LAGAN

Part of the Breedon Group

8. Air

8. Air

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INTRODUCTION

Background

8.1 This Chapter of the Environmental Impact Assessment Report (EIAR), prepared by SLR Consulting Ireland, addresses the potential effects associated with the proposed further development of an existing quarry on air quality. The existing quarry is located in the townland of Rossmore, Carrigtwohill, Co. Cork.

8.2 The proposed development being applied for under this current planning application is shown on EIAR Figure 2-1 and is similar to that previously granted under An Bord Pleanala reference number 04.QD.0010 and will consist of:

- Deepening of the existing quarry extraction area by 2 no. 15 metre benches from -20m OD to -50 m OD, along with minor amendments to the permitted quarry layout (Plan File ref. no's: S/02/5476 & ABP Ref. PL04.203762 and ABP Ref. PL04.QD.0010) all within the existing permitted quarry footprint and the continued use of the existing water management system (settlement pond / infiltration pond system permitted under PL04.QD.0010) for the life of the proposed development, within an application area of c. 12.6 hectares – refer to EIAR Figures 1.1 and 1.2;
- An extraction capacity of up to 375,000 tonnes per annum is sought to provide the applicant with the ability to respond to demand for aggregates for large infrastructure projects in the Region;
- Permission is sought for twenty years plus two years for final restoration (total duration 22 years).

8.3 A detailed description of the proposed development is provided in EIAR Chapter 2.

8.4 The proposed development will have the potential to generate fugitive dust emissions and particulates (PM_{10}), which may result in impacts on local air quality. Combustion emissions (primary PM_{10}, and oxides of nitrogen) from vehicle exhaust emissions associated with the extraction and transportation of aggregates may also have the potential to impact on local air pollution.

8.5 It is anticipated that, based on the projected maximum output levels, that the proposed development(s), in combination with the existing asphalt plant and permitted ready-mix concrete plant and ground limestone processing plant (not yet constructed) at the application site will not generate more than 186 trips daily.

Scope of Work

8.6 The main focus of this assessment is the potential impact on local residential amenity of fugitive dust emissions and particulate matter generated by the proposed development. No further stripping of topsoil or overburden materials will be carried out within the application area.

Dust emissions are likely to arise in the course of the following activities:

- handling and processing of excavated rock;
- transfer, end-tipping and stockpiling of aggregates;
- trafficking by heavy goods vehicles (HGVs) over paved / unpaved surfaces;
- landscaping and final restoration activities.

8.7 With respect to the potential for air quality impacts, the key objective at the application site is to manage activities in order to ensure that air emissions are prevented where possible, and the effects of any residual releases are minimised.

8.8 This EIA Report Chapter describes and assesses the existing air quality baseline characteristics of the area at and around Lagans quarry at Rossmore based on site specific surveys and EPA data. Air emissions arising from the proposed deepening activities at the quarry are then applied to these baseline conditions and the resulting air quality impacts assessed. Mitigation measures are identified where required, to eliminate and reduce these impacts insofar as practical.

8.9 The following sections of this Chapter describe the potential air quality impacts associated with the planned development activities. The following issues are addressed separately:

- relevant legislation, standards and guidance;
- baseline conditions pertaining to measured (or estimated) existing air quality levels around the existing quarry footprint;
- methodology used to assess the potential impacts of planned activities on air quality at local properties;
- assessment of the impacts;
- description of mitigation measures that are incorporated into the construction, design and operation of the quarry to eliminate or reduce the potential for increased air quality impacts (if required);
- summary of any residual impacts and reinstatement;
- summary of cumulative impacts;
- monitoring proposals.

Consultations / Consultees

8.10 A virtual pre-planning consultation meeting was held between officials of Cork County Council Planning Department and representatives of SLR and Lagan on 11th March 2021.

8.11 The author of this Chapter also contacted the Environment Section of Cork County Council in relation to the preparation of the air quality assessment (Ref. telephone conversation with Mr. Alan Costello on 30th Sep 2021).

8.12 Following a review of published development plans and site surveys, it was considered that there was no requirement for any further formal external consultations to be carried out in respect of air quality for the purposes of this assessment. There was however significant consultation with other specialist contributors to this EIA Report.

Contributors / Author(s)

8.13 The air quality impact assessment presented in this Chapter was prepared by SLR Consulting Ireland. The lead consultant for the study was Aldona Binchy MSc. Eng PIEMA Environmental Engineering.

Limitations / Difficulties Encountered

8.14 This assessment is compiled on the basis of published regional and local data, guidance documents, and site-specific field surveys. No difficulties were encountered in compiling the required information.

REGULATORY BACKGROUND

8.15 The following sections describe the main legislative policy requirements in respect of air quality associated with the proposed development.

Legislation

Air Quality Standards

8.16 The Government's policy on air quality within Ireland is set out in the Air Quality Standards (AQS) Regulations 2011. The CAFE Directive was transposed into Irish legislation by the Air Quality Standards Regulations 2011 (S.I. No. 180 of 2011). It replaces the Air Quality Standards Regulations 2002 (S.I. No. 271 of 2002), the Ozone in Ambient Air Regulations 2004 (S.I. No. 53 of 2004) and the EPA Act 1992 (Ambient Air Quality Assessment and Management) Regulations 1999 (S.I. No. 33 of 1999). The 4th Daughter Directive was transposed by the Arsenic, Cadmium, Mercury, Nickel and Polycyclic Aromatic Hydrocarbons in Ambient Air Regulations 2009 (S.I.no. 58 of 2009).

8.17 The AQS sets out a framework for reducing hazards to health from air pollution and ensuring that international commitments are met in Ireland.

8.18 The AQS sets standards and objectives for ten priority pollutants. Standards establish concentrations of pollutants in the atmosphere which can broadly be taken to provide a certain level of environmental quality. Objectives are policy targets, often expressed as maximum concentrations, not to be exceeded (either without exception, or with a limited number of exceedances within a specified timescale).

8.19 Under the AQS, the following pollutants are monitored and controlled :

- nitrogen oxides;
- sulphur dioxide;
- carbon monoxide;
- ozone;
- particulate matter (PM10, PM2.5 and black smoke);
- benzene and volatile organic compounds;
- heavy metals; and
- polycyclic aromatic hydrocarbons.

8.20 These pollutants are monitored at 32 stations across the country and together they form the national ambient air quality network. A summary of relevant air quality limit values in relation to human health are presented in Table 8-1. Air quality limit values in relation to vegetation protection are presented separately in Table 8-2.

8.21 The air quality monitoring network is coordinated and managed by the EPA, as the National Reference Laboratory for air quality. The results of the monitoring are compared to limit values set out in EU and national legislation on ambient air quality. Map-based assessments of air quality are prepared and published by the EPA.

Table 8-1
Relevant Air Quality Limit Values for Protection of Human Health

HUMAN HEALTH	LIMIT OR TARGET VALUE			INFORMATION AND ALERT THRESHOLDS (WHERE APPLICABLE)		LONG TERM OBJECTIVE
POLLUTANT	AVERAGING PERIOD	VALUE	MAXIMUM NUMBER OF ALLOWED OCCURRENCES	PERIOD	THRESHOLD VALUE	
Nitrogen Dioxide (NO_2)	Hour Year	200 µg/m³ 40 µg/m³	18 0	1 hour alert	400 µg/m³ Exceeded for 3 consecutive hours	
Sulphur Dioxide (SO_2)	Hour Day	350 µg/m³ 125 µg/m³	24 3	1 hour alert	500 µg/m³ Exceeded for 3 consecutive hours	
Particulate matter with aerodynamic diameter of less than 10µm (PM_{10})	Day Year	50 µg/m³ 40 µg/m³	35 0			
Particulate matter with aerodynamic diameter of less than 2.5µm ($PM_{2.5}$)	Year	25 µg/m³ 20 µg/m³ (ECO)				0 8.5 to 18 µg/m³

Table 8-2
Summary of Air Quality Limit Values : Protection of Vegetation

VEGETATION	CRITICAL LEVEL OR TARGET VALUE		LONG-TERM OBJECTIVE	
POLLUTANT	AVERAGING PERIOD	VALUE	VALUE	DATE
Nitrogen dioxide (NOx)	Calendar year	30 µg/m^3		
Sulphur Dioxide (SO2)	Calendar year and winter (October to March)	20 µg/m^3		

Planning Policy and Development Control

National Spatial Strategy (NSS) / National Planning Framework – Project Ireland 2040

8.22 The National Planning Framework 2040 (published in February 2018) is a national planning framework for Ireland. The framework provides the policies for all regional and local plans. In the framework, the extractive industries are recognised as important for the supply of aggregates and construction materials to variety of sectors. It emphases that the planning process will play a key role in realising the potential of the extractive industries and protecting reserves of aggregates and minerals. Aggregates and minerals will continue to be enabled where this is compatible with protection of the environments.

8.23 There are no specific policies in relation to air emissions in NPF for extractive or production of construction aggregates and materials. The general objective is to facilitate development and to protect the environment at the same time.

Local Planning Policy – Cork County Development Plan

8.24 Cork County Council has commenced the preparation of a new County Development Plan for the period 2022-2028 in accordance with the steps set out in the Planning and Development Acts.

8.25 County Development Plan Objective BE 15-12 for Air Quality:

'a) Monitor air quality and air quality trends in accordance with EU policy directives, preserve good air quality where it exists, and take appropriate action, where required, including the provision of additional air quality monitoring infrastructure in urban areas and along major roads.

b) Radon barriers should be provided in all new developments in compliance with best practice and relevant Building Regulations.

c) Air emissions associated with all new development are to be in line with Environmental Quality Standards as set out in the Air Quality Standards Regulations 2011, or any updated/superseding documents.'

8.26 The current Cork County Development Plan was adopted in 2014 and remains in force pending adoption of a replacement plan.

8.27 There are no policies adopted in the plan in relation to emissions to air from extractive industry and ancillary activities. The development plan sets out policies relating to air quality, principal among them Objective Gl 12-1 which requires the Council to

8.28 *'Monitor air quality and air quality trends in accordance with EU policy directives and take appropriate action where required including the provision of additional air quality monitoring infrastructure'.*

Guidelines Extractive Industry Emissions Limit Values

8.29 Section 261 of the Planning and Development Act 2000 (as amended), which regulated a significant proportion of established extractive development, came into effect in April 2004. The planning guidelines[1] for the extractive industries *'Quarries and Ancillary Activities – Guidelines for Planning Authorities'* were published by the Department of the Environment, Heritage and Local Government at around the same time.

8.30 Separately, in 2006, the EPA published complementary guidance aimed at quarry operators, planning authorities and the general public *Environmental Management Guidelines for Environmental Management in the Extractive Industry (Non-Scheduled Minerals)*[2].

8.31 The Irish Concrete Federation (ICF), the trade body representing the interests of quarry operators and producers of construction materials, has also published the ICF Environmental Code to provide guidance for its members on best practice in the environmental management of quarries. The document was last updated in 2005.

Specific Guidance Relating to Air Quality / Dust Nuisance

8.32 A range of monitoring techniques exists for dust deposition rates (i.e. Bergerhoff and Frisbee gauges). There is currently no Irish, European Union (EU) or World Health Organisation (WHO) statutory standards or limits appropriate for the assessment of deposited dust and its propensity to generate annoyance.

8.33 Industry standard criteria levels for the gravimetric assessment of dust deposition from extractive industry in Ireland are set out in the DoEHLG (2004) planning guidelines for the extractive industry, the ICF Guidelines (2005) and EPA (2006) Environmental Management Guidelines. Each of these Guidelines recommend the use of the Bergerhoff method for measuring dust deposition. In line with this approach, the guidelines recommend the TA Luft dust deposition limit value of 350mg/m^2/day (total dust deposition averaged over a 30 day period), measured at site boundaries

8.34 When the rate of accumulation of the coarser fraction of dust (referred to as deposited dust) is sufficiently rapid to cause fouling or discolouration, then it is generally considered to introduce a nuisance. The point at which an individual perceives dust deposition as a nuisance and causes a complaint is highly subjective.

8.35 The action of wind over dry ground will carry dust particles into the air. Although large emissions of dust occur naturally, man-made dust events are caused by a range of activities including agriculture, road traffic, construction works (including the handling and storage of soils and particulate matter) and by vehicles using paved and unpaved haul roads.

8.36 For operations involving the mechanical break up of solids, the most common concern regarding dust emissions is the potential nuisance effect from the larger fractions of dust.

Guidance on Assessment of Mineral Dust Impacts for Planning

8.37 Guidance on the assessment of the impacts of extractive operations on air quality has been prepared by the Institute of Air Quality Management (IAQM, 2016)[3]. This guidance uses a simple distance-based screening process to identify those operations where the dust impacts are unlikely to be significant and therefore require no further assessment. Where more detailed assessment is

[1] Quarries and Ancillary Activities – Guidelines for Planning Authorities (DoEHLG, 2004)
[2] https://www.epa.ie/pubs/advice/general/EPA_management_extractive_industry.pdf
[3] http://www.iaqm.co.uk/text/guidance/mineralsguidance_2016.pdf

required, a basic assessment framework is presented which employs the Source-Pathway-Receptor approach to evaluate risk of impacts and effects.

Air Quality and Ecological Receptors

8.38 The majority of research on the effects of particulate matter on vegetation has focussed on the chemical effects of alkaline dusts. A summary of a review of available research on behalf of the UK's Department for the Environment Transport and Regions (DETR) concluded that:

"The issue of dust on ecological receptors is largely confined to the associated chemical effect of dust, and particularly the effect of acidic or alkaline dust influencing vegetation through soils."

8.39 An Interim Advice Note (IAN) prepared as a supplement for Volume 11, Section 3, Part 1 of the UK DMRB (Design Manual for Roads and Bridges) and now incorporated into LA 105) suggests that only dust deposition levels above 1,000mg/m^2/day are likely to affect sensitive ecological receptors. This level of dust deposition is approximately five times greater than the level at which most dust deposition may start to cause a perceptible nuisance to humans. It states that most species appear to be unaffected until dust deposition rates are at levels considerably higher than this.

Assessment of Air Quality Impacts on Designated Nature Conservation Areas

8.40 Guidance on the assessment of the air quality impacts of development on designated nature conservation sites prepared by the Institute of Air Quality Management (IAQM, 2019). This guidance is also useful to evaluate the effects of air pollution on habitats and species using air quality assessment.

8.41 The predicted scale of dust effects may be classified as either 'significant', or not 'significant'. Where effects are predicted to be 'significant', further mitigation is likely required before the proposals are to be acceptable under planning policy.

Air Quality and Health Effects

8.42 The main health effects of air pollution can include stroke, heart disease, lung cancer, and both chronic and acute respiratory diseases, including asthma. These conditions can lead to sickness and ill health as well as premature mortality.

8.43 Two recent EPA reports, *Air Quality in Ireland 2015*[4] and *Ireland's Environment, An Assessment 2016* [5]detail the main air quality trends based on monitoring from the national ambient air quality network. There are monitored exceedances of the WHO guideline values for ozone, PM_{10} and $PM_{2.5}$ at a number of sites though there are no current exceedances of the lower (less protective) EU standards at the existing monitoring locations in Ireland. The reports also highlight the main challenges of reducing air pollution from key sources such as particulate matter emissions from solid fuel burning (e.g. peat, coal and wood) in the residential sector and NOx emissions from vehicles in the transport sector.

8.44 A summary of relevant Air Quality limit values in relation to human health was presented previously in Table 8-1.

[4] Environmental Protection Agency, 2016. Air Quality in Ireland 2015 - Key Indicators of Ambient Air Quality. Available at:https://www.epa.ie/pubs/reports/air/quality/Air%20Quality%20Report%202015.pdf

[5] Environmental Protection Agency, 2016. Ireland's Environment, An Assessment 2016. Available at: http://www.epa.ie/pubs/reports/indicators/SoE_Report_2016.pdf

Site Specific Emission Limits

8.45 Condition 13. (b) of the existing planning permission for the quarry (An Bord Pleanála Planning Ref. QD 04.QD0010) states the following in relation emission limits:

"A monthly survey and monitoring programme of dust and particulate emissions shall be undertaken to provide for compliance with these limits. Details of this programme, including the location of dust monitoring stations, and details of dust suppression measures to be carried out within the entire quarry complex, shall be submitted to, and agreed in writing with, the planning authority prior to re-commencement of any quarrying works on the site. This programme shall include an annual review of all dust monitoring data, to be undertaken by a suitably qualified person acceptable to the planning authority. The results of the reviews shall be submitted to the planning authority within two weeks of completion. The developer shall carry out any amendments to the programme required by the planning authority following this annual review."

8.46 The parameter that is required to be monitored and the associated limit is prescribed in ABP QD04.QD0010 Condition 13. (a):

"Dust levels at the site boundary shall not exceed 350 milligrams per square meter per day averaged over a continuous period of 30 days (Bergerhoff Gauge)."

RECEIVING ENVIRONMENT

Study Area

8.47 The application site is located wholly within an existing permitted quarry development, in a coastal setting and on a local county road south of Carrigtwohill and southwest of Midleton, Co. Cork. It is located south of N25 National Primary Road (E-30 European Route) which links Cork city to Rosslare Europort.

8.48 The site is located in the townland of Rossmore, Carrigtwohill, Co. Cork. Access to the lands is via an existing access to the public road to the north which connects to the N25 National Primary road to the north. The local county road forms the northern site boundary which links the R624 Regional Road to the west at Fota and the N25 National Primary Road at Midleton. Beyond the southern boundary of the lands is an access right of way to the adjacent Kilsaran quarry property lands, and Rossmore Bay, part of the Cork Harbour channel.

8.49 Further beyond the immediate adjacent land uses there is Fota Island Wildlife Park (located to the northeast), the commercial/retail/residential centre of Carrigtwohill (located to the north) and other extractive industries (located to the north-east).

8.50 The site is accessed by a private road that leads northwards forming a crossroads with the east-west LP3619-0 local public road and onwards on the L7645-0 local road to the Barryscourt interchange and the N25. The private road also serves the Rossmore Landfill and Civic Amenity Centre, which is operated by Cork County Council.

8.51 The surrounding landscape is characterised by Cork Harbour and the numerous islands, tidal estuaries, loughs and channels that make up Cork Harbour. The land use consists primarily of agricultural land but also includes a number of other quarries as well as golf courses. A private road adjoins the site to the East and accommodates quarry traffic. A local county road, with a number of residential dwellings located along it, runs in an east-west direction north of the Site.

8.52 Rossmore Bay is immediately adjacent to the southern boundary of Rossmore Quarry. Rossmore Bay forms part of Cork Harbour Special Protected Area (SPA) 004030 and the Great Island Channel Special Area of Conservation (SAC) 001058 – refer to EIAR Chapter 5 (Biodiversity) and the AA Screening Report submitted with the planning application.

8.53 There are isolated private residential property and agriculture farms located throughout the surrounding rural landscape, predominantly along the local road network.

8.54 The application site is not subject to any statutory or non-statutory nature conservation designations. Dwellings in the vicinity of application site are generally located along the local road network comprise farmsteads or isolated on-off residences, with occasional small clusters. The nearest dwellings to the application site boundary are shown in Figure 8-1.

Baseline Study Methodology

Baseline Dust Monitoring

8.55 Ongoing, baseline dust monitoring is undertaken by TMS Environment Ltd. in order to measure compliance with the 350mg/m^2/day emission limit around the existing quarry – refer to Figure 8.1 for monitoring locations.

8.56 Monitoring is undertaken using the 'Bergerhoff method' referred to in the TA Luft Air Quality Standard. The 'Bergerhoff' dust deposition gauge used in the survey comprises a plastic collection bottle with protective basket, mounted on a post and set at 1500mm above ground level. The input

of atmospheric borne particular material into the collection bottle takes place over a pre-determined measurement period (usually one month) by exposing it to the environment. The total dust collected in the bottle is expressed as deposition of total particulate matter (mg/m^2/day) arising from human activity in the area surrounding the application site.

PM_{10} Monitoring

8.57 The application site is located in environs of Air Quality Zone B Cork conurbation. No monitoring in the vicinity of the site is routinely undertaken for air pollutants regulated under the Air Quality Standards Regulations.

8.58 The closest air quality monitoring location to the Rossmore Quarry is located at Old Station Road / South Link Road and Heatherton Park, Cork, approximately 15km west of the application site, situated in a suburban location within Air Quality Zone B and, as such, is considered the most appropriate dataset available for assessment baseline concentrations in the study area.

Sources of Information

8.59 A desk study was carried out to examine all relevant information relating to air quality conditions around the application site. Met Eireann, the National Meteorological Service, was consulted in relation to the climate / weather data in respect of the study area. The EPA website was examined to note information on baseline air monitoring data around the application site (http://www.epa.ie/air/quality/data/).

8.60 Information published on its website by the National Parks and Wildlife Service (NPWS) (http://webgis.npws.ie/npwsviewer/), (part of the Department of the Environment, Community and Local Government, DoECLG), in respect of designated ecological sites, protected habitats and species was also reviewed, together with Ordnance Survey maps and aerial photography (http://map.geohive.ie/mapviewer.html).

Field Survey / Monitoring / Inspection Works

8.61 Dust deposition surveys were undertaken at and around the application site by TMS Environment Ltd, at monitoring locations shown in Figure 8-1. The dust deposition monitoring results recorded over this period are presented and reviewed as part of this assessment. A survey of the extent of existing residential housing around the application site was also undertaken.

8.62 The locations of dust deposition monitors are shown on Figure 8-1 are as follows:

- D1 – located at the northern boundary;
- D2 – located at the northern boundary;
- D3 –located at the northern boundary;
- D4 –located at the eastern boundary.
- D5 - located at the southern boundary.

Background Air Quality

8.63 The application site is located in the environs of Air Quality Zone B Cork conurbation. No monitoring in the vicinity of the site is routinely undertaken for air pollutants regulated under the Air Quality Standards Regulations (S.I. No. 180 of 2011).

8.64 The closest air quality monitoring location to the quarry is located at Old Station Road / South Link Road and Heatherton Park, approximately 15km west of the application site, situated in a suburban location within Air Quality Zone B and, as such, is considered the most appropriate dataset available for assessment baseline concentrations in the study area.

8.65 Those monitoring stations continuously monitors concentrations of particulate matter with an aerodynamic diameter of less than 10µm (PM10). Recent annual mean concentrations monitored at those stations (downloaded from the EPA website) are presented in Table 8-3.

Table 8- 3
PM10 Background Concentrations

Year	Annual Mean (µg/m³)	Number of Days >50µg/m³
Old Station Road/ South Link Road		
2012	17	7
2013	19	5
2014	19	5
2015	17	3
2016	17.9	7
2017	17.2	4
2018	17	0
PM10 Background Concentrations – Heatherton Park		
2012	13	1
2013	15	2
2014	19	1
2015	11	0
2016	11.5	2
2017	10.4	0
2018	11	0

8.66 Table 8-3 indicate that PM10 concentrations monitored at the Old Station Road / South Link Road and Heatherton Park monitoring site are below the annual mean Air Quality Standards (AQS) of 40µg/m³ and comply with the requirement that a 24-hour mean of 50µg/m3 should not be exceeded more than 35 times in a calendar year.

Dust Deposition Monitoring

8.67 The results of the dust deposition monitoring undertaken by TMS Environment Ltd. between January 2018 and September 2021 are presented in Table 8-4 below.

Table 8-4
Dust Deposition Monitoring Results

MONITORING PERIOD	D1 (mg/m²/day)	D2 (mg/m²/day)	D3 (mg/m²/day)	D4 (mg/m²/day)	D5 (mg/m²/day)
Frisbee Gauges Monitoring Method					
Q1 2018	27	30	27	27	78
Q2 2018	-	-	-	-	-
Q3 2018	20	NR	25	NR	NR
Q4 2018	41	N1	120	N1	45

MONITORING PERIOD	D1 (mg/m²/day)	D2 (mg/m²/day)	D3 (mg/m²/day)	D4 (mg/m²/day)	D5 (mg/m²/day)
Q1 2019	71	77	62	87	N1
Q2 2019	82	54	43	121	62
Bergerhoff Gauges Monitoring Method					
Q3 2019	NR	N1	N1	31	250
Q4 2019	N1	NR	349	239	308
Q1 2020	44	57	54	113	151
Q2 2020	59	224	44	246	181
Q3 2020	119	NR	NR	312	313
Q4 2020	65	183	117	297	220
Q1 2021	87	52	226	124	78
Q2 2021	209	NR	244	204	148
Q3 2021	88	82	76	112	60

NR - Organic Contamination in the collection vessel.

N1- Gauge missing or smashed.

8.68 The recorded baseline mineral (inorganic) dust deposition rates at Rossmore Quarry are below the compliance dust deposition limit of 130 mg/m2/ day for 2018, Q1 and Q2 of 2019 for Frisbee Gauges monitoring method as per the requirements of Planning Ref. PL04.203762.

8.69 The recorded baseline mineral (inorganic) dust deposition rates at Rossmore Quarry are below the compliance dust deposition limit of 350 mg/m²/ day for Q3 and Q4 of 2019, 2020 and 2021 up to date for Bergerhoff Gauges monitoring method as per requirements of ABP QD04.QD0010

8.70 Annual reviews of the dust monitoring results are submitted to Cork County Council in compliance with condition no. 13(b) of PL04.QD.0010, which demonstrates the applicant's commitment to ongoing compliance with the current permission.

Meteorology : Dispersion of Emissions

8.71 The most important climatological parameters governing the atmospheric dispersion of particles are as follows:

- Wind-direction determines the broad transport of the emission and the sector of the compass into which the emission is dispersed; and
- wind speed will affect ground level emissions by increasing the initial dilution of particles in the emission. It will also affect the potential for dust entrainment.

8.72 Rainfall is also an important climatological parameter in the generation of dust; sufficient amounts of rainfall can suppress dust at the source and eliminate the pathway to the receptor. According to Arup (1995)[6], rainfall greater than 0.2mm per day is sufficient to suppress dust emissions.

Local Wind Speed and Direction Data

8.73 The closest weather station with sufficient records of wind direction and wind speed considered representative of conditions experienced at the application site is Cork Airport Meteorological

[6] Arup Environmental, Ove Arup and Partners (1995) The Environmental Effects of Dust from Surface Mineral Workings, HMSO, London (ISBM 11 75 3186 3)

Station. A windrose for the average conditions recorded at Cork Airport over a ten-year period is presented in Figure 8-2. The predominant wind direction is from the south-western quadrant.

Rainfall Data

8.74 Relevant rainfall data applicable to the overall site has been obtained from the Irish Meteorological Service website for the Cork Airport Metrological Station, located approximately 15km southwest of the application site. The annual average days with rainfall, greater than 0.2 mm is 204 days per year. Natural dust suppression (from rainfall) is therefore considered to be effective for 56% of the year.

Sensitive Receptors

Ecological Receptors

8.75 The application site is not subject to any statutory nature conservation designation. There is one Natura 2000 site within a 2km radius of the application site at Rossmore, this site is identified in Table 8-5.

Table 8-5
Natura 2000 or Designated Site(s) within a 2km of Application Site

NATURA 2000 SITE	LOCATION AT CLOSEST POINT TO EXTRACTION AREA (m)
Cork Harbour Special Protected Area (SPA) 004030 and the Great Island Channel Special Area of Conservation (SAC) 001058	130

8.76 Based on the nature, size and scale of the planned development, it is considered that the maximum distance for which the project should be evaluated in terms of Natura 2000 or designated nature sites is up to a maximum radius of 2km unless there are any potential source-pathway-receptor links between the proposed development at Rossmore any Natura 2000 or designated site(s) beyond this distance. At a distance greater than 2km, and in the absence of any potential source-pathway-receptor link, it is generally considered that no Natura 2000 or designated sites would be affected by any direct loss of habitat or otherwise impacted upon.

8.77 Cork Harbour Special Protected Area (SPA) 004030 and the Great Island Channel Special Area of Conservation (SAC) 001058 lies within the potential zone of influence of the proposed development at Rossmore Quarry and as such, it is therefore deemed appropriate to screen it in as part of this air quality assessment.

Human Receptors

8.78 Sensitive locations are those where people may be exposed to dust from existing or planned activities. Locations with a high sensitivity to dust include hospitals and clinics, hi-tech industries, painting and furnishing and food processing. Locations classed as being moderately sensitive include schools, residential areas, and food retailers.

8.79 Receptors have been identified within a 1 km distance of the application site boundary at Rossmore. The relevant receptors are listed in Table 8-6 below and their locations are shown in Figure 8-3. As residences are clustered in some areas, receptors have been identified at the nearest location to the application site boundary.

8.80 There are 26 sensitive receptors identified within the 1km of the application site, see Table 8-6.

Table 8-6
Sensitive Receptors within the 1km of the Application Area

RECEPTOR REFERENCE	RECEPTOR	SENSITIVITY	DISTANCE (m) / DIRECTION FROM EXTRACTION AREA (APPROX.)
Group 1	Residential	Medium	752 S
Group 2	Residential	Medium	550 NE
Group 3	Residential	Medium	426 NE
Group 4	Residential	Medium	445 NW
Group 5	Residential	Medium	514 N
Group 6	Residential	Medium	650 N
Group 7	Residential	Medium	1120 E
R7	Residential	Medium	342 N
R8	Residential	Medium	267 N
R9	Residential	Medium	234 N
R10	Residential	Medium	213 N
R11	Residential	Medium	193 N
R12	Residential	Medium	178 N
R13	Residential	Medium	237 N
R14	Residential	Medium	214 N
R15	Residential	Medium	511 N
R16	Residential	Medium	1200 NW
R17	Residential	Medium	966 NE
R18	Residential	Medium	1100 NE
R19	Residential	Medium	1000 NE
R20	Residential	Medium	1115 E
R21	Residential	Medium	1070 E
R22	Residential	Medium	1100 E
R23	Residential	Medium	1090 E
R24	Residential	Medium	775 E
R25	Residential	Medium	645 E
C1	Commercial	Low	319 S

IMPACT ASSESSMENT - METHODOLOGY

Evaluation Methodology

8.81 Fugitive dust emissions and particulate matter arising from the application site activities have the potential to affect existing sensitive receptors in the area due to a potential increase in airborne dust deposition.

8.82 Combustion emissions (primarily oxides of nitrogen) from vehicle exhaust emissions associated with the proposed deepening activities also have the potential to contribute to local air pollution.

8.83 The significance of impacts due to emissions from the application site are dependent upon the magnitude of the emissions, the prevailing meteorological conditions for the location, and the proximity of sensitive locations to the emission sources.

8.84 This impact assessment is based upon a comparison of the baseline (both current and projected without the new development proposals) situation against the air quality impacts resulting from the 'with development' proposal scenario. The potential for 'cumulative' effects from other planned or proposed sources or air pollutants in the area has also been considered.

8.85 Each of the activities associated with extraction development have been assessed for potential air quality impacts including:

- emissions from rock extraction and processing
- emissions from the transfer, end-tipping and stockpiling of aggregates;
- ancillary manufacturing activities;
- PM_{10} contribution from operational activities; and
- traffic exhaust emissions.

8.86 The methodology used in each assessment is presented in the sub-sections below which also provide an explanation of the significance criteria to describe the impacts of the proposed development on air quality.

8.87 For the purposes of environmental assessment of releases of dust from construction and mineral activities, the classifications of PM_{10} and 'deposited dust' are typically applied. The impacts associated with PM_{10} are related to potential health impacts while deposited dust is related to potential nuisance effects. The assessment of the potential impacts of each fraction has, therefore, been undertaken separately.

Significance Criteria

8.88 The following air quality specific significance criteria have been used to assess the significance of air quality impacts in preference to overall descriptors of significance.

8.89 To determine the significance of particulate matter effects associated with the development, an evaluation of the sensitivity of the surrounding area is required. Receptors can demonstrate different sensitivities to changes in environment and are classified as per Table 8-7 below (and IAQM Construction Dust Guidance).

Table 8-7
Methodology for Defining Sensitivity to Dust and PM_{10} Effects

SENSITIVITY OF AREA	HUMAN RECEPTORS	ECOLOGICAL RECEPTORS(A)
Very High	Very densely populated area More than 100 dwellings within 20m Local annual mean PM_{10} concentrations exceed the Objective. Works continuing in one area of the site for more than 1-year	European Designated sites
High	Densely populated area. 10-100 dwellings within 20m of site. Local annual mean PM_{10} concentrations close to the Objective (36 – 40µg/m^3)	Nationally Designated sites
Medium	Suburban or edge of town Less than 10 receptors within 20m Local annual mean PM_{10} concentrations below the Objective (30 – 36µg/m^3)	Locally designated sites
Low	Rural area; industrial area No receptors within 20m Local annual mean PM_{10} concentrations well below the Objective (<30µg/m^3) Wooded area between site and receptors	No designations
Notes: (a)-Only applicable if ecological habitats are present which may be sensitive to dust effects.		

8.90 Table 8-8 below illustrates how the interaction of magnitude and sensitivity results in the significance of an environmental effect, with the application of mitigation measures as per the IAQM Construction Dust Guidance.

Table 8-8
Impact Significance Matrix – Dust Effects (With Mitigation)

SENSITIVITY OF SURROUNDING AREA	RISK OF SITE GIVING RISE TO DUST OR PM_{10} EFFECTS		
	HIGH	MEDIUM	LOW
Very High	Slight Adverse	Slight Adverse	Negligible
High	Slight Adverse	Negligible	Negligible
Medium	Negligible	Negligible	Negligible
Low	Negligible	Negligible	Negligible

Operation Stage Dust Impacts - Methodology

8.91 A staged approach has been adopted to the assessment of operations stage impacts generated by rock extraction and processing and concrete production activities. This ensures that the approach taken for the assessment of risk is proportional to the risk of an unacceptable impact being caused. As such, where a simple review of the situation shows that risk of a health or nuisance impact is negligible, this will be sufficient. In cases where the risk cannot be regarded as insignificant, a more detailed assessment may be required, such as a quantitative screening assessment or an advanced dispersion modelling exercise, as appropriate.

8.92 Guidance on the assessment of the impacts of extractive operations on air quality has been prepared by the Institute of Air Quality Management (IAQM). This guidance uses a simple distance-based screening process to identify those operations where the dust impacts are unlikely to be significant and therefore require no further assessment. Where assessment that is more detailed is required, a basic assessment framework is presented which employs the Source-Pathway-Receptor approach to evaluate risk of impacts and effects.

8.93 The predicted scale of dust effects may be classified as either 'significant', or not 'significant'. Where effects are predicted to be 'significant', further mitigation is likely required before the proposals are to be acceptable under planning policy.

8.94 A semi-quantitative assessment of fugitive dust emissions from the proposed development has been undertaken. The assessment has been undertaken by constructing a conceptual model that takes into consideration the potential sources, surrounding receptors, and the pathway between source and receptor in order to assess the magnitude of risk of impact on local amenities.

8.95 The distance from the source to the sensitive receptor is crucial. The initial risk screening stage (Tier 1) focuses upon the potential for dust generation at the site and the distance between source and receptors. In Tier 1 of the assessment, a representative selection of dust sensitive receptors in each direction of the application site is identified within the 1km study area.

8.96 Further assessment is considered to be required for those receptors within 500m of dust generating activities. Receptors within 500m of dust generating processes progress onto a Tier 2 assessment. Other residential receptors beyond 500m are considered too far away to be impacted by potential dust from the site and not considered any further in this assessment.

8.97 Tier 2 involves identifying source-pathway-receptor linkages and a semi-quantitative assessment of the likelihood and magnitude of any effects that could be associated with each pollutant linkage. This assessment takes account of:

- wind direction and speed data (to estimate frequency of exposure);
- proximity to source (to estimate magnitude of exposure);
- sensitivity of receptor; and
- occurrence of natural dust suppression (rainfall patterns).

8.98 This information is used to inform a semi-quantitative assessment of the likely magnitude of impact and is based upon professional experience of the assessor as the issue of dust nuisance on local receptors is a subjective issue, where public perception on what constitutes 'acceptable' levels varies from one person to the next. Assigning significance to nuisance impacts is qualitative and involves a judgement based on the likely magnitude, frequency, duration and reversibility (or recovery) of the impact. In this context, significant impact is taken to mean what is generally not publicly acceptable and desirable.

8.99 Note that the Tier 2 risk screening assessment **does not take into account proposed mitigation measures** to be implemented at the proposed development. These will include provision of perimeter screening berms, dust suppression measures etc., identified in the section dealing with Mitigation Measures later in this Chapter.

8.100 Following the results of the risk assessment, mitigation measures are detailed, and the residual impact assessed. The detailed methodology used within the assessment is described in more detail in Appendix 8-A.

PM_{10} Contribution from Site-Based Activities : Methodology

8.101 In terms of whether the PM_{10} concentration in the local area is likely to exceed the AQS, the following information has been reviewed:

- existing PM_{10} concentrations; and
- expected additional contribution of PM_{10} from site operations.

8.102 In terms of estimating the potential magnitude of impact from site operations, a UK edition of the LAQM Technical Guidance (LAQM.TG(03)) stated that fugitive dust from stockpiles and quarry operations can potentially contribute up to 5µg/m^3 towards annual mean background concentrations of the coarse fraction of particulates (2.5 – 10µm diameters) in the surrounding area.

8.103 Given the nature and scale of proposed activities, the potential PM_{10} impact of increased intake is considered to be similar or lower. However, to ensure a robust assessment of potential PM_{10} impacts, the upper limit of 5µg/m^3 has been applied to represent the development contribution to annual ambient PM_{10} concentrations. This value has then been added to existing background levels to assess whether the Air Quality Standards objective is likely to be exceeded.

Traffic Emissions - Methodology

8.104 Atmospheric emissions related to site proposals are primarily associated with the exhaust emissions from heavy duty vehicles (HDVs). The decision as to whether an assessment of potential impact is required is based upon the criteria set out in the DMRB.

8.105 The criterion for assessment of air quality contained within the latest DMRB guidance (LA 105) focuses on roads with relatively high changes in flows or high proportion of HDV / HGV traffic.

8.106 The following traffic scoping criteria shall be used to determine whether the air quality impacts of a project can be scoped out or require an assessment based on the changes between the do something traffic (with the project) compared to the do minimum traffic (without the project) in the opening year:

- annual average daily traffic (AADT) >= 1,000; or
- heavy duty vehicle (HDV) AADT >= 200; or
- a change in speed band; or
- a change in carriageway alignment by >= 5m.

ASSESSMENT OF IMPACTS

Operational Stage Dust Impact – Assessment

8.107 When commenced and operational, the principal air quality impacts generated by the proposed development will be dust and traffic related emissions. An overview of the sources and processes associated with the extraction activities, and their respective potential for dust deposition, is presented Table 8-9 below.

Table 8-9
Sources of Particulate Emissions

ACTIVITY	SOURCE	EMISSION POTENTIAL	COMMENTS
Material transfer to processing area	On-site vehicle, Dry loose material.	High when dry material being handled during strong windy weather	Emissions due to prevailing meteorological conditions and amount of dry loose material. Emissions due to re-suspension of loose material on surfaces.
Processing of rock	Processing plant, Dry loose material	High when dry material being processed during strong windy weather	Emissions due to prevailing meteorological conditions (high winds).
Material transfer to storage area or to the existing / permitted manufacturing plants on the site	On-site vehicle, Dry loose material	High when dry material being handled during strong windy weather	Emissions due to prevailing meteorological conditions and amount of dry loose material. Emissions due to re-suspension of loose material on surfaces.
Material storage	Dry loose material in stockpiles	High when dry material being stored during strong windy weather	Emissions due to prevailing meteorological conditions (high winds).
Material loading to HGV	On-site vehicle, Dry loose material	High when dry material being handled during strong windy weather	Emissions due to prevailing meteorological conditions and amount of dry loose material. Emissions due to re-suspension of loose material on surfaces.
Transfer off site / traffic off site	HGV / Road vehicles	Low - on paved road surfaces	Dependant on the amount of loose material on road surface available for re-suspension and track out.

Human Receptors

8.108 A total of 15 receptors were identified within the c. 1km study area around the application site. Using the tiered assessment methodology, 13 of these receptors located within 500m have progressed onto a Tier 2 assessment as they are considered to have a greater risk of dust impact. Each receptor is assessed against the frequency of exposure and the distance from the source to the receptor (i.e. the pathway) in accordance with the methodology described in Appendix 8-A.

8.109 The frequency of exposure of each receptor is based upon the frequency of winds capable of carrying dust particles blowing in the direction, from the source to the receptor, on days when rainfall does not inhibit dust from becoming airborne. Representative data on the local wind climate is therefore required for this section of the assessment.

8.110 A wind-rose for the site is presented in Figure 8-2 for Cork Airport Meteorological Station and illustrates the predominant wind directions from the south-west. The potential for the generation

of airborne dust will increase with wind speed, with winds greater than 3m/s capable of carrying airborne dust[7].

8.111 A wind rose showing the frequency of winds at wind speeds of greater than 2m/s is presented in Figure 8-2 with the individual frequencies for each 10 degree compass sector used within the assessment. In this assessment, wind speeds over 2m/s were used as this is how the data on percentage occurrence of wind frequency and wind speed is calculated and presented by Met Eireann. For this reason, the impact assessment presented herein is conservative.

8.112 A summary of the risk assessment of dust impacts at the selected Tier 2 properties / locations arising from the proposed development activities (in the absence of any mitigation measures) is presented in Table 8-10 below.

Table 8-10
Dust Risk Assessment Screening (Without Mitigation Measures)

RECEPTOR REFERENCE	DISTANCE FROM OPERATIONS (m)	RELEVANT WIND DIRECTION (A)	POTENTIAL EXPOSURE DURATION (B)	RELATIVE WIND / DISTANCE RANK (C)	RISK EVALUATION
Group 3	426	210-250	11.1	4/2	Acceptable
Group 4	445	110-130	2.0	1/2	Insignificant
R7	342	120-150	3.3	2/3	Insignificant
R8	267	120-160	4.3	2/4	Acceptable
R9	234	120-160	4.3	2/4	Acceptable
R10	213	120-160	4.3	2/4	Acceptable
R11	193	140-180	4.9	2/5	Acceptable
R12	178	170-210	7.5	3/5	Slight Adverse
R13	237	170-210	7.5	3/5	Slight Adverse
R14	214	190-230	10.5	4/5	Slight Adverse
C1	319	330-350	2.9	1/3	Insignificant

Table Notes:

(A) – relevant wind direction based on upwind sector which would potentially convey from site towards the receptor.

(B) – Potential duration of exposure based on frequency of moderate to high wind speed (adjusted for dry days only) as described in the methodology in Appendix 8-A.

(C) – Ranking as per methodology in Appendix 8-A

Refer to Figure 8-1 for Receptor Locations

8.113 From Table 8-10 above, it is observed that the risk of impact from dust emissions associated with the proposed development at Rossmore(without any mitigation measures in place) varies from :

- Insignificant at Group 4, R7, C;
- Acceptable at Group 3, R8, R9, R10 and R11;
- Slight Adverse at R12, R13, R14.

[7] Department of the Environment, Transport and the Regions, 1995. *The Environmental Effects of Dust from Surface Mineral Workings* – Volume 2. Technical Report. December 1995.

8.114 Using the screening assessment tool, the Air Quality Assessment (outlined in Appendix 8-A) considers that there is generally an insignificant to moderate adverse risk that dust may cause an impact at sensitive receptors within 500m of the source of the dust generated activities.

8.115 Note that this assessment ***does not take into account*** implementation of mitigation measures within the proposed development that include existing perimeter screening berms and strengthened boundary vegetation / screen planting, dust suppression measures etc. (as outlined in the section of Mitigation Measures section below). This assessment is considered to be conservative on the basis of the moderate wind speeds included in the risk evaluation.

Ecological Receptors

8.116 The quarry and application site are not subject to any statutory nature conservation designation.

8.117 Studies have indicated that fugitive dust is typically deposited within 100 to 200m of the source, the greatest proportion of which, comprising larger particles (greater than 30 microns) is deposited within 100m. Where large amounts of dust are deposited on vegetation over a long time-scale (a full growing season for example) there may be some adverse effects upon plants restricting photosynthesis, respiration, and transpiration.

8.118 Baseline dust deposition monitoring at the site indicates that the levels at the application site are low and well below the level of 1000 mg/m^2/day, where it is considered that dust could be likely to have a significant effect on sensitive ecosystems.

8.119 Based on the findings of the semi-quantitative assessment above, the results from the existing dust monitoring programme carried out for the existing quarry and the fact that the nearest designated nature site is:

- located at a distance of c. 130m;
- lies west and south of, and therefore upwind of, the quarry and application site;
- is separated and screened from the site by intervening berms, hedgerows and trees.

8.120 It is concluded that the proposed development will have an insignificant dust deposition impact on Cork Harbour Special Protected Area (SPA) 004030 and the Great Island Channel Special Area of Conservation (SAC) 001058.

Traffic Emissions - Assessment

8.121 For the purposes of assessment, it has been assumed that the projected traffic movements associated with the proposed development, in combination with the existing asphalt plant and permitted ready-mix concrete plant and ground limestone processing plant (not yet constructed) will equate to a maximum of 186 two-way HGV movements per day, although levels on most days will likely be less than this. In view of :

- the existing permitted levels of quarry output and associated HGV traffic movements across the local road network;
- the fact that none of the roads in the surrounding local road network meet any of the traffic / alignment criteria set out in HA 207/07.

8.122 It is considered that the extent of any change and the likely impact of the proposed development and ancillary manufacturing activity (both existing and permitted) can be deemed 'negligible' in terms of local air quality and that no further air quality assessment is necessary.

8.123 On this basis, the impact of the proposed development can be screened out and combustion emissions (primarily oxides of nitrogen) from vehicle exhaust emissions associated with the transportation of materials will not have the potential to contribute to local air pollution.

PM_{10} Contribution from Extraction / Production Activities - Assessment

8.124 In terms of PM_{10}, the maximum annual mean measured baseline background concentration is taken as 19µg/m³ for the years 2013, 2014 at Old Station Road and 2014 at the Heatherton Park monitoring station.

8.125 As the concentrations of the coarse particulate fraction (2.5µm–10µm diameter) recorded at the Stations are well below the annual threshold concentration of 40µg/m³, the impact of quarrying activities on ambient PM_{10} concentrations in the area is assessed as insignificant.

8.126 Given the limited magnitude of change in the extent and scale of planned activities at the quarry, the available monitoring data are taken to be representative of ambient PM_{10} concentrations likely to arise over the life of the proposed quarry deepening. As such, any potential future impact in relation to increased ambient PM_{10} concentrations is classified as 'negligible'.

Unplanned Events (i.e. Accidents)

8.127 Accidents, malfunctions and unplanned events refer to events or upset conditions that are not part of any activity or normal operation of the proposed development planned by the Applicant. Even with the best planning and the implementation of preventative measures, the potential exists for accidents, malfunctions or unplanned events to occur during the proposed deepening activities.

8.128 Many accidents, malfunctions and unplanned events are, however, preventable and can be readily addressed or prevented by good planning, design, emergency response planning, and mitigation. In terms of air quality impact, the following unplanned events could have an effect on the local area:

- equipment malfunction;
- vehicle collision;
- dry and windy weather conditions with dust suppression equipment malfunction;
- accidental material spillages during transport.

8.129 In relation to air quality, the impacts of any unplanned events are considered to be negligible. If unplanned events were not mitigated, the effects of dust during dry and windy conditions could possibly lead to occasional increases in nuisance dust and 24-hour mean PM_{10} concentration immediately surrounding the quarry and application site. However, these are not considered to be significant given the limited duration of such meteorological conditions and the likely limited scale of any incident.

Cumulative / Synergistic Impacts

8.130 In essence, cumulative impacts are those which result from incremental changes caused by other past, present or reasonably foreseeable actions together with those generated by the proposed development. Therefore, the potential impacts of the proposed development cannot be considered in isolation but must be considered in addition to impacts already arising from existing or planned development.

8.131 This air quality impact assessment shows that the proposed development air quality impact from the proposed operations at receptors is determined to be ACCEPTABLE to NEGLIGIBLE.

8.132 The proposed activities will not have the potential to impact the existing ambient air quality in the vicinity of quarry.

8.133 The manufacturing area of the site is located at the southern extent of the site and includes an existing asphalt plant. Planning permission is also in place for a readymix concrete plant and a ground

limestone processing plant (planning ref. 20/4124); however, these permitted developments have not been constructed to date.

8.134 The historic dust deposition monitoring results at the site show that the average dust deposition rate is well below the limit for fugitive dust emissions of 350 mg/m^2/day.

8.135 At present air quality monitoring shows that there are no exceedances of the Air Quality Objectives at any location in the study area, and dust emissions are well below the existing limits.

8.136 Considering the comprehensive historic monitoring data, it is considered that the cumulative impacts of proposed development and existing / permitted manufacturing operations at the site can be considered to be negligible.

8.137 Local existing and planned developments were reviewed as part of this assessment. There is an existing quarry to the west operated by Kilsaran.

8.138 At Kilsaran's Quarry rock is extracted by blasting. Processing of material within the site is undertaken within the quarry void.

8.139 The Kilsaran's Quarry is located immediately west of the application site. Considering the comprehensive historic monitoring data provided for the Lagan site, which would measure the exiting cumulative deposition, coupled with the fact there will be no change anticipated from the continuation of the quarrying and manufacturing operations on both the Lagan site and the adjacent Kilsaran site, it is considered that the cumulative impacts of both quarries can be considered to be negligible.

8.140 This assessment shows that the proposed development at Rossmore will not have the potential to contribute to local air pollution. The cumulative effects of both developments if not mitigated, in dry and windy conditions could possibly lead to occasional increases in nuisance dust and 24-hour mean PM10 concentration immediately surrounding the area. However, these are not considered to be significant given the limited duration of such meteorological conditions.

Interaction with Other Impacts

8.141 The potential impact on air quality by the project on sensitive receptors including sensitive ecological receptors and people living in the area has been fully assessed in this chapter. The overall impact of the project on these receptors is further considered in Chapter 4 Population and Human Health and Chapter 5 Biodiversity.

MITIGATION MEASURES

8.142 A large range of mitigation measures are already in place at the existing operation. These, along with measures recommended for implementation at the application site are listed in Table 8–11 below:

Table 8-11
Particulate Emission Mitigation Measures

SOURCE / RECEPTOR	EMISSION POTENTIAL	RECOMMENDED MITIGATION MEASURES	EFFECTIVENESS
Excavators / HGV Loading	High – dry or fine material during strong windy weather	Minimise drop heights when handling materials. Maximise use of excavated soil in construction of vegetated screening berms or in quarry restoration works. Dampen materials using mist cannon, sprinklers or water bowser	High
	Low – material of high moisture content during conditions of low wind speed	Minimise drop heights when handling material. Protect from wind where possible.	High
On-site Vehicles	High when travelling over un-surfaced and dry site roads.	Minimise length of on-site haul routes.	High
		Use of sprinklers / water bowser to dampen haul routes during dry weather periods.	High
		Restrict vehicle speeds to less than 20kph. Install signage and undertake staff training.	High
		Routing of traffic and away from any surrounding sensitive receptors.	High
		Existing landscaped berm between the quarry haul road and the SAC to the South.	High
Road Vehicles (transfer off-site)	Low / Moderate on paved road surfaces	Use of road sweeper to reduce the amount of material available for re-suspension.	Moderate / High
		Travel over paved surfaces / access road.	High
		Direct all HGVs through wheelwash facility	High
Stockpiles	High when dry or fine material being stored or handled during strong windy weather	Seed / vegetate surfaces of completed perimeter mounds and stockpiles of restoration soils.	High
		Locate stockpiles to take advantage of any available shelter from wind.	High
		Use of sprinklers / bowser to moisten materials during periods of dry and windy weather	High
		Limit mechanical disturbance of materials more likely to become airborne and/or time operations having regard to expected weather conditions	High

SOURCE / RECEPTOR	EMISSION POTENTIAL	RECOMMENDED MITIGATION MEASURES	EFFECTIVENESS
Slight Adverse Risk Receptors	High – during dry and strong windy weather	Hardstanding areas/site roads, stockpiles with the potential to give rise to dust will be regularly watered as appropriate during dry and/or windy conditions by dust canon, sprinklers or water bowser.	High

Trackout Measures

8.143 When adverse conditions apply (dry, windy weather), water from a bowser will continue to be sprayed on dry unpaved road surfaces in order to minimize dust rise. Any paved surfaces around the site and/or along the access road leading in and out of the quarry will also be sprayed as required.

8.144 A fixed sprinkler system is in place at the site. The sprinklers are set on a timer to ensure the internal paved roads are sufficiently dampened on a regular basis.

8.145 All heavy goods vehicles leaving the application site will continue to be routed through the existing wheelwash facility in order to remove and / or dampen any particulate materials attaching to the undercarriage and to prevent transport of fine particulates off-site, onto the local public road network. The internal access road leading from the wheelwash to the site entrance is paved with tarmacadam. This ensures that HGVs remain clean and do not pick up any dirt or debris between the wheelwash and the site entrance.

8.146 A road sweeper is employed on a regular basis to clean internal roadways and the road in the vicinity of the site.

Good Practice Measures

8.147 Effective site management practices are critical to demonstrate the willingness of the quarry operator to control dust emissions. Monitoring of dust deposition and recording of any complaints shall be carried out to take appropriate measures to reduce emissions in a timely manner.

8.148 Training on dust mitigation measures shall be provided to site-based staff. Training will also cover an 'emergency preparedness plan' to react quickly in case of any failure of dust mitigation measures.

RESIDUAL IMPACT ASSESSMENT

8.149 With the range of mitigation measures to be implemented and design measures to be incorporated into the working scheme, it is considered that the risk of dust related impacts at receptors generated by the proposed site activities will be further reduced.

8.150 After an assessment of potential adverse effects produced by the development it was concluded that there would be no significant adverse air quality effects for both human and ecological receptors which could cumulatively impact the site or the surrounding area. Overall, the effects of the proposed development on air quality have been considered to be insignificant to acceptable. A summary of the residual dust risk impact assessment at the closest sensitive receptors is provided in Table 8-12 below.

Table 8-12
Residual Dust Risk Assessment (With Mitigation Measures)

RECEPTOR REFERENCE	RISK EVALUATION
Group 3	Insignificant
Group 4	Insignificant
R7	Insignificant
R8	Insignificant
R9	Insignificant
R10	Insignificant
R11	Insignificant
R12	Acceptable
R13	Acceptable
R14	Acceptable
C	Insignificant

8.151 On the basis of the assessment presented above, it is concluded that the proposed development, with the range of mitigation measures to be implemented and design measures incorporated into the working scheme, will not have a dust deposition impact on any assessed receptors.

MONITORING

8.152 Dust deposition monitoring will continue to be carried out at the quarry. Monitoring will be carried out at the existing dust monitoring locations D1, D2, D3, D4 and D5 on a quarterly basis.

8.153 Results of the dust monitoring shall be submitted to Cork County Council on a regular basis for review and record purposes.

8.154 The monitoring locations will be reviewed on an annual basis, and where required, these locations will be revised, subject to the agreement of Cork County Council.

FIGURES

NOTES

1. ORDNANCE SURVEY IRELAND LICENCE NO. CYAL50167032 (C) ORDNANCE SURVEY IRELAND / GOVERNMENT OF IRELAND
2. AERIAL PHOTOGRAPHY CARRIED OUT BY SLR CONSULTING MARCH 2021

LEGEND

- APPLICATION AREA
- D1 DUST MONITORING LOCATIONS
- 1 KM OFFSET
- 500 M OFFSET

Planning Department
04 NOV 2021
Cork County Council
County Hall
Cork.

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DUST MONITORING LOCATIONS

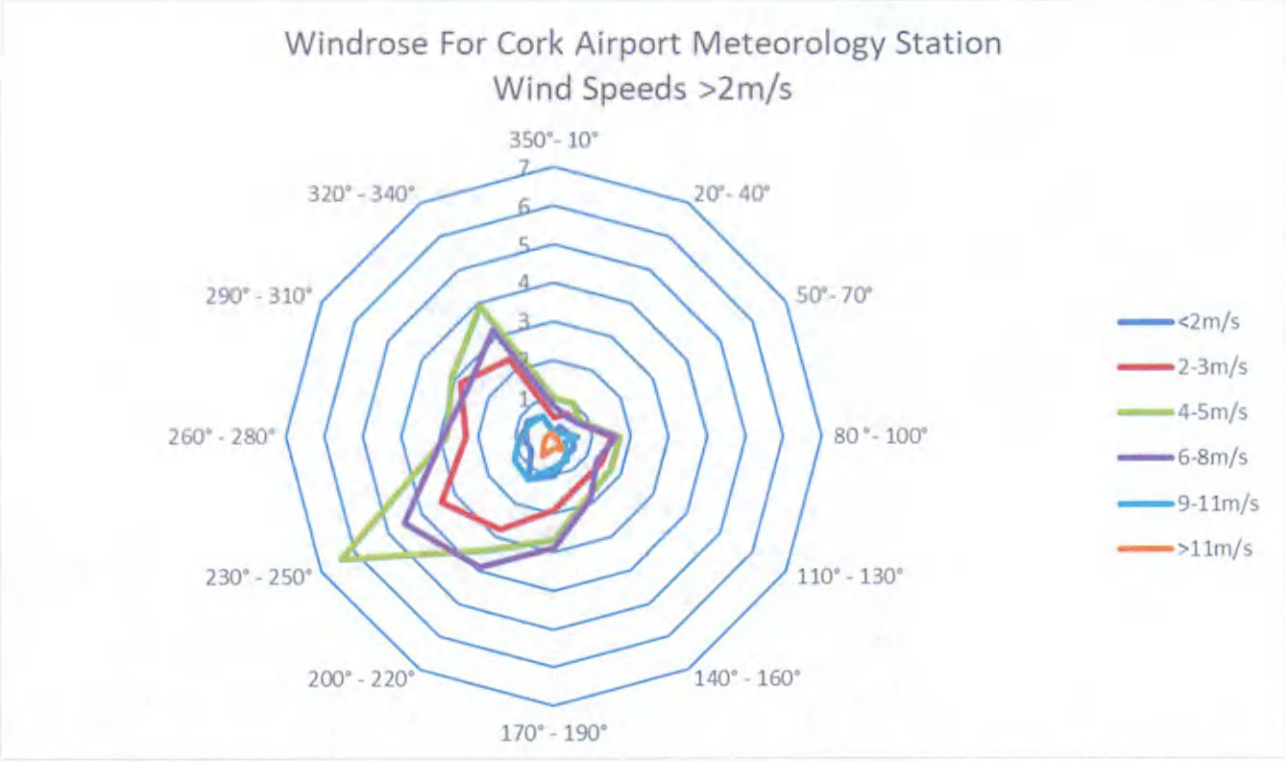
FIGURE 8.1

Scale: 1:10,000 @ A3

Date: AUGUST 2021

501.00584.00 IGURE 8.1_Rev 1.dwg

Figure 8-2
Windrose for Cork Airport Meteorological Station



NOTES

1. ORDNANCE SURVEY IRELAND LICENCE NO. CYAL50167032 (C) ORDNANCE SURVEY IRELAND / GOVERNMENT OF IRELAND
2. AERIAL PHOTOGRAPHY CARRIED OUT BY SLR CONSULTING MARCH 2021

LEGEND

- APPLICATION AREA
- R RESIDENCE
- C COMMERCIAL
- 1 KM OFFSET
- 500 M OFFSET
- GROUPS OF RECEPTORS

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LOCAL RECEPTORS LOCATIONS

FIGURE 8.3

Scale: 1:10,000 @ A3

Date: AUGUST 2021

FIGURE 8.3_Rev1.dwg

501.00584.0

APPENDIX 8-A

Dust Risk Screening Assessment Methodology

DUST RISK SCREENING ASSESSMENT METHODOLOGY

The methodology applied in the assessment is a semi-quantitative risk assessment methodology, in which the probability of an impact occurring and the magnitude of the impact, if it were to occur, are considered. This methodology is the Tier 2 assessment of the dust assessment methodology. In the event that identified dust sensitive receptors are not screened out within Tier 1, this approach provides a mechanism for identifying the areas where mitigation measures are required, and for identifying mitigation measures appropriate to the risk presented by the development, (i.e. the assessment does not take account of proposed mitigation being put in place).

The magnitude of the potential risk at each receptor is classified depending on the frequency of exposure and the distance from the site to the receptor. Frequency of exposure is represented by the percentage of moderate to high winds (over 3m/s) from the direction of the site.

The screening assessment tool assesses the significance of the distance from site and the frequency of exposure of each receptor by assigning a ranked number. Receptors with a higher potential for dust impacts would therefore result in a higher value whilst receptors with lower potential would expect to carry a lower value. The value corresponding to an evaluation of risk is a product of the significance of the distance and frequency of exposure, each is assigned a value representing its significance. The multiplication of the two values assigned gives a total, which is then corresponded to a qualitative term of risk magnitude.

Frequency of Exposure Criterion

The potential for any site to emit dust is greatly influenced by weather. Increased wind speed increases the potential for the generation of airborne dust due to the suspension and entrainment of particles in airflow. A worst-case situation would be strong, warm, drying winds which increase the rate at which dust is lifted from an untreated surface and emitted into the air. Wind can also have the effect of spreading dust over a large area. Conversely, rainfall decreases dust emissions, due to both surface wetting and increasing the rate at which airborne dust is removed from air. An article on dust generation from quarry/pit operations[8] suggests that rainfall of greater than 0.2mm per day is considered sufficient to effectively suppress windblown dust emissions.

The frequency of exposure to dust emissions represents the percentage of time that wind speeds capable of carrying airborne dust (greater than 3m/s) are blowing from the site to the direction of the receptor. Frequencies are calculated based on meteorological data. For screening assessment wind speeds greater than 2m/s were considered as this is how data on percentage occurrence of wind frequency and wind speed is calculated and presented by Met Eireann. For this reason, the assessment is considered to be conservative.

For the screening assessment, a value of 1mm would be used for the criteria to classify days as 'dry' or 'wet'; five times the recommended value, using annual average rainfall data. The average number of days when rainfall exceeds 1mm would be provided for each month, and calculated over the year to provide an average.

The resulting frequency of moderate to high wind speeds with the potential of carrying airborne dust towards receptors would then be classified into the criteria in Table 8 A-1 with the respective rank value assigned.

[8] Leeds University. Good Quarry. http://www.goodquarry.com/article.aspx?id=55&navid=2

Table 8 A- 1
Frequency of Exposure – Risk Classification

RISK CATEGORY	CRITERIA
1	Frequency of winds (>2 m/s) from the direction of the dust source on dry days are less than 3%
2	The frequency of winds (>2 m/s) from the direction of the dust source on dry days are between 3% and 6%
3	The frequency of winds (>2 m/s) from the direction of the dust source on dry days are between 6% and 9%
4	The frequency of winds (>2 m/s) from the direction of the dust source on dry days are between 9% and 12%
5	The frequency of winds (>2 m/s) from the direction of the dust source on dry days are between 12% and 15%
6	The frequency of winds (>2 m/s) from the direction of the dust source on dry days are greater than 15%

Distance to Source Criterion

In assessing dust impacts, the distance from the source to the sensitive location is crucial, as airborne and deposited dust tend to settle out close to the emission source. Smaller dust particles remain airborne for longer, dispersing widely and depositing more slowly over a wider area.

Guidance indicates that larger dust particles (greater than 30µm) will largely deposit within 100m of sources. Smaller particles (less than 10µm) are only deposited slowly. Concentrations decrease rapidly on moving away from the source, due to dispersion and dilution.

To allow for this effect of distance, buffer zones are often defined by mineral planning authorities around potentially dusty activities to ensure that sufficient protection is provided. They have not been established in any rigorous scientific way, but usually range from 50m to 200m. The 1995 UK DoE Guidance on dust from surface mineral working's, however, recommends a stand-off distance of 100-200m from significant dust sources (excluding short-term sources), although it is recognised that these distances can be reduced if effective mitigation measures are identified and implemented. In terms of identifying sensitive locations therefore, and to represent an extreme worst case scenario, consideration only needs to be given to sensitive receptors within 500m of the site boundary. Receptors at a distance greater than 500m have therefore been screened out in Tier 1 of the assessment.

The criteria for classifying the distance from receptor to source and thus assigning a rank value has therefore been based on the various references to dust behaviour described above. The rank classifications are presented below in Table 8 A-2. A risk category is maintained for receptors in excess of 500m for circumstances where although a receptor is beyond 500m from the dust source, its sensitivity for example is sufficient for it to be taken onto a Tier 2 assessment.

Table 8 A- 2
Distance to Source – Risk Classification

RISK CATEGORY	CRITERIA
1	Receptor is more than 500m from the dust source
2	Receptor is between 400m and 500m from the dust source
3	Receptor is between 300m and 400m from the dust source
4	Receptor is between 200m and 300m from the dust source
5	Receptor is between 100m and 200m from the dust source
8	Receptor is less than 100m from the dust source

Sensitivity of Receptors

Sensitive locations are those where the public may be exposed to dust from the site. Locations with a high sensitivity to dust include hospitals and clinics, hi-tech industries, painting and furnishing and food processing. Locations classed as being moderately sensitive include schools, residential areas and food retailers. Table 8 A-3 below[9] shows examples of dust sensitive facilities.

Table 8 A- 3
Examples of Dust Sensitive Facilities

HIGH SENSITIVITY	MEDIUM SENSITIVITY	LOW SENSITIVITY
Hospitals and clinics	Schools and residential areas	Farms
Retirement homes	Food retailers	Light and heavy industry
Hi-tech industries	Greenhouses and nurseries	Outdoor storage
Painting and furnishing	Horticultural land	
Food processing	Offices	

Evaluation of Risk

Once a rank value has been assigned to the frequency of exposure and distance to source, an overall risk can be evaluated by combining the two risk categories, along with consideration of the sensitivity of the receptor. For low sensitivity receptors the risk of dust impact is considered to be significantly lower than for medium and high sensitive receptors. Therefore, a factor of 0.5 would be applied to the final risk evaluation ranking.

For each receptor, the relative magnitude of risk is given by identifying which of the score categories in Table 8 A-4 it falls into. This final evaluation represents the risk of dust impacts prior to control and mitigation measures being employed on site.

[9] **Ireland M. (1992)** "Dust: Does the EPA go far enough?", Quarry Management, pp23-24.

Table 8 A-4
Risk Evaluation Ranking (Without Mitigation)

MAGNITUDE OF RISK	SCORE
Insignificant	7 or less
Acceptable	8 to 14
Slight Adverse	15 to 24
Moderate Adverse	25 or more

9. Climate

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INTRODUCTION

Background

9.1 This chapter of the Environmental Impact Assessment Report (EIAR), prepared by SLR Consulting Ireland, provides supporting information to accompany a Planning Application to Cork County Council by Lagan Materials Ltd. It primarily addresses potential climate related impacts from the proposed further development of the existing quarry at Rossmore, Carrigtwohill, Co. Cork.

9.2 The proposed development being applied for under this current planning application is shown on EIAR **Figure 2-1** and is similar to that previously granted under An Bord Pleanala reference number 04.QD.0010 and will consist of:

- Deepening of the existing quarry extraction area by 2 no. 15 metre benches from -20m OD to -50 m OD, along with minor amendments to the permitted quarry layout (Plan File ref. no's: S/02/5476 & ABP Ref. PL04.203762 and ABP Ref. PL04.QD.0010) all within the existing permitted quarry footprint and the continued use of the existing water management system (settlement pond / infiltration pond system permitted under PL04.QD.0010) for the life of the proposed development, within an application area of c. 12.6 hectares – refer to EIAR Figures 1.1 and 1.2;
- An extraction capacity of up to 375,000 tonnes per annum is sought to provide the applicant with the ability to respond to demand for aggregates for large infrastructure projects in the Region;
- Permission is sought for twenty years plus two years for final restoration (total duration 22 years).

9.3 A detailed description of the proposed development is provided in EIAR Chapter 2.

9.4 This quarry is located at a coastal location with the southern boundary of the property being adjacent to Rossmore Bay.

Scope of Work

9.5 The following sections of this Chapter describe the potential climate change impacts associated with the proposed development. The following issues are addressed separately:

- climate change legislative framework/policy context;
- analysis of evolving environmental baseline trends;
- identifying climate change concerns in relation to proposed development;
- assessing effects (cumulative effects and uncertainty);
- identifying alternatives and mitigation measures;
- identifying monitoring and adaptive management.

Contributors / Author(s)

9.6 SLR Consulting Ireland undertook the impact assessment presented in this chapter on behalf of Lagan Materials Ltd. The lead consultant for the study was Aldona Binchy MSc. Eng PIEMA Environmental Engineering.

Limitations / Difficulties Encountered

9.7 There are currently no published guidelines and established methodology providing specifically for assessment of climate impacts from extraction or associated quarrying activities in Ireland. This Chapter of the EIAR has therefore been prepared on the basis of published, general cross-sectoral guidance.

Legislative Framework/ Policy Context

Adaptation to Climate Change

9.8 In recent years, there has been increasing public awareness about the implications of past, ongoing and continued future emissions of greenhouse gases on the earth's climate. The implications of such change will potentially have significant impact on local communities and national populations across the world. The ever-increasing awareness and acceptance of this reality has, in recent years, prompted significant public policy development around emissions and climate change.

9.9 An overview of the legislative framework and policy context which informs this assessment of potential climate impacts of future backfilling and waste recovery activities at Rossmore Quarry is presented in Appendix 9-A and provides background detail in respect of the following :

- National Policy on Adaption to Climate Change
  - Sectoral Adaption Plans
  - Local Level Adaption
- Regulation / Control of Greenhouse Gas Emissions
  - Paris Agreement (2015)
  - Kyoto Protocol (2008-2012)
  - EU 2021-2030 Targets for non-ETS sector emissions- Effort Sharing Regulations
  - Energy White Paper (2015)
- Future Management of Flood Risk
- EIA Directive 2014/52/EU
- Published Guidelines
  - Guidance on Integrating Climate Change and Biodiversity into EIA
  - Assessing Greenhouse Gas Emissions and Evaluating their Significance
  - Climate Change and Major Projects
  - Sector Planning Guidelines for Climate Change Adaption
  - Local Authority Strategy Development Guidelines.

Cork County Council Climate Adaption Strategy 2019-2024

9.10 Under the National Adaptation Frameworks (NAF) the Environment Directorate of Cork County Council developed the Climate Adaptation Strategy for Cork County. The strategy establishes an

extreme weather event baseline and predicts the challenges and risks that climate change will pose for the county in the future. It also proposes a series of actions to adapt to those climatic changes which are already taking place.

9.11 Based on the risk register and the priority risks categorised by Cork County Council, seven high level goals were identified:

- Local Adaptation Governance and Business Operations : To support implementations of adaptation planning in all Council activities and operations. To build resilience within Cork County Council to support service delivery.
- Infrastructure and Built Environment : To increase resilience of roads and transport infrastructure and of Council owned assets housing stock.
- Landuse and Development : To integrate climate action considerations into landuse planning.
- Drainage and Flood Management : To adapt to the increased risk and impact of flooding. To liaise and work with other bodies responsible for management of water resources.
- Natural Environment, Built & Cultural Heritage : To develop approaches to protect the natural and key cultural assets in Cork County Council.
- Community, Health & Wellbeing : To build capacity & resilience within communities in regard to climate adaptation.
- Other Sectors & Agencies : To collaborate with other Sectors and Agencies in programs relating to climate action and adaptation planning.

RECEIVING ENVIRONMENT

Climate Environmental Baseline

Regional Context

9.12 Observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising sea level are unequivocal evidence of warming of the climate system globally. Global mean temperature has increased by 0.8°C compared with pre-industrial times for land and oceans, and by 1.0°C for land alone. Most of the observed increase in global average temperatures is very likely due to increases in anthropogenic greenhouse gas concentrations.

9.13 Landmasses are expected to warm more than the oceans, and northern, middle and high latitudes. Despite possible reductions in average summer precipitation over much of Europe, precipitation amounts exceeding the 95th percentile is very likely in many areas; thus, episodes of severe flooding may become more frequent despite the general trend towards drier summer conditions. In an ensemble-based approach using outputs from 20 global climate models (GCMs), the Mediterranean, northeast and northwest Europe are identified as warming hot spots but with regional and seasonal variations in the pattern and amplitude of warming. Regional climate models (RCMs) also project rising temperatures for Europe until the end of the 21st century, with an accelerated increase in the second half of the century. For precipitation, the larger-scale summer pattern shows a gradient from increases in Northern Scandinavia to decreases in the

Mediterranean region. By contrast, increases in wintertime precipitation primarily north of 45°N are a consistent feature of RCM projections over Europe, with decreases over the Mediterranean. Overall, then, there are consistent projections of change for northern and northwest Europe.

9.14 Ireland has a typical maritime climate, with relatively mild and moist winters and cool, cloudy summers. The prevailing winds are south-westerly in direction. The climate is influenced by warm maritime air associated with the Gulf Stream which has the effect of moderating the climate, and results in high average annual humidity across the country. The area of least precipitation is along the eastern seaboard of the country, in the rain shadow of the Leinster uplands.

9.15 Mean seasonal temperature will change across Ireland. A number of studies have applied selected Intergovernmental Panel on Climate Change (IPCC) Special Reports on Emissions Scenarios (SRESs) to model climatic changes across Ireland at a regional scale. Despite the different methods and scenario combinations used, there is agreement in projected changes in temperature for Ireland. However, there are more disparities in the magnitude and sign for the precipitation changes projected for the island.

9.16 Table 9-1 summarises climate impact projections for Ireland, estimates of projections confidence are derived from published projection data from the Local Authority Adaptation Strategy Development Guidelines.

Table 9- 1
Climate Impacts Projections: 30-year overview[1]

Variable	Summary	Confidence	Projected changes
Sea Levels Rise	Strong increase	High	Projections of sea level rise to 2100 suggest a global increase in the range of 0.09-0.88m with a mean value of 0.48. For 2050, it is reasonable to assume a sea level rise in the region of 25 cm above present levels.
Storm surge	Strong increase	Medium	An increase in the numbers of intense cyclones and associated strong winds are expected over the north - east Atlantic. By the 2050s, storm surge heights in the range of 50-100cm are expected to increase in frequency for all coastal areas with exception of the southern coast.
Costal Erosion	Moderate increase	Low	Currently approximately 20% of Ireland's coastline is at risk of costal erosion, particularly areas of the south and east coast and also in isolated areas on the west coast. Rates of increase will be determined by local circumstances; however, it is expected that areas of the south-west are likely to experience the largest increase.
Cold Snaps/ Frost	Moderate decrease (winter/night)	High	By mid-century, minimum temperatures during winter are projected to increase by ~2^{0}C in the southeast and ~2.9^{0}C in the north. This change will result in fewer frost days and milder nigh-time temperatures.

[1] Local Authority Adaptation Strategy Development Guideline, EPA 2016

Variable	Summary	Confidence	Projected changes
Heatwaves	Strong increase (summer)	High	Seven significant heatwaves (defined as 5+ days@>25^{0}C) have been recorded in Ireland over the past 30 years, resulting in approximately 300 excess deaths. By mid-century, a projected increase in summer maximum daily temperature of approximately 2^{0}C will likely intensify heatwaves, with maximum temperatures increasing and heatwave duration lengthening.
Dry Spells	Strong increase (summer)	Medium	There have been seven periods of insignificant rainfall in Ireland in the past 40 years. Of these, the events of 1976 and 1995 were the most severe, averaging 52 and 40 days in duration respectively across Irish rainfall stations. An approximate 20% decrease in summer precipitation receipts in many areas is strongly indicated under a high emissions scenario. This decrease is likely to results in progressively longer periods without significant rainfall, posing potentially severe challenges to water sensitive sectors and regions.
Extreme Rainfall	Strong increase (winter)	Low	Heavy precipitation days (in which more than 20mm of rainfalls) are likely to increase in frequency in winter. By the 2050s an increase in the number of heavy precipitation days of around 20% above the level of 1981-2000 is projected under both low-medium and high emissions scenarios. This may have serious consequences for flood risk in sensitive catchments.
Flooding	Moderate increase (winter)	Low	An Irish Reference Network of hydrometric stations has been established to assess signals of climate charge in Irish hydrology. This network has detected an increasing trend in high river flows since 2000. Projections of future flows are beset by uncertainty at the catchment scale, but a broad signal of wetter winters and drier summers is evident across a number of independent studies.
Wind Speed	Minor increase (winter)	Medium	Observed wind speed over Ireland has not changed significantly in recent times, but it is anticipated that the distribution of wind will alter slightly in future, with winters marginally winder and summers marginally less so. Though the average wind speed is anticipated to change in only a minor way over the coming decades, the frequency of extreme windstorms is expected to increase due to alternations in the origin and track of tropical cyclones.

Local Context

9.17 The weather station at Cork Airport which is located approximately 15km to the south-west of the application site is considered representative of conditions experienced at the application site.

Temperature

9.18 The moderating influence of the Atlantic Ocean is felt throughout Ireland. The annual mean temperature for different areas in Ireland varies between mountainous regions, lowlands and the coast. Mean daily maximum temperatures are typically between 8.2 to 18.7°C and mean daily minimum temperatures are typically between 3.0 to 11.8°C.

9.19 The mean daily duration recording of sunshine for the area around Cork Airport is 3.9 hours. December is the dullest month, with 1.7 hours for Cork Airport of mean daily duration. May is the sunniest month, with 6.2 hours for Cork Airport and of mean daily duration, explained largely by its long days and finer weather.

Table 9- 2
Cork Airport 1981-2010 Temperature Averages

Temperature (degrees Celsius)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Mean Daily Max	8.2	8.3	9.9	11.8	14.4	17	18.7	18.5	16.5	13.2	10.3	8.5	12.9
Mean Daily Min	3.0	3.1	4.0	4.9	7.4	10.0	11.8	11.8	10.2	7.7	5.2	3.7	6.9
Mean Temperature	5.6	5.7	6.9	8.4	10.9	13.5	15.3	15.2	13.3	10.5	7.8	6.1	9.5

Wind

9.20 Results from the synoptic meteorological station at Cork Airport, located approx. 15km south-west of the application site over the period 1990-2007, indicate that the main wind direction is from a west and south-westerly direction. The lowest frequency is for winds blowing from the east and northeast direction.

9.21 The mean yearly wind speed at Cork Airport over the period 1981 to 2010 is 10.5 knots, or 5.4 m/s, with maximum gusts of 65.9 knots or 33.9 m/s. The average number of gale days per year is 10.8; indicating that the area is "windy", without experiencing the extreme gusts that occur on the west coast (Table 9-3).

Table 9- 3
Cork Airport Wind

WIND (knots)	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Year
Mean monthly speed	12.1	12.0	11.6	10.3	10.1	9.4	9.0	9.0	9.4	10.7	10.9	11.6	10.5
Max. gust	78.0	83.0	70.0	62.0	59.0	49.0	57.0	54.0	58.0	75.0	66.0	80.0	65.9
Max. mean 10-minute speed	52.0	54.0	43.0	40.0	40.0	33.0	40.0	38.0	39.0	48.0	46.0	56.0	44.1
Avg days with gales	2.3	1.8	1.3	0.3	0.3	0.0	0.1	0.2	0.3	1.0	1.2	1.9	10.8

Rainfall / Precipitation

9.22 During the period 1981-2010, long-term monthly rates of precipitation were between 76.5mm and 133.1mm at the Cork Airport station, with winter months receiving the heaviest amounts. The mean of the Met Eireann records indicates that average annual rainfall around Cork Airport is approximately 1227.9mm / year; refer to Table 9-4. The average rainfall data indicates that the greatest daily total (73.2mm) falls in the month of July.

Table 9- 4
Average Precipitation Cork Airport (mm) 1981-2010

Rainfall (mm)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Mean Monthly Total	131.4	97.8	97.6	76.5	82.3	80.9	78.8	96.8	94.6	138.2	120.0	133.1	1227.9
Greatest Daily Total	45.7	49.9	55.2	34.2	34.9	59.7	73.2	60.9	58.9	52.1	47.9	41.9	73.2
Mean num. of days with ≥ 0.2mm	20	17	19	16	15	14	15	15	16	19	19	19	204

9.23 Rainfall is an important climatological parameter in the generation or control of dust; sufficient amounts of rainfall can suppress dust at the source and eliminate the pathway to the receptor. According to Arup Consulting Engineers (1995)[2], rainfall greater than 0.2mm per day is sufficient to suppress dust emissions – refer to EIAR Chapter 8 (Air Quality). For the 30-year period (1981-2010) Cork Airport has recorded an average of 204 days per year (55%) where rainfall is equal to or above 0.2mm.

[2] Arup Environmental. Environment Effects of Surface Mineral Workings. UK DoE, October 1995

Sea Level Rising and Storm Surge

9.24 Relative sea level for Ireland is rising 1 mm/y on average, although there are significant regional variations (Devoy (2008)).

9.25 Coastal flooding events, particularly those associated with storm surge events that occur in combination with spring tides can cause devastating effect. Towards the end of the century there is likely to be an increase in the number of intense cyclones and associated strong winds, over the North Atlantic; a slight shift of the storm tracks is also likely. These changes will have a direct impact on storm surges. Rising sea levels will enhance the impact of surges. According to the research of Lowe et al. (2001), along the south Irish Sea coast the surge height is dominated by the low-pressure effect, with the wind forcing providing only 16% of the surge height.

9.26 Model projections of climate change impact on storm surge in the Irish Sea was made for two 30-year time-slice periods (1961–1990 and 2031–2060). A climate change scenario characterized by low population growth, rapid economic growth and rapid introduction of new and efficient technologies (the so-called SRES A1B emission scenario in the IPCC report of 2000). The atmospheric CO2 concentration in this scenario reaches 720 ppm at the end of 21st century and the global mean temperature will rise about 3.8 degrees Celsius by the end of this century (relative to the mean temperature between 1961 and 1990). From their analysis Wang et al. (2008) concluded that their model is capable of reproducing storm surge events with reasonable accuracy, supporting its use as a suitable tool in climate change studies.

9.27 For 2031–2060 relative to 1961–1990 changes (%) in the annual mean wind speed are relatively small; there is an increasing tendency along the west and north-west coast of Ireland and part of the UK coast, but a decrease over the open sea. For the difference changes of mean sea level pressure, the distribution pattern shows an increase around Ireland and to the south, and a decrease to the northwest. This is consistent with an increase in the frequency of intense cyclones over the area in the future.

9.28 Study shows that storm surge heights in the range 50–100 cm are increasing in frequency around all Irish coastal areas from 1961–1990 to 2031–2060; up to 20% in the west and northwest. There is also a significant increase in the height of the extreme surges along the west and east coasts, with most of the extreme surges occurring in wintertime. Changes in extreme surge heights also appear to be related to changes in extreme wind speeds and mean sea level pressure. There are also significant changes in the return values of surge heights.

9.29 Due the complex bathymetry in the continental shelf area, some non-local surge propagating along the coast also caused the discrepancy between the surge height and wind speed. The significant test results show that large fraction of the extreme surge heights in the southern Irish sea area are significant at 10% level, while almost non-significant in the northern area, which is totally different from the extreme wind speed distribution.

IMPACT ASSESSMENT

Methodology

9.30 In Ireland some sectors have independently begun the process of identifying key vulnerabilities for their activities. The report by the Irish Academy of Engineering, Ireland at Risk Critical Infrastructure – Adaptation for Climate Change (The Irish Academy of Engineering, 2009) and the report by the

Heritage Council and Fáilte Ireland (the National Tourism Development Authority), Climate Change, Heritage and Tourism, Implications for Ireland's Coast and Inland Waterways (ed. Kelly and Stack, 2009) are examples of initiatives of this kind.

9.31 Other research work on adaptation in specific sectors has been carried out or commissioned by other Government Departments/bodies such as the OPW, CoFoRD (programme of competitive forest research for development research programme, etc. (e.g. CLIMADAPT).

9.32 A National Climate Change Vulnerability Scoping Study (Sweeney and Coll, 2012) was undertaken to identify first generation vulnerabilities for Ireland based on a sensitivity analysis across key sectors. The analysis identified a clustering of impacts and their importance in relation to an assessment of likely resilience by sector. The assessment methodology used was an impacts-first, science-first classical approach. The priority sectors identified are: biodiversity and fisheries; water resources and the built coastal environment; forestry and agriculture. As each sector develops its sectoral adaptation plan (under the Climate Action and Low Carbon Development Act 2015), detailed vulnerability and risk analysis will be required. Some preliminary work has been undertaken on costing the impacts of climate change in Ireland. This is now being supported by more detailed analysis of the current and future costs of flood risk management.

9.33 The implementation of adaptation is being supported by the development of a suite of guidelines, tools and approaches. These include the Local Authority Adaptation Strategy Development Guideline; and the Irish climate information platform "Climate Ireland", which includes data, information, tools and approaches for local level adaptation decision making. Work is ongoing to develop sectoral decision-making tools and supports.

9.34 The EPA is currently funding a research project called Urb-Adapt which aims to identify the impact of climate change on Dublin city and surrounding towns within the greater Dublin region. The project aims to identify possible risks to the population living in that area and future risks posed to it by the changing climate.

9.35 There are no specific tools developed for assessing climate change for extraction industry. The Climate Change and Major Project guideline on how to make vulnerable investments resilient to climate change provides methodology for undertaking a vulnerability and risk assessment.

9.36 Climate change adaptation and mitigation shall be integrated in the preparation and approval of proposed development. Adaptation seeks to ensure adequate resilience of proposed development to the adverse impacts of climate change based on Vulnerability. Mitigation seeks to reduce the emissions greenhouse.

Development Vulnerability

9.37 The aim of the vulnerability assessment is to identify the relevant climate hazards for the development at the foreseen location. The main steps include identifying and combining the sensitivity and exposure of the project which will describe the vulnerability, the risk will be defined as likelihood and impact.

9.38 Adaptation through project options, appraisal, and planning will depend on the assessed project vulnerability and risk.

9.39 Timescale for the project vulnerability and risk assessment shall correspond to the lifespan of the project. During the lifespan, there could be significant changes in frequency and intensity of weather events due to climate change, which should be taken into account. Detailed methodology charts for development vulnerability assessment are presented in Appendix 9- B.

Greenhouse Gases Emissions

9.40 All projects have the potential to emit greenhouse gas (GHG) emissions to atmosphere during the construction, operational and decommissioning phase of the development. Direct GHG emissions may be caused by operational activities, and project decommissioning. Indirect GHG emissions may be due to increased demand for energy and indirect GHG activities. Indirect GHG activities are linked to the implementation of the proposed project and may include transport, office space heating of buildings or loss of habitats that provide carbon sequestration, (e.g. through land-use change). The significance of project's GHG emissions should be based on its net impact, which may be positive or negative. Where GHG emissions cannot be avoided, significance of project's emissions shall be reduced by mitigation or project design. Where GHG emissions remain significant but cannot be reduced further approaches to compensate project emissions should be considered.

9.41 Currently in Ireland, there is no set methodology to evaluate significance criteria or a defined threshold for GHG emissions for mineral extraction industry. Due to the inconsistences between the different methods and their assumptions for assessment, there is no single agreed method by which to assess a project carbon budget. The method of assessment varies according to the type and scale of the development.

9.42 Due to a lack of guidelines and an established methodology, the assessment of significance of the GHG emissions is based on whether the development's GHG emissions cumulatively represent a considerable contribution to the global atmosphere and whether the development as continued or extended will replace existing development that would have a higher GHG profile.

9.43 Where the GHG emissions cannot be avoided, the mitigation should aim to reduce the development emissions at all stages.

Assessment

Development Vulnerability

9.44 The aim of the vulnerability assessment is to identify the relevant climate hazards for the project at the foreseen location. Detailed development vulnerability assessment for the proposed development is presented in Appendix 9-C.

9.45 Based on the development vulnerability assessment, measures to improve the resilience of the project to extreme rainfall, flood, flash flood, storms, and winds, are required.

9.46 The relative sea level rise (c. 25 cm over the next 50 years) and storm surges (50 to 100cm) will not materially impact on the quarry development over its operational life due to the topographic level differences between Rossmore Bay and the southern boundary of the property.

9.47 The OPW national coastal / tidal flood mapping for Cork harbour shows that the quarry void is liable to flood during a Medium Probability flood event in Cork harbour estuary.

9.48 The OPW Medium Probability flood events have approximately a 1-in-a-200 chance of occurring or being exceeded in any given year. This is also referred to as an Annual Exceedance Probability (AEP) of 0.5%.

9.49 The available OPW flood mapping (www.floodinfo.ie) indicates that the quarry is liable to flood via a low point along the southern edge of the quarry site.

9.50 The coastal / tidal flood level in Cork harbour has been modelled under the CFRAMS project and the modelled 0.5% AEP and 0.1% AEP flood levels are shown in Table 9-5 below. The OPW 0.5% AEP flood event modelled water level ranges from 2.73mOD to 2.86mOD and the 0.1% AEP event modelled water level ranges from 2.89mOD to 3.02mOD.

Table 9- 5
OPW CFRAMS Modelled Flood Levels in Cork Harbour Estuary

Location	CFRAM Model Node No.	Flood Water Level 0.5% AEP (mOD)	Flood Water Level 0.1% AEP (mOD)
Passage West	10	2.73	2.89
Glounthaune	11	2.86	3.02
Little Island	08	2.76	2.91
Ballynacorra / Midleton	24	2.76	2.91

9.51 The modelled water level of 2.86mOD for the 0.5% AEP flood event in Cork harbour is c. 1.93m below the lowest surveyed point on the crest of the berm along the southern boundary of the quarry, indicating that the berm will not be overtopped by the modelled flood waters in the estuary.

9.52 The OPW CFRAMS modelled flooding of the site is based on the OPW's national Digital Terrain Model (DTM) which does not include defences or berms. It should be noted that the national DTM does not include the berm along the southern boundary of the quarry and therefore shows the quarry as being liable to flood from the modelled water levels. However, as will be discussed in later sections of this report, site specific data in the form of topographic levels taken at site along with other evidence shows that the proposed development is in line with the principles of the flood planning guidelines in relation to flood risk management.

Greenhouse Gas Emissions

9.53 For the purpose of this assessment, GHG emissions have been calculated for the quarry development based on energy and fuel use, assuming a maximum limestone production of up to 375,000 tonnes / year.

9.54 Based on a 48-week year, 5.5 days per week, the above operations will, on a cumulative basis, result in an average of maximum of 186 daily trips. It has been assumed that the average distance travelled for one movement will be 50km.

9.55 Total energy consumption at Rossmore in 2020 was 9,329,633 kWh.

9.56 Total cumulative annual GHG emissions for the proposed development are presented in Table 9-6.

Table 9- 6
GHG Emissions Calculations

Type	Value	Distance Travelled(km)	Conversion factor	Calculated	Total annual CO_2e kg
Traffic (movements)	49104	50	0.71266	3499.446	-
Total Energy	9,329,633		0.35156	3279925.777	-
TOTAL					3283425.223

9.57 Based on the calculated total of 3283425.223 CO_{2e} kg and a comparison to Ireland's 2018 emissions value of 60.51 MTonnes of CO_{2e}, it is assessed that proposed operations would represent a maximum of just 0.005 % of Ireland's annual CO_{2e} emissions for the duration.

Major Accidents

9.58 Accidents, malfunctions and unplanned events refer to events or upset conditions that are not part of any activity or normal operation of the proposed development planned by the Applicant. Even with the best planning and the implementation of preventative measures, the potential exists for accidents, malfunctions or unplanned events to occur during the proposed quarry deepening activities.

9.59 Many accidents, malfunctions and unplanned events are, however, preventable and can be readily addressed or prevented by good planning, design, emergency response planning, and mitigation. In terms of climate change impact, the following unplanned events could have an effect on the local area:

- equipment malfunction;
- vehicle collision;
- accidental material spillages during transport.

9.60 In relation to climate change, the impacts of any unplanned events are considered to be negligible.

MITIGATION

9.61 Mitigation is designed to increase the resilience of the development, or wider environmental receptors, to climate change and should focus on increasing its capacity to absorb climate related shocks.

Project Adaptation against Expected Climate Change Effects

9.62 In the context of climate change adaptation to increase adaptive capacity of Rossmore Quarry, disaster risk reduction strategies shall be developed with a view to reducing vulnerability and increase resilience of the development. Significant incidents related to the climate change that affect operation of Rossmore Quarry shall be recorded for future analysis.

9.63 Based on the development vulnerability assessment, measures to improve the resilience of the project to extreme rainfall, flood, flash flood, storms, and winds are required. Table 9-7 details specific mitigation measures for Rossmore Quarry related to climate change adaptation.

Table 9- 7
Mitigation Measures Related to Climate Change Adaptation

Main Concerns Related to:	Mitigation Measures
Extreme Rainfall, Flood, Flash Flood	Design that allows for rising water levels and ground water levels.
	Robust water management system implemented
Storms and Winds	Project design can withstand increases high winds and storms
	Choice of equipment working at the project is weather efficient.
Risk Reduction Mechanism	Appropriate insurance for damage of assets / incidences.

Proposed Reduction of GHG Emissions

9.64 Lagan Materials Ltd shall adopt GHG monitoring programme at Rossmore Quarry. Based on the GHG monitoring results Lagan Materials Ltd shall establish short, medium, and long-term objectives and targets for GHG reduction programme and energy management plan.

9.65 Table 9-8 details specific mitigation measures for Rossmore Quarry related to GHG reduction programme.

Table 9- 8
Mitigation Measures Related to GHG Reduction Programme

Main Concerns Related to:	Mitigation Measures
Increased demand for energy	Consider using renewable energy sources/ suppliers. Use low carbon construction materials.
Direct GHG emissions	Use energy efficient machinery/ energy.
GHG emissions related to transport	Unnecessary equipment/ transport journeys should be avoided by management of transport and travel demands. Equipment should not be left idling.

MONITORING

Project Adaptation against Expected Climate Change Effects

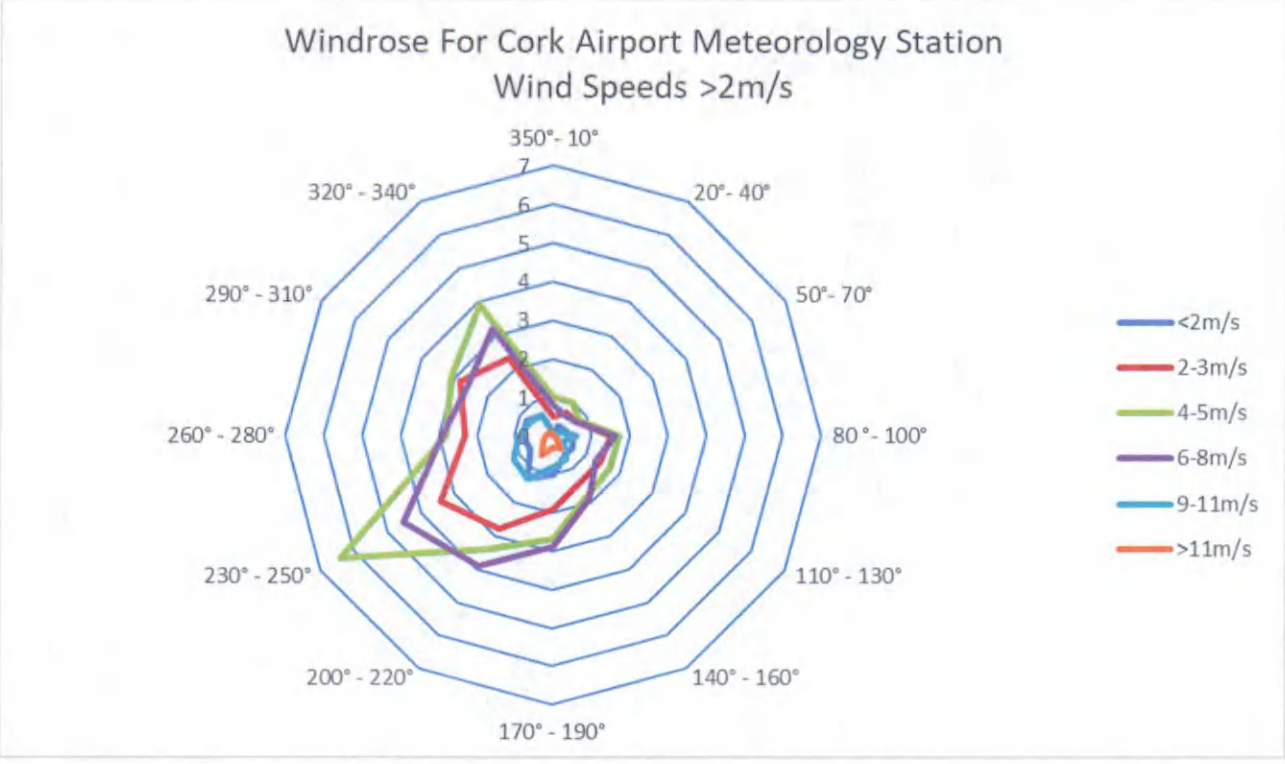
9.66 Monitoring of the climate resilience measures shall be undertaken on a regular basis, and details of these reviews shall be recorded under the Environmental Management System (EMS) for the development.

GHG Emissions

9.67 Monitor report and review GHG reduction progress.

FIGURES

Figure 9-1
Windrose for Cork Airport Meteorology Station



Appendix 9- A

Adaptation to Climate Change

9.68 The Irish National Policy Position on Climate Action and Low Carbon Development[3] establishes the fundamental national objective of achieving transition to a competitive, low carbon, climate-resilient and environmentally sustainable economy by 2050. It sets out the context for the objective; clarifies the level of greenhouse gas (GHG) mitigation ambition envisaged; and establishes the process to pursue and achieve the overall objective. Specifically, the National Policy Position envisages that policy development will be guided by a long-term vision based on:

- an aggregate reduction in carbon dioxide (CO2) emissions of at least 80% (compared to 1990 levels) by 2050 across the electricity generation, built environment and transport sectors;
- in parallel, an approach to carbon neutrality in the agriculture and land-use sector, including forestry, which does not compromise capacity for sustainable food production.

9.69 The evolution of climate policy in Ireland will be an iterative process based on the adoption by Government of a series of national plans over the period to 2050. Greenhouse gas mitigation and adaptation to the impacts of climate change are to be addressed in parallel national plans – respectively through National Mitigation Plans and National Climate Change Adaptation Frameworks. The plans will be continually updated, as well as being reviewed on a structured basis at appropriate intervals, and at a minimum, every five years. This will include early identification and ongoing updating of possible transition pathways to 2050 to inform sectoral strategic choices.

9.70 The Climate Action and Low Carbon Development Act 2015[4] was enacted in December 2015. The Act identified and provided for the development and submission to the Government of national mitigation and adaptation plans. It also established the institutional and governance framework within which these plans can be developed and implemented on a cyclical basis.

9.71 The Department of Communications, Climate Action & Environment (DCCAE) published a National Adaptation Framework (NAF) in January 2018[5]. The NAF sets out the national strategy to reduce the vulnerability of the country to the negative effects of climate change and to avail of positive impacts.

9.72 The NAF builds on the work already carried out under the National Climate Change Adaptation Network (NCCAF, 2012). Under the NAF a number of Government Departments will be required to prepare sectoral adaptation plans in relation to a priority area that they are responsible for. Local authorities are required to prepare local adaptation strategies. The NAF also aims to improve the enabling environment for adaptation through ongoing engagement with civil society, the private sector, and the research community.

9.73 The production of aggregates was not specifically identified under the NAF to prepare sectoral adaptation plans in line with the requirements of the Climate Action and Low Carbon Development Act.

9.74 The Climate Action Plan 2019[6] sets out the Irish Government's plan to tackle climate breakdown and achieve net zero greenhouse gas emissions by 2050.

[3] https://www.dccae.gov.ie/en-ie/climate-action/publications/Pages/National-Policy-Position.aspx
[4] https://www.dccae.gov.ie/en-ie/climate-action/legislation/Pages/Climate-Action-and-Low-Carbon-Development-Act-2015.aspx
[5] https://www.dccae.gov.ie/en-ie/climate-action/topics/adapting-to-climate-change/national-adaptation-framework/Pages/default.aspx
[6] https://www.dccae.gov.ie/en-ie/climate-action/publications/Pages/Climate-Action-Plan.aspx

9.75 The Plan clearly identifies the nature and scale of the challenge. It outlines the current state of play across key sectors including Electricity, Transport, Built Environment, Industry and Agriculture and charts a course towards ambitious decarbonisation targets. Reflecting the central priority climate change will have in our political and administrative systems into the future, the Plan sets out governance arrangements including carbon-proofing our policies, establishment of carbon budgets, a strengthened Climate Change Advisory Council and greater accountability to the Oireachtas.

9.76 This Plan clearly recognises that Ireland must significantly step up its commitments to tackle climate disruption. The leadership role both the Government and public bodies can play in taking early action on climate is fundamental to achieving our decarbonisation goals.

Sectoral Adaptation Plans

9.77 Under the non-statutory 2012 Framework, four Government Departments prepared draft sectoral plans covering five sectors. These plans are:

- Sectoral Adaptation Plan for Flood Risk Management (OPW, 2015);
- Adaptation Planning - Developing Resilience to Climate Change in the Irish Agriculture and Forest Sector (DAFM, 2017);
- Adaptation Planning - Developing Resilience to Climate Change in the Irish Transport Sector (DTTAS, 2017);
- Adaptation Plan for the Electricity and Gas Networks Sector (DCCAE, 2017).

9.78 As mentioned previously a number of Government Departments are required develop statutory sectoral adaptation plans under NAF. These are to be prepared in accordance with a six-step adaptation planning process described in the Sectoral Planning Guidelines for Climate Change Adaptation[7]. The guidelines aim to ensure that a coherent and consistent approach to adaptation planning will be adopted by the key sectors in Ireland. The completed plans include actions that:

- Mainstream (integrate) adaptation into key sectoral plans and policies;
- Identify and understand the key vulnerabilities, risks, and opportunities facing their sectors. This should include major cross cutting risks;
- Ensure that plans related to emergencies assigned to a sectoral department as lead Government department under the Strategic Emergency Planning Guidelines are climate proofed;
- Identify and collect information on the costs and benefits of adaptation within their sectors;
- Build capacity within their sectors to cope with climate change;
- Identify and address key research gaps within their sectors;
- Improve co-ordination with the local government sector;
- Develop appropriate monitoring and verification systems within their sectors.

9.79 Sectoral Adaptation Plans have already been published for the following twelve sectors under seven Government Departments[8]:

[7] https://www.dccae.gov.ie/documents/SPG%20Climate%20Change%20Adaptation.pdf
[8] https://www.dccae.gov.ie/en-ie/climate-action/topics/adapting-to-climate-change/national-adaptation-framework/sectoral-adaptation-planning/Pages/Sectoral.aspx

- Seafood - Department of Agriculture, Food and the Marine
- Agriculture - Department of Agriculture, Food and the Marine
- Forestry - Department of Agriculture, Food and the Marine
- Biodiversity - Department of Culture, Heritage and the Gaeltacht
- Built and Archaeological Heritage - Department of Culture, Heritage and the Gaeltacht
- Transport infrastructure - Department of Transport, Tourism and Sport
- Electricity and Gas Networks - Department of Communications, Climate Action and Environment
- Communications networks - Department of Communications, Climate Action and Environment
- Flood Risk Management - Office of Public Works
- Water Quality - Department of Housing, Planning and Local Government
- Water Services Infrastructure - Department of Housing, Planning and Local Government
- Health - Department of Health.

Local Level Adaptation

9.80 The National Adaptation Framework (NAF) identifies the critical role to be played by local authorities in addressing climate change adaptation. This will effectively build on their existing expertise and experience as first responders in emergency planning scenarios. Under the NAF each local authority has developed their own adaptation strategies in line with guidelines developed for the sector.

9.81 The NAF explores how local authorities might adopt a joint or regional approach to adaptation planning. In January 2018 the Department entered into a five-year financial commitment of €10m establishing four Climate Action Regional Offices (CAROs). Building on a business case prepared by the local government sector itself, this commitment recognises the significant obligation which has been placed on local government to develop and implement its own climate action measures, as well as the need to build capacity within the sector to engage effectively with climate change – both in terms of mitigation and adaptation.

9.82 The Climate Action Regional Offices are being operated by a lead local authority in the four different regions that have been grouped together based on a climate risk assessment with a focus on the predominant risk(s) in each geographical area. The establishment of these offices enables a more coordinated engagement across the whole of government and will help build on the experience and expertise which exists across the sector.

9.83 Table 9A-1 summarises the adaptation actions to climate change in Ireland.

Table 9A-1
Summary of Adaptation to Climate Change Actions in Ireland[9]

Item	Status	Programs
National Climate Adaptation Strategy	Legislation enacted. Statutory Framework adopted	Climate Action and Low Carbon Development Act 2015 National Adaptation Framework
Action Plans	Sectoral Adaptation Plans published. Local authority plans published.	Local Authority Adaptation Strategy Development Guidelines (2018) Sectoral Planning Guidelines for Climate Change Adaptation (2018) Local Authority Adaptation Support Tool
Impacts, Vulnerability and Adaptation Assessments	National Vulnerability Assessment	2012 National Climate Change Vulnerability Scoping Study Climate Change Impacts on Biodiversity in Ireland (2013) Climate change Impacts on Phenology in Ireland(2013) COCOADAPT (2013) 2013 Hydro Detect Project Robust Adaptation to Climate Change in the Water Sector in Ireland (2013) Ensemble of Regional Climate Projections for Ireland(2015) Urb-ADAPT Sectoral Adaptation Plan for Flood Risk Management (OPW, 2015). Adaptation Planning - Developing Resilience to Climate Change in the Irish Agriculture and Forest Sector (DAFM, 2017) Adaptation Planning - Developing Resilience to Climate Change in the Irish Transport Sector (DTTAS, 2017). Adaptation Plan for the Electricity and Gas Networks Sector (DCCAE, 2017).
Research Programs	EPA Research Programme (Climate Pillar)	http://www.epa.ie
Climate services / Met Office	Established	http://www.met.ie
Web Portal	Established	http://www.climateireland.ie
Monitoring, Indicators, Methodologies	Established	Ensemble of regional climate model projections for Ireland (EPA 2015) http://www.climatecouncil.ie/
Training, Education	Ongoing / in development	http://www.climateireland.ie

[9] http://climate-adapt.eea.europa.eu/countries-regions/countries/ireland

Green House Gas Emissions

9.84 Ireland is a party to both the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol, which together provide an international legal framework for addressing climate change.

9.85 In December 2015, an ambitious new legally binding, global agreement on climate change was agreed in Paris. The Paris Agreement aims to restrict global temperature rise to well below 2°C above pre-industrial levels, and to pursue efforts to limit the temperature increase to 1.5°C. It aims to increase global ability to adapt to the adverse impacts of climate change and to foster climate resilience and low greenhouse gas emissions development, in a manner that does not threaten sustainable food production. It also seeks to achieve a balance between anthropogenic emissions by sources, and removals by sinks, of greenhouse gases in the second half of this century.

9.86 The first Irish National Mitigation Plan[10] represents an initial step to set us on a pathway to achieve the level of decarbonisation required. It is a whole-of-Government Plan, reflecting in particular the central roles of the key Ministers responsible for the sectors covered by the Plan – Electricity Generation, the Built Environment, Transport and Agriculture, as well as drawing on the perspectives and responsibilities of a range of other Government Departments.

9.87 The measures that will be implemented through the plan will lay foundations for transitioning Ireland to a low carbon, climate resilient and environmentally sustainable economy by 2050. To support this ongoing work, the Plan also includes over 100 individual actions for various Ministers and public bodies to take forward.

9.88 Emissions reduction measures and actions set out in this National Mitigation Plan are aligned with and build upon commitments made in the 2015 Energy White Paper. The Paper will be guided by the following strategic objectives:

- policy will contribute to reductions in Ireland's greenhouse gas emissions and enhancement of sinks in a manner that achieves the optimum benefits at least cost;
- a stable and predictable policy and regulatory framework will be underpinned by rigorous analysis and appraisal, supported by strong research and analytical capacity;
- the Government will pursue investment, innovation and enterprise opportunities towards building a competitive, low carbon, climate-resilient and environmentally sustainable economy; and
- the citizen and communities will be at the centre of the transition.

Paris Agreement

9.89 The Paris Agreement entered into force on the 4th November 2016[11].

9.90 The Paris Agreement aims to tackle 95% of global emissions through 188 Nationally Determined Contributions (NDCs) which will increase in ambition over time. Ireland's contribution to the Paris Agreement will be via the NDC tabled by the EU on behalf of its Member States. This is a binding target for an overall reduction of at least 40% in greenhouse gas emissions by 2030 (relative to 1990 levels). The target will be delivered by the EU by 2030 through reductions in the Emissions Trading Scheme (ETS) and non-ETS sectors of 43% and 30% respectively (relative to 2005).

[10] https://www.dccae.gov.ie/en-ie/climate-action/topics/national-mitigation-plan/Pages/default.aspx
[11] https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement

Kyoto Protocol (2008 – 2012)

9.91 The EPA has overall responsibility for the national greenhouse gas inventory in Ireland's national system, which was established in 2007 under Article 5 of the Kyoto Protocol[12].

9.92 Ireland currently accounts for GHG emissions under the Kyoto Protocol. The Kyoto Protocol required Ireland to limit total national greenhouse gas emissions to 314.2 Mtonnes of CO_{2eq} over the five-year period 2008 – 2012 which is equivalent to 62.8 Mtonnes of CO_{2eq} per annum. The Kyoto Protocol limit is calculated as 13% above Ireland's 1990 baseline value which was established and fixed at 55.61 Mtonnes of CO_{2eq} following an in-depth review of Ireland's 2006 greenhouse gas inventory submission to the UNFCCC.[13]

EU 2021-2030 Targets for non-ETS sector emissions- Effort Sharing Regulations[14]

9.93 Under the EU Commission's Climate and Energy Package, sectors of the economy not covered by the EU ETS must reduce emissions by 30% by 2030 compared to 2005 as their contribution to the overall target.

9.94 The non-ETS sectors cover those sectors that are outside the EU Emissions Trading Scheme and includes agriculture, transport, built environment (residential, commercial/institutional), waste and non-energy intensive industry.

2015 Energy White Paper

9.95 The White Paper on Energy Policy, Ireland's Transition to a Low Carbon Energy Future 2015-2030[15], published in 2015, sets out a framework to guide energy policy in the period to 2030. The White Paper recognises that a radical transformation of our energy system is required to meet our national, EU and international climate objectives and sets a course for an energy sector where the State will provide the supports that enable consumers to become active energy citizens. It posits a policy approach where our energy system will change from one that is almost exclusively led by Government and utilities to one where individuals and communities are agents of change in the way Ireland generates, transmits, stores, conserves and uses energy. It sets out a vision, a framework and over 90 actions for Irish energy policy up to 2030 as we transition to a low carbon society and economy by 2050.

Catchment Flood Risk Assessment and Management (CFRAM) Programme[16]

9.96 The Catchment Flood Risk Assessment and Management (CFRAM) Programme (see www.cfram.ie) is the mechanism established to facilitate future adaptation to climate change. It provides for long-term flood risk management in Ireland and the embedment of flood risk assessment in the future development of capital projects. The future scenario flood maps produced under the CFRAM Programme facilitate this approach, inform other industrial sectors, and provide a valuable resource for local adaptation planning and sustainable land use management and planning.

[12] http://unfccc.int/kyoto_protocol/items/2830.php
[13] http://unfccc.int/files/national_reports/annex_i_natcom/submitted_natcom/application/pdf/nc6_br1_ire.pdf
[14] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:32018R0842

[15] https://www.dccae.gov.ie/en-ie/energy/publications/Pages/White-Paper-on-Energy-Policy.aspx
[16] https://www.cfram.ie/

EIA Directive 2014/52/EU

9.97 Directive 2014/52/EU[17] of the European parliament and of the Council of 16th April 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment had to be transposed into national law by 16th May 2017, necessitating changes in laws, regulations, and administrative provisions across a number of legislative codes.

9.98 Key changes introduced in the 2014 Directive (in Annex IV - Information referred to in Article 5(1) – Information for the Environmental Impact Assessment Report) and the national transposing regulations (the European Union (Planning and Development)(Environmental Impact Assessment) Regulations, S.I. No. 296 of 2018) include a requirement for information on the impact of a project on climate (for example the nature and magnitude of greenhouse gas emissions) and the vulnerability of the project to climate change to be provided in the Environmental Impact Assessment Report.

Guidelines

Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment (EC, 2013)[18]

9.99 EU Guidelines provide recommendations how to integrate climate change and biodiversity in Environmental Impact Assessment (EIA). The need for action on climate change and biodiversity loss is recognised across Europe and around the world. The guidelines contain explanation as to why climate change and biodiversity are so important in EIA, present the relevant EU-level policy background, provide advice on how to integrate climate change and biodiversity into selected stages of the EIA process. The annexes provide sources of further reading and links to other relevant information, data, and tools.

Assessing Greenhouse Gas Emissions and Evaluating their Significance (IEMA, 2017)[19]

9.100 IEMA Guidance provides information to assist practitioners with addressing greenhouse gas (GHG) emissions assessment and mitigation in statutory and non-statutory Environmental Impact Assessment (EIA). It complements IEMA's earlier guide on Climate Change Resilience and Adaptation and builds on the Climate Change Mitigation and EIA overarching principles. The requirement to consider this topic has resulted from the 2014 amendment to the EIA Directive.

Climate Change and Major Projects (EC, 2016)[20]

9.101 This publication provides guidance for assessing vulnerability and risk from Climate Change for major projects funded by the European Regional Development Fund (ERDF) and the Cohesion Fund and listed in the concerned operational programmes.

Sectoral Planning Guidelines for Climate Change Adaptation[21]

9.102 The guidelines aim to ensure that a coherent and consistent approach to adaptation planning is adopted by the key sectors in Ireland. Sectors preparing sectoral adaptation plans under the NAF are

[17] http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32014L0052
[18] http://ec.europa.eu/environment/eia/pdf/EIA%20Guidance.pdf
[19] https://www.iaia.org/pdf/wab/EIA%20Guide_GHG%20Assessment%20and%20Significance_IEMA_16May17.pdf
[20] https://ec.europa.eu/clima/sites/clima/files/docs/major_projects_en.pdf
[21] https://www.dccae.gov.ie/documents/SPG%20Climate%20Change%20Adaptation.pdf

required to prepare their plans in line with the process described in these guidelines while also being aware of the overall requirements regarding the development of sectoral adaptation plans.

Local Authority Adaptation Strategy Development Guidelines[22]

9.103 Guidance was produced to provide a consistent and coherent process for local authorities in helping them develop local adaptation strategies and contain information on the process of developing an adaptation strategy:

- provide background information on what adaptation entails and provides the rationale behind implementing a local scale adaptation strategy;
- outline the initial steps required in launching a strategy development process, describing key roles and who can fulfil them, and setting out important factors to consider in the early stages of strategy development;
- explains how to assess the role that weather extremes and periods of climate variability currently play within the local jurisdiction, and it describes why doing so is a fundamental element of working towards a more climate-resilient future;
- moves from the present to the identification of future climate risks, describing a staged risk assessment process and positioning the adaptation strategy within more detailed risk assessments undertaken during shorter term decision-making processes such as statutory plan-making;
- on the basis of the risk assessment process undertaken determination of adaptation goals and objectives and the types of adaptation actions that are available and outlines how each might be identified, assessed, prioritised and implemented is described;
- outlines the steps required to move from a phase of planning to one of implementation, and it explains the importance of monitoring and evaluation in ensuring that the strategy is achieving its anticipated adaptation objectives.

[22]https://www.dccae.gov.ie/documents/LA%20Adaptation%20Guidelines.pdf

Appendix 9- B

Development Vulnerability Assessment Methodology

9.104 The scale for assessing the likelihood of a climate hazard is presented in Table 9B-1. The output of the likelihood analysis is an estimation of the likelihood for each of the essential climate variables and hazards.

Table 9B- 1
Scale of Likelihood of Climate Hazard

Term	Qualitative	Quantitative
Rare	Highly unlikely to occur	5%
Unlikely	Unlikely to occur	20%
Moderate	As likely to Occur	50%
Likely	Likely to Occur	80%
Almost certain	Very likely to occur	95%

9.105 The scale for assessing the potential impact of a climate hazard is presented in Table 9B-2. The impact analysis provides an assessment of the potential impact of each of the essential climate variables and hazards.

Table 9B- 2
Example Table for Climate Hazard Impact Analysis

Risk Areas	Insignificant	Minor	Moderate	Major	Catastrophic
Asset damage, engineering, operational					
Safety and Health					
Environment					
Social					
Financial					
Reputation					

9.106 The matrix for assessing the sensitivity of project to climate hazards is presented in Table 9B-3. The sensitivity is summarised, along with the ranking of the relevant climate variables and hazards relating to the project.

Table 9B- 3
Example Table for Sensitivity of Project to Climate Hazards

	Extreme rainfall, flood , flash flood	Heat	Drought	Wildlife Fires	Storms and winds	Landslides	Cold Spells and snow	Freeze –thaw damage	Rising sea levels
On site assets									
Inputs - Water									
Inputs - Energy									
Outputs - product									
Transport links									

9.107 The matrix for assessing exposure of a project to climate hazards is presented in Table 9B-4. The exposure analysis ranks climate variables and hazards as low, medium or high based on current and future climate.

Table 9B- 4
Example Table of Exposure of the Project to Climate Hazards

	Extreme rainfall, flood , flash flood	Heat	Drought	Wildlife Fires	Storms and winds	Landslides	Cold Spells and snow	Freeze –thaw damage	Rising sea levels	Storm surge
Current Climate										
Future Climate										

9.108 An example of the vulnerability of a project to climate hazards is presented in Table 9B-5. The vulnerability combines the sensitivity and the exposure analysis.

Table 9B- 5
Example Table for Vulnerability Analysis of Project to Climate Hazards

Sensitivity	Exposure (Current & Future Climate)		
	Low	Medium	High
Low			
Medium			
High			

Appendix 9- C

Development Vulnerability Assessment

9.109 The likelihood analysis of the proposed development to climate hazards is presented in Table 9C-1.

9.110 The proposed development has been assessed to be moderate affected by extreme rainfall, flood, flash flood, storms, and winds. The proposed development would be unlikely affected to cold spells and snow. The proposed development would not be affected by heat, drought, wildlife fires, landslides, and freeze –thaw damage. The proposed development will likely be affected by rising sea level and storm surge.

Table 9C- 1
Analysis of Likelihood of Climate Hazards at Rossmore Quarry

	Extreme rainfall, flood , flash flood	Heat	Drought	Wildlife Fires	Storms and winds	Landslides	Cold Spells and snow	Freeze –thaw damage	Rising sea levels	Storm Surge
Rare		√	√	√		√		√		
Unlikely							√			
Moderate	√				√				√	√
Likely										
Almost certain										

9.111 Table 9C-2 shows the climate hazard impact analysis of the proposed development. It was assessed that climate hazards will have major impacts on health and safety, the environment and financial areas and climate hazards will have moderate impacts on asset damage and engineering, operational, social and reputation areas.

Table 9C- 2
Climate Hazard Impact Analysis

Risk Areas	Insignificant	Minor	Moderate	Major	Catastrophic
Asset damage, engineering, operational			√		
Safety and Health				√	
Environment				√	
Social			√		
Financial				√	
Reputation			√		

9.112 Table 9C-3 below assesses the sensitivity of the project to climate hazard. It was assessed that site assets, energy inputs and transport links are of high sensitivity to extreme rainfall, flood, flash floods, storms and winds; storm surge, water inputs will be highly sensitive to droughts. On site

assets will be medium sensitive to cold spells and snow and freeze – thaw damage. Transport links will be medium sensitive to cold spells and snow.

Table 9C- 3
Sensitivity of Project to Climate Hazards

	Extreme rainfall, flood , flash flood	Heat	Drought	Wildlife Fires	Storms and winds	Landslides	Cold Spells and snow	Freeze –thaw damage	Rising sea levels	Storm surge
On site assets	High	Low	Low	Low	High	Low	Medium	Medium	Low	Low
Inputs - Water	Low	Low	High	Low	Low	Low	Low	Low	Low	Low
Inputs - Energy	High	Low	Low	Low	High	Low	Low	Low	Low	Low
Outputs - product	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low
Transport links	High	Low	Low	Low	High	Low	Medium	Low	Low	Low

9.113 In Table 9C-4, the exposure of the project to climate hazards was assessed. In the current climate, the exposure of the project extreme rainfall, flood, flash flood, storms and winds rising sea levels and storm surge has been assessed to be medium. The project was assessed to have high future climate exposure to rainfall, flood, flash flood, storms, and winds.

Table 9C- 4
Exposure of the Development to Climate Hazards without Mitigation

	Extreme rainfall, flood, flash flood	Heat	Drought	Wildlife Fires	Storms and Winds	Landslides	Cold Spells and Snow	Freeze –thaw damage	Rising sea levels	Storm surge
Current Climate	Medium	Low	Low	Low	Medium	Low	Low	Low	Low	Low
Future Climate	High	Low	Low	Low	High	Low	Low	Low	Medium	Medium

9.114 Table 9C-5 shows the vulnerability analysis of the project to climate hazards; it combines the sensitivity and the exposure analysis. The project was assessed to be most sensitive to extreme rainfall, flood, flash flood, storms, and winds.

Table 9C- 5

Vulnerability Analysis of Project to Climate Hazards

Sensitivity	Exposure (Current & Future Climate)		
	Low	Medium	High
Low	Freeze –thaw damage, Landslides, Drought, Heat, Wildlife Fires	Rising sea level, storm surges	
Medium		Cold Spells and Snow	
High			Extreme rainfall, flood, flash flood, Storms and winds