Denbigh Quarry

Dust Impact Assessment

Breedon Trading Limited

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Basis of Report

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1.0 Introduction

SLR Consulting Ltd has been commissioned by Breedon Trading Limited to undertake a Mineral Dust Impact Assessment in support of a proposed western extension to Denbigh Quarry (the 'Site'). The live planning application (reference: 01/2022/0523) describes the proposed development as a '*Consolidating application for the extension of winning and working of limestone, importation of inert waste and restoration to amenity land*'.

The planning application was submitted to Denbighshire County Council (DCC) in June 2022, inclusive of an Air Quality Assessment which formed part of the wider Environmental Impact Assessment[1] (EIA).

Following critical appraisal by Enzygo Environmental Consultants (on behalf of DCC), several comments have been raised in relation to the air quality assessment, as follows:

> "*We consider that the activity with the greatest potential to exceed 'medium' dust magnitude is blasting. IAQM guidance suggests that blasting of hard materials of a high dust potential can be considered as a 'large' magnitude. A judgement has been made that a moderate working area and extraction amounts/frequencies lead, on balance, to a 'medium' magnitude. Given that there are no specific dust mitigation measures relating to blasting activities specified (such as damping, stemming materials etc), it would have been considered more robust to consider as potential magnitude of 'large' as a worst-case assessment or sensitivity test. […]*
>
> *The meteorological data used for the assessment has been taken from the Shawbury station. The assessment incorrectly states this as being 12 km from the site, whereas as Shawbury is in excess of 65 km from the site. There are potentially 5 or 6 closer meteorological stations including Rhyl that could be considered as better representations of on-site conditions. I would request that consideration is given to a closer and potentially more representative meteorological data set and the assessment revised.*"

This report aims to address the above comments. It describes the scope, relevant legislation, assessment methodology and the baseline conditions currently existing at the Site and its surroundings. It then considers any potential impacts of the proposed development and an evaluation of the air quality and dust effects.

1.1 Proposed Development

The proposals include for a western extension to the existing quarry, and a consolidated working scheme for the Site. The extension covers an area of approximately 5ha, to be worked over five distinct phases and will provide an approximate lifespan of 25 years (dependent on market fluctuations), followed by a further 2 years required for restoration activities.

The immediate Site locale is bounded by:

- The Crest Mawr Wood Site of Special Scientific Interest (SSSI) to the north, with agricultural land beyond;
- Ancient Woodland to the east, with Ffordd Y Graig and industrial premises beyond;
- The Graig Quarry SSSI to the south, with residential premises beyond; and
- The Crest Mawr Wood SSSI to the west, with agricultural land beyond.

1.2 Scope

This assessment considers the impact of the proposal on the local air quality environment. Regarding air quality, the key aspects of the proposed approach are as follows:

[1] Denbigh Quarry, Plas Chambres Road, Denbigh, Denbighshire LI16 3YE. Consolidating Application for The Extension of Winning and Working of Limestone, Importation of Inert Restoration Material and Restoration to Amenity. Volume 2. Environmental Statement. February 2022.

- baseline evaluation;
- an assessment of dust emissions and associated impacts and effects; and
- review of dust control measures at the Site and recommendations for additional controls and mitigation measures, where required.

The need for an assessment of offsite vehicle emissions has been reviewed and screened out of this assessment, as it is understood that production rates and associated vehicle movements are not proposed to change from current permitted levels.

2.0 Relevant Air Quality Legislation and Guidance

2.1 UK Legislation

2.1.1 Air Quality Strategy

The UK Government and the devolved administrations are required under the Environment Act 1995 to produce a national air quality strategy to improve air quality and review this strategy every 5 years.

In 2020, the Welsh Government published The Clean Air Plan for Wales (CAPfW)[2]. This sets out the strategic framework for air quality management in Wales and actions to improve air quality and reduce the impacts of air pollution on human health, biodiversity, the natural environment and the Welsh economy.

In 2023, following a review of the National Air Quality Strategy for England, Scotland, Wales and Northern Ireland, which was published in 2007[3], the Welsh Government formerly adopted The Clean Air Plan for Wales as the National Air Quality Strategy for Wales, to replace the 2007 document. However, they have retained the air quality objectives of the former 2007 National Air Quality Strategy.

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.

Many of the objectives are made statutory in Wales for the purpose of Local Air Quality Management (LAQM).

The objectives for the pollutants considered in this assessment (collectively termed Air Quality Objectives (AQOs) throughout this report) are shown in Table 2-1.

Table 2-1: Relevant Air Quality Objectives

Pollutant	AQO (µg/m^3)	Averaging Period
Particles (PM_{10})	40	Annual mean
	50	24-hour mean (not to be exceeded on more than 35 occasions per annum)
Particles ($PM_{2.5}$)	25	Annual mean

2.1.2 Applicable Public Exposure

In accordance with the Department for Environment, Food and Rural Affairs' (Defra) Local Air Quality Management Technical Guidance (LAQM.TG(22))[4], the AQOs should be assessed at locations where members of the public are likely to be regularly present and are likely to be exposed for a period of time appropriate to the averaging period of the objective. A summary of relevant exposure for the AQOs are shown below in Table 2-2.

[2] Welsh Government (2020), The Clean Air Plan for Wales.

[3] Defra (2007) The air quality strategy for England, Scotland, Wales and Northern Ireland: Volume 1

[4] Local Air Quality Management Technical Guidance (TG22), Published by Defra in partnership with the Scottish Government, Welsh Government and Department of Agriculture, Environment and Rural Affairs. August 2022.

Table 2-2: Relevant Public Exposure

AQO Averaging Period	AQOs should apply at:	AQOs should not apply at:
Annual mean	Building facades of residential properties, schools, hospitals etc.	Facades of offices Hotels Gardens of residences Kerbside sites
24-hour mean	As above together with hotels and gardens of residential properties	Kerbside sites where public exposure if expected to be short term

2.1.3 Local Air Quality Management

Part IV of the Environment Act 1995 induces a statutory duty for local authorities to undergo a process of LAQM. This requires local authorities to review and assess air quality within their boundaries to determine the likeliness of compliance, regularly and systematically.

Where any of the prescribed objectives are not likely to be achieved, the authority must designate an Air Quality Management Area (AQMA). For each AQMA, the local authority is required to prepare an Air Quality Action Plan (AQAP), which details measures the authority intends to introduce to deliver improvements in local air quality in pursuit of the objective. AQMAs can give rise to potential constraints to development, or at least a higher degree of scrutiny to air quality assessment work. Local authorities therefore have formal powers to control air quality through a combination of LAQM and through application of wider planning policies.

2.1.4 General Nuisance Legislation

Part III of the Environmental Protection Act (EPA) 1990 (as amended by the Noise and Statutory Nuisance Act 1993) contains the main legislation on Statutory Nuisance and allows Local Authorities and individuals to take action to prevent a statutory nuisance. Section 79 of the EPA defines as a potential Statutory Nuisance amongst other things, smoke, fumes, dust and smells emitted from industrial, trade or business premises so as to be prejudicial to health or a nuisance. It also defines as a nuisance accumulation or deposit which is prejudicial to health.

There are no statutory limit values for dust deposition above which 'nuisance' is deemed to exist: 'nuisance' is a subjective concept, and its perception is highly dependent upon the existing conditions and the change which has occurred.

Dust deposition is not covered within the National Air Quality Strategy as it typically relates to nuisance effects as opposed to potential health effects. When the rate of accumulation of this coarser fraction of 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, and there are no statutory numerical limits that define at what level dust becomes a nuisance.

2.2 Planning Policy

2.2.1 National Planning Policy

The Planning Policy Wales (PPW)[5] document sets out the Welsh Government's land use planning policies for development across Wales.

The document states the following in relation to air quality and planning:

> "*6.1.32 When considering a scheme of enabling development, planning permission should be granted only where all of the following can be applied:*

[5] Welsh Government, Planning Policy Wales, Edition 11, February 2021.

[…]

- *the enabling development does not give rise to significant risks, for example residential development in the floodplain or significantly impact on air quality or soundscape.*"

Furthermore, in relation to addressing air quality in the planning system:

"*6.7.4 The planning system should maximise its contribution to achieving the well-being goals, and in particular a healthier Wales, by aiming to reduce average population exposure to air and noise pollution alongside action to tackle high pollution hotspots. In doing so, it should consider the long-term effects of current and predicted levels of air and noise pollution on individuals, society and the environment and identify and pursue any opportunities to reduce, or at least, minimise population exposure to air and noise pollution, and improve soundscapes, where it is practical and feasible to do so.*

6.7.5 In taking forward these broad objectives the key planning policy principle is to consider the effects which proposed developments may have on air or soundscape quality and the effects which existing air or soundscape quality may have on proposed developments. Air Quality and soundscape influence choice of location and distribution of development and it will be important to consider the relationship of proposed development to existing development and its surrounding area and its potential to exacerbate or create poor air quality or inappropriate soundscapes. The agent of change principle says that a business or person responsible for introducing a change is responsible for managing that change. In practice, for example, this means a developer would have to ensure that solutions to address air quality or noise from nearby pre-existing infrastructure, businesses or venues can be found and implemented as part of ensuring development is acceptable."

Specifically in relation to minerals developments and air quality, PPW states:

"*The role of the planning authority in relation to mineral extraction is to balance the fundamental requirement to ensure the adequate supply of minerals with the protection of amenity and the environment. The key principles are to:*

[…]

- *reduce the impact of mineral extraction and related operations during the period of working by ensuring that impacts on relevant environmental qualities caused by mineral extraction and transportation, for example air quality and soundscape, are within acceptable limits; and […]*"

2.2.2 National Policy - Minerals Planning Policy Wales Minerals Technical Note 1: Aggregates

Minerals Planning Policy Wales, Minerals Technical Note Wales 1: Aggregates[6] was published in March 2004. The technical advice note sets out advice on the mechanisms for delivering policy for aggregates extraction by mineral planning authorities.

2.2.3 Local Planning Policy

2.2.3.1 Denbighshire County Council Local Development Plan

The Denbighshire County Council Local Development Plan[7] (LDP) was adopted in June 2013. The following policies are considered relevant to this assessment.

[6] Minerals Planning Policy Wales (2004) Minerals Technical Note Wales 1: Aggregates

[7] Denbighshire County Council (2013) Local Development Plan

Policy PSE 16 – Mineral buffer zones:

> *"Extensions to quarries will only be permitted where a suitable buffer can be retained, i.e. where such an extension would not cause other development to become part of a buffer, and where it can be demonstrated that there is no unacceptable impact on the environment or human health.*

Policy PSE 17 – Future mineral extraction:

> "[…]
>
> iv) *Applications that accord with the above criteria will be permitted provided that all the following criteria are met:*
>
> *a. An appropriate buffer is included, within which no mineral working, or sensitive development will be allowed; and*
>
> *[…]*
>
> *e. Measures to reduce the impact of dust, smoke and fumes are implemented; and*
>
> *f. Suitable blasting controls and implemented; and*
>
> *[…]"*

DCC are in the process of updating the LDP. The Denbighshire Replacement Local Development Plan 2018 – 2033 Revised Delivery Agreement[8] states that the current adopted Denbighshire LDP 2006 – 2021 will remain the statutory LDP until it is replaced by the revised LDP.

2.3 Relevant Guidance

2.3.1 The Mineral Industry Research Organisation (MIRO)

A 'Good Practice Guide' issued on behalf of MIRO was released in 2011. The purpose of the Guide is to assist in the identification, control and management of dust arising from the extractive industries. The guidance provides a useful reference for available methods of mitigation and monitoring.

2.3.2 IAQM Guidance on the Assessment of Mineral Dust Impacts for Planning

The Institute of Air Quality Management (IAQM) released the document '*Guidance on the Assessment of Mineral Dust Impacts for Planning*'[9] in 2016.

Designed specifically for the planning process, the guidance is based upon the judgement of the IAQM Minerals Working Group. The IAQM guidance provides an effective methodology in the absence of any other guidance for the assessment of dust from mineral sites.

2.3.3 Defra Local Air Quality Management Technical Guidance

Defra Technical Guidance LAQM.TG(22) was published for use by local authorities in their LAQM review and assessment work. The document provides key guidance in aspects of air quality assessment, including screening, monitoring, use of monitoring data, use of background data and detailed modelling of traffic emissions that are applicable to air quality assessments.

[8] Denbighshire County Council (2022) Denbighshire Replacement Local Development Plan 2018 – 2033 Revised Delivery Agreement

[9] IAQM (2016) Guidance on the Assessment of Mineral Dust Impacts for Planning, v1.1.

3.0 Assessment Methodology

3.1 Dust Impact Assessment

The assessment of dust impacts is undertaken with reference to relevant research and best practice guidance (e.g. IAQM's mineral guidance, MIRO, and LAQM.TG(22)).

Dust arising from limestone quarrying operations has the potential to reduce amenity in the local community and damage sensitive ecological receptors due to visible dust plumes and soiling / deposition; these coarse dust particles are referred to as deposited dust.

Smaller dust particles can remain airborne for longer, potentially increasing local ambient concentrations of suspended particulate matter (e.g. PM_{10} and $PM_{2.5}$) associated with health effects. Mineral site impacts are more likely to be associated with coarse particulate matter (PM_{10}).

The IAQM guidance assesses the impacts of both PM_{10} and deposited dust on human and ecological receptors and presents a simple distance-based screening process to identify those mineral sites where the dust impacts are likely to be significant and require further assessment. The IAQM guidance uses PM_{10} as the health indicator of airborne particles to be consistent with the England Planning Practice Guidance[10] for mineral sites, whereby a screening distance of 1km is recommended.

In relation to deposited dust, the guidance states "*from the experience of the working group, adverse dust impacts from sand and gravel sites are uncommon beyond 250m and beyond 400m from hard rock quarries, measured from the nearest dust generating activity.*"

Where a more detailed assessment is required, a basic assessment framework is presented which employs the Source – Pathway – Receptor approach to evaluate the risk of dust impacts and effects which incorporates the following elements:

- assess Site Characteristics and Baseline Conditions: this incorporates a review of baseline conditions including PM_{10} background, existing dust deposition data, and dust complaints (where available); a description of Site activities to inform the Source Term; and characterisation of the Site setting in terms of the location and sensitivity of representative receptors, and meteorological conditions (wind patterns and rainfall);
- estimate Dust Impact Risk: the Dust Impact Risk for each representative receptor is determined from the Source Term (residual dust risk after embedded mitigation) and Pathway. The 'pathway effectiveness' is based upon the distance of the receptor from the dust source and the frequency at which it is down-wind from the source (factoring out the frequency of wet days); and
- estimate Likely Magnitude of Effect: the risk predicted at each representative receptor is considered together with the sensitivity of that receptor, to give the likely magnitude of the effect that will be experienced.

In accordance with the IAQM methodology for hard rock quarries (i.e. limestone), if there are sensitive receptors within 1km and 400m of the Site then further assessment of potential dust impacts for PM_{10} and deposited dust, respectively, will be required.

With respect to PM_{10}, if backgrounds are less than 17µg/m^3, it is considered there is little risk of the Process Contribution (PC) from the Site causing an exceedance of the annual mean AQO. Where backgrounds are greater than 17µg/m^3, the PC is estimated, and total Predicted Environmental Concentration (PEC) used to assess the potential significance of effects on the surrounding receptors.

[10] https://www.gov.uk/guidance/minerals.

4.0 Site Setting and Baseline

4.1 Site and Surroundings

The Site is bordered to the east and south by the town of Denbigh, with the extension located at the approximate National Grid Reference (NGR) x304750, y367065. The extension area covers approximately 5ha of land in total, extending from the western border of the existing quarry. The area to the north-west of the extension is woodland (comprising an unnamed area of ancient woodland and the Crest Mawr Wood SSSI) with the Denbigh Golf Course and pastoral/agricultural land beyond. The area to the south of the extension is pastoral/agricultural land with residential areas beyond.

The nearest residential receptors to the extension area are located along Bryn Seion located 256m south of the extension's southern border.

The surrounding uses of the Site are a mixture of residential, recreational, commercial, pastoral and agricultural. A Public Footpath (PF6) runs perpendicular to the eastern boundary of the extension, between the current operations and proposed extension area, and will be diverted to meet Public Footpath 5 according to the phasing plans.

4.2 Sensitive Receptors

The term 'sensitive receptors' includes any persons, locations or systems that may be susceptible to changes in abiotic factors as a consequence of the development. These have been identified as human and ecological receptors sensitive to dust emissions.

4.2.1 Human Receptors

AQOs for PM_{10} should apply to locations where members of the public may be reasonably likely to be exposed to air pollution for the duration of the relevant standard. Therefore, the annual mean for PM_{10} should apply only at locations where people are likely to be present for long periods (examples given are residential properties, schools, hospitals and care homes). In the case of the 24-hour mean AQO, a relevant location would be one where the individuals may be exposed for eight hours or more in a day. As such, all residential and workplaces within 1km are considered of relevance to the assessment of potential PM_{10} impacts.

With respect to amenity impacts, the sensitivity will relate to the level of amenity that can be reasonably expected. For example, dwellings and schools are more sensitive than industrial units or farmland typically. Receptor locations have been characterised as high, medium or low sensitivity according to IAQM guidance.

The IAQM screening distance for deposited dust from hard rock quarries is 400m and therefore receptors outside of this distance have been excluded from consideration in relation to deposited dust on the basis that significant impacts can be screened out.

The human receptors considered in the assessment are presented in Table 4-1, whilst their locations are presented in Figure 4-1. Sensitivities have been assigned in accordance with IAQM guidance.

Table 4-1: Human Receptors

ID	Receptor Information	Approx. Distance to Extension Boundary (m)	Approx. Distance to Working Area Boundary (m)	IAQM Sensitivity
HR1	Residential – 101 Bryn Seion	256	250	High
HR2	Residential – 81, 83 Bryn Seion	322	317	High
HR3	Residential – 119 Bryn Seion	333	227	High
HR4	Residential – Tan y Chwarel	570	169	High
HR5	Residential – Llys Thomas Jones	622	212	High

ID	Receptor Information	Approx. Distance to Extension Boundary (m)	Approx. Distance to Working Area Boundary (m)	IAQM Sensitivity
HR6	Residential – Cysgod-y-Graig	496	221	High
HR7	Residential – Bryn Onnen	475	256	High
HR8	Residential – Cysgod-y-Graig	574	229	High
HR9	Residential – Fford y Graig	576	259	High
HR10	Residential – Fford y Graig	602	271	High
HR11	Educational – Ysgol Pendref	714	713	High
HR12	Residential/Commercial – Ffordd Coppy	421	425	High
HR13	Residential – Fford y Graig	503	61	High
HR14	Commercial – Denbigh Auto Body	535	16	Medium
HR15	Commercial – Denbigh Timber Products Ltd	524	86	Medium
HR16	Commercial – Jewson Warehouse	512	203	Medium
HR17	Recreational – Public Footpath 6	120	84	Low
HR18	Recreational – Public Footpath 5	98	96	Low
HR19	Recreational – Public Footpath 6 (post-diversion)	39	40	Low

4.2.2 Ecological Receptors

There are designated nature conservation sites[11] within 400m of the extension; this includes two SSSI (the Graig Quarry SSSI and Crest Mawr Wood SSSI) and several Ancient Woodland.

The ecological receptors considered within this assessment are presented in Table 4-2 whilst their locations are presented in Figure 4-1. Site specific receptor sensitivity have been defined below, in line with IAQM guidance.

Table 4-2: Ecological Receptors

ID	Receptor Information	Approx. Distance to Extension Boundary (m)	Approx. Distance to Working Area Boundary (m)	IAQM Sensitivity
ER1	Ancient Woodland	304	1	Low
ER2	Ancient Woodland/SSSI	138	116	Medium
ER3	Ancient Woodland/SSSI	38	38	Medium
ER4	Ancient Woodland	471	7	Low
ER5	Ancient Woodland	377	26	Low
ER6	Ancient Woodland	179	24	Low
ER7	Ancient Woodland	35	35	Low
ER8	Ancient Woodland/SSSI	60	49	Medium
ER9	Ancient Woodland/SSSI	136	136	Medium

[11] Defra Magic website, https://magic.defra.gov.uk/, accessed June 2023.

ID	Receptor Information	Approx. Distance to Extension Boundary (m)	Approx. Distance to Working Area Boundary (m)	IAQM Sensitivity
ER10	Ancient Woodland	281	5	Low
ER11	Ancient Woodland	109	92	Low
ER12	Ancient Woodland	475	10	Low
ER13	Ancient Woodland	400	71	Low
ER14	Crest Mawr Wood SSSI	37	37	Medium
ER15	Graig Quarry SSSI	399	20	Medium

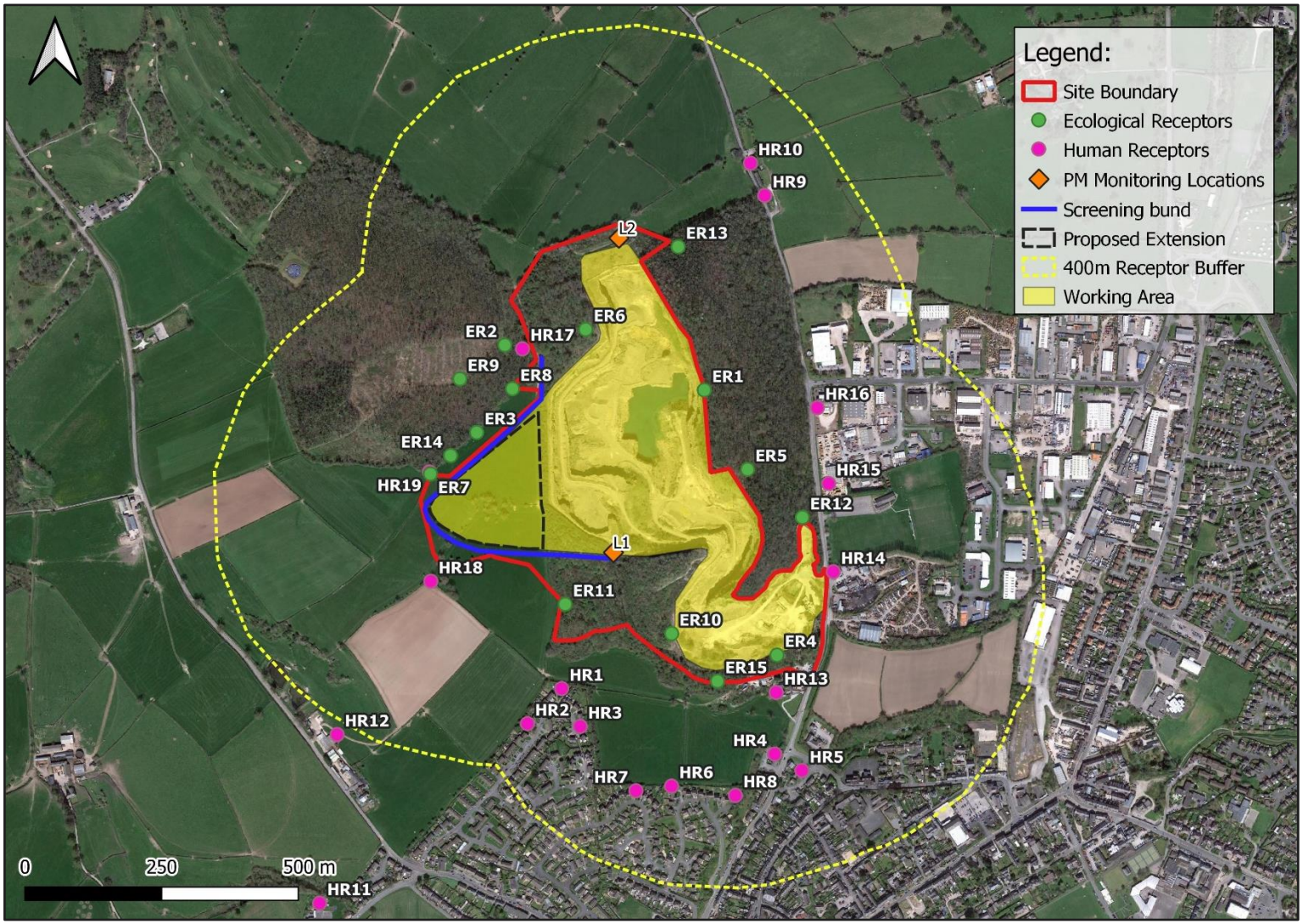


Figure 4-1: IAQM Dust Assessment and Receptors

4.3 Baseline Air Quality

Monitoring data collected prior to the COVID-19 pandemic (i.e. pre-2020) has been used to characterise the baseline environment, as pollutant concentrations monitored during 2020 and 2021 are expected to be atypical and not representative of the local environment.

4.3.1 Local Air Quality Management

As required under Section 82 of the Environment Act 1995 (Part IV), DCC has conducted an on-going exercise to review and assess air quality within their administrative area.

On review of the latest Annual Progress Report (APR) for DCC[12] (not impacted by the COVID-19 pandemic), there are currently no AQMAs declared within their administrative area.

4.3.2 Baseline Monitoring Data

From review of national (e.g. Automatic Urban and Rural Network (AURN)) and local air quality monitoring networks, there are no PM_{10}/$PM_{2.5}$ automatic monitors in proximity to the Site considered relevant to this assessment. The closest AURN monitor to the Site recording particulates is in Wrexham, located 32km southeast of the extension.

4.3.3 Defra Mapped Backgrounds

Defra provides modelled background pollutant concentration data on a 1km x 1km resolution across the UK that is routinely used to support LAQM and Air Quality Assessments. Background pollutant concentrations are based upon a 2018 base year and projected forwards. The annual mean background concentrations of PM_{10} and $PM_{2.5}$ for 2023 (the current year and anticipated commencement of activities within the extension area) from the 1km grid squares containing the Site and receptors are presented below in Table 4-3.

Table 4-3: Defra Mapped Background Concentrations 2023

Grid Square (X, Y)	Annual Mean Concentration (µg/m³)	
	PM_{10}	$PM_{2.5}$
305500, 367500	9.9	6.1
304500, 367500	9.2	5.8
305500, 366500	12.1	6.7
304500, 366500	9.8	6.2
AQO	***40***	***25***

As displayed in Table 4-3, the Defra mapped background concentrations are well below the respective AQOs.

4.3.4 Baseline Dust

Given that the Site is already an established working quarry, the baseline environment may be characterised by a certain level of dust. Breedon Trading Limited operate in line with best practice and implement a series of control measures to minimise potential environmental impacts. In relation to dust, the Site are not aware of any recent dust complaints.

In addition, $PM_{2.5}$ and PM_{10} monitoring was undertaken on the Southern and Northern extents of the Quarry boundary between August and November 2021. The monitoring results are detailed in Table 4-4 and Table 4-5 whilst their locations are illustrated in Figure 4-1.

[12] Wood (2020) North Wales Authorities Collaborative Project, 2020 Air Quality Progress Report.

Table 4-4: Monitoring Results - Location 1

Monitoring Period		Pollutant	Measured 1-hour Mean PM Concentrations (µg/m³)		
			Minimum	Maximum	Mean
1	24/08/2021 - 24/09/2021	PM_{10}	2.68	37.36	13.40
		$PM_{2.5}$	1.17	29.12	10.87
2	24/09/2021 - 24/10/2021	PM_{10}	2.16	28.08	5.70
		$PM_{2.5}$	0.62	22.89	3.66
3	24/10/2021 - 24/11/2021	PM_{10}	2.22	34.68	5.75
		$PM_{2.5}$	0.68	26.92	3.47

Table 4-5: Monitoring Locations - Location 2

Monitoring Period		Pollutant	Measured 1-hour Mean PM Concentrations (µg/m³)		
			Minimum	Maximum	Mean
1	24/08/2021 - 24/09/2021	PM_{10}	2.39	37.20	12.84
		$PM_{2.5}$	1.13	28.56	10.40
2	24/09/2021 - 24/10/2021	PM_{10}	2.34	27.40	5.37
		$PM_{2.5}$	0.64	22.15	3.44
3	24/10/2021 - 24/11/2021	PM_{10}	2.17	33.02	5.37
		$PM_{2.5}$	0.66	25.74	3.23

On review of Table 4-4 and Table 4-5, the highest PM_{10} period mean was 13.4 µg/m³ and 12.84 µg/m³ at location 1 and 2 respectively (between 24/08/2021 - 24/09/2021) representing 33.5% and 32.1% of the annual mean PM_{10} AQO. Furthermore, the highest $PM_{2.5}$ period mean was 10.87 µg/m³ and 10.40 µg/m³ at location 1 and 2 respectively (between 24/08/2021 - 24/09/2021) representing 43.4% and 41.6% of the annual mean $PM_{2.5}$ AQO respectively.

4.4 Meteorology – Dispersion of Emissions

The most important climatic parameters governing the release and dispersal of fugitive emissions from the Site are wind speed, direction and rainfall:

- wind direction determines the broad direction of dispersal;
- wind speed affects ground level concentrations by increasing the initial dilution of pollutants in the emission. It will also affect the potential for dust entrainment; and
- rainfall naturally supresses dust release (>0.2mm rainfall per day is considered sufficient to suppress dust emissions).

The closest and most representative observation station to the Site is Rhyl station, located approximately 8km north-west of the Site. A 5-year average windrose is presented in Figure 4-2.

Use of meteorological data from Rhyl station addresses the critical appraisal comments received from Enzygo Environmental Consultants on behalf of DCC.

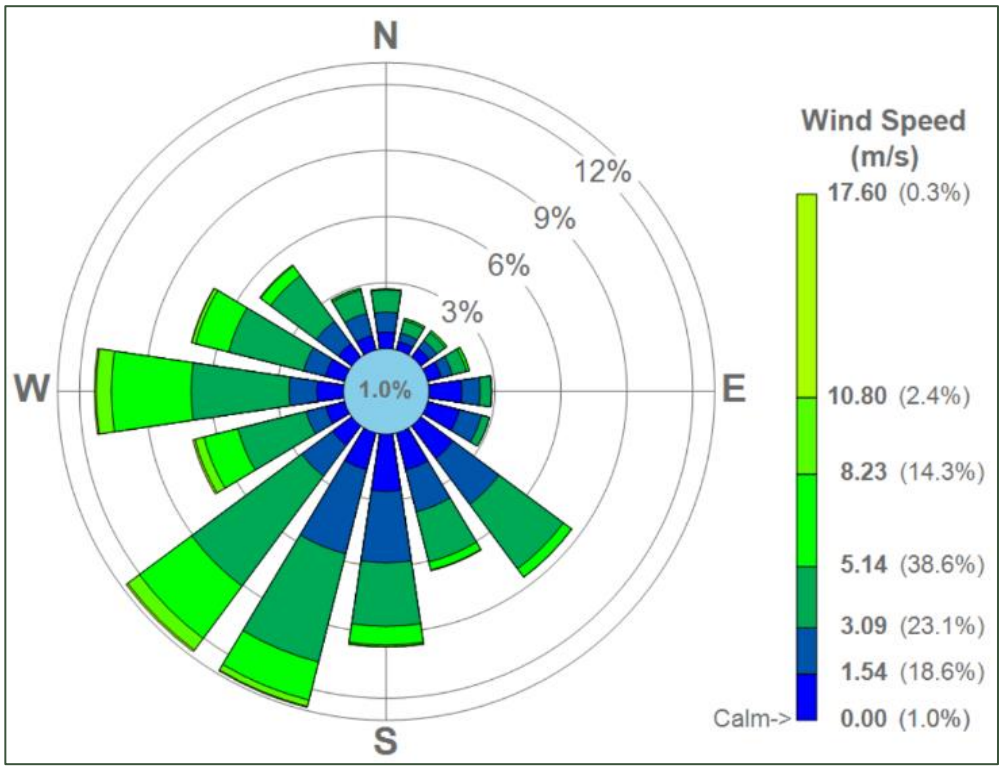


Figure 4-2: Windrose of Rhyl Meteorological Observation Station (2016 - 2020)

From review of Figure 4-2, the majority of winds are from the south-western and western sectors. High wind speeds (greater than 5m/s) occur for an average of ~55% of the year.

On this basis, it is locations to the north-east and east that would likely have the highest potential for impacts from any dust emissions generated from the Site.

5.0 Assessment Effects and Significance

This section describes the assessment of dust effects from the proposed extension and additional working areas of the Site. The assessment has considered all potentially active areas (marked in yellow as the 'Working Area' in Figure 4-1) and discusses potential dust generating activities and sources in turn.

5.1 Screening Assessment: PM_{10} and Deposited Dust

On the basis of the adopted screening criteria, an assessment of deposited dust and particulate matter (PM) is required at human receptors within 400m and 1km, respectively. In terms of ecological receptors, an assessment of dust deposition is required for those designated sites located within 400m of the Site.

5.2 Further Assessment: PM_{10}

The IAQM minerals guidance states that if the PM_{10} background concentration is less than 17µg/m³ it is considered unlikely that any PC from the additional activities proposed would lead to an exceedance of the annual mean AQO.

Utilising the Defra background maps (Table 4-3), in the absence of long-term local PM_{10} monitoring, the maximum 2023 annual mean PM_{10} concentration across the area is 12.1µg/m³ and therefore less than 17µg/m³. It is also worth noting that the maximum period mean recorded during the 3-month monitoring period in 2021 was 13.4µg/m³ which again, is less than 17µg/m³ (see Section 4.3.4). Furthermore, Denbigh Quarry is already active, and this would be accounted for in the mapped background concentrations.

It is therefore considered that in the absence of additional mitigation, the impact on human health from emissions of PM_{10} from site operations would be negligible, with the associated effect not significant.

5.3 Further Assessment: Deposited Dust

5.3.1 Site Operations

The maximum permitted sale of mineral (limestone) from the Site is 500,000 tonnes per annum (tpa), however an output of 200,000-250,000 tonnes per annum (tpa) is currently maintained. Extracted mineral is transported to the mobile plant located on the quarry floor for processing (crushing/screening), prior to transportation off-site via the local road network to the point of sale.

The proposed development seeks to amend the extant working scheme of the quarry to assimilate the western extension and allow for the workings to facilitate the complete extraction of reserves. This seeks to extend the Quarry's operational life by an additional 25 years from commencement of workings in the western extension, to approximately 31st December 2047.

The output and day to day operations at the Site are not proposed to alter, albeit would incorporate the western extension area.

5.3.2 Potential Sources of Dust

Activities or sources associated with the proposed development that have the potential to result in the release of dust include:

- site preparation;
- mineral extraction;
- storage of materials;
- mineral processing;

- on-site transportation;
- off-site transportation; and
- restoration.

5.3.2.1 Site Preparation

The site preparation works in the western extension would involve the removal of vegetation and stripping of soils and overburden to expose the limestone. The soil and overburden would be stripped using hydraulic excavators and initially be utilised to form a low-level peripheral screening bund around the extension area, and additionally used to widen the access road at the southern end of the existing quarry or used in restoration activities at the eastern edge.

The new screening bund would be designed to screen views of the mineral operations and would also act as a physical protective barrier to any potential fugitive dust emissions. The bund will be grass seeded to stabilise the soil, with the majority of the bund also planted with woodland and shrubs.

The formation of storage bunds/screening landforms can be an intense activity with high dust emission potential; however, the activity is short-term in nature and can be undertaken when the weather conditions are not excessively adverse (i.e. very dry and windy).

Further to this, sections of Public Footpath 6 would need to be stopped up and the route diverted to join Public Footpath 5.

Given the above, the residual source emission magnitude for site preparation is considered to be medium; however, activities would be intermittent and short-term in duration.

5.3.2.2 Mineral Extraction

Mineral extraction within the western extension area will progress in five distinct phases, assimilated with the current working scheme for the existing quarry. The extension area is anticipated to release some 5 million tonnes of minerals.

The existing working practices will be followed in the extension area, whereby blasting is required to fragment the limestone rock mass at the quarry face. Blasting can be an inherently dusty activity, albeit very short-term in duration. Furthermore, blasting is undertaken at the quarry face and therefore after initial development is set within the void or behind landscape screening where it is largely sheltered from winds which may have the potential to transport dust emissions off-site.

Quarry blasting is undertaken in line with strict health and safety legislation and industry best practice. Blasting can only be undertaken during set times of day (e.g. between 10:00 and 16:00 as set out in the extant planning permission) and each blast is carefully designed.

A Blasting Impact Management Protocol[13] has been developed to support the application. Furthermore, potential dust emissions from blasting will be controlled by soaking the area with water from a tractor and bowser unit prior to the shot and removing the drilled dust fines from the shot area prior to the blast.

As per existing practice blasted rock would be loaded onto dump trucks at the quarry face using hydraulic excavators or loading shovels and transported to the mobile crushing and screening plant within the base of the quarry prior for processing.

Dust suppression equipment, e.g. water bowser and water sprays, is available for use during mineral extraction activities when required to suppress dust emissions.

Given the above and with the blasting related mitigation measures in place, the residual source emission magnitude for mineral (limestone) extraction is considered to be medium.

[13] EPC Groupe (2023) Blasting Impact Management Protocol at Denbigh Quarry, Breedon Trading Limited

5.3.2.3 Storage of Materials

During phase 1, the initial stripped soil and overburden would be utilised to form a peripheral screening bund around the extension area. The exposed surface of the bund presents a potential source of dust emission by wind erosion. This potential will be reduced by seeding and re-vegetation which acts to stabilise the bund and prevent erosion of its surface. In addition, once established, woodland and shrub planting are proposed on/around the majority of the landform.

Additional overburden and inert materials stripped throughout the phases will either be placed directly to form restoration landforms throughout the quarry or stored within the base of the existing quarry for use in later restoration. For example, a historic overburden mound located on the southern boundary will be removed to facilitate the extraction within the extension area and stored on the quarry floor for later use in the final restoration landform.

Any required stockpiles within the Plant Site are located on a level and hard surfaced area and are therefore stable. Long-term stockpiles would be profiled to optimise wind dynamics and reduce dust entrainment, where feasible.

Dust suppression equipment is available throughout the quarry for use during potentially dusty activities, and on stockpiles and bunds/mounds, as required.

Overall and given the above, the storage of materials presents a small dust emission potential.

5.3.2.4 Mineral Processing

Extracted mineral is transported to the mobile plant on the quarry floor where it is crushed and screened by size. This reduces the size of the rock further and screens it into a range of graded products. Mineral processing is an inherently dusty process; however short-term in duration, and potential dust emissions would be controlled by ensuring equipment is well maintained and fitted with dust suppression equipment where feasible.

In addition, as the processing is undertaken on the quarry floor and therefore within the void, it will be partially sheltered from winds which have the potential to carry dust emissions off-site. In line with the maximum Site outputs, a maximum of circa 250,000tpa of mineral is processed.

Processed, saleable product is loaded onto road-going Heavy Goods Vehicles (HGVs) which then proceed to the public highway via the weighbridge adjacent to the Site office.

Dust suppression equipment, e.g. water sprays, is available for use on pre- and processed material as required.

Overall and based on the above, mineral processing presents a small dust emission potential.

5.3.2.5 On-site Transportation

On-site transportation (using a Volvo A40 or similar) is required for the movement of blasted rock to the mobile plant for processing.

The movement of vehicles around the Site presents a high dust emission potential in the absence of mitigation. The potential for dust emissions from haul roads can depend on the moisture content of the road and vehicle speed; which can be controlled by effective operational measures. For example, the Site has the capability to use water suppression equipment (e.g. tractor and bowser unit) on dusty road surfaces, if required, and a Site speed limit is implemented.

The internal haul roads within the Site are generally formed on quarry benches and ramps between the working levels and vehicle movements are controlled and managed.

Overall and based on the above, on-site transportation presents a medium dust emission potential.

5.3.2.6 Off-site Transportation

Processed material (product) is transported off-site to the point of sale. This presents potential risk of trackout; when dust and dirt is transported onto the public road network, where it may be deposited and then re-suspended by vehicles using the network.

A wheel wash facility is located near the Site exit, to be utilised by all vehicles leaving Site, which helps to mitigate this risk. In addition, regular road sweeping is carried out on the access road and adjacent road network.

The Site is accessed off the Ffordd Y Graig, which is tarmacked and therefore of low dust emission potential. The access road is approximately 50m in length from active areas of the Plant Site to the local road network.

Overall and based on the above, off-site transportation presents a small dust emission potential.

5.3.2.7 Restoration

The Site will employ a progressive restoration scheme, whereby the western extension area will be assimilated into the currently working scheme.

Due to the phased nature of the scheme, soils and overburden would be progressively stripped from distinct areas and used directly in restoration activities where practicable. This will minimise the area of exposed surface, helping to reduce potential dust emissions from wind action and the amount of material requiring storage.

In addition, inert materials extracted from the extension area will be directly used to form restoration landforms. Further additional inert material (some 100,000 tonnes per annum) will be imported to the Site for use in restoration activities.

Restoration activities involve the tipping, spreading, and shaping of material which can present a moderate to high risk of dust generation in the absence of mitigation. Restoration activities are generally undertaken within the quarry voids and would therefore be sheltered.

Furthermore, restoration activities are intermittent in nature and any potential dust generation would therefore be temporary/short-term. Dust suppression equipment will be utilised as required.

Overall and based on the above, restoration presents a medium dust emission potential.

5.4 Environmental Design and Mitigation Measures

Operational mitigation measures detailed are in line with the extant planning permission and have been detailed by Breedon and are due to remain in place for the duration of the proposed extension.

5.4.1 Operational Mitigation Measures

Site operations are undertaken in line with industry good practice. The control measures and equipment utilised (current/proposed) have been described where necessary in Section 5.3.2 and 5.5.1 summarised below:

- wheel wash facilities are utilised by HGVs leaving site;
- the Site operates to a speed limit, and vehicle movements are controlled and managed;
- progressive extraction and restoration scheme to minimise the double handling of material;
- dust suppression equipment, e.g. water bowsers, available across the Site, as required;
- potentially dusty activities are planned (i.e. the timing/duration) to minimise the release of dust;
- road sweeper employed on the Site access road, as required; and
- blasting is undertaken in line with strict protocols. In addition, the area is soaked with water prior to the shot and the drilled dust fines are removed from the shot area prior to the blast.

5.4.2 Environmental Design Measures

A number of specific mitigation measures have been incorporated into the layout and design, including:

- existing woodland around the Site will be maintained;
- screening landform on the periphery of the western extension is 3m in height and will be grass seeded and maintained, followed by additional woodland and shrub planting;
- the mobile processing plant is located within the quarry void and therefore screened; and
- the Site access road is tarmacked and therefore of low dust emission potential, and is >50m in length from Ffordd Y Graig to any active areas;
- wheel wash facilities are installed near the Site exit;
- materials stored within the quarry void and therefore sheltered;
- short distance between the working face and processing plant reduces the distance traversed by on-site vehicles;
- hard surfaced and level Plant Site;
- assimilation of the working scheme reduces the area of exposed surface and the material requiring storage; and
- buffer maintained between western extension area and SSSI.

5.5 Assessment of Effects and Significance – Deposited Dust

5.5.1 Summary of Residual Source Emissions Magnitude

The residual source emissions (the potential dust emissions after designed-in mitigation measures have been taken into account) for each activity is summarised in Table 5-1.

Table 5-1: Residual Source Emissions Magnitude

Activity	Details and Mitigation Measures	Residual Source Emissions Magnitude
Site Preparation	Periphery screening bund is maximum 3m in height. Screening bund grass seeded and planted. Progressive stripping of soils/overburden within extension area. Extension area 5ha, with active area less than this at any time.	Medium
Mineral Extraction	Proposed maximum extraction rate of 250,000tpa. Blasting required, however is intermittent / short-term activity. Strict blasting protocols and mitigation measures in place. Extension area 5ha, considered 'small'. <5 heavy plant active.	Medium
Storage of Materials	Periphery screening bund is maximum 3m in height. Screening bund grass seeded and planted. Minimal storage of processed mineral as for the majority transported directly off-site. Plant Site is hard surfaced and level.	Small

Activity	Details and Mitigation Measures	Residual Source Emissions Magnitude
Mineral Processing	Mobile plant (crusher and screening plant) located within on the quarry floor and therefore sheltered. <5 mobile plant. Maximum of 250,000tpa processed.	Small
On-site Transportation	Site speed limit enforced. Water suppression (tractor and bowser) used as required. Short distance from working quarry face to mobile processing plant.	Medium
Off-site Transportation	Use of wheel wash for all vehicles leaving Site. Road sweeper in regular use. Site access road speed limit enforced. Site access road is tarmacked. Site access road >50m in length from local road network to active areas.	Small
Restoration	Progressive restoration scheme to minimise exposed areas, double handling of material and material requiring storage. Approx. 100,000tpa inert material imported – directly placed. Activities undertaken within the quarry void.	Medium

5.5.2 IAQM Assessment of Pathway Effectiveness

The pathway effectiveness at each receptor has been assigned in accordance with the IAQM criteria and is based on the distance of the receptor to the active areas within 400m of the receptor and the frequency of potentially dusty winds (>5m/s on dry days) from the direction of dust sources. Receptors >400m from activities have screened out from the assessment in line with IAQM guidance.

An 'effective' pathway would be classified as such when the dust emissions are able to reach the receptor. This would likely be caused by a high frequency of winds >5m/s travelling in the direction of the receptor (i.e. the receptor is usually positioned downwind of the dust source) and/or when the receptor is located close to the dust source.

An 'ineffective' pathway would be classified as such when the dust emissions are less able to reach the receptor. This would likely be caused by a lower frequency of winds >5m/s travelling in the direction of the receptor (i.e. the receptor is usually positioned upwind of the dust source) and/or when the receptor is not located close to the dust source.

In addition, structures or vegetation can act to disrupt the pathway, reducing the effectiveness as dust emissions are more likely to be deposited or captured before reaching the sensitive receptor.

A summary of pathway effectiveness is presented in Table 5-2.

Table 5-2: Summary of Pathway Effectiveness

Ref.	Approx. Distance to Site (m)	Distance Category	Frequency of Potentially Dusty Winds on Dry Days (%)	Frequency Category	Pathway Effectiveness
HR1	250	Distant	0.5	Infrequent	Ineffective
HR2	317	Distant	0.4	Infrequent	Ineffective

Ref.	Approx. Distance to Site (m)	Distance Category	Frequency of Potentially Dusty Winds on Dry Days (%)	Frequency Category	Pathway Effectiveness
HR3	227	Distant	0.4	Infrequent	Ineffective
HR4	169	Intermediate	0.5	Infrequent	Ineffective
HR5	212	Distant	0.4	Infrequent	Ineffective
HR6	221	Distant	0.1	Infrequent	Ineffective
HR7	256	Distant	0.2	Infrequent	Ineffective
HR8	229	Distant	0.5	Infrequent	Ineffective
HR9	259	Distant	4.7	Infrequent	Ineffective
HR10	271	Distant	4.0	Infrequent	Ineffective
HR13	61	Close	2.1	Infrequent	Ineffective
HR14	16	Close	8.6	Moderately Frequent	Moderately Effective
HR15	86	Close	8.5	Moderately Frequent	Moderately Effective
HR16	203	Distant	8.3	Moderately Frequent	Ineffective
HR17	84	Close	1.8	Infrequent	Ineffective
HR18	96	Close	0.3	Infrequent	Ineffective
HR19	40	Close	0.9	Infrequent	Ineffective
ER1	1	Close	9.3	Moderately Frequent	Moderately Effective
ER2	116	Intermediate	1.8	Infrequent	Ineffective
ER3	38	Close	3.7	Infrequent	Ineffective
ER4	7	Close	5.1	Moderately Frequent	Moderately Effective
ER5	26	Close	9.3	Moderately Frequent	Moderately Effective
ER6	24	Close	3.8	Infrequent	Ineffective
ER7	35	Close	0.9	Infrequent	Ineffective
ER8	49	Close	2.6	Infrequent	Ineffective
ER9	136	Intermediate	1.4	Infrequent	Ineffective
ER10	5	Close	2.3	Infrequent	Ineffective
ER11	92	Close	1.8	Infrequent	Ineffective
ER12	10	Close	9.2	Moderately Frequent	Moderately Effective
ER13	71	Close	6.8	Moderately Frequent	Moderately Effective
ER14	37	Close	1.8	Infrequent	Ineffective
ER15	20	Close	1.2	Infrequent	Ineffective

5.5.3 IAQM Assessment of Dust Effects

The IAQM assessment has been undertaken using a worst-case scenario for dust emissions from the Site, by assigning the greatest residual source emission magnitude determined i.e. medium. This method potentially over-estimates impacts as it assumes all activities and areas have the same potential for dust generation and it does not account for the temporal and spatial variation of activities. This precautionary approach does however ensure that potential cumulative effects of simultaneous activities across the Site are captured within the assessment.

The mineral extraction activity (which includes consideration of blasting) has been determined as having a medium residual source emission magnitude. This is considered appropriate given the Blasting Impact Management Protocol and dust control measures in place (discussed in Section 5.3.2.2), in addition to the strict regulation, and environmental compliance measures associated with the activity. The determined residual source emission magnitude is therefore justified, addressing the critical appraisal comments received from Enzygo Environmental Consultants on behalf of DCC.

The magnitude of effect due to potential dust deposition from on-site activities located within 400m of each receptor location has been estimated, as presented in Table 5-3.

Table 5-3: Summary of Dust Effects

Ref.	Receptor Sensitivity	Pathway Effectiveness	Dust Impact Risk	Magnitude of Effect
HR1	High	Ineffective	Negligible Risk	Negligible Effect
HR2	High	Ineffective	Negligible Risk	Negligible Effect
HR3	High	Ineffective	Negligible Risk	Negligible Effect
HR4	High	Ineffective	Negligible Risk	Negligible Effect
HR5	High	Ineffective	Negligible Risk	Negligible Effect
HR6	High	Ineffective	Negligible Risk	Negligible Effect
HR7	High	Ineffective	Negligible Risk	Negligible Effect
HR8	High	Ineffective	Negligible Risk	Negligible Effect
HR9	High	Ineffective	Negligible Risk	Negligible Effect
HR10	High	Ineffective	Negligible Risk	Negligible Effect
HR13	High	Ineffective	Negligible Risk	Negligible Effect
HR14	Medium	Moderately Effective	Low Risk	Negligible Effect
HR15	Medium	Moderately Effective	Low Risk	Negligible Effect
HR16	Medium	Ineffective	Negligible Risk	Negligible Effect
HR17	Low	Ineffective	Negligible Risk	Negligible Effect
HR18	Low	Ineffective	Negligible Risk	Negligible Effect
HR19	Low	Ineffective	Negligible Risk	Negligible Effect
ER1	Low	Moderately Effective	Low Risk	Negligible Effect
ER2	Medium	Ineffective	Negligible Risk	Negligible Effect
ER3	Medium	Ineffective	Negligible Risk	Negligible Effect
ER4	Low	Moderately Effective	Low Risk	Negligible Effect

Ref.	Receptor Sensitivity	Pathway Effectiveness	Dust Impact Risk	Magnitude of Effect
ER5	Low	Moderately Effective	Low Risk	Negligible Effect
ER6	Low	Ineffective	Negligible Risk	Negligible Effect
ER7	Low	Ineffective	Negligible Risk	Negligible Effect
ER8	Medium	Ineffective	Negligible Risk	Negligible Effect
ER9	Medium	Ineffective	Negligible Risk	Negligible Effect
ER10	Low	Ineffective	Negligible Risk	Negligible Effect
ER11	Low	Ineffective	Negligible Risk	Negligible Effect
ER12	Low	Moderately Effective	Low Risk	Negligible Effect
ER13	Low	Moderately Effective	Low Risk	Negligible Effect
ER14	Medium	Ineffective	Negligible Risk	Negligible Effect
ER15	Medium	Ineffective	Negligible Risk	Negligible Effect

On the basis of the applied medium residual source emission magnitude, defined pathway effectiveness at each receptor location and the receptor sensitivity, the magnitude of effect has been determined as negligible at all of the receptor locations.

Taking into account the outcomes of the dust assessment, operational dust controls and the environmental designed-in measures of the proposed working scheme, the overall significance of potential dust effects is considered to be not significant.

5.6 Assessment of Effects and Significance – PM_{10}

The effect of PM_{10} emissions can be classified as negligible (see Section 5.2), therefore the overall effect of the proposed development on PM_{10} concentrations on human receptors in the local area is considered to be 'not significant'.

6.0 Mitigation Measures

This section discusses the mitigation requirements of the proposed development with reference to the assessment undertaken.

The proposed operations would be undertaken in line with industry good practice, and the measures which are in place to effectively control and minimise the risk of dust emissions. The working of the western extension will facilitate a continuation of operations at the Site.

The assessment has predicted negligible effects in relation to deposied dust at all receptor locations, and impacts on PM_{10} concentrations are considered negligible. On the basis of the dust assessment outcomes, the existing/proposed measures presented throughout Section 5.0, and Table 5-1 are considered sufficient to control potential dust emissions from the Site.

7.0 Conclusions

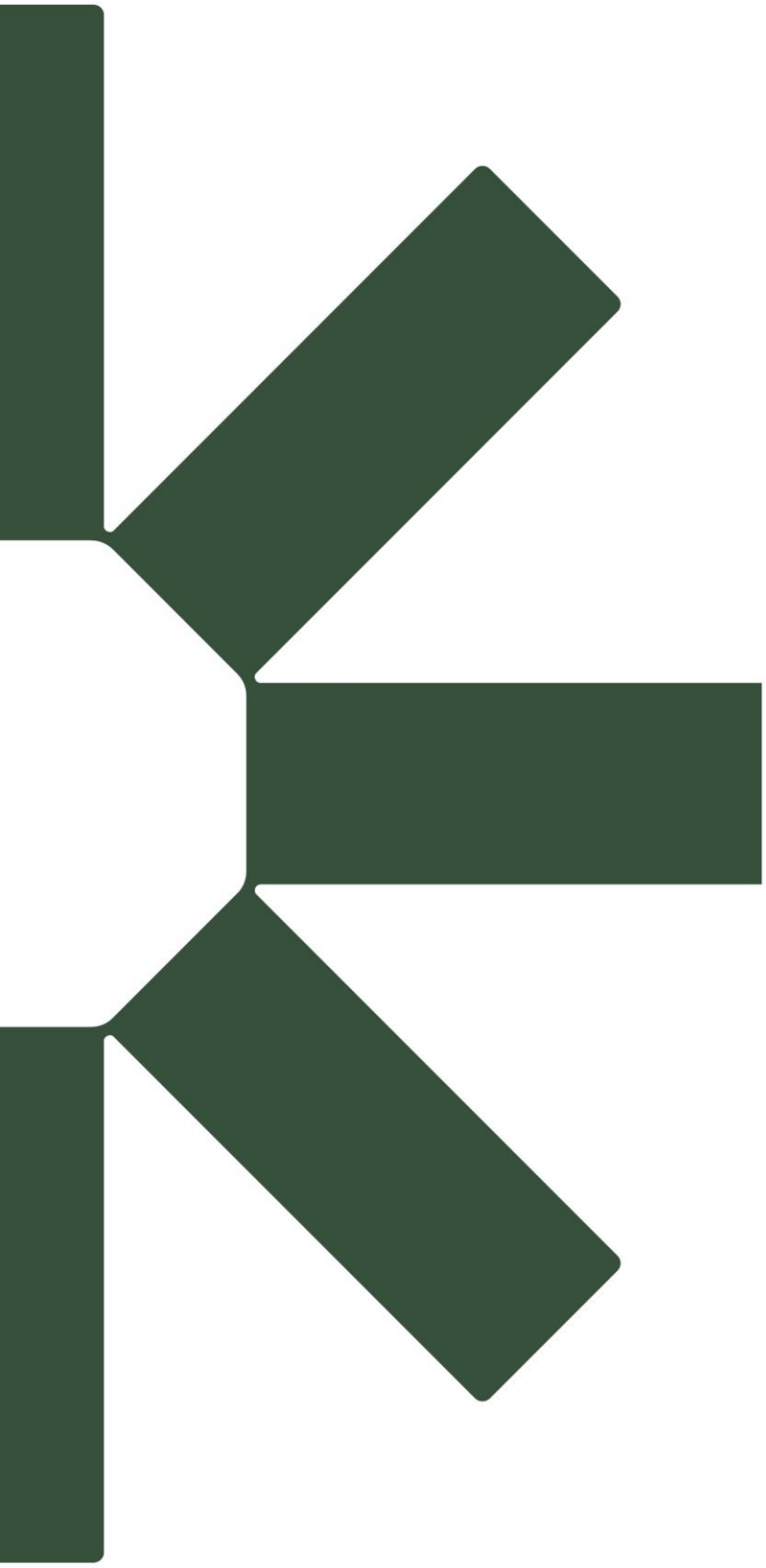
A Mineral Dust Impact Assessment has been undertaken in support of a proposed consolidating application at Denbigh Quarry, which includes an extension to the winning and working of limestone.

The assessment has accounted for comments received during critical appraisal of the air quality assessment which was submitted to support the 2022 planning application. It has been undertaken in line with the IAQM minerals guidance and has considered the potential significance of effects on amenity, human health (from PM_{10}) and ecological receptors as a result of operations within the Site.

The assessment has concluded the following:

- The effect on amenity from deposited dust is considered to be 'not significant';
- The effect on PM_{10} concentrations at human receptors is considered to be 'not significant'; and
- The effect from dust on ecological receptors are considered to be 'not significant'.

These conclusions rely on the implementation of operational mitigation measures and the environmental design measures throughout the proposed development.



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