on chlorophyll degradation of the lichen Physcia adscendens (Fr.) Oliv. Bulletin of Environmental Contaminants and Toxicology, 50: 852–855.*

Weather

Although not specifically required as part of the IAQM dust assessment method, analysis of the local climatic conditions was also undertaken to provide additional context to the risk assessment and assist in the determination of the sensitivity of the area.

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. Due to the variability of the weather, it is impossible to predict what the weather conditions will be when specific construction activities are being undertaken.

Local wind speed and direction influences the dispersion of dust. This will depend on the frequency that the receptor is downwind and the distance of the receptors from the construction activities. Higher wind speeds will result in the highest potential release of dust from a site. Buildings, structures and trees can also influence dispersion.

Adverse impacts can occur in any direction from a site. They are, however, more likely to occur downwind of the prevailing wind direction and/or close to the site. It should be noted that the 'prevailing' wind direction is usually the most frequent direction over a long period such as a year; whereas construction activity may occur over a period of weeks or months during which the most frequent wind direction might be quite different. The most frequent wind direction may also not be the direction from which the wind speeds are highest. The use of the prevailing wind direction in the assessment of risk is most useful, therefore, for construction projects of long duration.

Dust impacts are more likely to occur during drier periods, as rainfall acts as a natural dust suppressant.

Seasonal

Impacts during the summer and winter months are generally different, and if it can be guaranteed that the construction will take place during a particular season (with this enforced through a planning condition, for example), consideration could be given to using seasonal wind and rainfall data. This type of guarantee is not usual because the start of construction depends on many factors.

Topography & Natural Barriers

Local conditions also need to be accounted for. Topography and natural barriers (e.g. woodland) will reduce airborne concentrations due to impaction. In addition, if the locality has a history of dust generating activities, such as quarrying, a given level of additional dust may be more acceptable, i.e. more readily tolerated, than in a suburban residential area. Alternatively, impacts may be less acceptable, where nearby residents have become sensitised to dust, have a history of complaining and may therefore be more likely to complain about a new dust source. Similarly, in rural areas agricultural activities may generate dust and this should be taken into account in the assessment of risk.

Assessment Procedure (Risk/Magnitude/Impact highlighted as appropriate to this Proposed Development)

This guidance provides a framework for the assessment of risk. Every site is different and therefore this guidance cannot be too prescriptive and professional judgement is required. Any judgements must be fully auditable in the dust assessment report, with the source(s) defined and choice of dust risk category justified for each activity (see below). Where justification cannot be given, a precautionary approach must be taken and the highest level of mitigation recommended.

Activities on construction sites have been divided into four types to reflect their different potential impacts. These are:

A. Demolition;

B. Earthworks;

C. Construction; and

D. Trackout.

The potential for dust emissions is assessed for each activity that is likely to take place. Obviously, if an activity is not taking place, e.g. demolition, then it does not need to be assessed.

The assessment methodology considers three separate dust impacts:

1. annoyance due to dust soiling;
2. the risk of health effects due to an increase in exposure to PM_{10}; and
3. harm to ecological receptors with account being taken of the sensitivity of the area that may experience these effects.

The assessment is used to define appropriate mitigation measures[8] to ensure that there will be no significant effect.

The assessment steps are summarised below and in **Figure A**.

STEP 1 is to screen the requirement for a more detailed assessment.

No further assessment is required if there are no receptors within a certain distance of the works.

STEP 2 is to assess the risk of dust impacts. This is done separately for each of the four activities (demolition; earthworks; construction; and trackout) and takes account of:

1. the scale and nature of the works, which determines the potential dust emission magnitude (STEP 2A); and
2. the sensitivity of the area (STEP 2B).

These factors are combined in STEP 2C to give the risk of dust impacts.

Risks are described in terms of there being a low, medium or high risk of dust impacts for each of the four separate potential activities. Where there are low, medium or high risks of an impact, then site-specific mitigation will be required, proportionate to the level of risk. Based on the threshold criteria and professional judgement one or more of the groups of activities may be assigned a ‘negligible’ risk. Such cases could arise, for example, because the scale is very small and there are no receptors near to the activity.

STEP 3 is to determine the site-specific mitigation for each of the four potential activities in STEP 2. This will be based on the risk of dust impacts identified in STEP 2. Where a local authority has issued guidance on measures to be adopted at demolition/construction sites, these should also be taken into account.

STEP 4 is to examine the residual effects and to determine whether or not these are significant.

STEP 5 is to prepare the dust assessment report.

[8] *There is little legislation that explicitly seeks to control dust emissions from construction sites. Certain equipment/processes on construction sites are controlled under The Environmental Permitting (England and Wales) Regulations 2010, and equivalent legislation in Scotland and Northern Ireland. Dust is controlled indirectly, through the duty of care provisions for waste under Part 11, Environmental Protection Act 1990 (EPA) (applicable to England, Wales and Scotland) with respect to the transport of waste materials. Part III of the EPA includes provisions for Statutory Nuisance (see Section 2 on Terminology). Exhaust emission from road vehicles and non-road mobile machinery (NRMM) are controlled through European Directives.*

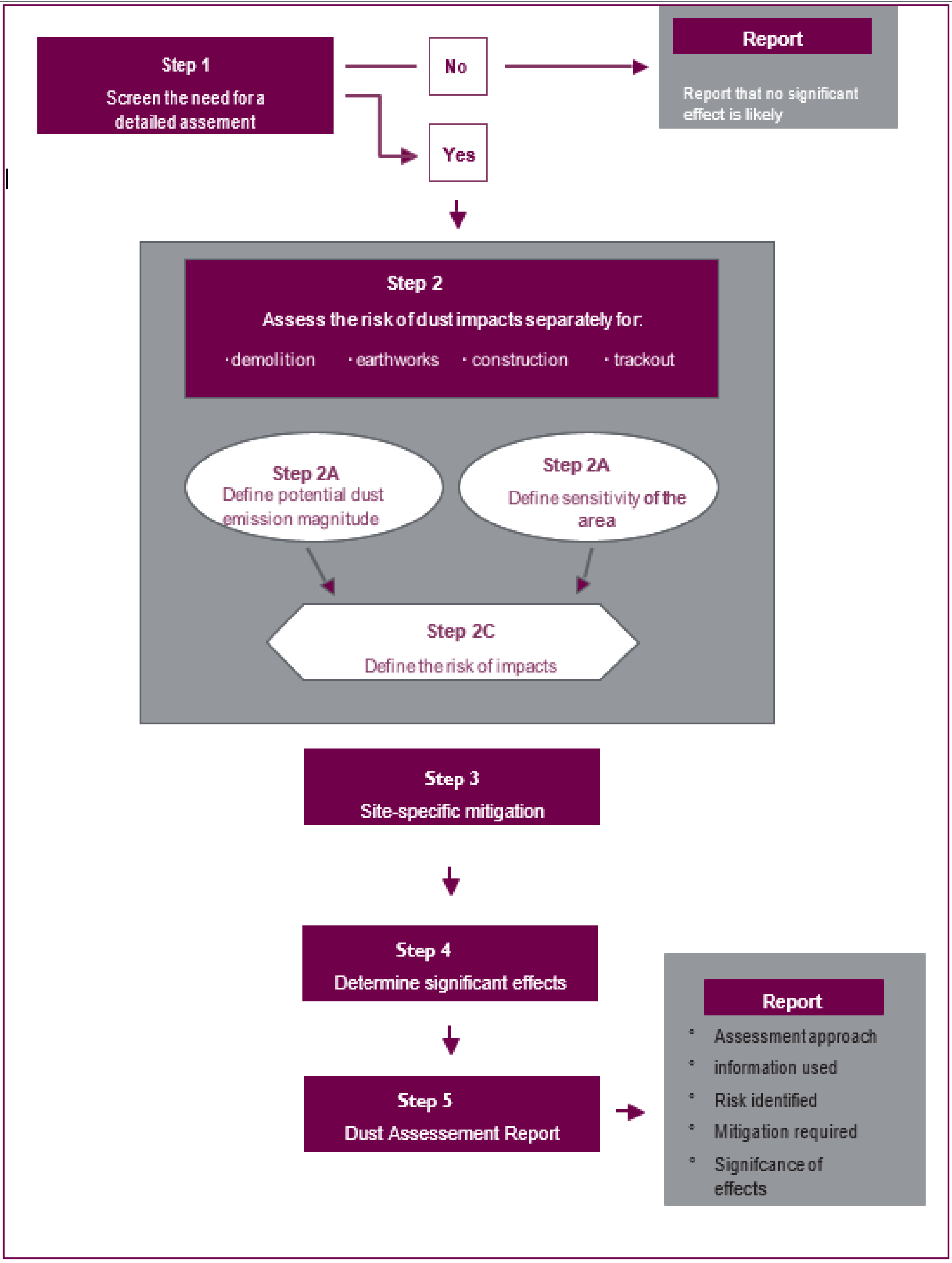

Figure A: Steps to Perform a Dust Assessment

STEP 1: SCREEN THE NEED FOR A DETAILED ASSESSMENT

This step is deliberately chosen to be conservative, and will require assessments for most schemes. The distances cited here, and in subsequent sections, take account of the exponential decline in both airborne concentrations and the rate of deposition with distance, as well as practical experience of members of the Working Group.

Where the need for a more detailed assessment is screened out, it can be concluded that the level of risk is "negligible", and any effects will be not be significant.

Please also refer to Figures B and C in this Appendix.

Box 1: Screening Criteria

An assessment will normally be required where there is:

- a 'human receptor' within:
  - 350 m of the boundary of the site; or
  - 50 m of the route(s) used by construction vehicles on the public highway, up to 500 m from the site entrance(s).
- an 'ecological receptor' within:
  - 50 m of the boundary of the site; or
  - 50 m of the route(s) used by construction vehicles on the public highway, up to 500 m from the site entrance(s).

STEP 2: ASSESS THE RISK OF DUST IMPACTS

The risk of dust arising in sufficient quantities to cause annoyance and/or health and/or ecological impacts should be determined using four risk categories: negligible, low, medium and high risk. A site is allocated to a risk category based on two factors:

3. the scale and nature of the works, which determines the potential dust emission magnitude as small, medium or large (**STEP 2A**); and
4. the sensitivity of the area to dust impacts (**STEP 2B**), which is defined as low, medium or high sensitivity.

These two factors are combined in **STEP 2C** to determine the risk of dust impacts with no mitigation applied. The risk category assigned to the site can be different for each of the four potential activities (demolition, earthworks, construction and trackout). More than one of these activities may occur on a site at any one time.

Where appropriate, the site can be divided into 'zones' for the dust risk assessment. This may result in different mitigation levels being applied to each zone. This could be where different parts of a large site are different distances from the nearest receptors, or where development activities move away from a receptor through time on a large scheme.

However, on complex sites where activities are not easily segregated the mitigation appropriate for the highest risk category should be applied. The aim is to ensure that it is clear what mitigation is supposed to be implemented on a site and to make auditing this simpler.

Every site is different in terms of timing (seasonality), building type (construction materials), duration and scale (area, volume and height), and therefore professional judgement must be applied by a technically competent assessor (see **Box 2**) when allocating activities into one of the three potential dust emission magnitude categories. Justification of the category used must be stated in the report. Where there is doubt, the higher risk category should be applied (e.g. if the site is assessed as low/ medium then mitigation appropriate to a medium site should be applied).

Box 2: Technical Competency of Assessor

The following risk assessment procedure requires 'professional judgement'. Those who are responsible for making this judgement must be able to demonstrate technical competency in the assessment of dust impacts. It is difficult to define precisely who has sufficient experience and expertise to make reasonable judgements, but, a person with full Membership of IAQM *and* experience of assessing dust impacts for a minimum of 10 diverse projects, including some complex multi-phase projects and similar projects to that being assessed, is likely to be technically competent.

IAQM is the only professional body specifically for air quality practitioners in the UK, although there are a number of more general environmental professional bodies, whose members may be competent.

STEP 2A: Define the Potential 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 examples of how the potential dust emission magnitude for different activities can be defined. Note that, in each case, not all the criteria need to be met, and that other criteria may be used if justified in the assessment:

Demolition: Example definitions for demolition are:

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.

The proposed developed dust emission magnitude for Demolition is ****MEDIUM**.**

Earthworks: Earthworks will primarily involve excavating material, haulage, tipping and stockpiling. This may also involve levelling the site and landscaping. Example definitions for earthworks are:

Large: Total site area >10,000 m^2, 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 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 <20,000 tonnes, earthworks during wetter months.

The proposed developed dust emission magnitude for Earthworks is ****LARGE**.**

Box 3: Crushing and Screening

Mobile crushing equipment can be a significant source of dust associated with the demolition phase. This equipment is regulated by District Councils or Unitary Authorities in England and Wales, SEPA in Scotland and District Councils in Northern Ireland, under the Environmental Permitting Regulations 2010 in England and Wales, and equivalent legislation in Scotland and Northern Ireland.

Equipment should be designed and operated in accordance with the most recent version of Process Guidance Note 3/16 for Mobile Crushing and Screening (note this is under review).

Professional judgement will be required to determine how the use of crushing and screening equipment will affect the dust emission magnitude. For example, it may be appropriate to increase the dust emission magnitude by one or more classes

Box 4: Concrete Batching Plant

Concrete batching equipment is regulated by District Councils or Unitary Authorities in England and Wales, SEPA in Scotland and District Councils in Northern Ireland under the Environmental Permitting Regulations 2010 and equivalent legislation in Scotland and Northern Ireland.

Such equipment should be operated in accordance with the latest version of Process Guidance Note 3/1 on Guidance for Blending, Packing, Loading, Unloading and Use of Bulk Cement.

Professional judgement will be required to determine how the use of concrete batching equipment will affect the dust emission magnitude. For example, it may be appropriate to increase the dust emission magnitude by one or more classes.

Construction: The key issues when determining the potential dust emission magnitude during the construction phase include the size of the building(s)/infrastructure, method of construction, construction materials, and duration of build. Example definitions for construction are:

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

Medium: Total building volume 25,000 m^3 – 100,000 m^3, potentially dusty construction material (e.g. concrete), 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).

The proposed developed dust emission magnitude for Construction is **LARGE**.

Trackout: Factors which determine the dust emission magnitude are vehicle size, vehicle speed, vehicle numbers, geology and duration. As with all other potential sources, professional judgement must be applied when classifying trackout into one of the dust emission magnitude categories. Example definitions for trackout are:

Large: >50 HDV (>3.5t) outward movements[9] in any one day[10], potentially dusty surface material (e.g. high clay content), unpaved road length >100 m;

Medium: 10-50 HDV (>3.5t) outward movements in any one day, moderately dusty surface material (e.g. high clay content), unpaved road length 50 m – 100 m; and

Small: <10 HDV (>3.5t) outward movements in any one day, surface material with low potential for dust release, unpaved road length <50 m.

The proposed developed dust emission magnitude for Trackout is **LARGE**.

These numbers are for vehicles that leave the site after moving over unpaved ground, where they will accumulate mud and dirt that can be tracked out onto the public highway.

[9] *A vehicle movement is a one way journey. i.e. from A to B, and excludes the return journey.*
[10] *HDV movements during a construction project vary over its lifetime, and the number of movements is the maximum not the average.*

STEP 2B: Define the Sensitivity of the Area

The sensitivity of the area takes account of a number of factors:

5. the specific sensitivities of receptors in the area;
6. the proximity and number of those receptors;
7. in the case of PM_{10}, the local background concentration; and
8. site-specific factors, such as whether there are natural shelters, such as trees, 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 also should be given to the number of 'human receptors'. Exact counting of the number of 'human receptors', is not required. Instead it is recommended that judgement is used to determine the approximate number of receptors (a residential unit is one receptor) within each distance band. For receptors which are not dwellings professional judgement should be used to determine the number of human receptors for use in the tables, for example a school is likely to be treated as being in the >100 receptor category.

The likely routes the construction traffic will use should also be included to enable the presence of trackout receptors to be included in the assessment. As general guidance, without site-specific mitigation, trackout may occur along the public highway up to 500 m from large sites (as defined in STEP 2A), 200 m from medium sites and 50 m from small sites, as measured from the site exit.

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.

A series of boxes provide guidance on the sensitivity of different types of receptor to dust soiling (**Box 6**), health effects (**Box 7**) and ecological effects (**Box 8**).

In all cases the specific circumstances should be taken into account and may mean that on occasion the examples given will be subject to exceptions. For instance, the first occupants moving into residential dwellings on a large phased housing development, may reasonably be expected to be less sensitive to dust soiling effects (albeit for a limited time) than other residential receptors. **Box 9** contains additional factors that may need to be taken into account.

Box 6: Sensitivities of People to Dust Soiling Effects

For the sensitivity of people and their property to soiling, the IAQM recommends that the air quality practitioner uses professional judgement to identify where on the spectrum between high and low sensitivity a receptor lies, taking into account the following general principles:

High sensitivity receptor – surrounding land where:

- 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.
- indicative examples include dwellings, museums and other culturally important collections, medium and long term car parks[b] and car showrooms.

Medium sensitivity receptor

- users would expect[a] to enjoy a reasonable level of amenity, but would not reasonably expect[a] 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[a] 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 sensitivity receptor

- the enjoyment of amenity would not reasonably be expected[a]; or
- property would not reasonably be expecteda 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 include playing fields, farmland (unless commercially-sensitive horticultural), footpaths, short term car parks[b] and roads.

[a] People's expectations will vary depending on the existing dust deposition in the area.
[b] Car parks can have a range of sensitivities depending on the duration and frequency that people would be expected to park their cars there, and the level of amenity they could reasonably expect whilst doing so. Car parks associated with work place or residential parking might have a high level of sensitivity compared to car parks used less frequently and for shorter durations, such as those associated with shopping. Cases should be examined on their own merits.

Box 7: Sensitivities of People to the Health Effects of PM_{10}

For the sensitivity of people to the health effects of PM_{10}, the IAQM recommends that the air quality practitioner assumes 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, consistent with the Defra's advice for local air quality management (Defra. 2009, LAQM Technical Guidance LAQM.TG (22).

High sensitivity receptor

- 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).[a]
- 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 sensitivity receptor

- 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.

Low sensitivity receptor

- locations where human exposure is transient.
- indicative examples include public footpaths, playing fields, parks and shopping streets.

[a]This follows Defra guidance as set out in LAQM.TG(22).
[b] Notwithstanding the fact that the air quality objectives and limit values do not apply to people in the workplace, such people can be affected to exposure of PM_{10}. However, they are considered to be less sensitive than the general public as a whole because those most sensitive to the effects of air pollution, such as young children are not normally workers. For this reason workers have been included in the medium sensitivity category.

[c] There are no standards that apply to short-term exposure,

e.g. one or two hours, but there is still a risk of health impacts, albeit less certain.

Box 8: Sensitivities of Receptors to Ecological Effects

Dust deposition due to demolition, earthworks, construction and trackout has the potential to affect sensitive habitats and plant communities.

Dust can have two types of effect on vegetation: physical and chemical. Direct physical effects include reduced photosynthesis, respiration and transpiration through smothering. Chemical changes to soils or watercourses may lead to a loss of plants or animals for example via changes in acidity. Indirect effects can include increased susceptibility to stresses such as pathogens and air pollution. These changes are likely to occur only as a result of long-term demolition and construction works adjacent to a sensitive habitat. Often impacts will be reversible once the works are completed, and dust emissions cease.

The advice of an ecologist should be sought to determine the need for an assessment of dust impacts on sensitive habitats and plants[a]. Professional judgement is required to identify where on the spectrum between high and low sensitivity a receptor lies, taking into account the likely effect and the value of the ecological asset. A habitat may be highly valuable but not sensitive, alternatively it may be less valuable but more sensitive to dust deposition. Consequently, specialist ecological advice should also be sought to determine the sensitivity of the ecological receptors to dust impacts. In general most receptors will either be of high sensitivity or low sensitivity i.e. either sensitive or not to dust deposition. The following provides an example of possible sensitivities:

High sensitivity receptor

- locations with an international or national designation and the designated features may be affected by dust soiling; or
- locations where there is a community of a particularly dust sensitive species such as vascular species included in the Red Data List For Great Britain[b].
- 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 sensitivity receptor

- 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 Area of Special Scientific Interest (ASSI) with dust sensitive features.

Low sensitivity receptor

- 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.

[a] Habitat Regulation Assessment of the site may be required as part of the planning process, if the site lies close to an internationally designated site i.e. Special Conservation Areas (SACs), Special Protection Areas (SPAs) designated under the Habitats Directive (92/43/EEC) and RAMSAR sites.

Table B, **Table C**, and **Table D** show how the sensitivity of the area may be determined for dust soiling, human health and ecosystem impacts respectively. These tables take account of a number of factors which may influence the sensitivity of the area. When using these tables, it should be noted that distances are to the dust source and so a different area may be affected by trackout than by on-site works. The highest level of sensitivity from each table should be recorded. It is not necessary to work through the whole of each table once it is clear that the highest level of sensitivity has been determined.

While these tables are necessarily prescriptive, professional judgement may be used to determine alternative sensitivity categories, and the factors set out in **Box 9** may be useful to consider. Any judgements made should be fully documented..

Box 9: Additional Factors to Consider when Determining the Sensitivity of the 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 go beyond the classifications given in this document.

Receptor Sensitivity	Number of Receptors	Distance from the Source (m)[c]			
		<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

[a] The sensitivity of the area should be derived for each of the four activities: demolition, construction, earthworks and trackout. See **STEP 2B**, **Box 6** and **Box 9**.

[b] Estimate the total number of receptors within the stated distance. Only the highest level of area sensitivity from the table needs to be considered. For example, if there are 7 high sensitivity receptors <20 m of the source and 95 high sensitivity receptors between 20 and 50 m, then the total of number of receptors <50 m is 102. The sensitivity of the area in this case would be high.

[c] For trackout, the distances should be 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 it is only necessary to consider trackout impacts up to 50 m from the edge of the road.

Table B: Sensitivity of the Area to Human Health Impacts [a b]

Receptor Sensitivity	Annual Mean PM10 concentration[c]	Number of Receptors[d]	Distance from the Source (m)[e]				
			<20	<50	<100	<200	<350
High	>32 μg/m³ (>18 μg/m³ in Scotland)	>100	High	High	High	Medium	Low
		10-100	High	High	Medium	Low	Low
		1-10	High	Medium	Low	Low	Low
	28-32 μg/m³ (16-18 μg/m³ in Scotland)	>100	High	High	Medium	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	High	Medium	Low	Low	Low
	24-28 μg/m³ (14-16 μg/m³ in Scotland)	>100	High	Medium	Low	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	<24 μg/m³ (<14 μg/m³ in Scotland)	>100	Medium	Low	Low	Low	Low
		10-100	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Medium	>32 μg/m³ (>18 μg/m³ in Scotland)	>10	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	28-32 μg/m³ (16-18 μg/m³ in Scotland)	>10	Medium	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	24-28 μg/m³ (14-16 μg/m³ in Scotland)	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	<24 μg/m³ (<14 μg/m³ in Scotland)	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Low	-	≥1	Low	Low	Low	Low	Low

[a] *The sensitivity of the area should be derived for each of the four activities: demolition, construction, earthworks and trackout. See* ***STEP 2B****,* ***Box 7*** *and* ***Box 9****.*

[b] *Estimate the total within the stated distance (e.g. the total within 350 m and not the number between 200 and 350 m), noting that only the highest level of area sensitivity from the table needs to be considered. For example, if there are 7 high sensitivity receptors <20 m of the source and 95 high sensitivity receptors between 20 and 50 m, then the total of number of receptors <50 m is 102. If the annual mean PM10 concentration is 29 µg/m³, the sensitivity of the area would be high.*

[c] *Most straightforwardly taken from the national background maps but should also take account of local sources. The values are based on 32 µg/m³ being the annual mean concentration at which an exceedance of the 24-hour objective is likely in England, Wales and Northern Ireland. In Scotland there is an annual mean objective of 18µg/m³.*

[d] In the case of high sensitivity receptors with high occupancy (such as schools or hospitals) approximate the number of people likely to be present. In the case of residential dwellings, just include the number of properties.

[e] For trackout, the distances should be 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 it is only necessary to consider trackout impacts up to 50 m from the edge of the road.

Table C: Sensitivity of the Area to Ecological Impacts [a b]

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

Table D: Example of the Outcome of Defining the Sensitivity of the Area

Potential Impact	Sensitivity of the Surrounding Area			
	Earthworks	Construction	Trackout	Demolition
Dust Soiling	Medium	Medium	Medium	Medium
Human Health	Low	Low	Low	Low
Ecological	Negligible	Negligible	Negligible	Negligible

Notes:

[a] *The sensitivity of the area should be derived for each of the four activities: demolition, construction, earthworks and trackout and for each designated site. See **STEP 2B**, **Box 8** and **Box 9**.*

[b] *Only the highest level of area sensitivity from the table needs to be considered.*

[c] *For trackout, the distances should be 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.*

STEP 2C Define the Risk of Impacts – 3FM Development

The dust emission magnitude determined at **STEP 2A** should be combined with the sensitivity of the area determined at **STEP 2B** to determine the risk of impacts with no mitigation applied. The matrices in **Table E**, **Table F**, **Table G** and **Table H** provide a method of assigning the level of risk for each activity. This should be used to determining the level of mitigation that must be applied. Mitigation is discussed in **STEP 3**. For those cases where the risk category is 'negligible', no mitigation measures beyond those required by legislation will be required.

Table F: 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 G: 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 H: 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 I: 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

Ecological Designations (Please also refer to Figure C)

Site Code	Site Name	Qualifying Interests & Conservation Objectives	Distance from proposed development	Receptor Sensitivity	Overall Magnitude of Impact
IE00 0206	North Dublin Bay SAC	**Conservation Objectives Specific Version 1.0 (06/11/13)** To maintain or restore the favourable conservation condition of 9 no. Annex 1 habitat type in the SAC, as defined by a range of attributes and targets; and of 1 no. Annex II species in the SAC, as defined by 5 no. attributes and targets. Mudflats and sandflats not covered by seawater at low tide [1140] Annual vegetation of drift lines 1210] Salicornia and other annuals colonizing mud and sand [1310] Atlantic salt meadows (Glauco-Puccinellietalia maritimae) [1330] Petalophyllum ralfsii [1395] Mediterranean salt meadows (Juncetalia maritimi) [1410] Embryonic shifting dunes [2110] Shifting dunes along the shoreline with Ammophila arenaria ("white dunes") [2120] *Fixed coastal dunes with herbaceous vegetation (“grey dunes”) [2130] Humid dune slacks [2190]	1.35 km to the northeast and by sea from the Plot N dredge pocket	**High**	**Negligible**
IE00 0210	South Dublin Bay SAC	**Conservation Objectives Specific Version 1.0 (22/08/13)** To maintain the favourable conservation condition of 1 no. Annex 1 habitat type [1140] in the SAC, as defined by 4 no. attributes and targets.	0 m at Stormwater discharge points south of Plot O.	**High**	**High**

Site Code	Site Name	Qualifying Interests & Conservation Objectives	Distance from proposed development	Receptor Sensitivity	Overall Magnitude of Impact
		Note: Habitat types [1210], [1310] and [2110] were added as qualifying interests in 2015 and the site's conservation objectives have not yet been revised to take account of these features. Their objectives from North Dublin Bay SAC have been adopted for this assessment. Mudflats and sandflats not covered by seawater at low tide [1140] Annual vegetation of drift lines [1210] Salicornia and other annuals colonizing mud and sand [1310] Embryonic shifting dunes [2110]	0 m at landscaped coastal edge along existing pathway of Irishtown Nature Park south of Plot O 2.95 km by sea from dredge pocket of Plot N out to end of Great South Wall and back around other side		
IE00 3000	Rockabill to Dalkey Island SAC	**Conservation Objectives Specific Version 1.0 (07/05/13)** To maintain the favourable conservation condition of 1 no. Annex 1 habitat type in the SAC, as defined by 3 no. attributes and targets; and of 1 no. Annex II species in the SAC, as defined by 2 no. attributes and targets. Reefs [1170] Harbour porpoise (Phocoena phocoena) [1351]	0 m at licensed sea disposal site 5.75 km east by sea from Plot N dredge pocket	**Low**	**Low**

Site Code	Site Name	Qualifying Interests & Conservation Objectives	Distance from proposed development	Receptor Sensitivity	Overall Magnitude of Impact
IE004024	South Dublin Bay & River Tolka Estuary SPA	**Conservation Objectives Specific Version 1.0 (09/03/2015)** To maintain the favourable conservation condition of – 9 no. overwintering species in the SPA, as defined by 2 no. attributes and targets; 3 no. breeding and passage species of terns, as defined by a wider range of attributes and targets; and wetland habitats in the SPA as a resource for the regularly-occurring migratory waterbirds that utilise it, as defined by 1 no. attribute and target. *<u>Note</u>: Grey Plover (Pluvialis squatarola) [A140] is proposed for removal from the list of Special Conservation Interests for South Dublin Bay and River Tolka Estuary SPA. As a result, a site-specific conservation objective has not been set for this species.* Light-bellied Brent Goose (Branta bernicla hrota) [A046] Oystercatcher (Haematopus ostralegus) [A130] Ringed Plover (Charadrius hiaticula) [A137] Knot (Calidris canutus) [A143] Sanderling (Calidris alba) [A144] Dunlin (Calidris alpina) [A149] Bar-tailed Godwit (Limosa lapponica) [A157] Redshank (Tringa etanus) [A162] Black-headed Gull (Croicocephalus ridibundus) [A179] Roseate Tern (Sterna dougallii) [A192] Common Tern (Sterna hirundo) [A193]	0 m at ESB structure for breeding terns between turning circle and Plot N where structure is located within Plot N dredge pocket 15 m at ESB structure for breeding terns between turning circle and Plot N where structure is located 15 m from turning circle dredge pocket Tolka Estuary portion of SPA is 260 m north of Plot N dredge pocket Sandymount Strand portion of SPA is 1.75 km from dredge pocket of Plot N along Great South Wall and around other side	**Low**	**Low**

Site Code	Site Name	Qualifying Interests & Conservation Objectives	Distance from proposed development	Receptor Sensitivity	Overall Magnitude of Impact
		Arctic Tern (Sterna paradisaea) [A194] Wetland and Waterbirds [A999]			
IE004006	North Bull Island SPA	**Conservation Objectives Specific Version 1.0 (09/03/2015)** To maintain the favourable conservation condition of 17 no. Annex 1 species in the SPA, as defined by 2 no. attributes and targets; and of wetland habitats in the SPA as a resource for the regularly-occurring migratory waterbirds that utilise it, as measured by 1 no. attribute and target Light-bellied Brent Goose (*Branta bernicla hrota*) [A046] Shelduck (Tadorna tadorna) [A048] Teal (Anas crecca) [A052] Pintail (Anas acuta) [A054] Shoveler (Anas clypeata) [A056] Oystercatcher (Haematopus ostralegus) [A130] Ringed Plover (Charadrius hiaticula) [A137] Golden Plover (Pluvialis apricaria) [A140] Grey Plover (Pluvialis squatarola) [A141] Knot (Calidris canutus) [A143] Dunlin (Calidris alpina) [A149] Black-tailed Godwit (Limosa limosa) [A156] Bar-tailed Godwit (Limosa lapponica) [A157] Curlew (Numenius arquata) [A160] Redshank (Tringa totanus) [A162] Black-headed Gull (Croicocephalus ridibundus) [A179] Wetland and Waterbirds [A999]	1.35 km to the northeast and by sea from the Plot N dredge pocket	**Low**	**Negligible**

Site Code	Site Name	Qualifying Interests & Conservation Objectives	Distance from proposed development	Receptor Sensitivity	Overall Magnitude of Impact
IE00 0202	Howth Head SAC	**Conservation Objectives Specific Version 1.0 (06/12/2016)** To maintain the favourable conservation condition of 2 no. Annex 1 habitat type in the cSAC, as defined by a range of attributes and targets. Vegetated sea cliffs of the Atlantic and Baltic coasts [1230] European dry heaths [4030]	2.8 km north of licensed sea disposal site 6.60 km east-northeast of Plot N	**High**	**Negligible**
IE00 4113	Howth Head Coast SPA	**Site Specific Conservation Objectives (12/10/2022)** To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA Kittiwake (Rissa tridactyla) [A188] (Note: Conservation attributes and targets for the SCI species have not been published in the first order site specific conservation objectives for Howth Head Coast SPA).	2.6 km north of licensed sea disposal site 8.60 km east-northeast of Plot N	**Low**	**Negligible**

Site Code	Site Name	Qualifying Interests & Conservation Objectives	Distance from proposed development	Receptor Sensitivity	Overall Magnitude of Impact
IE004172	Dalkey Islands SPA	**Site Specific Conservation Objectives (12/10/2022)** To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA Roseate Tern (Sterna dougallii) [A192] Common Tern (Sterna hirundo) [A193] Arctic Tern (Sterna paradisaea) [A194] (Note: Conservation attributes and targets for the SCI species have not been published in the first order site specific conservation objectives for Dalkey Islands SPA).	5.2 km south-southwest of licensed sea disposal site 9.40 km southeast of Plot O	**Low**	**Negligible**
IE004236	North-West Irish Sea SPA	**Conservation Objectives Specific Version 1.0 (19/09/2023)** To maintain the favourable conservation condition of 21 no. Annex 1 species in the SPA, as defined by 5 no. attributes and targets Manx Shearwater (Puffinus puffinus) [A013] Cormorant (Phalacrocorax carbo) [A017] Shag (Phalacrocorax aristotelis) [A018] Lesser Black-backed Gull (Larus fuscus) [A183] Roseate Tern (Sterna dougallii) [A192] Common Tern (Sterna hirundo) [A193] Arctic Tern (Sterna paradisaea) [A194] Little Tern (Sterna albifrons) [A195] Puffin (Fratercula arctica) [A204] Red-throated Diver (Gavia stellata) [A001] Great Northern Diver (Gavia immer) [A003] Common Scoter (Melanitta nigra) [A065]	780 m north of licensed sea disposal site 1.80 km east and by sea from the Plot N dredge pocket	**Low**	**Negligible**

Site Code	Site Name	Qualifying Interests & Conservation Objectives	Distance from proposed development	Receptor Sensitivity	Overall Magnitude of Impact
		Black-headed Gull (Chroicocephalus ridibundus) [A179] Common Gull (Larus canus) [A182] Great Black-backed Gull (Larus marinus) [A187] Little Gull (Hydrocoloeus minutus) [A862] Fulmar (Fulmarus glacialis) [A009] Herring Gull (Larus argentatus) [A184] Kittiwake (Rissa tridactyla) [A188] Guillemot (Uria aalge) [A199] Razorbill (Alca torda) [A200]			

Only SACs and SPAs are listed in the table below. There are two Ramsar sites and three proposed NHAs also:

- North Bull Island Ramsar site overlaps with North Bull Island SPA
- Sandymount Strand / Tolka Estuary Ramsar site overlaps with South Dublin Bay & River Tolka Estuary SPA
- North Dublin Bay pNHA overlaps with North Dublin Bay SAC and parts of North Bull Island SPA and South Dublin Bay & River Tolka Estuary SPA.
- South Dublin Bay pNHA overlaps with South Dublin Bay SAC and parts of South Dublin Bay & River Tolka Estuary SPA.
- Dolphins, Dublin Docks pNHA comprises two structures comprising colonies of Common, Roseate and Arctic Terns. They are the CDL Dolphin and the ESB Dolphin and both are located near the south bank of the River Liffey. The ESB Dolphin is also contained within South Dublin Bay & River Tolka Estuary SPA.

Figure B – IAQM Distance Bandings

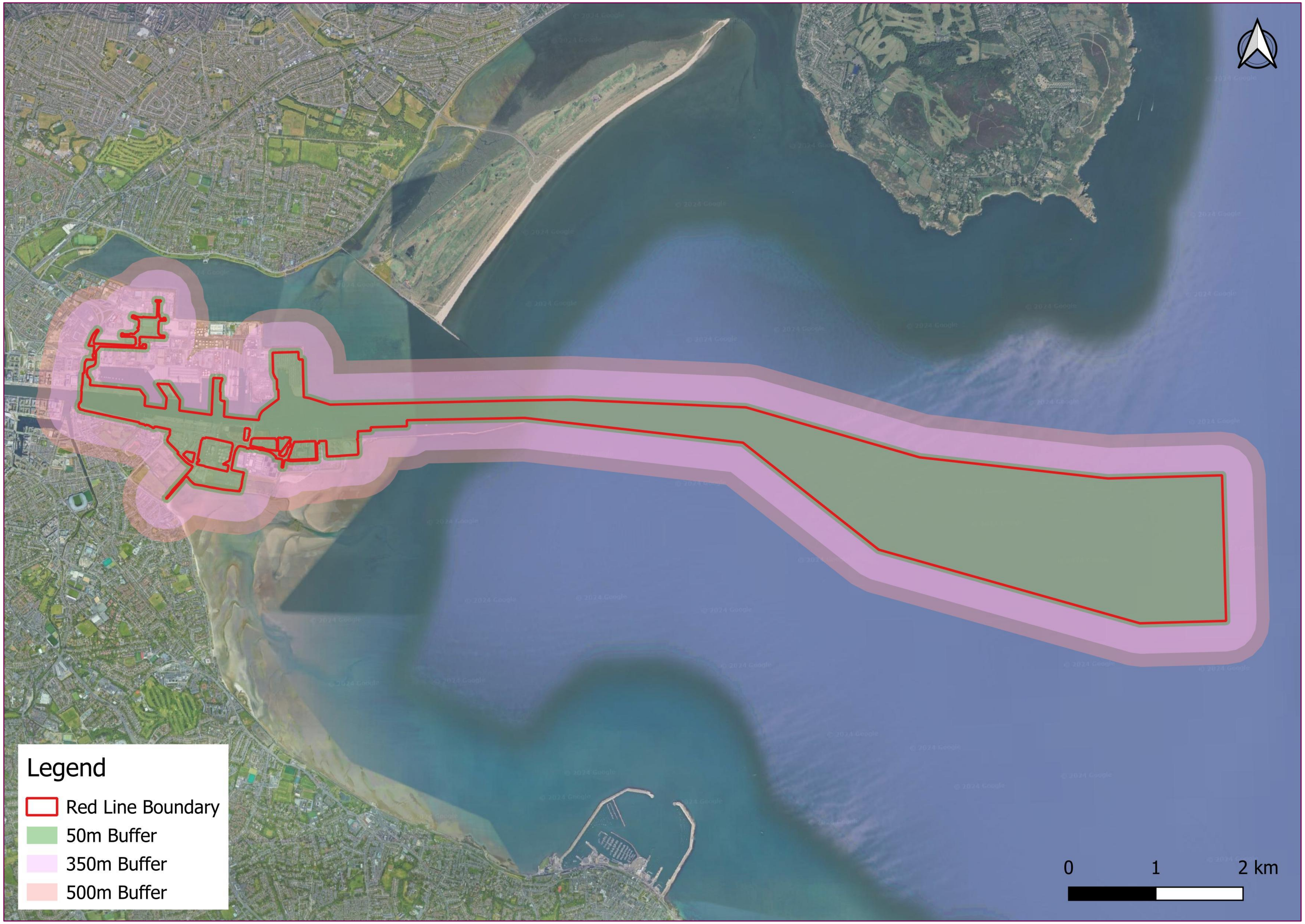

Figure C – IAQM Distance Bandings & Ecological Designations