7 Air Quality

7.1 Introduction

This remedial Environmental Impact Assessment Report (rEIAR) has been prepared to accompany the substitute consent application for the disused quarry in the townland of Coolsickin or Quinsborough, Ballykelly, Monasterevin, Co. Kildare. The Project is located within the administrative boundary of Kildare County Council (KCC).

This chapter of the rEIAR has been prepared by WSP Ireland Consulting Ltd (WSP) and assesses the potential air quality impacts associated with the Project during the assessment period, 01st January 2000 to 31st December 2006. It should be read together with Chapter 2 (Project Description), Chapter 4 (Ecology and Biodiversity), Chapter 8 (Climate), and Chapter 12 (Traffic and Transport).

The assessment has been prepared by and Shivank Mishra (BE, MTech) and reviewed by Katie Armstrong (BSc, MSc). Katie is a member of the Air and Waste Management Association (A&WMA) and has over 18 years of experience preparing air quality assessments. Shivank is a Member of Institution of Environmental Sciences (IES) and a Member of the Institute of Air Quality Management (IAQM); he has over a years' experience.

7.1.1 Project Description Summary

The Project seeking substitute consent consists of extraction of sand, gravel and rock over an area of 7.87 ha through blasting, mechanical excavation and rock breaking along with aggregate processing and stockpiling. The Project was operational between the years 2000-2006.

A full project description is presented in Chapter 2 (Project Description).

7.1.2 Background

The Project Lands were acquired by Bison Quarries Ltd in 2022 with the aim of returning the lands to agricultural use and make safe the quarry pond at the Site. Information pertaining to the Project is limited as it was not subject to a valid planning permission. The quarry is reported to have been operated from approximately 2000-2006 and is no longer an active quarry. Previous activities at the Project Lands included the extraction of sand and gravel, limestone rock, and associated processing and temporary stockpiling of materials being stored prior to sale to market.

Information regarding former Project activities was obtained from various sources including local anecdotal knowledge, Kildare County Council Planning portal and mapviewer, geohive imagery and Kildare County Council section 261A quarry register.

7.1.3 Scope and Methodology

The EIA Directive (Directive 2011/92/EU, as amended by Directive 2014/52/EU) requires that a description of the likely significant effects of the Project on the environment resulting from air pollutant emissions is provided.

The Project Lands, which are the subject of this rEIAR (i.e., lands within the Application Boundary) extend to approximately 7.87 ha and are located within the EIA boundary for the rEIAR. The existing quarry void extends to approximately 2.3 ha and is located entirely within the EIA boundary and the substitute consent Application Boundary.

Historical arial mapping and documentation held by Kildare Country Council indicates extraction of aggregates within the Project Lands is estimated to have commenced within 2000 and the operation had ceased within 2006. Accordingly, the baseline for this rEIAR has been set to 01 January 2000, and the rEIAR process has assessed impacts from that date to 31 December 2006 (see Chapter 2 Project Description for detail). Based on EPA guidance, this assessment period equates to approximately seven years and its duration is defined as 'short-term' (lasting one to seven years).

7.1.4 Sources of Emissions to Air

Various potential sources of emissions were reviewed to determine their relevance to this assessment.

These sources encompass emissions from both on-site activities and broader operational processes, contributing to particulate matter and gaseous pollutants.

7.1.4.1 Items Screened Into the Assessment

7.1.4.2 Mineral Dust

For quarry related activities, the most likely emissions to air are dust and particulate matter (e.g., PM_{10} and $PM_{2.5}$) which arise predominantly from the handling and transport of materials. These tend to be fugitively dispersed source emissions rather than specific point source emissions and this dictates the mitigation measures required. Consequently, a qualitative assessment of dust impacts associated with mineral dust from the quarrying activities has been undertaken in line with Institute of Air Quality Management's (IAQM) 'Guidance on the Assessment of Mineral Dust Impacts for Planning'.

7.1.4.3 Plant and Non-Road Mobile Machinery Emissions

The IAQM's guidance on the 'Assessment of Dust from Demolition and Construction' guidance states that:

"Experience of assessing the exhaust emissions from on-site plant (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".

Consequently, impacts associated with the operation of site plant and non-road mobile machinery (NRMM) emissions during the operational life of the quarry have been assessed qualitatively.

7.1.4.4 Items Screened Out of the Assessment

7.1.4.5 Road Vehicle Emissions

Chapter 12 (Traffic and Transport) summarises the operational phase traffic data for the Project during the assessment period. There are two inbound and two outbound light-duty vehicle (LDV) trips per day as well as miscellaneous trips which account for two further LDV trips per day (one inbound and one outbound, i.e., an increase in LDV movements of 6 AADT (annual average daily traffic, vehicles per day). During the assessment period heavy-duty vehicle (HDV, >3.5t) movements accounted for an increase in 46 AADT, (23 inbound and 23 outbound trips per day).

Consequently, the change in operational traffic flows do not exceed the indicative scoping criteria given for determining the need for a detailed air quality assessment provided in the Environmental Protection UK (EPUK) / IAQM 'Land-Use Planning and Development Control: Planning for Air Quality' guidance. Therefore, the potential impacts form operational traffic emissions can be considered as having an insignificant effect on local air quality.

7.1.4.6 Vehicle Trackout

The IAQM's guidance on the 'Assessment of Dust from Demolition and Construction' requires consideration of sensitive human receptors within 50m of the route(s) used by vehicles on the public highway, up to 250m from the Site entrance(s). For sensitive ecological receptors, which are defined in the guidance as including Ramsar sites, Special Protection Areas (SPA), Special Areas of Conservation (SAC) or any other ecological sites identified as sensitive to dust deposition the same criteria are used.

There are no sensitive receptors within 50m of the trackout route up to 250m from the Site's entrance (which is taken to be the section of the L7049 between the site entrance and the junction with the R414). Thus, assessment of vehicle trackout on sensitive receptors has been scoped out and is not considered further.

7.1.4.7 Odour Emissions

Inert materials have been excavated from the Project Lands during the assessment period, which do not give rise to odours, and no infilling of waste has taken place. Therefore, consideration of operational odour emissions have been screened out and are not considered further.

7.1.4.8 Point Source Emissions

No substantial stationary combustion processes or point source emissions to air formed part of the operations of the Project during the assessment period, therefore consideration of emissions to air have also been screened out of this assessment and are not considered further.

7.2 Legislative and Policy Context

7.2.1 Legislation and Guidance

7.2.1.1 Nuisance Dust

The impact of dust is usually monitored by measuring rates of dust deposition. According to the Environment Protection Agency (EPA) guidance 'Environmental Management in the Extractive Industries', there are currently no Irish statutory standards or EPA guidelines relating specifically to dust deposition thresholds for inert mineral dust.

There are a number of methods to measure dust deposition but only the German TA Luft Air Quality Standards specify a method of measuring dust (nuisance) deposition – the Bergerhoff Method (German Standard VDI 2119).

On this basis, the EPA recommend a boundary dust deposition limit value of 350 mg/m^2/day (when averaged over a 30-day period (one month), +/- two days).

7.2.1.2 Air Pollutants

European Air Quality Directives

The European Union (EU) Directive on Ambient Air Quality Assessment and Management came into force in September 1996 (96/62/EC) and defines the policy framework for 12 air pollutants known to have harmful effects on human health and the environment. Air quality limit values (ambient pollutant concentrations not to be exceeded after a given date) for the pollutants are set through a series of Daughter Directives. The first Daughter Directive (1999/30/EC) sets limit values for NO_2 and PM_{10} (amongst other pollutants) in ambient air.

Following the Daughter Directives, EU Council Directive 2008/50/EC on ambient air quality and cleaner air for Europe (known as the 'CAFE' Directive) came into force in June 2008, consolidating the existing air quality legislation, making provision for Member States to postpone attainment deadlines and allowing exemption from the obligation to limit values for certain pollutants, subject to strict conditions and assessment by the European Commission. Directive 2008/50/EC was transposed into Irish legislation in 2011 through The Air Quality Standards Regulations 2011. The Directive merged the four daughter directives and EU Council decision into a single directive on air quality. The new Directive also introduced a new limit value for $PM_{2.5}$ but does not change the existing air quality standards.

National Air Quality Legislation

The Air Pollution Act 1987 is the primary legislation relating to air quality in Ireland and provides the means for local authorities to take the measures that they deem necessary to control air pollution.

SI 180/2011 - Air Quality Standards Regulations (2011) transpose the Directive on ambient air quality (2008/50/EC) into Irish law. These regulations establish limit values and

thresholds for various pollutants in ambient air, the relevant air quality standards used in this assessment are given **in Table 7-1.**

Table 7-1 - Relevant Air Quality Standards

Air Pollutant	Averaging Period	Standard (µg/m^3)
Nitrogen dioxide (NO_2)	Annual	40
	1-hour	200 (Not to be exceeded more than 18 times in a year)
Particulate Matter (PM_{10})	Annual	40
	24-hour	50 (not to be exceeded more than 35 times a year)
Particulate Matter ($PM_{2.5}$)	Annual	20

7.2.1.3 Other Relevant Legislation

The relevant legislation considered in the assessment include:

- European Communities (Environmental Impact Assessment Regulations) 1989 (SI No. 349/1989);
- Planning & Development Act 2000 (as amended);
- Directive 2014/52/EU of the European Parliament and of the Council (amending Directive 2011/92/EU);
- European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018, SI 296/2018;
- Planning and Development Regulations 2001 (as amended); and
- Mines and Quarry Act 1965.

7.2.1.4 Relevant Guidance

This assessment has been undertaken with reference to the following guidance:

- Environmental Protection Agency ‘Annual Air Quality in Ireland Report’ (2023);
- Health and Safety Authority Safe Quarry ‘Guidelines to the Safety, Health and Welfare at Work (Quarries) Regulations’ (2008);
- Department of the Environment, Heritage and Local Government ‘Quarries and Ancillary Activities - Guidelines for Planning Authorities’ (2004);
- IAQM ‘Guidance on the Assessment of Dust from Demolition and Construction’ (2024);
- EPA ‘Guidelines on the Information to be Contained in Environmental Impact Assessment Reports’ (2022);

- EPUK / IAQM ‘Land-Use Planning and Development Control: Planning for Air Quality’ (2017);
- IAQM ‘Guidance on the Assessment of Mineral Dust Impacts for Planning’ (2016);
- European Commission ‘Climate Change and Major Projects’ (2016);
- Department for Environment, Food and Rural Affairs (Defra, UK) ‘Process Guidance Note 3/16 (12) - Secretary of State’s Guidance for Mobile Crushing and Screening’ (2012); and
- EPA ‘Environmental Management in the Extractive Industries’ (2006).

7.2.2 Local Policy

- The Kildare County Development Plan (CDP) 1999 is the strategy document for County Kildare which covers most of the temporal scope of this assessment period. The key policies and objectives of this plan are listed in Section 2.5.1 of the Project Description (Chapter 2).
- The Kildare CDP 2005-2011 was adopted on 18 May 2005 and covers the temporal scope from this date to 31 December 2006. The key policies and objectives of this current plan are listed in Section 2.5.2 of the Project Description (Chapter 2).

7.3 Assessment Methodology and Significance Criteria

7.3.1 Mineral Dust

The following section details the IAQM methodology used for assessing the impacts of deposited dust and fine particulates from the extraction activities. It follows a standard source-pathway-receptor methodology.

The residual source emissions have been characterised based on the scale of the operations and the Project activities and are classified as either small, medium or large. Guidance on the appropriate scale of the residual source is provided in the 2016 IAQM guidance (in Appendix 4). This source characterisation includes consideration of the routine management and mitigation measures which have been undertaken at the Project Lands.

The pathway from the source to the receptor has been assessed considering the distance and direction of receptors to the source relative to the prevailing wind and local meteorology. The local meteorological data has also been used to assess the frequency of the winds in each direction. The guidance states that it is commonly accepted that the greatest impacts will occur within 100m of the source and that deposited dust does not generally travel beyond 400m therefore all (sensitive and non-sensitive) receptors within this distance of the boundary are considered.

The criteria for the categorisation of the frequency of potentially dusty winds (given in **Table 7-2**) and the receptor distance from source (given in **Table 7-3**) is used to define the pathway effectiveness (given in **Table 7-4**). The residual source emissions and the pathway effectiveness are then combined to predict the Dust Impact Risk as shown in

Table 7-5.

Table 7-2- Categorisation of Potentially Dusty Winds

Pathway	Criteria
Infrequent	Frequency of winds (>5 m/s) from the direction of the dust source on dry days are less than 5%
Moderately Frequent	Frequency of winds (>5 m/s) from the direction of the dust source on dry days are between 5% and 12%
Frequent	Frequency of winds (>5 m/s) from the direction of the dust source on dry days are between 12% and 20%
Very Frequent	Frequency of winds (>5 m/s) from the direction of the dust source on dry days are greater than 20%

Table 7-3 - Categorisation of Receptor Distance from Source

Category	Criteria
Distant	Receptor is between 200m and 400m in an unobstructed direction from the dust source
Intermediate	Receptor is between 100m and 200m in an unobstructed direction from the dust source
Close	Receptor is less than 100m in an unobstructed direction from the dust source

Table 7-4 - Pathway Effectiveness

		Frequency of Potentially Dusty Winds			
		Infrequent	**Moderately Frequent**	**Frequent**	**Very Frequent**
Receptor Distance Category	**Close**	Ineffective	Moderately Effective	Highly Effective	Highly Effective
	Intermediate	Ineffective	Moderately Effective	Moderately Effective	Highly Effective
	Distant	Ineffective	Ineffective	Moderately Effective	Moderately Effective

Table 7-5 - Estimation of Dust Impact Risk

		Residual Source Emissions		
		Small	**Medium**	**Large**
Pathway Effectiveness	**Highly Effective**	Low Risk	Medium Risk	High Risk
	Moderately Effective	Negligible Risk	Low Risk	Medium Risk
	Ineffective Pathway	Negligible Risk	Negligible Risk	Low Risk

The last step is to assess the likely magnitude of the dust effects during the operation of the Project as a quarry (i.e. 2000 – 2006) (as given in **Table 7-6**). This is determined using both the dust impact risk and the receptor sensitivity. Receptor sensitivity is classified as either low, medium or high based on the receptor type.

Table 7-6 - Descriptors for Magnitude of Dust Effects

		Receptor Sensitivity		
		Low	**Medium**	**High**
Dust Impact Risk	**High Risk**	Slight Adverse Effect	Moderate Adverse Effect	Substantial Adverse Effect
	Medium Risk	Negligible Effect	Slight Adverse Effect	Moderate Adverse Effect
	Low Risk	Negligible Effect	Negligible Effect	Slight Adverse Effect
	Negligible Risk	Negligible Effect	Negligible Effect	Negligible Effect

7.3.2 Plant and Non-Road Mobile Machinery Emissions

The qualitative assessment of operational phase plant and NRMM on sensitive human receptors within 200m of the EIA site boundary has considered the number of plant/vehicles operating on-site, their typical operating hours and their locations when determining whether a significant effect is likely to occur.

7.4 Conditions Prior to Project

7.4.1 Site Location

The Project Lands are located in the townland of Coolsicken or Quinnsborough, which is situated 2.7km north of Monasterevin and 9km southwest of Kildare Town, it comprises a quarry void area which has been used for sand, gravel and limestone rock extraction between the years 2000-2006. The grid reference coordinates (Irish Transverse Mercator) for the approximate centre of the Site are E663403, N713199. The Project location is shown in **Figure 7-1.**

Figure 7-1: Site Location

7.4.2 Study Area

The land which is the subject of this rEIAR is located within the EIA project boundary (as a minimum) and is shown in **Figure 7-2**. The figure also includes the study areas for the items screened into the assessment (given above) and these are described below.

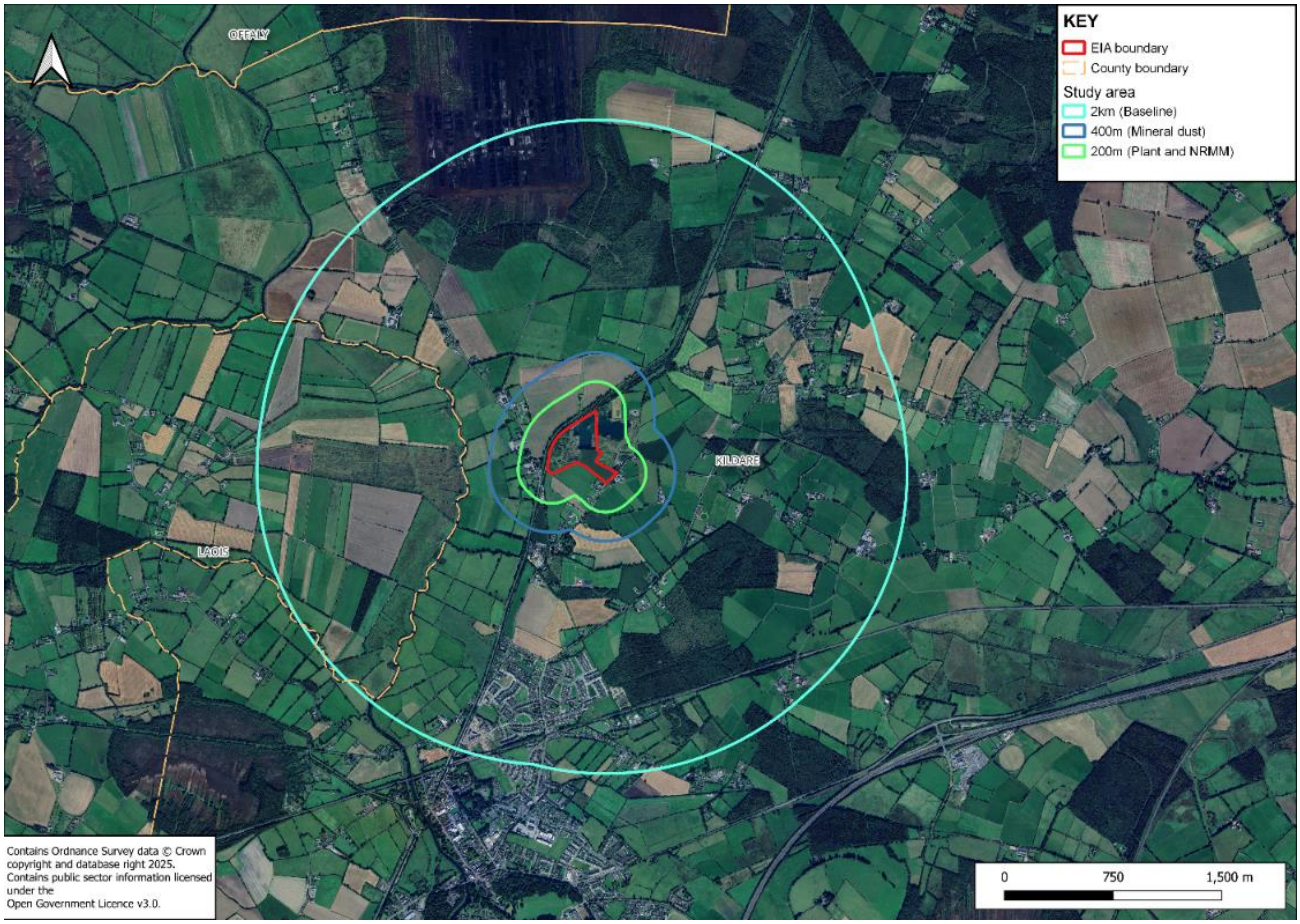

Figure 7-2: Assessment Study Areas

Different study areas have been used for the assessment of baseline conditions (i.e. the conditions on 1 January 2000 prior to extraction) and assessment of operational phase conditions (i.e. the worst case conditions during the period when the Project was operating as a quarry), including the impacts associated with mineral dust, plant and NRMM emissions on sensitive human receptors The study areas have been defined through reference to the appropriate guidance (given above), beyond these distances no significant effects are anticipated.

7.4.2.1 Baseline

The baseline study area includes the area immediately surrounding the Project Lands.

Where air quality data is unavailable, the study area has been extended as required to allow for the inclusion of additional data, e.g., monitoring data, indicative of conditions at the Project Lands. Likewise, where data is not available for the assessment period (01st January 2000 to 31st December 2006) the best available data, i.e., data for period closest to the assessment period, has been used and this noted in the assessment.

7.4.2.2 Mineral Dust

The study area for the assessment of mineral dust from quarry emissions extends 400m from the EIA site boundary; this area includes both non-sensitive, i.e., commercial premises and businesses, and sensitive human receptors, i.e. residential properties.

7.4.2.3 Plant and Non-Road Mobile Machinery Emissions

The study area for the assessment of plant and NRMM emissions extends 200m from the EIA site boundary; this area includes sensitive human receptors (residential properties).

7.4.3 Receptors

Sensitive locations are places where the public or sensitive ecological habitats may be exposed to pollutants resulting from activities associated with the Project Lands. These will include locations sensitive to increases in dust deposition and PM_{10} exposure resulting from mineral dust, and gaseous pollutants from operational emissions due to plant and NRMM. An assessment is undertaken where there are sensitive receptors within the study areas defined in Section 7.4.2.

7.4.3.1 Sensitive Human Receptors

In terms of locations that are sensitive to dust and air pollutants, these will include places, such as residential properties, where members of the public are likely to be regularly present over the period of time prescribed in **Table 7-1**. For instance, on a footpath where exposure will be transient (for the duration of passage along that path) comparison with a short-term standard, i.e., 1-hour mean, may be relevant. At a school or adjacent to a private dwelling, where exposure may be for longer periods, comparison with a long-term standard (such as the 24-hour or annual mean) may be more appropriate.

For the Project lands, this includes the Barrow line canal towpath which is considered to be a sensitive receptor due to its valuable cultural and heritage use as an amenity for walkers and cyclists.

7.4.3.2 Sensitive Ecological Receptors

The IAQM guidance defines the types of sensitive ecological receptors to be considered in the assessment.

Table 7-7 - Ecological Receptor Sensitivity and Types

Receptor Sensitivity	Types of Ecological Receptors
High	Locations with an international designation, e.g., a Ramsar site, where the designated features may be affected by dust soiling. Locations where there is a community of a dust sensitive species such as vascular plants. Indicative examples include SAC

Receptor Sensitivity	Types of Ecological Receptors
	designated for acid heathlands adjacent to a source of alkaline dusts.
Medium	Locations where there is a particularly important plant species, where its dust sensitivity is uncertain or unknown. Nationally designated site and the designated features may be affected by dust deposition, indicative examples include SSSIs or local wildlife sites with very specific sensitivities.
Low	Locations with a local designation where the features may be affected by dust deposition. An indicative example is a local Nature Reserve with dust sensitive features.

The nearest ecological site is the Grand Canal, proposed Natural Heritage Area (pNHA) which is located just beyond the northern boundary of the Project Lands. The Project Ecologist identified that this is considered to be a high sensitive receptor under the IAQM guidance as it serves to provide functional connectivity for otters, salmon and Twaite Shad which are a designated feature of the River Barrow and River Nore SAC. The River Barrow and River Nore SAC and all other identified designated sites are located outside the 400 m Study Area for the assessment and are therefore not considered further as any impacts are anticipated to be not significant.

7.4.4 Climate at the Site

The climate at the Project Lands is summarised in **Chapter 8 Climate** and the local wind field, i.e., the prevailing wind speed and wind direction, which influences the dispersion of dust and air pollutants is summarised below.

The Irish climate is subject to strong maritime influences, the effects decrease with increasing distance from the Atlantic coast. The climate at the Project Lands is typical of the Irish climate, which is temperate maritime.

The closest Met Éireann station is located at Casement Aerodrome, Baldonnell, County Dublin, approximately 45km northeast of the Project Lands. A wind rose based on daily averages of wind speed and wind direction observations for the periods 01st January 2000 to 31st December 2004 and 1st January 2006 to 31st December 2006 measured at Casement Aerodrome is presented in **Figure 7-3**. Data was not available for the 2005 year. This figure shows that the prevailing winds are from the south-west with a small easterly component.

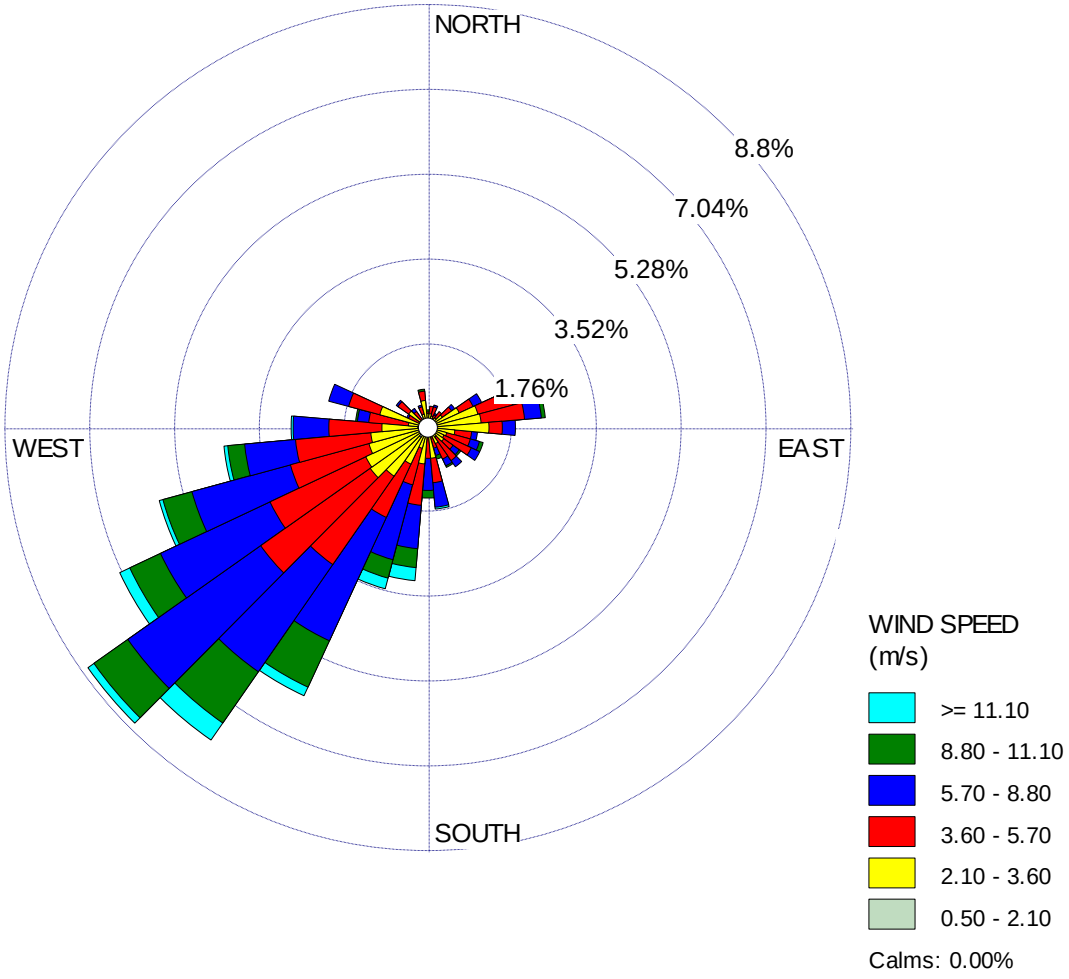

Figure 7-3 - Wind Rose for Casement Aerodrome (2000-2004 and 2006)

7.4.5 Background Air Quality

There are four air quality Zones in Ireland, defined for air quality management and assessment purpose. Highly populated areas are classified as Zone A, with sparsely populated areas as Zone D. The Project Lands are located within a designated Zone D for air quality.

7.4.5.1 Primary Data - Project Lands Monitoring Data

It is understood that no boundary dust monitoring was taken at the Project lands during quarry operation. However, boundary dust monitoring was undertaken at the Project Lands on a monthly basis by BHP laboratories from 24 May 2024 to 23 August 2024 at a total of three locations which are described in **Table 7-8** and shown in **Figure 7-4**.

Table 7-8: Dust Monitoring Locations

Monitoring Location	Description	Site coordinates (based on ITM grid reference, m)	
		X	Y
DS01	Located in the south boundary corner of the Project Lands, approximately 150m from the entrance.	663416	713011
DS02	Located near the north boundary of the Project Lands	663351	713233
DS03	Located near the southwest boundary of the Project Lands.	663207	713004

Figure 7-4 - Dust Monitoring Locations

As noted in Section 7.2.1.1, the EPA recommend a boundary dust deposition limit value of 350 mg/m^2/day measured using the Bergerhoff method, the monitoring results are summarised in **Table 7-9**.

Table 7-9: Recorded Boundary Deposited Dust (mg/m^2/day)

Monitoring Period		Recorded Boundary Deposited Dust (mg/m^2/day)		
Start Date	**End Date**	**DS01**	**DS02**	**DS03**
24-05-2024	24-06-2024	**700**	80	118
24-06-2024	25-07-2024	118	188	**441**
25-07-2024	23-08-2024	23	20	28
Average		**280.3**	**96.0**	**195.7**
Notes: Monitoring data provided by the BHP laboratories. The number precision report is based on the data reported by analyst in the accompanying reports. **Bold text** denotes boundary dust deposition levels above **350**mg/m^2/day.				

Based on the data presented in **Table 7-9**, there were two instances (at different monitoring locations) when the monitored dust concentration was more than 350mg/m^2/day and seven samples remained within the limit. One of the exceedances occurred during the May–June sampling period at monitoring location DS01, located close to the site entrance. The second exceedance was recorded during the June–July sampling period at monitoring location DS03. The exceedances and high dust concentrations during the first two months of monitoring are believed to be due to local agricultural activities in the surrounding fields at the time of monitoring.

There is variability in the deposition rates recorded across the monitoring months and locations. Furthermore, all monitoring was completed after quarrying activities ceased. As such, the quarry's contribution of recorded deposited dust is not represented within the monitoring data.

7.4.5.2 Secondary Data - EPA Monitoring

A review of publicly available information published by the Irish EPA indicates that background monitoring has historically been undertaken at three locations in Kildare, Celbridge, Naas and Newbridge. None of these are currently active and none are located within the 2km baseline study area.

During the assessment period (i.e., between 2000 to 2006), monitoring was undertaken at Naas in County Kildare approximately 27km northeast from the Project Lands. The reported data from the EPA ambient air monitoring station at Naas was undertaken between the 16 October 2003 and 22 April 2004 and is summarised in **Table 7-10**.

Table 7-10 - Air Quality Monitoring Data for Naas (2003-2004)

Pollutant	Averaging Period	Mass Concentration (µg/m^3)
NO_2	Average	25.9
	98%ile of hourly values	69.3
PM_{10}	Average	17.3
	98%ile of daily values	38.5
$PM_{2.5}$	Average	6.1
	98%ile of daily values	13.7

In the absence of local background data, the annual mean NO_2, PM_{10} and $PM_{2.5}$ monitoring data for period closest to the assessment period from other stations within the EPA National Ambient Air Quality Monitoring Network located in Zone D areas across Ireland are detailed in **Table 7-11**. Data is provided for 2013 as that is the year closest to the assessment period, for which data was available. The Project ceased operation prior to 2013.

Table 7-11 - Annual Mean Monitoring Data for Zone D Stations (2013)

Monitoring Location	Annual Mean Concentration (µg/m^3)		
	NO_2	**PM_{10}**	**$PM_{2.5}$**
Emo, Laois	4	ND	ND
Castlebar, Mayo	11	15	ND
Kilkitt, Monaghan	14	11	ND
Claremorris	ND	13	8
Longford	ND	ND	17
Note: ND denotes no data.			

All monitored concentrations in 2013 are below the relevant standards for NO_2, PM_{10} and $PM_{2.5}$ given in **Table 7-1**.

7.5 Characteristics of the Project

The Project is described in Chapter 2 (Project Description).

Details of any measures used to reduce the impact of potential dust emissions from the Project on the surrounding area and the sensitive receptors identified for the duration of the

assessment period are not available but based on a review of aerial imagery the following characteristics of the Development are considered to have been embedded design measures:

- Rock extraction has been conducted within the quarry void, with blasting activities primarily contained within the quarry walls to minimize external impact;
- The sand and gravel material extracted is expected to have a high moisture content, which inherently reduces the potential for dust generation; and,
- Existing treelines and hedgerows on field boundaries have acted as vegetation barriers and wind breaks to screen emissions from the quarry void onto the Canal and lands adjacent to the Development.

7.6 Potential Effects

7.6.1 Sources

The following section sets out sources in the context of the extraction and processing carried out within the Application Site and the plant used to facilitate this. Limited data is available regarding specific quarry operations at the Application Site from the early- to mid-2000s and assumptions have been made with regards to the type and number of plant that would have been use based on similar development from that time. See Chapter 2 (Project Description) for details.

7.6.1.1 Mineral Dust

The main potential impact on ambient air quality associated with extraction activities and aggregate processing is that associated with deposition of dust generated by the rock extraction and material transfer operations. Potential dust emissions associated with quarrying activities include:

- Mechanical handling operations, including crushing and grading processes, where in general the more powerful the machinery and the greater the volumes of material handled the greater the potential for dust emission;
- Haulage, where the weight of vehicles, their speed of passage and number of wheels in contact with the ground, and the nature and condition of road surfaces or haul routes affect the amount of dust emitted;
- Loading and movement of overburden to dump areas;
- Blasting and rock breaking; and
- Wind blow from paved areas, material stockpiles, unsurfaced internal haul roads and quarry floors.

The activities / sources within the Project have been assessed using the methodology outlined in Section 7.3 to identify the potential dust emission magnitude (prior to the implementation of mitigation), these are summarised below:

- Site preparation has been classified as a small magnitude source due to removal of topsoil and overburden with low dust potential from the relatively small sized working area (the quarry void area has a footprint of approximately 2.3 ha) and because there are less than 5 heavy plant items expected to have been operational at any one time;
- Mineral extraction has been classified as a medium magnitude source due to the average annual extraction rate of up to approximately 108,571 tonnes/year of sand, gravel and limestone (averaged over 7-years) within the working area and periodic drilling and blasting undertaken to extract;
- Material handling has been conservatively classified as a medium magnitude source due to there being less than 4 loading plant (1 no. excavator, 1 no. loader and 2 no. 18 tonne haulers) which operated during the 7-year operational phase within the quarry void;
- On-site transportation has been conservatively classified as a medium magnitude source as there has been conservatively estimated to be 100 HDV movements per day along internal unpaved haul routes, which includes 46 HDV entering the Site and 40 plant movements within the boundary. However, the length of the on-site roads are relatively short and some of these movements would have occurred within the quarry void, which would reduce the potential for dust generation off-site;
- Mineral processing has been classified as a medium magnitude source as mobile crushing and screening of the sand and gravel is expected to have taken place but this material is expected to have a low dust potential due to its high moisture content and the annual throughput of crushed and screened material is estimated to be low (maximum of 108, 571 tonnes per year assuming all material is processed);
- Stockpiles and exposed surfaces have been conservatively classified as a medium magnitude source as while the stockpiles were located entirely within the site, they may have been as close as 50 m from the EIA site boundary.; and
- Off-site transportation has been classified as a medium magnitude source as there are expected to have been 46 HDV movements per day. It is unknown if cleaning facilities were available.

7.6.1.2 Plant and Machinery Emissions

Emissions of oxides of nitrogen (NO_X) and particulate matter from site plant and NRMM have the potential to increase NO_2, PM_{10} and $PM_{2.5}$ concentrations at locations within 200m of the EIA site boundary. As shown in **Figure 7-5** there are 15 residential properties (where the air quality objectives apply) within 200m of the EIA site boundary within the boundary that could be affected by plant and NRMM emissions.

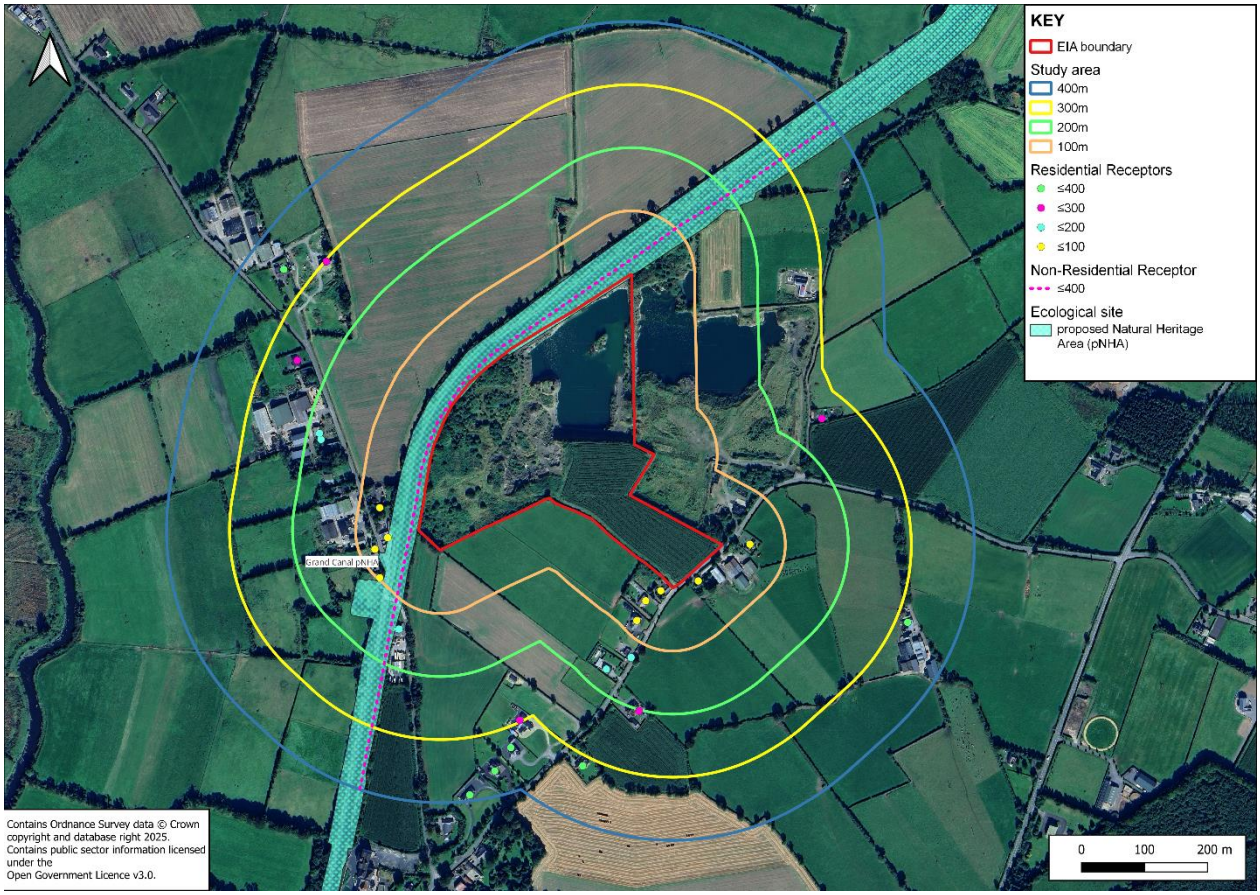

Figure 7-5 - Location of Receptors within the Assessment Study Areas that existed during the operation of the Project as a Quarry

As noted in **Chapter 2 Project Description**, there have been up to 6 items of plant and NRMM operating on site between 1st January 2000 and 31st December 2006. It is predicted that plant and NRMM requiring energy, including the pump used to dewater the void during the extraction of bedrock below groundwater table, operated using portable diesel-fired power generation.

Plant and NRMM are expected to have been used within the quarry's operating hours, so any emissions are expected to have been short-term and temporary (i.e., no longer than the working day: 07:00 hours and 17:00 hours, Monday to Friday and between 07:00 hours and 14:00 hours on Saturdays) in nature.

Most of the dewatering, material extraction and handling activities including blasting, crushing and screening occur on the quarry floor, i.e., below ground level, therefore the plant and NRMM tend to be operate correspondingly within the void. All plant and NRMM are assumed to have been routinely maintained to allow optimal operational condition.

7.6.2 Site Parameters

The risks of potential dust emissions associated with the Project being transported off-site are largely determined by the local atmospheric conditions and the distance from the source to the receptor.

The conditions considered in the assessment include:

- Wind speed, to determine the likely occurrence of particles travelling beyond the Project Lands boundary; and
- Wind direction, to identify the areas over which particles are likely to travel.

As detailed in Section 7.4.4, the closest Met Éireann station to the Project Lands is located at Casement Aerodrome approximately 45km northeast of the Project Lands. Wind speed and wind direction are measured at the station and a wind-rose is presented in **Figure 7-3** based on daily data from 01 January 2000 to 31 December 2006. Analysis of the data shows that the prevailing wind direction is from the southwest.

7.6.2.1 Mineral Dust Assessment

The receptors within 400m of the Project Lands (shown in **Figure 7-5**) are given in **Table 7-12**. Residential receptors have been categorised as high sensitivity receptors and Non-residential receptors have also been categorised as medium sensitivity receptors.

Table 7-12 - Receptors within the Mineral Dust Study Area

Receptor Type and Distance Band	Number of Receptors in Group	Category of Receptor distance	Number of Receptors in Prevailing Wind Direction (NE of boundary or haul route)	Frequency of dusty winds	Pathway Effectiveness
Residential Properties					
≤100m	9	Close	0	Infrequent	Ineffective
≤200m	6	Intermediate	0	Infrequent	Ineffective
≤300m	5	Distant	1	Moderately frequent	Ineffective
≤400m	6	Distant	0	Infrequent	Ineffective
Non-Residential Locations					
≤100m	1	Considered intermediate due to the	1	Moderately frequent	Moderately effective

Receptor Type and Distance Band	Number of Receptors in Group	Category of Receptor distance	Number of Receptors in Prevailing Wind Direction (NE of boundary or haul route)	Frequency of dusty winds	Pathway Effectiveness
		presence of vegetation berms reducing exposure to on-site sources			
Ecological Sites					
≤100m	1	Considered intermediate due to the presence of vegetation berms reducing exposure to on-site sources	1	Frequent	Moderately Effective

The category of receptor distance is defined based on the criteria in **Table 7-3** of the methodology and the frequency of dusty winds is determined based on the criteria in **Table 7-2** of the methodology. The receptor distance category and the frequency of dusty winds are then combined using **Table 7-4** of the methodology to define the pathway effectiveness.

Assessment of the disamenity dust associated with the operation of the Project during the assessment period is summarised for each receptor in **Table 7-13**.

Table 7-13 - Assessment of Dust Disamenity Effects at Receptors

Receptor Type and Distance Band from Boundary	Maximum Residual Source Emissions	Pathway Effectiveness	Dust Impact Risk	Receptor Sensitivity	Magnitude of Dust Effects
Residential Properties					
≤100m	Medium	Ineffective	Negligible Risk	High	Negligible

Receptor Type and Distance Band from Boundary	Maximum Residual Source Emissions	Pathway Effectiveness	Dust Impact Risk	Receptor Sensitivity	Magnitude of Dust Effects
≤200m	Medium	Ineffective	Negligible Risk	High	Negligible
≤300m	Medium	Ineffective	Negligible Risk	High	Negligible
≤400m	Medium	Ineffective	Negligible Risk	High	Negligible
Non-Residential Properties/Locations					
≤100m	Medium	Moderately Effective	Low Risk	Medium	Negligible
Ecological Sites					
≤100m	Medium	Moderately Effective	Low Risk	High	Slight adverse

Following the IAQM guidance, the nature of the Project, the magnitude of any deposited dust effects will be slight adverse at all human receptor locations but have the potential to be slight adverse at the Grand Canal pHIA due to its classification as having high sensitivity. Further assessment of the sensitivity of this receptor is provided in Chapter 4 (Ecology and Biodiversity) .

7.6.2.2 Plant and Machinery Emissions

Based on the current local air quality in the baseline study area (given in Section 7.4.2.1), the limited number and proximity of sensitive human receptors to the EIA site boundary, the predominant location of plant and NRMM emissions, i.e., within the quarry void, the number and hours of operation, the impact of plant and NRMM emissions on local air quality is considered to be negligible and not significant.

7.7 Remedial Measures

There are no significant effects from the activities on the Site that required remedial measures.

The determination of significance refers to the EPA Guidelines; **Table 7-14** assesses the potential impacts associated with the operation of the Project on dust and local air quality that have been considered for the assessment period including the embedded mitigation.

The duration of these effects will have occurred in the medium term during the quarry's phased operations (i.e., during stripping, extraction and restoration).

Table 7-14 - Assessment of Impacts to Local Air Quality and Mitigation Measures Employed

Impact	Type of Effect	Quality of Effects	Significance of Effects	Duration of Effects
Mineral dust and PM_{10} associated with the extraction and handling of quarried material on sensitive human receptors	Direct	Negative	Imperceptible	S-T
Mineral dust and PM_{10} associated with the extraction and handling of quarried material on ecological receptors	Direct	Negative	Slight	S-T
Emissions of NO_X, PM_{10} and $PM_{2.5}$ from plant and NRMM	Direct	Negative	Imperceptible	S-T

7.8 Residual Effects

Due to the embedded mitigation measures, the residual effect of mineral dust and PM_{10} on sensitive human receptors is expected to be imperceptible (i.e., negligible) and unlikely to lead to a significant effect. There is a potential for slight effect at the Grand Canal pNHA but this would have been a short term effect during the duration of the project. Further discussion on the sensitivity of this pNHA is provided in Chapter 4, Ecology.

Likewise, the impact of emissions of NO_X, PM_{10} and $PM_{2.5}$ from plant and NRMM is expected to be imperceptible (negligible) and unlikely to lead to a significant effect.

7.9 Cumulative Effects

Interactions between the Project and the adjacent existing quarry to the northeast may have the potential to cumulatively effect the local air quality, in particular both activities are expected to be sources of mineral dust, NOx, PM_{10} and $PM_{2.5}$ and the two quarries are understood to have shared an access route.

The embedded measures outlined in Section 7.7, provide sufficient mitigation for the Project against significant effects for human receptors. It is assumed that the neighbouring quarry also employs appropriate and proportionate mitigation measures as good practice, and therefore it is expected that any cumulative impact would be sufficiently minimised and not result in a significant effect for human receptors. The Grand Canal pNHA is located adjacent to both quarries but would only be downwind of both operations less than 10% of the time based on the wind rose provided in **Figure 7-3** and has a dense vegetation barrier along the

sides of both quarries, which would have acted as a wind break and reduced the potential for dust impacts at this location.

As a result, Cumulative effects are considered to be **Not Significant.**

7.10 References

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