Environmental Statement

Section 73 Planning Application for the proposed deepening of the existing quarry and an extension of time for mineral extraction and restoration operations through the variation of conditions 1 (timescales), 2 (approved plans), 4 (depth of mineral extraction), 6 (phasing plans), 40 (final restoration scheme) and 41 (water level timescales) of planning permission 01/03/1185 (original planning permission ref 1/86/760)

at

Leapers Wood Quarry,
Kellet Road, Carnforth, LA6 1BP

on behalf of

TARMAC
A CRH COMPANY

by

Heatons
Planning Environment Design

CONTENTS

APPENDICES

Appendix A - Heatons EIA Scoping Report

Appendix B - Lancashire County Council Scoping Opinion

TECHNICAL APPENDICES

Appendix C – Landscape and Visual Impact Assessment – Drawings & Viewpoints

Appendix D – Biodiversity – Preliminary Ecological Appraisal & Breeding Bird Survey

Appendix E – Transport Assessment

Appendix F – Noise Assessment

Appendix G – Air Quality & Health Impact Briefing Note

Appendix H – Groundborne Vibration and Air Overpressure Assessment

Appendix I – Flood Risk Assessment

Appendix J – Hydrogeological Impact Assessment

Appendix K – Geotechnical Stability Assessment – Boreholes and Drawings

DRAWINGS

Location Plan	D.004
Current Situation	D.009
Phase 1	D.019
Phase 2	D.020
Phase 3	D.021
Phase 4	D.022
Phase 5	D.023
Proposed Concept Restoration	D.024

Statement of Competence for the Preparation and Management of Planning Applications Subject to Environmental Impact Assessment

The Town and Country Planning (Environmental Impact Assessment) Regulations 2017, Part 5, 18(5) states '*In order to ensure the completeness and quality of the environmental statement—*

(a) the developer must ensure that the environmental statement is prepared by competent experts; and
(b) the environmental statement must be accompanied by a statement from the developer outlining the relevant expertise or qualifications of such experts.'

The list below identifies the qualifications of those involved in undertaking the Environmental Impact Assessment and compiling the Environmental Statement:

EIA Coordination (Core ES Chapters including Alternatives and Climate Change) – Heatons

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Heatons is a consultancy with specialist planning knowledge of the minerals, waste, energy, commercial and housing development sectors. The Company was established in 1999 and currently employs ten appropriately qualified planners. Heatons has undertaken and managed Environmental Impact Assessments, prepared and submitted Environmental Statements and Non-Technical Summaries since 1999.

The following identifies the individual authors of ES Chapters and their qualifications or expertise:

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Robin Smithyman BSc (Hons), PG DipLA CMLI PG DipTP PG DipUD PG Dip SI MIQ

Robin has over 25 years' experience working with operators and planning authorities on minerals extraction and restoration schemes, their landscape and visual assessment, mitigation and enhancement.

Ecology and Biodiversity

Tamsin Douglas MSc MCIEEM

Tamsin has been working as a professional ecologist in Cumbria for 18 years, 10 of which have been as a partner of South Lakes Ecology. Tamsin has an MSc in Biological Recording, is a full member of CIEEM and has extensive experience in habitat surveying and protected species surveys in Cumbria and surrounding areas.

Amy Tose BSc (Hons) Qualifying Member of CIEEM

Principal Ecologist with several years of consultancy experience. Managing projects and coordinating with clients and different disciplines on a variety of projects. Excellent botanical ID for plants and grasses. Experience leading and conducting a variety of protected species surveys including great crested newt, bats, badgers, nesting bird surveys, reptile, water vole, otter and white-clawed crayfish.

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Senior Ecologist with several years of consultancy experience with experience conducting a variety of surveys and reports. Holds a GCN Level 1 Class Licence CL08 Holder and is also River Condition Assessment Certified. Ecological Clerk of Works (ECoW) on a variety of sites for species including Great Crested Newts and Badgers.

Rhia McBain BSc(Hons) MCIEEM

Director of Ecology at Heatons, with nearly 20 years experience in the ecology sector including managing ecology on everything from small scale projects to large infrastructure projects. She has extensive experience leading on Phase 1 and NVC surveys, and on species surveys including bat, dormouse, GCN, reptile and badger in addition to providing Ecological Clerk of Works (ECoW) support on a range of projects. Rhia has Great Crested Newt Survey Licence (Level 1), Bat Survey Licence (Level 2) and Hazel Dormouse Survey Licence.

<u>Transport – Tetra Tech</u>

Pravin Godhania BEng (Hons) MCIHT MSORSA

Pravin has over 25 years of extensive experience in several facets of Transport Planning, Traffic Engineering and development control for both the private and public sectors. He has provided input to numerous minerals and waste related development proposals including input to ES/EIAs.

<u>Noise and Groundborne Vibration – Advance Environmental</u>

Dr Robert Storey BEng(Hons) PhD Member of Institute of Acoustics

Robert has significant experience in carrying out Environmental Noise Impact Assessments for quarries and related development gained through over 15 years of working in consultancy.

Kevin Gough

Kevin worked on a number of environmental monitoring projects within local government before moving to the mineral extractive industry in 1986. He founded Advance Environmental Consulting Limited and has managed environmental monitoring and assessment projects and contracts for clients throughout the UK and Europe. His principal areas of expertise are the monitoring and assessment of environmental noise and ground borne vibration from blasting, which have been developed through over 40 years' practical experience in the field. He served as a regional steering group member and Chairperson of the Institute of Environmental Management and board member. Currently an Honorary Fellow of the Institute of Quarrying where most recently he served as a director and executive board member.

Air Quality – Advance Environmental

Ian Stone BSc(Hons) Member of Institute of Environmental Sciences and Institute of Air Quality Management

Ian is a Principal Scientist specialising in air quality monitoring, analysis and associated impact assessments, primarily in relation to the extractive industries. He has worked as an air quality researcher and consultant for over 30 years both within the UK and overseas, initially with the University of Exeter and latterly with Advance Environmental Consulting Limited. He has been on a number of steering groups and committees associated with air quality. The most pertinent is the Minerals Industry Research Organisation's publication 'Good Practice Guide: Control and Measurement of Nuisance Dust and PM_{10} from the Extractive Industries' (2011) and its associated document: 'Management, Mitigation and Monitoring of Nuisance Dust and PM_{10} Emissions Arising from the Extractive Industries: An Overview' (2011). He was also one of the authors of the Institute of Air Quality Management 'Guidance on the Assessment of Mineral Dust Impacts for Planning', 2016.

In addition to providing Environmental Impact Assessments for mineral site planning applications Ian has extensive experience in monitoring and characterisation of PM_{10} / $PM_{2.5}$ and 'nuisance' dust associated with the extractive industries. These have been undertaken on behalf of both industrial clients and regulatory authorities.

Health – Savills

Tara Barratt BSc(Hons) MSc (DIC) Associate of IEMA

Tara has 8 years' experience undertaking health impact assessments, including assessing population and human health within EIA, is an Associate of the Institute of Environmental Management and Assessment (IEMA), and contributing author to IEMAs guidance on "Determining Significance For Human Health In EIA" and "Effective Scoping of Human Health in EIA.

Water Environment – Hafren Water

Chris Ainscow BSc

Rosie Morrant BSc MSc FGS

Charlotte Hale BSc(Hons) MCIWEM

Chris Leake BSc MSc FGS

Hafren Water has been involved with environmental water management issues within the vicinity of the site for more than 20 years and therefore have a detailed understanding of the local water environment.

Land Stability – KeyGS

Simon Railton – BSc Earth Sciences MSc Engineering Rock Mechanics Chartered Geologist Chartered Engineer

Simon has 30 years' experience in geotechnical engineering predominantly within the minerals industry.

Heatons is the trading name of Heaton Planning Ltd

Heatons Document Management

Revision	Author	Checked by	Date
FINAL	CS/SG/GI	CS/SG	07/06/2024

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1 INTRODUCTION

1.1 Background

1.1.1 This Environmental Statement (ES) has been prepared by Heatons on behalf of Tarmac Trading Limited (the Applicant) to support a planning application at Leapers Wood Quarry, Kellet Road, Carnforth, Lancashire (the site).

1.1.2 Planning permission is being sought for the deepening of existing quarry operations and an extension of time for the quarrying operations until 31 December 2064, with interim restoration being completed a year later, by 31 December 2065. Final restoration would be achieved by 31 December 2078 to take account of the proposed continued working at the adjacent Back Lane Quarry until the end of 2077.

1.1.3 This planning application is submitted under Section 73 of the Town and Country Planning Act 1990 and proposes to vary conditions 1 (timescales), 2 (approved plans), 4 (depth of mineral extraction), 6 (phasing plans), 40 (final restoration scheme) and 41 (water level timescales) of planning permission 01/03/1185 (original planning permission ref 1/86/760).

1.1.4 Leapers Wood Quarry has been operating for many years and is one of a very limited number of quarries able to meet the carboniferous limestone aggregate demand of the north-west England market.

1.1.5 The site is a strategic supplier of high-grade aggregates, essential for the repair, maintenance and improvement of the built environment in the region.

1.1.6 Since minerals are a finite natural resource, and can only be worked where they are found, best use needs to be made of them to secure their long-term conservation. Carboniferous limestone resources are extremely limited within Lancashire and the northwest of England, being confined to the Carnforth area in the north of the county and the Clitheroe area to the south. Further afield, carboniferous limestone resources are generally very heavily constrained by designations such as National Parks and National Landscapes.

1.1.7 It is considered preferable for the existing quarries to seek permission to extract additional minerals from a deeper depth, rather than to pursue a lateral extension to the existing workings.

1.1.8 It is therefore essential that the long-term plans for the site are considered at an

early stage to ensure that the resource available is not unnecessarily sterilised or compromised.

1.1.9 The working of Leapers Wood Quarry is coordinated with the development of Aggregate Industries' adjoining Back Lane Quarry which also proposes to deepen the extraction area to the same depth. It is important that the working and restoration of both quarry operations are closely coordinated as the site is essentially a single void.

1.1.10 Details of the proposed development and a site description are outlined within this ES, along with a broad assessment of any potential environmental effects and their significance. Comprehensive assessments and other background information are contained within the accompanying technical assessments.

1.2 Applicant

1.2.1 Tarmac are one of the UK's leading sustainable building materials companies. Its innovative products, solutions and services not only deliver infrastructure needed to grow the UK economy today but also enable a more sustainable built environment for the country's long-term future.

1.2.2 Tarmac currently employs almost 7,000 people across the UK and manages a wide range of sites across the country. Tarmac resources include 120 quarries, 74 asphalt plants, 100 ready-mix concrete plants, 22 contracting offices, and 3 cement and lime plants. The company also manage 330 strategically located sites across the UK.

1.2.3 Each site has a Biodiversity Action Plan (BAP), to identify targets, manage existing biodiversity and create new areas through on-going quarry restoration and ecological management. As a national minerals operator, the site BAPs help to monitor progress and make a significant contribution towards local and national biodiversity targets. These, in turn, contribute to global action for biodiversity.

1.2.4 The Company is also working with the Wildlife Trust in relation to their Biodiversity Benchmark Award which recognises a business's ongoing commitment to improving biodiversity on their sites. The award is one that requires the Company to be able to demonstrate that continuous improvement is being made and is the subject of annual review. The company operates fifteen quarries which have been awarded Benchmark status.

1.2.5 Further information on the Company can be obtained via their website www.tarmac.com

1.3 Information Availability

1.3.1 Electronic copies of all the documents submitted to Lancashire County Council in respect of the planning application are available at:

https://planningregister.lancashire.gov.uk/Search/Advanced

1.3.2 Paper format copies of the planning application, Environmental Statement and supporting information are available on request at the following prices:

- Paper Copy - £250
- Electronic (pdf) – no cost (also downloadable via Public Access)

1.3.3 All requests for hard copy information should be addressed as follows:

Heaton Planning Ltd
The Arc
6 Mallard Way
Pride Park
Derby
DE24 8GX

2 SITE APPRAISAL

2.1 Site Location

2.1.1 The site location is shown on drawing D.004. The current situation at the site is shown on drawing D.009 and the proposed extraction depths and consented extraction area are shown on drawings D.019 to D.023.

2.1.2 Leapers Wood Quarry is located within Lancaster City Council authority area, lying to the south-east of Carnforth in Lancashire. The site lies immediately adjacent (to the north) of Back Lane Quarry operated by Aggregate Industries (AI). The site is otherwise bounded to the north, east and west by an extensive woodland belt. The M6 motorway lies nearby to the west of the site.

2.1.3 Carnforth is the nearest major settlement to the site, the town centre of which lies around 1.5km west of the site. Further afield, Lancaster city centre lies 8.5km to the south of the site.

2.1.4 Access to Leapers Wood Quarry is via Kellet Road to the north of the quarry. The dedicated site access road provides immediate access to the former A601(M) – now B6601, some 70m to the west of the quarry access, which then provides onward access to the M6 and A6.

2.2 Site Description

2.2.1 The site lies immediately adjacent to, and north of, Back Lane Quarry. The sites are operated independently but their phased working and subsequent restoration are interrelated.

2.2.2 The site extends to approximately 48 hectares (ha) in size and comprises an operational limestone quarry across the majority of the application area, site offices and a weighbridge in the north of the site and a naturally regenerating overburden tip in the west of the site. Perimeter areas comprise lowland mixed deciduous woodland, mixed plantation woodland, hedgerows, dense scrub, calcareous grassland, improved pasture, open mosaic habitat and inland rock and scree.

2.3 Site Context

2.3.1 The northern boundary of the site consists of a woodland belt made up of Leapers Wood, Bowman Stout Wood and Slacks Wood (around 100m wide) beyond which are agricultural fields separating the quarry area from the settlement of Over Kellet

(around 500m away). Leapers Wood is classified as Ancient & Semi – Natural Woodland, Bowman Stout Wood is Ancient Replanted Woodland and Slacks Wood is also Ancient & Semi – Natural Woodland.

2.3.2 To the south of the site, beyond Back Lane Quarry, there are agricultural fields leading down to Back Lane, Main Road and the village of Nether Kellet. Hawthorns Caravan Park lies approximately 700m to the south of the quarry.

2.3.3 To the west of the site is a belt of woodland screening the site from the M6 which runs in a north / south direction past the site. To the east of the quarry is Kit Bill Wood, an Ancient and Semi-Natural Woodland covering around 4.9 ha.

2.3.4 The nearest residential areas to the extraction area lie around 400m to the north-west on the edge of Carnforth, beyond the M6. Over Kellet village lies around 500m to the north-east and Nether Kellet village lies around 900m to the south of the quarry at its nearest point.

2.3.5 There are a number of Listed Buildings within 2km of the site, the closest of which is Grade II* listed 'Church of St Cuthbert' approximately 500m to the east. The nearest cluster of listed buildings are within the village of Over Kellet around 800m north-east of the site.

2.3.6 A Public Footpath (PROW ref: 1-24-FP 7) runs north to south along the eastern side of Kit Bill Wood (to the east of the quarry), reaching Main Road. Here it runs parallel with Main Road before heading east to west (PROW ref: 1-22-FP 5) across the agricultural fields to the south of Back Lane Quarry.

2.3.7 There are two Sites of Special Scientific Interest (SSSI) within 2km of the site. Crag Bank SSSI is a 3.7ha biological designation located around 1.5km to the west of the site. Thwaite House Moss SSSI is a 7.25ha biological designation approximately 1km to the south-west of the site.

2.3.8 The Forest of Bowland National Landscape and the Arnside and Silverdale National Landscape lie around 1.7km to the east and 1.8km to the west respectively.

2.4 Background and Planning History

2.4.1 Leapers Wood Quarry is a long-established limestone quarry supplying high grade limestone aggregate throughout the region. Planning permission for mineral extraction at Leapers Wood Quarry was granted in 1988 (ref. 1/86/760). The permission was subject to an Environment Act review in 2003 (Application reference: 1/03/1185).

2.4.2 Planning permission was granted for the construction of a western embankment at Leapers Wood Quarry in 1995 (ref 1/94/582). The embankment provided a location for the tipping of overburden and waste material from the adjacent quarry and improved the screening of the quarry when seen from Carnforth and surrounding areas to the west. Condition 1 of the planning permission required the embankment to be completed by 30th June 2012 with restoration completed within a further year.

2.4.3 Planning permission to vary condition 1 of planning permission 01/94/0582 to extend the time period for the completion of the western embankment to 30 June 2022 was permitted on 28th September 2012 (ref. 01/12/0662).

3 DESCRIPTION OF THE PROPOSAL DEVELOPMENT

3.1 Introduction

3.1.1 The proposed development comprises a deepening of the currently permitted mineral extraction operations and an extension of time to allow the mineral reserves to be fully worked and the site restored.

3.2 Existing Operations

3.2.1 Leapers Wood Quarry comprises an operational limestone quarry, areas of stockpiling, site offices and associated car parking.

3.2.2 The site is accessed off Kellet Road and currently sells approximately 800,000 tonnes per annum (mtpa) of limestone aggregate. This is an average figure which will fluctuate depending upon demand and the wider economy.

3.2.3 The current permission for the site restricts working to a maximum depth of 38mAOD via planning condition.

3.2.4 The existing permission also limits the timescales for extraction and restoration of the site to 19 September 2048 and 19 September 2049 respectively.

3.2.5 The existing theoretical reserve remaining on site has been calculated to be approximately 6.5 million tonnes (mt) although some of these reserves (0.2 million tonnes) are constrained by plant, machinery, site buildings and a mineral waste tip and are not therefore able to be worked at present.

3.3 Description of Proposed Development

3.3.1 This planning application is submitted under Section 73 of the Town and Country Planning Act 1990 and proposes to vary conditions 1 (timescales), 2 (approved plans), 4 (depth of mineral extraction), 6 (phasing plans), 40 (final restoration scheme) and 41 (water level timescales) of 01/03/1185 (original planning permission ref 1/86/760).

<u>Reserves and output</u>

3.3.2 Leapers Wood Quarry extracts a high-grade limestone aggregate, the supply of which is critical in facilitating the construction of strategic projects throughout the region.

3.3.3 Permission is being sought for the deepening of the current quarrying operations in order to extract the limestone reserves to a depth of -37mAOD (i.e. an additional

depth of 75m). The proposed deepening would release a further 26 million tonnes (mt) of limestone, assuming the joint working of the boundary between Back Lane Quarry and Leapers Wood Quarry. This would result in an overall resource of around 33mt, including the existing workable reserves and those reserves currently constrained.

3.3.4 The existing annual sales from the site of approximately 800,000tpa would remain unchanged.

Phasing

3.3.5 The mineral would be extracted in 5 Phases (phases 1 – 5).

Phase 1

3.3.6 Mineral extraction would continue within the permitted limit of extraction, working southwards to extract rock down to the permitted level of 38mAOD, with subsequent deepening to 33mAOD and 23mAOD within the Phase period.

3.3.7 Extracted mineral would be processed on site at the quarry's processing plant, temporarily stocked and transported off-site by HGV to its point of sale.

3.3.8 Phase 1 would release approximately 9.103mt of mineral.

Phase 2

3.3.9 Mineral extraction would continue within the permitted limit of extraction, with deepening to a depth of 7mAOD within the Phase period.

3.3.10 Extracted mineral would be processed on site at the processing plant, temporarily stocked and transported off site by HGV to its point of sale.

3.3.11 Phase 2 would release approximately 5.338mt of mineral.

Phase 3

3.3.12 Phase 3 mineral extraction would continue within the permitted limit of extraction, with deepening to a depth of -37mOAD.

3.3.13 Extracted mineral would be processed on site at the processing plant, temporarily stocked and transported off site by HGV to its point of sale.

3.3.14 Phase 3 would release approximately 4.894mt of mineral.

Phase 4

3.3.15 During Phase 4 the processing plant would be decommissioned and removed from the site. During and following its removal a temporary mobile processing plant would be used within the quarry void, to facilitate the processing of rock and to avoid the sterilisation of the mineral resource.

3.3.16 The quarry weighbridge and offices would also be relocated.

3.3.17 Mineral extraction would continue within the permitted limit of extraction, with deepening to a depth of -37mAOD within the Phase period, together with the extraction of rock beneath the existing stockyard and processing plant areas.

3.3.18 Extracted mineral would be processed on site using mobile plant, to be located adjacent to the quarry face. Material would be temporarily stocked within the quarry void and transported off-site by HGV to its point of sale.

3.3.19 Phase 4 would release approximately 12.125mt of mineral.

Phase 5

3.3.20 Mineral extraction would continue in Phase 5 with the removal of the internal eastern ramps / access infrastructure.

3.3.21 Extracted mineral would be processed on site using mobile plant, to be located adjacent to the extraction face.

3.3.22 Material would be temporarily stocked within the quarry void and transported off site by HGV to its point of sale, via the Back Lane internal ramp/access infrastructure.

3.3.23 Following the cessation of mineral extraction, processing and sale of all mineral stocks, all quarry plant and machinery would be decommissioned and removed from the site.

3.3.24 Phase 5 would release approximately 1.978mt of mineral.

<u>Timescales</u>

3.3.25 In order to fully extract the additional reserves within the site, it would be necessary to extend the currently permitted timescales. Assuming the existing extraction rates are maintained, this would require an extension of time from 19 September 2048 to 31 December 2064 for mineral extraction and from 19 September 2049 to 31 December 2065 for interim restoration, with final restoration being undertaken by 31 December 2078.

Employment

3.3.26 The site currently employs 11 full time equivalent staff. No changes are proposed to the number of staff employed on the site.

Hours of Operation

3.3.27 Condition 13 and 14 of the site's extant planning permission (ref:01/03/1185) specify the operating hours for the site, as follows:

Condition 13

'*The use of explosives shall only take place between the hours of 1000 and 1700 Mondays to Fridays (except Public Holidays) and between 0830 and 1200 on Saturdays and at no other times, except in emergency situations. In such emergency situations the operator shall inform the County Planning Authority prior to blasting or within 48 hours of a blast having taken place'*.

Condition 14

'*Notwithstanding the hours of working contained in condition 13 above, no soils or overburden shall be stripped or re spread from any part of the site nor shall construction of storage, landscape or baffle mounds take place on any part of the site before 0730 hours or after 1800 hours on Monday to Fridays (expect Public Holidays) or before 0730 hours or after 1300 on Saturdays or at any time on Sundays or Public Holidays*.'

3.3.28 Due to the critical need for flexible working to service specific overnight road construction projects, no restrictions are placed on hours of operation of the mineral extraction activities within the quarry.

3.3.29 No changes are proposed to the above operating hours.

Traffic & Access

3.3.30 The site access is from Kellet Road to the north of the site along a purpose built access road with a junction onto the B6254 Kellet Road.

Lighting

3.3.31 No changes are proposed to the current lighting arrangements within the site.

Restoration

3.3.32 The restoration of Leapers Wood Quarry would be undertaken as a combined restoration scheme which would be achieved through the restoration and after-use

for both Leapers Wood Quarry and the adjacent Back Lane Quarry. An approved restoration scheme exists for the restoration of these sites, as shown on Drawing Number L13/08a 'Combined Conceptual Restoration Scheme'. The scheme is based on the mineral reserves being worked to a depth of 38mAOD. This planning application seeks permission to extract mineral to -37mAOD and therefore, a revised restoration scheme has been prepared.

3.3.33 Given its location close to two National Landscapes, the Lake District National Park and attractive rural parts of the north-west of England, as well as its proximity to the M6 motorway network, the resultant void at the two quarries would be well situated for recreational and amenity after-uses. As with the approved restoration scheme, the proposed restoration scheme recognises the potential for a multi-purpose after-use consisting of water and land-based recreational activities centered on and around a central lake, supplemented by discrete areas of nature conservation habitat, generally located on the quieter outer fringes.

4 PLANNING POLICY CONSIDERATIONS

4.1 Introduction

4.1.1 Section 38(6) of the Planning and Compulsory Purchase Act 2004 states that determination by the relevant MPA, in this instance, Lancashire County Council, must be made in accordance with the Development Plan unless material considerations indicate otherwise.

4.1.2 In reaching a decision on this application, the first consideration is therefore whether the proposals accord with the Development Plan. Having done this, it is then necessary to have regard to all other material considerations, which include all relevant policy considerations contained in the emerging development plan as well as National Planning Policy and guidance.

4.2 The Development Plan

4.2.1 The Development Plan for the application comprises the following documents:

- Joint Lancashire Minerals and Waste Development Framework Core Strategy DPD (Adopted February 2009);
- Joint Lancashire Minerals and Waste Local Plan - Site Allocation and Development Management Policies (Adopted September 2013);
- Lancaster Local Plan Part One: Strategic Policies & Land Allocations DPD (Adopted July 2020); and
- Lancaster Local Plan Part Two: Development Management DPD (Adopted July 2020).

4.2.2 Material considerations include:

- National Planning Policy Framework (last amended 2023)
- Planning Practice Guidance
- Review of the Minerals and Waste Local Plan (Emerging)

<u>Joint Lancashire Minerals and Waste Development Framework Core Strategy DPD (February 2009)</u>

4.2.3 The Core Strategy was adopted in February 2009 as part of the Local Development Framework for Lancashire. The document sets out the future for minerals and waste development in Lancashire until 2021 and outlines the strategic policies required to deliver the vision. However, it should be noted that the DPD is now considered out of date and therefore proposals now fall to be considered against

national policy. Notwithstanding this, policies of relevance within the Core Strategy are set out below.

4.2.4 The Core Strategy has the following objectives:

- To identify and safeguard mineral resources for specific purposes which meet a proven and sustainable need, recognising their environmental, cultural and landscape value and their potential for future working;
- To provide a sustainable supply of locally sourced minerals, sufficient to meet our local, regional, and national needs;
- To provide certainty for businesses, operators, and the public by identifying sites and areas for new mineral extraction, whilst seeking to conserve and enhance Lancashire's environmental assets and ensure a high quality of life for all;
- To support high standards of working practices and environmental protection and take an integrated and innovative approach to enhancing the quality of land and our landscapes during extraction and in restoration for beneficial after-use, including potential benefits to biodiversity, amenity, and access to the countryside; and
- To encourage and enable local communities, businesses, and local authorities to work together in coming to decisions and delivering solutions for sustainable resource management.

4.2.5 Policy CS1 (Safeguarding Lancashire's Mineral Resources) states that minerals will only be extracted where they meet a proven need for materials with those particular specifications. Mineral resources are to be conserved where they have an economic, environmental or heritage value. Mineral Safeguarding Areas will be used to identify mineral resources with the potential for extraction. The site is identified as a limestone site with 'Long-Term Strategic Provision' on the Key Diagram, situated within a 'Limestone Resource Area'.

4.2.6 Policy CS2 (Minimising the need for Mineral Extraction) requires new developments to maximise the use of recycled and secondary materials.

4.2.7 Policy CS3 (Meeting the demand for new Minerals) set out the provision of 57.8 million tonnes of limestone between 2001 – 2021 to be met through a combination of rolling forward and identifying a minimal range of new sites and relying on secondary and recycled aggregates. No additional land was allocated for limestone extraction for aggregate use before 2021.

4.2.8 Policy CS5 (Achieving Sustainable Minerals Production) encourages alternatives to the bulk transportation of minerals by road. Criteria for site identification will be developed in order to ensure new sites identified for minerals development are sustainable. Concurrent mineral working is encouraged where it will maximise the recovery of materials worked.

Joint Lancashire Minerals and Waste Local Plan - Site Allocation and Development Management Policies - Part 1 (2013)

4.2.9 The Site Allocation and Development Management Policies Local Plan (Part 1) provides site specific policies and allocations, and detailed development management policies for minerals and waste planning in the areas covered by the Councils of Lancashire, Blackpool and Blackburn with Darwen. Policies of relevance within the Core Strategy are set out below.

4.2.10 Policy NPPF 1 (Presumption in Favour of Sustainable Development) states that when a planning application accords with the policies in the Local Plan, it will be approved without delay, unless material considerations indicate otherwise.

4.2.11 Policy DM1 (Management of Waste and Extraction of Minerals) supports the extraction of mineral provision as set out in the Core Strategy and management of waste capacity as set out in Policy WM1.

4.2.12 Policy DM2 (Development Management) sets out the parameters for minerals and waste management operations. Minerals and waste developments will be supported that can demonstrate a positive contribution to the:

- Local and wider economy;
- Historic environment;
- Biodiversity, geodiversity and landscape character;
- Residential amenity of those living nearby;
- Reduction of carbon emissions; and
- Reduction in the length and number of journeys made.

4.2.13 Policy DM3 (Planning Obligations) where planning obligations are required to make a development acceptable in terms of its social, economic and environmental impacts, the MPA / WPA will seek to ensure the provision of, where appropriate:

- Access or road improvements;
- Long term aftercare or management;
- Provision of new or diverted footpaths;

- Public access to restored sites;
- Compensatory provision elsewhere for ecological mitigation;
- Wider transport improvements highlighted in the development's travel plans;
- District heating infrastructure sought under Policy DM4;
- Time limiting the development; and
- Ensuring full site restoration by a fixed date.

4.2.14 Policy SA2 (Safeguarding of Land for Access Improvements) safeguards land for the 'haulage route through Back Lane and Leapers Wood Quarries', identified as route 'MRT14' on the policies map.

4.2.15 Policy M1 (Managing Mineral Production) states that development will not be supported for any new extraction of sand and gravel, limestone, gritstone or brickshale. If permitted reserves are unable to maintain the required production levels (identified in the latest sub-regional apportionments), increasing the working depth at existing limestone quarries and extraction at Dunald Mill Quarry will be supported.

4.2.16 Policy M2 (Safeguarding Minerals) states that development within Minerals Safeguarding Areas as outlined on the Policies Map will not be supported if it is incompatible by reason of scale, proximity and permanence with working the minerals. The policy also sets out exemptions to this, such as in areas where mineral has no value or where prior extraction can take place.

<u>Lancaster District Council Local Plan Part One: Strategic Policies & Land Allocations DPD (Adopted July 2020)</u>

4.2.17 The Strategic Policies & Land Allocations DPD was adopted on 29th July 2020 and allocates land for housing, employment, services and new investments within Lancaster District.

4.2.18 Policy SP1 (Presumption in Favour of Sustainable Development) echoes guidance contained within the NPPF. The Council are required to take a positive approach when considering development proposals. Planning applications that accord with the Development Plan should be approved without delay.

4.2.19 Policy SP8 (Protecting the Natural Environment) seeks to ensure that the natural environment is protected, in particular biodiversity and geodiversity. Development should address any potential flood risk issues, taking into consideration the effects

of Climate Change. The district's biodiversity and geodiversity should be maintained and enhanced through the appropriate location of uses, sympathetic design, sustainable construction techniques and appropriate mitigation measures.

4.2.20 Policy SP10 (Improving Transport Connectivity) states that, where appropriate, development proposals will be expected to contribute to the delivery of important transport infrastructure.

4.2.21 Policy EN3 (Open Countryside) requires development proposals in the open countryside to have due regard to the relevant policies contained within the Local Plan, in particular the Development Management DPD. The site is located within the open countryside.

4.2.22 Policy EN7 (Environmentally Important Areas) requires development proposals which may impact upon regionally designated sites to have due regard to Policy DM44 of the Development Management DPD. Part of the site is designated as a regionally important area.

Lancaster District Council Local Plan Part Two: Development Management DPD (Adopted July 2020)

4.2.23 Policy DM29 (Key Design Principles) seeks to ensure that development responds to its environment, having regard to the existing character and quality of the area. The Council will expect development to, inter alia:

- Contribute positively to the identity and character of the area through good design, having regard to local distinctiveness, appropriate siting, layout, palate of materials, separation distances, orientation and scale;
- Ensure there is no significant detrimental impact to amenity in relation to overshadowing, visual amenity, privacy, overlooking, massing and pollution;
- Create buildings and spaces that are adaptable to changing social, environmental, technological and economic conditions.

4.2.24 Suitable and safe access to the existing highway network should be provided to ensure highway safety. Landscaping should be provided to protect adjoining sensitive users and the open countryside. Potential sources of air quality, noise and light pollution should be minimised.

4.2.25 Policy DM31 (Air Quality Management and Pollution) seeks to ensure that development proposals do not negatively impact upon air quality in the district. Proposals must demonstrate how they have sought to minimise polluting emissions

and, where necessary, incorporate on-site and/or off-site mitigation measures. Air Quality Assessments may be required for relevant development proposals.

4.2.26 Policy DM33 (Development and Flood Risk) requires development proposals to take a sequential approach which directs development to the areas of lowest risk of flooding.

4.2.27 Policy DM34 (Surface Water Run-off and Sustainable Drainage) requires surface water to be managed sustainably. Sustainable drainage systems should be implemented unless it is inappropriate or impractical. A drainage strategy is required for all major development proposals.

4.2.28 Policy DM35 (Water Supply and Waste Water) seeks to ensure that new development does not have a detrimental impact on surface water and groundwater quantity and quality and the quality and standard of bathing water in the locality. Waste-water must be disposed of efficiently and effectively. Proposals should seek to increase water availability and protect and improve the quality of rivers or groundwater where possible.

4.2.29 Policy DM44 (The Protection and Enhancement of Biodiversity) requires proposals to protect and enhance biodiversity and/or geodiversity and minimise both direct and indirect impacts. Where possible, a net gain of biodiversity assets should be delivered. Where harm is identified, developers must demonstrate how the harm will be mitigated or compensated for in line with the mitigation hierarchy.

4.2.30 Developments affecting environmentally sensitive sites and species will not be permitted where there is an adverse effect, unless the benefits of the proposal outweigh the potential adverse effects. If the adverse effects are unavoidable a development proposal will be required to demonstrate that:

- Adverse effects are minimised;
- Provision is made for mitigation and compensation measures, such as on-site landscape works, off-site habitat creation, species relocation and ongoing management as appropriate, such that there is a clear net gain for biodiversity; and
- The biodiversity value of the site is not compromised, both on its own and as part of the wider network of sites.

4.2.31 Development should protect and enhance the district's soil resource and avoid the use of best and most versatile agricultural land.

4.2.32 Policy DM45 (The Protection of Trees, Hedgerows and Woodland) states that the Council will protect ancient trees and ancient woodland. New development should positively incorporate trees and hedgerows, unless justification is provided as part of an Arboricultural Implications Assessment (AIA). Replacement trees will be sought where there are losses. Opportunities to plant new trees, hedgerow and woodland will be supported.

4.2.33 Policy DM46 (Development and Landscape Impact) requires a Landscape and Visual Impact Assessment to be prepared for development that has the potential for significant landscape or visual impact. Development proposals should be designed to avoid negative landscape and visual effects and, where unavoidable, mitigation measures and compensatory measures should be implemented.

4.2.34 Policy DM47 (Economic Development in Rural Areas) supports economic development in rural areas, providing the rural vitality and character of the area is maintained. Proposals will need to demonstrate the community benefits of the scheme. Sites in rural areas which are allocated for particular purposes through the Development Plan will be supported in principle.

4.2.35 Policy DM57 (Health and Well-being) requires development in the district to promote health and well-being and contribute to addressing health inequalities. Measures to achieve this include, inter alia, ensuring that development does not have an adverse impact on the environment through air, noise and water pollution.

4.2.36 Policy DM60 (Enhancing Accessibility and Transport Linkages) seeks to ensure that development generating significant footfall and / or motorised vehicle journeys is located where sustainable travel patterns can be achieved. Development proposals should, inter alia, include measures that address matters of highway safety to the satisfaction of the local highway authority and ensure that the proposal site can be accessed safely both during the construction and occupation phases of development. Any significant impacts must be addressed through the preparation of a Travel Plan. Where highway capacity is insufficient, provision of new transport and highway infrastructure will be sought.

4.2.37 Policy DM62 (Vehicle Parking Provision) requires development proposals to provide car and cycle parking in accordance with the levels and layout requirements set out in Appendix E of the DM DPD.

4.2.38 Policy DM63 (Transport Efficiency and Travel Plans) supports proposals that maximise sustainable modes of transport. Appropriate contributions should be

made via development proposals to improve transport infrastructure. A Transport Assessment may be required to assess the likely impacts of a development proposal on the local highway network.

4.3 Material Considerations

National Planning Policy Framework

4.3.1 The National Planning Policy Framework (NPPF) has been subject to several amendments since it was first published in 2012, the latest being in December 2023. The NPPF sets out the principle of a presumption in favour of sustainable development. Where a proposal satisfies the requirement of NPPF i.e. being sustainable and in accordance with the Development Plan, planning authorities are directed to grant planning permission without delay unless material considerations indicate otherwise.

4.3.2 Paragraph 7 of the NPPF defines the objective of sustainable development, which can be summarised as meeting the needs of the present without compromising the ability of future generations to meet theirs.

4.3.3 Paragraph 8 states that the planning system has three overarching objectives, which are interdependent and need to be pursued in mutually supportive ways. These are:

- An economic objective – to help build a strong, responsive and competitive economy, by ensuring that sufficient land of the right types is available in the right places and at the right time to support growth, innovation and improved productivity; and by identifying and coordinating the provision of infrastructure;
- A social objective – to support strong, vibrant and healthy communities, by ensuring that a sufficient number and range of homes can be provided to meet the needs of present and future generations; and by fostering well-designed, beautiful and safe places, with accessible services and open spaces that reflect current and future needs and support communities' health, social and cultural well-being; and
- An environmental objective – to protect and enhance our natural, built and historic environment; including making effective use of land, improving biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy'.

4.3.4 So that sustainable development is pursued in a positive way, at the heart of the Framework is a presumption in favour of sustainable development (paragraph 10). Paragraph 11 sets out that decision taking should apply the presumption in favour of sustainable development which means that development proposals that accord with an up-to-date development plan should be approved without delay, and in instances where there are no relevant development plan policies, or policies important for decision making are out of date, permission should be granted unless:

- the application of policies in this Framework that protect areas or assets of particular importance provides a clear reason for refusing the development proposed; or
- any adverse impacts of doing so would significantly and demonstrably outweigh the benefits, when assessed against the policies in this Framework taken as a whole.

4.3.5 Paragraph 38 states that decision-makers at every level should seek to approve applications for sustainable development where possible.

4.3.6 The bulk of the Framework contributes to the definition of sustainable development and includes the following paragraphs which are of particular relevance to this development, following the order of the NPPF document.

A Strong, Competitive Economy

4.3.7 In terms of building a strong, competitive economy, paragraphs 85-89 state that the planning system should operate to create conditions in which businesses can invest, expand and adapt, with significant weight placed on the need to support economic growth and productivity.

Sustainable Transport

4.3.8 Paragraphs 114-117 relate to the approach taken towards considering development proposals in a transport context. Proposals should ensure that safe and suitable access to an application site can be achieved for all users and that significant impacts on the transport network (including highway safety) can be cost effectively mitigated to an acceptable degree.

4.3.9 Paragraph 115 states that development should only be prevented or refused on highways grounds if there would be an unacceptable impact on highway safety, or the residual cumulative impacts on the road network would be severe.

Conserving and Enhancing the Natural Environment

4.3.10 Paragraph 180 states that determining planning applications should contribute to and enhance the natural and local environment. Measures to achieve this include, inter alia:

- protecting and enhancing valued landscapes, sites of biodiversity or geological value and soils;
- minimising impacts on and providing net gains for biodiversity, including by establishing coherent ecological networks that are more resilient to current and future pressures; and
- preventing new and existing development contributing to unacceptable levels of soil, air, water, or noise pollution or land instability.

4.3.11 Paragraph 186 advises that in decision making, refusal of permission should be issued only if adequate mitigation for proposals where significant harm to biodiversity cannot be avoided cannot be achieved, or, as a last resort, compensated for.

4.3.12 Paragraph 188 advises that 'the presumption in favour of sustainable development does not apply where the plan or project is likely to have a significant effect on a habitats site (either alone or in combination with other plans or projects), unless an appropriate assessment has concluded that the plan or project will not adversely affect the integrity of the habitats site'.

Conserving and Enhancing the Historic Environment

4.3.13 Paragraphs 195-214 outline the approach to the conservation and enhancement of the historic environment. The NPPF seeks to ensure that in decision making, local planning authorities aim to avoid or minimise any conflict between the conservation of a heritage asset and a development proposal.

4.3.14 Paragraph 200 advises that: 'In determining applications, local planning authorities should require an applicant to describe the significance of any heritage assets affected, including any contribution made by their setting. The level of detail should be proportionate to the assets' importance and no more than is sufficient to understand the potential impact of the proposal on their significance'.

Facilitating the sustainable use of minerals

4.3.15 Chapter 17 of the NPPF relates specifically to minerals and facilitating the sustainable use of mineral assets. Minerals are stated as being essential to

supporting sustainable economic growth and the Framework prioritises their long-term conservation.

4.3.16 Paragraph 215 makes it clear that, *'it is essential that there is a sufficient supply of minerals to provide the infrastructure, buildings, energy and goods that the country needs. Since minerals are a finite natural resource, and can only be worked where they are found, best use needs to be made of them to secure their long-term conservation.'*.

4.3.17 Paragraph 216 of the NPPF states that mineral resources should be safeguarded by defining Mineral Safeguarding Areas; and adopt appropriate policies so that known locations of specific minerals resources of local and national importance (such as aggregates) are not sterilised by non-mineral development where this should be avoided (whilst not creating a presumption that the resources defined will be worked).

4.3.18 Paragraph 217 emphasises that that *'great weight should be given to the benefits of mineral extraction, including to the economy'* and that when determining planning applications for mineral extraction, local planning authorities should:

- As far as practical, provide for the maintenance of landbanks of non-energy minerals from outside National Parks, the Broads, National Landscapes and World Heritage Sites, scheduled monuments and conservation areas;
- Ensure that there are no unacceptable adverse impacts on the natural and historic environment, human health or aviation safety, and take into account the cumulative effect of multiple impacts from individual sites and nearby sites;
- Ensure that any unavoidable noise, dust and particle emissions are controlled, mitigated or removed at source and noise limits are established where appropriate;
- Provide for restoration and aftercare at the earliest opportunity to be carried out to high environmental standards through appropriate conditions. Bonds or other financial guarantees should only be sought in exceptional circumstances.

4.3.19 NPPF Paragraph 219 sets out Government planning policy on the provision of construction aggregates in England and advises on a minimum landbank for crushed rock of 10 years in each Mineral Planning Authority area.

Planning Practice Guidance

4.3.20 The National Planning Practice Guidance (NPPG) is a web-based resource which brings together planning guidance on various topics into one place. It was launched in March 2014 and gives guidance on many aspects of planning. The PPG has been reviewed and the topics of particular relevance are as follows:

- Design;
- Noise;
- Travel Plans, Transport Assessments and Statements;
- Minerals;
- Natural Environment;
- Flood risk and Coastal change;
- Open spaces, sports and recreation facilities, public rights of way and local green space;
- Planning Obligations;
- Use of Planning Conditions;
- Water Supply, Wastewater and Water Quality.

Joint Lancashire Local Aggregate Assessment (LAA) (2023 with 2022 data)

4.3.21 The LAA (2023) provides an overview of the sand and gravel, limestone and gritstone reserve position for the joint councils of Lancashire, Blackpool and Blackburn with Darwen.

4.3.22 The latest sub-regional apportionment figure for crushed rock set by the North West Aggregate Working Party was in 2011 and equates to 2.54 mt per annum. The rolling 10 year sales average is 2.25 mt (2013 – 2022) whereas the rolling 3 year sales average is 2.52 mt per annum (2020 – 2022).

4.3.23 The LAA includes housing delivery forecasts for the District which have been calculated using Lancaster City Council's Local Plan forecast. This figure, 3mt, indicates that although permitted reserves and annual outputs are sufficient at present, there may be a need to consider the permitted reserves' ability to meet the forecast demand.

4.3.24 The LAA concludes that the assessment of supply and demand for crushed rock, together with a consideration of the economic and local circumstances, indicates that there is potential for a shortfall towards the end of the forecast demand period of 15 years (i.e. 2021 – 2036).

North West Aggregates Working Party (NWAWP) Annual Monitoring Report 2021 (including data from 2019 and 2020)

4.3.25 The NWAWP Annual Monitoring Report (AMR) provides sales and reserve data for the period 1st January to 31st December 2020. The report also contains data for 1st January to 31st December 2019, which has been taken from the Government's Aggregate Minerals Survey 2019 (AM2019) undertaken by the BGS.

4.3.26 The AMR provides information on aggregates in the North West of England so that the NWAWP can contribute to the monitoring of the Managed Aggregate Supply System (MASS) and assess whether the North West of England is making a full contribution towards meeting both national and local aggregate needs.

Review of the Minerals and Waste Local Plan

4.3.27 A review of the adopted Minerals and Waste Local Plan (MWLP) is currently in preparation. A Scoping consultation was carried out in November 2014 and the responses were published in May 2018. Consultation on the Publication version of the emerging MWLP was anticipated in Summer 2019 as per the latest Local Development Scheme (LDS) (August 2018). A revised LDS is anticipated to be published which will provide an updated timetable for preparation of the emerging MWLP.

4.4 Planning Policy Conclusions

4.4.1 Policy M1 (Managing Mineral Production) states that development will not be supported for any new extraction of sand and gravel, limestone, gritstone or brickshale. The proposals seek to deepen and extend the timescales of an existing permitted limestone quarry. Therefore, the site should not be considered as new extraction.

4.4.2 Policy CS1 (Safeguarding Lancashire's Mineral Resources) safeguards minerals of economic, environmental or heritage value from permanent sterilization through designating Mineral Safeguarding Areas (MSAs). Policy M2 (Safeguarding Minerals) states that development within Minerals Safeguarding Areas as outlined on the Policies Map will not be supported if it is incompatible by reason of scale, proximity and permanence with working the minerals. The site is identified within a MSA on 'Policies map 2' of the MWLP (2009). The site is also identified as a limestone site with 'Long-Term Strategic Provision' on the Key Diagram, situated within a 'Limestone Resource Area'.

4.4.3 MWLP Policy DM2 (Development Management) supports mineral operations that can demonstrate a positive contribution to, inter alia, the economy, biodiversity and geodiversity, landscape character and the reduction of carbon emissions. The site currently operates under a Biodiversity Management Plan and employs best practice measures, which will both be continued. The approved restoration scheme is shown on Drawing Number BLQ 5/1 'Combined Conceptual Restoration Scheme'. The approved restoration scheme combines economic and biodiversity gains through development of a 42 hectare lake for water and land-based recreational activities with designated areas of nature conservation habitat.

4.4.4 MWLP Policy NPPF 1 (Presumption in Favour of Sustainable Development) states that when a planning application accords with the policies in the Local Plan, it will be approved without delay, unless material considerations indicate otherwise. The proposals are considered to accord with the Development Plan and other material considerations.

4.5 Key Policy Considerations

4.5.1 Having regard to the location, nature, scale and extent of the proposed development at Leapers Wood Quarry, the Development Plan and other material considerations identify the following key considerations that must be taken into account:

- Need and benefits of the proposal;
- Alternatives to the proposal;
- Potential for landscape and visual impact;
- Potential for impact on nature conservation and ecology;
- Potential for impact on water resources and flood risk;
- Potential for impact upon amenity and health, in terms of noise, air quality and dust;
- Potential for impact on heritage assets and/or designations;
- Potential for impact on highway capacity and safety;
- Potential for impact on Public Rights of Way; and
- Carbon management and potential climate change implications.

4.5.2 The key policy considerations set out above are addressed in detail throughout the subsequent chapters of this ES, which collectively provide information to demonstrate the acceptability of the proposed development in planning terms, and

to assess the technical acceptability of the proposed development in the context of EIA.

5 ENVIRONMENTAL IMPACT ASSESSMENT

5.1 Introduction

5.1.1 The need for an Environmental Impact Assessment is considered under the terms of the Town and Country Planning (Environmental Impact Assessment) Regulations 2017 (hereafter referred to as the 'EIA Regulations').

5.1.2 The proposal falls within the description of Category 24 of Schedule 1 of the EIA Regulations, 'Any change to or extension of development listed in this Schedule where such a change or extension in itself meets the thresholds, if any, or description of development set out in this Schedule', as the proposed development comprises an extension of an EIA development listed in Schedule 1.

5.1.3 In accordance with Part 4, Paragraph 15 of the EIA Regulations, in September 2021 the Applicant requested that LCC provides a Scoping Opinion as to the information to be provided in the Environmental Statement. To assist LCC in the formulation of the Scoping Opinion a report was submitted which provided an outline of the development proposal and a broad outline of potential environmental effects and technical considerations, as well as the potential benefits and other relevant considerations.

5.1.4 LCC responded to this request on 20th December 2021 where it was confirmed that the proposals constituted EIA development and set out their formal Scoping Opinion which included responses from the consultation exercise with a number of statutory consultees. In summary, the topics to be assessed within the Environmental Impact Assessment are:

- Landscape and visual impact;
- Ecology;
- Water environment;
- Traffic;
- Noise;
- Dust/Air quality;
- Blasting vibration;
- Climate change;
- Land stability;
- Alternatives; and
- Cumulative impacts.

5.1.5 LCC confirmed that a Non-Technical Summary would also be required.

5.1.6 The Scoping Opinion stated that the ES should consider cumulative impact issues and other environmental impacts that may occur due to other adjacent similar development. In particular this relates to the operation of Back Lane Quarry, immediately south of the site, particularly in relation to the topics of noise, air quality, blasting and hydrological impacts.

5.2 The Environmental Statement

5.2.1 An Environmental Impact Assessment has been carried out to determine the likely impacts of the proposed development with regard to the EIA Regulations 2017. In accordance with the Scoping Opinion received by LCC in December 2021, the matters detailed in Section 5.1.4 have been assessed through the EIA process. This ES assesses the main or significant environmental effects to which the development is likely to give rise and has been prepared on an iterative basis.

5.2.2 In preparation of the ES, consultation with statutory bodies on the main issues has been undertaken and has informed the relevant environmental assessment work. Details of such consultations are included within the individual technical assessment reports. The technical reports for the EIA are contained within Technical Appendices to this ES. The main findings and conclusions of the technical reports are summarised within this ES. These findings demonstrate the most potentially significant environmental effects of the proposed development.

5.2.3 In preparing the ES, the EIA team of consultants has had regard to the contents of Schedule 4 of the Town and Country Planning (Environmental Impact Assessment) Regulations 2017. Specifically, the ES has addressed the main elements of the proposals that have the potential to impact (positively and/ or negatively) on:

a) population and human health;

b) biodiversity, with particular attention to species and habitats protected under Directive 92/43/EEC(a) and Directive 2009/147/EC(b);

c) land, soil, water, air and climate;

d) material assets, cultural heritage and the landscape; and

e) the interaction between the factors referred to in sub-paragraphs (a) to (d).

5.2.4 This ES and accompanying Planning Statement have been prepared by Heatons alongside several technical appendices prepared by the Applicant's team of

technical consultants, all of whom are suitably qualified and benefit from an understanding of the site and significant experience of similar proposals to that contained within the scope of this planning application.

5.2.5 The appointed team of technical specialists is as follows:

- Landscape and Visual Impact – Heatons
- Ecology and Biodiversity – South Lakes Ecology / Heatons
- Biodiversity Net Gain - Heatons
- Transport – Tetra Tech
- Noise Assessment – Advance Environmental Limited
- Air Quality and Dust Assessment – Advance Environmental Limited
- Groundborne Vibration and Air Overpressure Assessment – Advance Environmental Limited
- Health – Savills
- Geotechnical/Stability – KeyGS
- Water Environment – Hafren Water

5.3 Main Environmental Considerations

5.3.1 Within the Development Plan and Government guidance notes there are numerous policies that seek to ensure development proposals protect the environment and, where appropriate, make contributions to enhance the environmental assets of the area within which they are proposed. The environmental policies of relevance to this planning application are those focused on the following:

- Landscape and visual impact – ensuring that the proposed deepening and lateral extension can be worked in a manner that does not cause an unacceptable impact upon the landscape or have an impact upon the visual amenity of nearby residents or users of the area;
- Impact upon ecology – including the protection of habitats and the protection of species;
- Protection of amenity – ensuring that levels of noise, dust and vibration are kept to within acceptable levels;
- The promotion of an appropriate land use following mineral extraction;
- Protection of the water environment – ensuring that there is no pollution of groundwater or surface water resources and ensuring that there is no increase in flood risk;
- Impact of transport – ensuring that the highway network can accommodate

HGVs associated with the quarrying operations;

- Impacts on Public Rights of Way and their users; and
- Managing the effects of climate change.

5.3.2 All of the above are explored in further detail in the following sections.

6 ALTERNATIVES

6.1 Introduction

6.1.1 As set out in paragraph 041 (Reference ID: 4-041-20170728) of the Planning Practice Guidance, the Town and Country Planning (Environmental Impact Assessment) Regulations 2017 do not require an applicant to consider alternatives.

6.1.2 Notwithstanding this, where alternatives have been considered, Schedule 4 (Part II) of the Town and Country Planning (Environmental Impact Assessment) Regulations 2017 (the Regulations) provides that the information for inclusion in Environmental Statements should include 'A description of the reasonable alternatives (for example in terms of development design, technology, location, size and scale) studied by the developer, which are relevant to the proposed project and its specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effect'. In accordance with Schedule 4, the main alternatives to the scheme, as studied by the Applicant, are considered below.

6.1.3 The assessment of alternatives has considered the environmental assessment work undertaken by the team of technical consultants and indicates where the assessment work has influenced the ultimate design of the scheme having regard to the potential for environmental effects.

6.2 Approach and Methodology

6.2.1 The assessment of alternatives has had regard to relevant Development Plan policy, Government planning guidance and the EIA Regulations 2017 together with its corresponding Circular and good practice guide.

6.2.2 In terms of an overall approach, it is considered to be neither practical nor necessary to look at every single alternative option. Instead, and in accordance with Government guidance, consideration of 'main alternatives studied by the applicant' is detailed below.

6.3 Do Nothing

6.3.1 The first consideration in terms of an alternatives assessment is the 'do nothing option'. In practical terms, this would involve the continuation of mineral extraction operations at Leapers Wood Quarry until the unconstrained mineral reserves have been fully exhausted. At current rates of extraction, the reserve would be exhausted by 2033. The mineral contained within the higher working benches

within the quarry void would be removed, along with the internal haul roads, in order to ensure that all workable mineral is extracted. Without also being able to work the shared boundary between Back Lane Quarry and Leapers Wood Quarry beyond the permitted 38mAOD, the remaining boundary would have to be left unexcavated, sterilising a significant tonnage of mineral from this part of the site.

6.3.2 Once the permitted unconstrained mineral reserves have been fully extracted, the site would be restored in accordance with the currently approved restoration scheme. Whilst this phase of the site would require a small number of staff for landscaping, planting and operating mobile plant and machinery, the majority of site-based staff and haulage jobs could potentially be transferred to other Tarmac sites, or lost through redundancy.

6.3.3 The 'do nothing' option is not the preferred option for Tarmac as it would result in the loss of both direct and indirect jobs with the associated input to the local economy and effectively sterilise mineral reserves that have a significant economic value.

6.3.4 The 'do nothing' approach would not allow for the site to be worked at some point in the future from an operational perspective, as it would have removed the higher level working areas and internal haul roads. Furthermore, from an economical perspective, recommencing operations at the site would require the reinstatement of plant and processing equipment etc. The capital investment required for this would not make the mineral economically viable to extract.

6.4 Alternative Crushed Rock Sources

6.4.1 The number of quarries within Lancashire which have current planning permissions will reduce in 2022 and 2028. Dunald Mill Quarry continues to be mothballed but a planning application was submitted in September 2021 to extend the life of mineral extraction from February 2022 until February 2034. This application is yet to be determined. Ribblesdale Lanehead Quarry and Ribblesdale Cement Bellman Quarry, operated by Hanson UK, primarily supply cement raw materials but a proportion of the reserve is not suitable for this and is sold as aggregate. The sites have permission until 2027. Back Lane Quarry, adjacent to Leapers Wood Quarry, which is operated by Aggregate Industries UK Limited (AI), has permission until 2048 but if the shared boundary with Back Lane Quarry is not able to be worked, the remaining reserves of approximately 6.5mt would be exhausted around 2033. A planning application is being submitted by AI to extend the operational life of the

Back Lane Quarry to allow for the deepening of the mineral extraction within the site and to allow the extraction of mineral within the joint boundary to a depth of -37mAOD.

6.4.2 Lancashire's 2023 Local Aggregates Assessment addresses the supply of aggregate within the Plan Area and the ability of the existing and permitted sites to deliver the required volumes of material. It states that in 2022 there were 45.39 million tonnes of limestone reserves with planning permission, held in 5 quarries.

6.4.3 Beyond the Plan Area, there are a number of limestone quarries within Cumbria, including the Lake District National Park (LDNP), although five crushed rock quarry permissions within the Plan Area will expire before 2030 and none have permission beyond 2042.

6.4.4 It is acknowledged that in the short term there are alternative sources of crushed rock. However, beyond 2030 there will be a significant reduction in the number of permitted sites within Lancashire and the surrounding authorities. The 2023 LAA states that the landbank of at least 10 years is expected to begin to be eroded in 2031 (using 10 year sales average) or 2029 (using 3 year sales average), although this does not take account of mineral reserves which are permitted and therefore included in the calculated landbank, but are constrained by site infrastructure etc and therefore may not be worked. In order to secure the long term supply of limestone resources within Lancashire, it is necessary to consider development options at an early stage. As stated in Section 6.3.4, if permission is not granted for the deepening of the working area of the quarry, it would not be feasible to work the constrained mineral at a later date as access to these parts of the site would be effectively cut off.

6.4.5 If the deepening of working at Leapers Wood Quarry is permitted, it would facilitate the extraction of around 33mt (including the existing reserves), which would be worked until the end of 2064. In conclusion, whilst short term alternatives sources of crushed rock do exist within the Plan Area, the proposed development is required in order to maximise the available mineral within the quarry and secure the supply of limestone over the longer term. Since minerals are a finite natural resource, and can only be worked where they are found, it is important to make best use of them to secure their long-term conservation.

6.5 Alternatives to Primary Aggregates

6.5.1 There are two alternatives to primary aggregates – recycled aggregates and secondary aggregates.

6.5.2 Recycled aggregates: derived from reprocessing materials previously used in construction. Examples include recycled concrete from construction and demolition waste material (C&DW) and railway ballast.

6.5.3 Secondary aggregates: usually by-products of other industrial processes not previously used in construction. Secondary aggregates can be further sub-divided into manufactured and natural, depending on their source. Examples of manufactured secondary aggregates are pulverised fuel ash (PFA) and metallurgical slags. Natural secondary aggregates include china clay sand and slate aggregate.

6.5.4 In 2002, the WRAP (Waste & Resources Action Programme) Aggregates Programme funded by DEFRA was launched to minimise the demand for primary aggregates through promoting greater use of recycled aggregates.

6.5.5 To ensure demolition waste could be processed into recycled aggregate which was of an appropriate quality and conformed to the appropriate European Aggregate Product Standard, WRAP worked with the industry to formulate a Quality Protocol (QP). This QP, entitled 'The Quality Protocol for the production of aggregates from inert waste', was first published and implemented in 2004. It was reviewed and reprinted in 2008 to produce the current edition.

6.5.6 In summary, the Quality Protocol provides recycled aggregate suppliers with the following:

- A procedure to control the quality of recycled aggregates for sale as construction materials, or as constituents in a product, e.g. concrete, asphalt and unbound mixtures; and
- Recommended minimum frequencies of inspection and testing conforming to the requirements of the European Standards for Aggregates (See references below).
- The means for suppliers to provide adequate assurance that their products conform to relevant technical specifications and certified characteristics.

6.5.7 The aggregates market supplied from recycled and secondary sources has risen to 29%. This 29% market share is nearly three times higher than the European average of 10%, highlighting the fact that the use of recycled and secondary materials in

Britain is close to full potential. (Source: Profile of the UK Mineral Products Industry - 2018 Edition)

6.5.8 The use of recycled and secondary aggregates is widely supported. However, they will never be able to wholly replace primary aggregates as there can never be a guarantee of supply of material of an appropriate quality to meet a specific demand. Therefore, there still remains a need for the provision of primary aggregate and this is reflected in the continuation of apportionment figures for primary aggregate and the provision of a landbank.

6.6 Alternative Restoration Options

6.6.1 Alternative options have been considered by Tarmac in relation to the restoration of the site once mineral extraction operations have ceased. The preparation of the proposed development scheme, including the restoration proposals, has been an iterative process. The Company has given careful consideration to the findings of the EIA work and the Development Plan. The overall aim of the restoration strategy is to create a site with a variety of habitats of both nature conservation and amenity value whilst reflecting the local landscape character.

6.6.2 The proposed scheme would be delivered in conjunction with the adjacent Back Lane Quarry and would comprise a central lake feature with areas of lakeside shallows to support fringe reedbed of predominantly common reed with some emergent and aquatic plants around the shore. It is proposed that the controlled water level would be maintained at approximately 44.8mAOD. As the mineral, under the proposed scheme, would be excavated to a depth of -37mAOD, this would equate to a water depth of approximately 82m.

6.6.3 The proposed restoration scheme has been developed taking account of the three dimensions to sustainable development (NPPF, para 8). The restoration proposes a balance of environmental and economic considerations. The proposed end uses would enable the site to be developed for leisure and recreation but would also provide significant long-term enhancements to ecology and nature conservation.

6.6.4 Alternatives considered include leaving the site as it is following mineral extraction and letting it fill up with water naturally, which could present health and safety issues due to the sheer and steep quarry faces. Another alternative considered involved infilling the quarry void to create a shallower restoration profile. However, the significant scale of the quarry void would require vast quantities of restoration materials to make measurable changes to the profile of the void and it was

considered that importing waste or recovered material would not provide significant environmental or economic benefits. Furthermore, as the site is not rail linked, all fill material would need to be imported by road, which may have traffic and highway implications. It was therefore, decided that available on-site mineral waste would be used to create a shoreline with areas of shallows around the periphery of Back Lane Quarry and a 2m wide shallow water margin would be created within Leapers Wood Quarry, which would provide health and safety benefits as well as creating valuable habitats for aquatic plants and wildlife.

6.6.5 The restoration proposals therefore provide a balanced range of economic, social and environmental benefits to deliver beneficial after uses securing economic value for the Company as well as ecological/biodiversity enhancement.

6.7 Conclusions

6.7.1 Whilst alternative options have been considered by the Applicant, the proposed development was considered to represent the best option for the reasons set out below.

6.7.2 The 'do nothing' option is not the preferred option for Aggregate Industries. It would require the site to continue to operate in accordance with the extant planning permission and would involve the continuation of mineral extraction operations at Leapers Wood Quarry until the unconstrained mineral reserves have been fully exhausted. This is predicted to be well before the permitted end date of 2048 (around 2033 at current extraction rates). The mineral contained within the higher working benches within the quarry void would be removed, along with the internal haul roads. The 'do nothing' approach would not allow for the site to be worked at some point in the future from an operational perspective, as it would have removed the higher level working areas and internal haul roads. From an economical point of view, it would require the reinstatement of plant and processing equipment etc. The capital investment required for this would not make the mineral economically viable to extract. The 'do nothing' approach would also result in the loss of both direct and indirect jobs with the resulting effect on the local economy.

6.7.3 Alternative sources of crushed rock have been considered. It is acknowledged that in the short term there are alternative sources of crushed rock. However, beyond 2030 there will be a significant reduction in the number of permitted sites within Lancashire and the surrounding authorities. The 2023 LAA states that the landbank

of at least 10 years is expected to be eroded in 2032 (using 10 year sales average) or 2029 (using 3 year sales average), although this does not take account of mineral reserves which are permitted and therefore included in the calculated landbank, but are constrained by site infrastructure etc and therefore may not be worked. In order to secure the long term supply of limestone resources within Lancashire, it is necessary to consider development options at an early stage, to prevent them from becoming sterilised and to plan for their extraction.

6.7.4 The important contribution that recycled and secondary aggregates make in industry is acknowledged. However, they will never be able to wholly replace primary aggregates as there can never be a guarantee of supply of material of an appropriate quality to meet a specific demand. Therefore, there still remains a need for the provision of primary aggregate.

6.7.5 Whilst consideration was given to leaving the site unrestored, following the cessation of mineral extraction, and allowing the void to fill with water, this option was discounted as the sheer quarry faces would potentially have health and safety implications. Given the significant scale of the void, the importation of restoration materials was also discounted as it was considered that there would be little economic or environmental benefit unless vast quantities of material were deposited. The use of relatively small quantities of mineral waste available within the site was therefore proposed to create areas of shallows around a lake shoreline. This approach would have both health and safety as well as ecological benefits.

6.7.6 The proposals, as submitted, represent the best scheme from both sustainability and commercial viability points of view, as well as being the most environmentally acceptable.

7 LANDSCAPE AND VISUAL

7.1 Introduction

7.1.1 A Landscape and Visual Impact Assessment (LVIA) has been prepared to support this planning application. The LVIA report, as well as accompanying plans and viewpoints are provided at Technical Appendix C.

7.1.2 The aim of the LVIA is to understand the baseline landscape and visual resources and receptors within the Site and the local area and to assess their value and sensitivity to change resulting from the proposed development type. From this baseline position, to then assess the specific magnitude of effect of the detailed development proposed on landscape and visual resources/receptors and to determine the Level of Significance of Effect on landscape and visual matters (which could be potentially adverse/ or beneficial). The report also considers the potential for cumulative effects which could arise from the Proposed Development in combination with either existing and / or potential other development / activities.

7.1.3 The LVIA report has taken on board the comments received during the Scoping process from Lancashire County Council's (LCC) County Landscape Advisor. The report follows guidelines for Landscape and Visual Impact Assessment (GLVIA3), produced by the Landscape Institute and Institute of Environmental Management and Assessment. (TGN) 06/19 – The Visual Representation of Development Proposals – Photography and Photo Montage Guide (01-11) being followed.

7.1.4 Leapers Wood Quarry is located within Lancaster City Council authority area, lying to the south-east of Carnforth in Lancashire. The site is bounded to the north by higher ground and landuses of Leapers Wood and Bowman Stout Wood, to the east by Kit Bill Wood, to the south by Aggregate Industries' Back Lane Quarry and to the west by a further large woodland block leading down to a section of the M6.

7.1.5 The LVIA report assesses the potential for Landscape Character and Visual Change / Effects between the baseline of the permitted development against the proposed development changes. It is noted at the start of the report that as the nature of the application is principally for deepening, the existing operational disturbance / effect of the quarry activities are already present in the landscape. These effects have been assessed and in essence there is Neutral Change between the Current Situation / permitted site and the Proposed Development. What will change is the time element with development taking a further 16 years. This has been considered along with the potential for cumulative effects.

7.2 Methodology

7.2.1 *"LVIA is a tool used to identify and assess the significance of and the effects of change resulting from development on both the landscape as an environmental resource, in its own right, and on people's views and visual amenity"* GLVIA.

7.2.2 Data collation and assessment has been carried out utilising both desktop and Site survey works to identify the baseline landscape character and visual nature and condition of the Site and its local area. Initial desk top survey analysis helped to identify the potential areas the Proposed Development may influence / change in respect of character and viability. A 1:25,000 Ordnance Survey map was used to identify potential areas of visibility from roads, properties, public rights of way and open access land. Utilising Site and Site context topographical 3D data the Zone of Theoretical Visibility (ZTV) of the existing Site and the potential Proposed Development was undertaken. See Drawing Numbers KD.BKLN.D.1.028, for the site's Current ZTVI, KD.BKLN.D.1.029 for the ZTVI associated with the Proposed Development and KD.BKLN.D.1.033 for the ZTVI post restoration within Technical Appendix C. Please note there is no discernible change in either the geographical spread or levels of magnitude of impact between 3No. ZTVs. These were then used to inform and help define a study area within which the Proposed Development could influence / change both Landscape Character and Visual Amenity. It is worth noting that the ZTVs are a worst-case scenario in assessing the geographical land area from where the existing / proposed Site development could be observed / influence Landscape Character as this method of analysis does not account for existing built form or vegetation structure which would affect / could screen views towards the Site from landscape and visual receptors.

7.2.3 The desktop appraisal helped form the basis for Site survey works which were carried out in September 2023. Based upon these models the study area for the assessment was set at 5km^2.

7.2.4 A description of the full Methodology and Assessment Process used is detailed within Technical Appendix C.

7.2.5 In summary and in highlighting the main assessment process the GLVIA states that when undertaking an LVIA, this should consider:

- Landscape effects i.e. the effects on the landscape as a resource; and
- Visual effects i.e. the effects on views and visual amenity.

7.2.6 It also states that; "LVIA must deal with both and should be clear about the difference between them". GVLA 3 para 2.2.2 para 21.

7.2.7 The Guidelines explain that both landscape and visual effects are dependent upon the sensitivity of the landscape resource or visual receptors and the magnitude of impact.

Sensitivity – is the term applied to specific receptors, combining judgements of the susceptibility of the receptor to the type of change or development proposed and the value related to that receptor.

Susceptibility – is the ability of a defined landscape or visual receptor to accommodate the specific proposed development without undue negative consequences.

Landscape Value – being the relative value that is attached to different landscapes by society. A landscape may be valued by different stakeholders for a whole variety of reasons. Value attached to views – The recognition of the value attached to particular views e.g. in relation to heritage assets or through planning designations.

7.2.8 *Magnitude (of effect)* – the term that combines judgements about the size and scale of the effect, the extent of the area over which it occurs, whether it is reversible or irreversible and whether it is short or long term in duration.

7.2.9 *Assessed Overall Level of Significance of Effect* – this term relates to the final judgement about whether each effect identified is significant or not. It is a measure of the importance or gravity of the environmental effect, defined by the significance criteria specified within Technical Appendix C.

7.3 Development Proposals

Existing Operations

7.3.1 The site is accessed off Kellet Road (B6254) and currently sells approximately 0.8mt per annum of limestone aggregate. The current permission for the site restricts working to a maximum depth of 38mAOD via planning condition. The extant permission also limits the timescales for extraction and restoration of the site to 19th September 2048 and 19th September 2049 respectively.

Proposed Operations

7.3.2 The proposed development seeks permission for extraction of limestone to a depth of -37mAOD. The proposed deepening of the quarry would release a further 26mt

of mineral. This tonnage is dependent upon joint boundary working between Leapers Wood and Back Lane.

7.3.3 The existing annual sales from the site of approximately 800,000 tpa would remain unchanged. It would therefore also be necessary to seek permission for an extension to the extraction period and final restoration date of the site. Assuming that the existing extraction rate is maintained and that the site is worked in conjunction with the adjacent Back Lane Quarry, this would require an extension to the extraction period until 31 December 2064, with interim restoration by 31 December 2065.

7.3.4 The annual output of the quarry (and therefore the average daily HGV movements) would be maintained and existing hours of operation would remain as approved. No new infrastructure is proposed on site as part of the proposals and access arrangements would remain as permitted. No other changes are proposed as part of the application.

7.3.5 Phase 1 - See Drawing No. KD.BKLN.D.1.019. Proposed Phase 1 Operations include:

- Mineral extraction to continue within the permitted limit of extraction, working southwards to extract rock down to a level of 33mAOD, with subsequent deepening to 23mAOD within the Phase period.
- Extracted mineral to be processed on site at the quarry processing plant, temporarily stocked and transported off-Site by HGV to point of sale.

7.3.6 Phase 2 – See Drawing No. KD.BKLN.D.1.020. Proposed Phase 2 Operations include:

- Mineral extraction to continue within the permitted limit of extraction, with deepening to a depth of 7mAOD within the Phase period.
- Extracted mineral to be processed on site at the processing plant, temporarily stocked and transported off-Site by HGV to point of sale.

7.3.7 Phase 3 – See Drawing No. KD.BKLN.D.1.021. Proposed Phase 3 Operations include:

- Mineral extraction to continue within the permitted limit of extraction, with deepening to a depth of -37mAOD within the Phase period, together with the extraction of rock beneath the existing stockyard.
- Extracted mineral to be processed on site at the processing plant, temporarily stocked and transported off-Site by HGV to point of sale.

7.3.8 Phase 4 – See Drawing No. KD.BKLN.D.1.022. Proposed Phase 4 Operations include:

- During this period, the Leapers Wood Quarry processing plant area will be decommissioned and removed from Site. During and post its removal, a temporary mobile plant will be utilised within the quarry void, to ensure the continued processing of mineral and to avoid the sterilisation of the mineral resource.
- The quarry weighbridge and offices will also be relocated.
- Mineral extraction to continue within the permitted limit of extraction, with deepening to a depth of -37mAOD within the Phase period, together with the extraction of rock beneath the existing stockyard and processing plant area.
- Extracted mineral to be processed on site utilising mobile plant, to be located adjacent to the extraction face. Material to be temporarily stocked within the quarry void and transported off-Site by HGV to point of sale.

7.3.9 Phase 5 – See Drawing No. KD.BKLN.D.1.023. Proposed Phase 5 Operations include:

- Mineral extraction to continue, with the removal of the internal eastern Leapers Wood Quarry ramps / access infrastructure.
- Extracted mineral to be processed on site utilising mobile plant, to be located adjacent to the extraction face.
- Material to be temporarily stocked within the quarry void and transported off-Site by HGV to point of sale, via the Back Lane Quarry internal ramp / access infrastructure.
- Post mineral extraction, processing and sale of stock, all quarry plant and machinery is to be decommissioned and removed from site.

7.3.10 Concept Restoration – See Drawing No. KD.BKLN.D.1.024. The aim of the Concept Restoration Scheme and associated Objectives are as follows:

7.3.11 ***Aim*** *– To restore and establish landform and habitats to support wildlife and leisure land uses, set and integrated within the local landscape setting.*

Objectives:

- Retain the existing controlled access point into Leapers Wood Quarry, providing access to a principally wildlife enhanced / leisure walk area, with viewpoints over both the restored quarries.
- To establish a long term aftercare and management plan, to ensure the quality and maintenance of the site's restored land uses.
- To establish and maintain a permanent lake water level discharge point.

- The provision and implementation of detailed habitat plans and protected species enhancement measures.

7.3.12 The currently permitted Concept Restoration Scheme is illustrated on Drawing No. L13/08a.

7.4 Landscape Orientated Designations and Planning Policies

7.4.1 The site is not located within a nationally designated landscape e.g. National Park or National Landscape. However, the site is located approximately 1.8km to the south and east of Arnside / Silverdale National Landscape and around 1.7km to the west of the Forest of Bowland National Landscape. Given a combination of positioning and elevations, the site has the potential to fall within the visual envelope of the designated National Landscape areas. Please see Drawing No. KD.BKLN.D.002A Landscape Orientated Designations and KD.BKLN.D.1.029 for the Proposed Development ZTVI within Technical Appendix C.

Sites of Special Scientific Interest (SSSI)

7.4.2 Thwaite House Moss SSSI is located around 1km to the south-west of the quarry and Crag Bank SSSI is approximately 1.9km to the west (Morecambe Bay SSSI is located further afield some 2.3km to the west).

Listed Buildings

7.4.3 There are approximately 65 Listed Buildings within 2km of the application site. They are present largely within four distinct clusters in the settlements of Over Kellet (~330m north), Nether Kellet (~1.07km south), Carnforth (~740m north west) and the A6 corridor (~1.07km west). There are a total of 55 Grade II, four Grade II* listings and one unclassified.

7.4.4 The closest Listed Building is the Grade II* Church of St Cuthbert located ~430m east of the site.

Ancient Woodland

7.4.5 There are ten areas of Ancient Woodland present within the site as well as to the north and east of the site. They consist of eight Ancient & Semi Natural Woodland and two Ancient Replanted Woodland blocks. There are three blocks located within the planning boundary of Leapers Wood, consisting of two Ancient & Semi Natural Ancient Woodland blocks and one Ancient Replanted Woodland. All three parcels are known as Leapers / Slacks Woods.

7.4.6 The most easterly tip of the Morecambe Bay Ramsar / SSSI / Special Protection Area borders the study area ~2km north west of the site.

7.4.7 No further landscape orientated designated sites or assets were identified as falling within the study area.

7.4.8 There are several areas within the vicinity of the wider site that are subject to Limestone Pavement Orders. Areas of Leapers Wood, Bowman Stout Wood and Slacks Wood are also protected by a Tree Preservation Order.

Landscape Related Planning Policy

7.4.9 The Site is located within the administrative boundaries of Lancashire County Council. The designation and policy information used as a baseline for the LVIA report has come from:

- Joint Lancashire Minerals and Waste Core Strategy Development Plan (February 2009)
- Joint Lancashire Minerals and Waste Site Allocation and Development Management Plan (September 2013)
- A Local Plan for Lancaster District Part One: Strategic Policies and Land Allocations DPD (July 2020)
- A Local Plan for Lancaster District Part Two: Review of the Development Management DPD (July 2020)
- National Planning Policy Framework (2023)

7.4.10 Lancashire County Council are currently reviewing the Minerals and Waste Local Plan. At present there are no policies to consider as part of this assessment. Lancaster City Council are reviewing the Strategic Policies and Land Allocations DPD through preparation of the Draft Climate Emergency review of the Strategic Policies & Land Allocation Development Plan Document (March 2022).

7.4.11 Relevant landscape orientated policies associated within the above documents, are outlined below.

National Planning Policy Framework (2023)

7.4.12 In accordance with previous national planning guidance the NPPF maintains the primary importance of the development plan and confirms that planning decisions should be in accordance with policy outlined in the latest development plan documents unless material considerations suggest otherwise. The purpose of the planning system is to contribute to the achievement of sustainable development.

The policies in the NPPF, constitute the Government's view of what sustainable development in England means in practice for the planning system.

Joint Lancashire Minerals and Waste Core Strategy Development Plan (February 2009)

7.4.13 The Joint Lancashire Minerals and Waste Core Strategy Development Plan (February 2009) remains the extant Local Plan for Lancashire despite the plan period only covering to 2021. The Local Plan Review is underway, however at present it has not been adopted. The Core Strategy sets strategic objectives and vision for waste development in Lancashire across the Plan period.

Policy CS5 – The policy provides for a number of criteria which applications will be test against. In relation to landscape;

- Proposals for mineral workings incorporate measures to conserve, enhance and protect the character of Lancashire's landscapes; and,
- Sensitive environmental restoration and aftercare of sites take place, appropriate to the landscape character of the locality and the delivery of national and local biodiversity action plans. Where appropriate, this will include improvements to public access to the former workings to realise their amenity value.

Joint Lancashire Minerals and Waste Site Allocation and Development Management Plan (September 2013)

Policy DM2: Development for minerals or waste management operations will be supported where it can be demonstrated to the satisfaction of the mineral and waste planning authority, by the provision of appropriate information, that all material, social, economic or environmental impacts that would cause demonstrable harm can be eliminated or reduced to acceptable levels. In assessing proposals account will be taken of the proposal's setting, baseline environmental conditions and land uses, together with the extent to which its impacts can be controlled in accordance with best practice and recognised standards.

Proposals should make a positive contribution to the biodiversity, geodiversity and landscape character. This is to be achieved through quality of design, layout, form, scale and appearance of buildings amongst other criteria, such as; restoration within agreed time limits, to a beneficial afteruse and the management of landscaping and tree planting.

A Local Plan for Lancaster District Part One: Strategic Policies and Land Allocations DPD (July 2020)

7.4.14 The Part One plan of the Lancaster Local Plan contains the strategic policies relevant to the spatial vision and plan for delivery of development across the plan period to 2031.

Policy SP8: Protecting the Natural Environment - Development proposals will be expected to protect, maintain and enhance the district's biodiversity and geodiversity through the appropriate location of uses, sympathetic design, sustainable construction techniques and appropriate mitigation measures.

A Local Plan for Lancaster District Part Two: Review of the Development Management DPD (July 2020)

7.4.15 The Part Two plan provides for the detailed development management policies which proposed development is tested against.

Policy DM44: The protection and enhancement of biodiversity - The Council will support proposals where the primary objective is to conserve or enhance biodiversity and/or geodiversity or where development proposals provide better opportunities to secure management for the long-term biodiversity and geodiversity enhancement. The policy seeks to protect and enhance sites of ecological / biological value, as well as protect soils and land of agricultural value.

Policy DM45: Protection of Trees, Hedgerows and Woodland - The Council will support the protection of trees and hedgerows that positively contribute, either as individual specimens or as part of a wider group, to the visual amenity, landscape character and/or environmental value of the location.

Policy DM46: Development and Landscape Impact – In determining planning applications the Council will attach great weight to the protection of nationally important designated landscapes. The Council will require proposals that are within, or would impact upon the setting of, designated landscapes to be appropriate to the landscape character type and designation. In relation to proposals within National Landscapes they should be sustainable, consistent with the primary purpose of the National Landscape designation and support the special qualities of the National Landscape as set out in the National Landscape Management Plans.

7.4.16 Criteria is also provided for consideration of proposed development both within, and outside, protected and designated landscapes. Additionally, specific guidance is provided for the delivery of Landscape and Visual Impact Assessments:

A Landscape and Visual Impact Assessment (LVIA) will be required where the proposal is for a Schedule I EIA development; the proposal is for wind turbines, pylons, telecommunication masts and solar farms; the proposal involves significant landscape or visual impact by virtue of the sensitivity of the location within or adjacent to an AONB or National Park or the proximity of the proposal to a heritage asset where it is likely to affect the assets setting.

The LVIA should systematically assess the effects of change on the landscape character and visual amenity, including cumulative impacts, as a consequence of the development proposal. Through such an assessment, development proposals should be designed to avoid negative landscape effects and where this is not possible negative landscape effects should be reduced or offset through appropriate mitigation/compensatory measures.

Draft Climate Emergency review of the Strategic Policies & Land Allocation Development Plan Document (March 2022) – Submission Version

7.4.17 In light of Lancaster declaring a climate emergency in 2019, the City Council made the decision to review the Local Plan to seek better environmental outcomes for the district and assist in achieving net zero carbon ambition of the Council.

Policy SP8: Policy wording is updated to include for proposals considering the resilience of development against climate change.

7.5 Landscape Character and Assessment

7.5.1 The assessment of an area's landscape character and its ability to accommodate change is initially based on the identification, understanding and categorisation of a landscape's features and elements that combine to create the distinctive character of an area. Landscape character comprises a description and assessment of the distinct and recognisable pattern of elements and features that occur consistently in a particular type of landscape and how this is perceived. The character of a landscape is a combination of geology, landform, soils, vegetation, land-use and human activities. In addition, character is identified through characterisation, which classifies, maps and describes areas of similar character.

7.5.2 In order to assess potential landscape effects resulting from the Proposed Development a baseline study of the landscape character of the Site and its surroundings was carried out. The study involved desk-based analysis and Site survey to determine landscape character of the area including an examination of aesthetic and perceptual aspects of the landscape that contribute to local distinctiveness.

7.5.3 The baseline study has taken account of, and describes, relevant national, regional, and local landscape character assessments, important individual landscape receptors including landscape and nature conservation designations and individual elements of the landscape fabric that are present and that contribute to local landscape character.

7.5.4 The assessment has built upon information provided within the 'National Character Assessment' (NCA) produced by Natural England to provide landscape character profiles for the whole of England which follow natural lines in the landscape rather than administrative boundaries.

7.5.5 Assessment of the landscape within which the Site is situated at a regional level has been informed by 'A Landscape Strategy for Lancashire – Landscape Character Assessment' (2000). This defines landscape character within the county at a smaller scale than the National Character Areas, breaking this down into Landscape Character Types which reflect some of the broad variations discernible to the county's landscape that weren't accounted for in some of the larger national units.

7.5.6 Information gathered as part of the study of national, regional and local character areas will inform an understanding of the quality and condition of the landscape which will be considered alongside on-site identified forces for change present in the local area. Based on a consideration of these aspects, an assessment of significance of effect will be made.

Description of Landscape Character at a National Scale

7.5.7 The site is located largely within the Morecambe Bay Limestones National Character Area 20. However, the south western corner of the site is located within the neighbouring Morecambe Coast and Lune Estuary NCA 31, as defined by Natural England. The characteristics of both NCAs will be considered.

Morecambe Bay Limestones NCA

7.5.8 There are four Statements of Environmental Opportunity relevant to the Morecambe Bay Limestones NCA:

- SEO 1: Protect and enhance the extensive mosaic of high-quality limestone habitats, including pavement, woodland, scrub and grassland, to create a coherent and resilient ecological network, retain a sense of place and maintain the strong relationship between the landscape and its underlying geology.
- SEO 2: Ensure the long-term sustainable management of the nationally and internationally designated coastal zone by conserving and managing its habitats, including the extensive sand flats, salt marshes, estuarine landscapes and limestone cliffs, for their wildlife, strong sense of place, inspiration and tranquillity, their diverse range of species, their traditional fisheries, and for their ability to mitigate the effects of climate change through carbon sequestration and coastal flood mitigation.
- SEO 3: Ensure the long-term sustainable management of the nationally, and internationally designated wetland landscape and its linking, non-designated, habitats by conserving and restoring the lowland raised bogs, fens, rivers and reedbeds for their strong sense of inspiration and tranquillity, their diverse range of species, and for their ability to mitigate the effects of climate change through carbon sequestration.
- SEO 4: Conserve and enhance the wider landscape of the NCA as the supporting framework to its distinctive attributes, including features of the drumlin landscape, the settlement character, orchards, recreational identity and heritage features, for their individual importance and the complementary role they play in supporting the local visitor economy and providing enjoyment and education to visitors and residents alike.

7.5.9 Key characteristics of this area include:

- A flat lowland landscape, dominated by conspicuous, often steep-sided, hills of Lower Carboniferous Limestone, many of which include exposures of limestone pavement. Between the hills the landform is geologically recent, including areas of drumlin field, fluvial and estuarine sediment and peat bogs.
- Wide expanses of shifting intertidal sand flats and expanses of salt marsh

arcing round the head of Morecambe Bay, backed by low cliffs with windswept trees, or grassed embankments defending reclaimed grazing marshes.

- The rivers Kent and Leven enter Morecambe Bay via dynamic estuary systems. The smaller rivers Winster, Bela and Keer lie predominantly within this NCA and have relatively extensive flood plain areas before flowing into the channel of the River Kent as they enter Morecambe Bay.
- The limestones support a mixed pastoral farming and woodland landscape, often in tight mosaics, with orchards surrounding the farmsteads and fields bounded by limestone drystone walls.
- A winter climate ameliorated sea which, as well as the exposed south facing slopes of the limestone outcrops allows a number of temperature sensitive species to make this the northernmost fringe of their range.
- Strong contrasts between the rectilinear enclosures of reclaimed valley bottoms and coastal fringes, and the older enclosures associated with farmsteads and ancient woodland, bounded by limestone drystone walls, on the limestone escarpments.
- Extensive areas of native broadleaved woodland on limestone areas, particularly on the steeper slopes and thinnest soils.
- An abundance of high-quality semi-natural habitats of national and international importance, including limestone pavements, herb-rich grasslands with juniper, species-rich scrub, ancient limestone woodlands, peaty fenlands, marl tarns, reedbeds, lowland raised bogs, salt marshes and intertidal mud and sand flats.
- An exceptional range of species associated with the diverse range of seminatural habitats, many with populations of national importance, including a suite of limestone butterflies, bittern, marsh tit and lady's-slipper orchid.
- Sheep and cattle graze the pastures and salt marshes, with rough grazing a feature of the higher grounds on unimproved limestone grassland.
- Extensive areas of reclaimed land on the coastal fringe and in the Lyth Valley have large fields bounded by ditch-flanked hedgerows. Lowland raised mires surrounding the limestone outcrops have been reclaimed for agriculture.
- Several stately homes set in parkland landscapes with well-maintained

gardens.

- A vernacular building style common to all settlements and farmsteads based on the use of local limestone for walls and Lake District slate.
- Settlements are generally dispersed and rural in character, having usually grown around large farmsteads. Larger centres include Grange-over-Sands, Arnside, Silverdale and Milnthorpe, some of which have a seaside resort character, reflecting the growth in the use of the area for recreation from the 18th century onwards.
- A range of visible heritage features including burial mounds, stone circles, prehistoric settlements and enclosures, medieval field patterns, the Lancaster Canal and Second World War airfields.
- An extensive rights of way network, particularly on areas of limestone geology, integrated with areas of permissive access land.

7.5.10 The NCA supporting document contains a number of landscape changes experienced within the Character Area. A number of these are relevant to the landscape at the development site.

- By 2003 the area of woodland covered by England Woodland Grant Scheme management agreements was about 19 per cent of the eligible area. About 49 per cent of the woodland cover is on an ancient woodland site, and the proportion of these sites covered by a Woodland Grant Scheme agreement increased from 12 per cent in 1999 to 27 per cent in 2003.
- Local changes in the distribution of different woodland types have arisen as a consequence of programmes restocking harvested non-native plantations and plantation ancient woodland sites with native trees species, and the restoration of non-native plantations to open habitats, particularly on Sites of Special Scientific Interest (SSSI).
- Decline in woodland condition has occurred outside of Arnside and Silverdale National Landscape as a result of inadequate management and problems with grazing by deer that have prevented natural regeneration in places.
- Through the latter half of the 20th century many species associated with the managed agricultural landscape have declined in the NCA particularly those associated with wet grasslands and pastures, such as curlew, redshank and yellow wagtail. This decline is associated with incremental intensification in agricultural management with development such as silage

production, slurry spreading, and reseeding of grasslands affecting bird breeding success.

- The area of SSSI is significant at 18 per cent of land cover. Of this there has been an increase from 57 per cent in 2003 to 85 per cent in 2011 of the SSSI area in favourable or recovering condition. In addition to national designated sites there has been a considerable increase in the extent of other priority habitat under agri-environment or English Woodland Grant schemes.
- Historically there has been a significant loss in the extent of limestone pavement due to quarrying or removal for ornamental garden features. However, since the early 1980s this loss has largely been halted through Limestone Pavement Order protection.
- Invasive non-native species are an issue in some areas, for example cotoneaster invasion of limestone habitats, and Himalayan balsam along riparian corridors.
- Although the total number of sites has declined over time, quarrying continues to be a local industry with three large scale active sites at Sandside, Over Kellet, and Holme, all quarrying limestone.
- Except where open habitat is being maintained for biodiversity or geological interest, former quarry sites, which are present on all the main limestone outcrops, are generally developing into woodland communities.

Morecambe Coast and Lune Estuary NCA

7.5.11 There are four Statements of Environmental Opportunity relevant to the Morecambe Bay Limestones NCA:

- SEO 1: Maintain and enhance the historic and landscape character and the internationally significant habitats of the coastal environment, including the mudflats, salt marsh, sand dunes, vegetated shingle and the Lune Estuary, to support its key features, reflect the dynamic nature of the coastal systems, and ensure that the area remains able to regulate coastal flooding and sequester and store carbon, while providing access and recreation that is sensitive to the character of the coastal zone.
- SEO 2: Enhance the mainly pastoral, rural landscape by supporting land managers to adopt long-term sustainable land management practices on both the organic soils of the coastal plain and reclaimed land from the Lune Estuary to Knott End-on-Sea, and the mineral soils of higher ground, seeking

outcomes which deliver both economic and environmental benefits.

- SEO 3: Working with land managers, seek opportunities to enhance the historic character of the rural landscape, including heritage assets, boundary features and habitats, to protect the character of the rural landscape and restore the ecological condition and connectivity of these features.
- SEO 4: Promote the social, economic and cultural value of a healthy natural environment and embed wide understanding of sustainable management, building on the close proximity of areas of exceptional environmental value, particularly the coastal zone, to areas of high population density.

7.5.12 Key Characteristics of this area include:

- Broad and relatively flat lowlands enclosed by escarpments which open out dramatically into the undulating landscape of the coastal strip with substantial drumlin features.
- The sheltered expanse of the Lune Estuary with its salt marshes and tidal channels overlooked by low ridges on the Heysham peninsula and around Lancaster.
- Panoramic vistas across Morecambe Bay from Lancaster and higher ground, to backdrops of the Cumbrian Fells and across the Lune Estuary from Sunderland Point and the Heysham peninsula towards the Bowland Fells.
- Range of coastal landscape features including extensive salt marshes backing extensive sand and mud flats, particularly around the Lune Estuary; reclaimed mosses and marshland; a small area of intact remnant mossland at Heysham; sand and shingle beaches north of the Lune Estuary; and Millstone Grit sandstone cliffs at Heysham.
- Intensively managed pastoral landscape bounded by ditches in the lowest-lying reclaimed areas, hedges with mature trees in low-lying areas and grading into stone walls on drumlin fields and upland foot slopes with limited extent of semi-natural habitats away from the coastal strip.
- Low woodland cover throughout with woodland largely restricted to the sides of the Lune Valley on the boundary of the NCA and small copses on farmland.
- Presence of Heysham power station, which is a dominant feature on the visual profile of the coastal strip and is widely visible from adjacent NCAs, as well as the associated infrastructure such as power lines which are also

widely visible.

- The cathedral city of Lancaster, market town and former administrative capital of Lancashire. Mainly built from Millstone Grit sandstone, the city overlooks a former fording point at the head of the Lune Estuary with a castle, cathedral, neo-Georgian town hall, canal and Victorian parks.
- Rural architecture, including farmsteads, that mostly results from rebuilding in brick and stone in the late 18th and 19th centuries, with fragments of earlier timber frame, sandstone, Millstone Grit and earth constructions, with fields subject to high levels of boundary change since the mid-19th century.
- Coastal developments that reflect a long history of a visitor economy and associated recreation, including the sea front facade at Morecambe with hotels, amusements and a promenade, and a range of caravan sites and golf courses along the more rural parts of the coastal strip from Heysham north to Carnforth.
- Traversed north–south by the west coast transport network including the M6, the West Coast Main Line railway and the Lancaster Canal, which pass between the Bowland Fells and Morecambe Bay.

7.5.13 The NCA supporting document contains a number of landscape changes experienced within the Character Area. A number of these are relevant to the landscape at the development site.

- Woodland is not a major feature of the NCA with only about 3 per cent coverage. Of this less than 1 per cent is ancient woodland. Woodland is a feature of some designed landscapes, such as Williamson Park in Lancaster and Ashton Hall at Conder Green near Glasson. There is limited evidence of recent change.
- Of the area designated as SSSI, 94 per cent is in favourable condition with a further 5 per cent recovering (Natural England 2011 data) indicating that these areas have seen little change in recent years, and that the limited changes have been positive. In the NCA most of the SSSI resource consists of coastal habitats, in particular salt marshes, including some of the best quality ungrazed marshes in the north-west, which grade into unvegetated intertidal communities.
- Some of the most distinctive species in the NCA appear to have shown recent declines, which are likely to be linked to a decline in habitat extent

and/or quality including natterjack toad and purple-ramping fumitory.

- There is limited evidence to detail landscape change for historic features. However, only about 50 per cent of historic farm buildings remain unconverted, indicating an ongoing usage but in a changed context. Most are intact structurally.

Description of Landscape Character at a Regional Scale

A Landscape Strategy for Lancashire – Landscape Character Assessment

7.5.14 At a regional level, A Landscape Strategy for Lancashire - Landscape Character Assessment (2000) defines the site as being located within Landscape Character Area 12a: Low Coastal Drumlins – Carnforth-Galgate-Cockerham. Partially within Landscape Character Area 13c: Drumlin Field - Docker-Kellet-Lancaster, and in proximity to 12b Low Coastal Drumlins – Warton-Borwick; and as such it is considered that the proposed development may influence these defined character areas.

Landscape Character Area 12a: Carnforth-Galgate-Cockerham – The site is located within this character area but has many of the elements and features of LCA13c

7.5.15 This character area is described as comprising, "The Low Coastal Drumlins, on or near which Lancaster and Morecambe Cockerham are built, extend along the coast behind Morecambe Bay from Cockerham in the south to Carnforth in the north. This landscape supports an extremely high proportion of built development including the large settlements of Lancaster and Morecambe and recent built development along the A6. The Low Coastal Drumlins provide a convenient transport corridor; the Lancaster Canal, M6, A6 and mainline railway run side-by-side in a north-south orientation. The canal, which weaves through the drumlins, is an important reminder of the area's industrial heritage; a branch emerges into the Lune at Glasson Dock. To the west of Cockerham settlement is sparse and dominated by scattered large scale farmsteads in contrast to the towns and large villages further north. Fields are largely of post medieval pattern, however there are areas of older enclosure and settlement, notably at Cockersand Abbey. The drumlins provide elevated points from which there are views over the salt marshes to Morecambe Bay. Near Thurnham there is a significant area of mossland lying between the drumlins, allowing long distant views towards the coast. Traditional farmsteads and older settlement cores are built of stone but the modern development is often built using red brick. Buildings on top of the drumlin hills are

particularly visible. Woodland is limited to small plantations, woods associated with former estates and rarely, fragments of ancient woodland in unusual hilltop or hillside settings."

Landscape Character Area 13c: Drumlin Field - Docker-Kellet-Lancaster

7.5.16 This Drumlin Feld character type is described as being "a distinctive landscape type characterised by a `field' of rolling drumlins. The consistent orientation of the hills gives the landscape a uniform grain, which is sometimes difficult to appreciate from within the field. The regular green hillocks are between about 100m and 200m high with steep sides and broad rounded tops. However, there are often solid rock outcrops within the field where the underlying bedrock is exposed. Drumlin Fields occur inland, on higher land than the Low Coastal Drumlins. They are found on the edges of upland areas where the retreating ice sheets left moulded boulder clay deposits in their paths. Low Coastal Drumlins are found on the north-west coast of the study area where the last retreating ice sheets left a series of rounded boulder clay hills in their paths."

7.5.17 In more detail Character Area 13c is described as a drumlin field having, "a distinctive north-east, south-west grain and runs from the edge of Lancaster northwards into Cumbria. The area is underlain by limestone and is distinguished by large scale undulating hills of pasture, some formed from glacial till and others which are outcrops of limestone, or reef knolls. These are particularly evident around Over and Nether Kellet where the limestone is exposed; significantly by the extensive quarries where limestone extraction is ongoing. The smooth rolling scenery is emphasised by the network of stone walls. Greater variety of texture is provided by the isolated areas of moorland which protrude from the field, for example at Docker Moor, and the River Lune which cuts a gorge through the hills at Halton. This gorge provides a major transport route through the hills with a number of parking, picnic and camping sites scattered along its length. Woodlands are often associated with designed landscapes and built development takes advantage of views from the hill tops, for example the Ashton Memorial on the edge of Lancaster which sits atop a drumlin and is a landmark for miles around. The drumlins create a setting for the city of Lancaster and its university."

Landscape Character Area 12b: Warton-Borwick

7.5.18 This character area is described as follows: "The Low Coastal Drumlins around Warton are more rural in character than those immediately to the south. Large

pastures are divided by low clipped hedgerows or stone walls, some of which are degraded or missing. There are areas of waterlogged, rushy pasture and standing water in the low lying areas between the drumlins. The River Keer winds its way between the low drumlins, draining into Morecambe Bay at Carnforth. Historic Halls and estates are associated with the River Keer at Capernwray and Borwick. Gravel extraction has had an impact on this landscape in the creation of open water bodies which attract wildfowl. The largest of these is Pine Lakes. There is considerable development associated with the M6, A6 and railway such as motels and a lorry park. Parking areas and caravan sites are also features of coastal parts of this area."

Landscape Character Area 18b: Hest Bank-Silverdale Marshes

7.5.19 This character area is described as follows: "These marshes are on a raised platform backed by cliffs of sand and clay from Hest Bank to Carnforth and by the steep limestone cliffs of the Arnside and Silverdale wooded limestone hills further north. The front edge of the platform is eroding significantly at the point where it meets the sea. The marshes are open areas of sea-washed turf, grazed by cattle and sheep, and patterned by narrow rills, winding muddy creeks and brackish pools. Traditional turf cutting activities take place resulting in a patchwork of stripped and naturally regenerating areas on the southern half of the marsh. There are a number of access points to the marsh and it is visited by many people who walk, park and picnic upon the marsh. There is a recent landfill site on the edge of the marsh at Cote Stones, as well as remnant slag heaps from the historic iron workings at Carnforth."

Description of Landscape Character at a Local Scale

7.5.20 Areas of historic extraction and ongoing operations occupy the majority of the current site, which is now disturbed to near its full permitted extent. This internal quarry landscape comprises a combination of quarry benches and faces, access ramps and haul routes, operational water bodies / lagoons and ancillary built structures and quarry plant / machinery, along with mineral stocks and waste tips.

7.5.21 The site, whilst situated on elevated ground, is generally well contained by surrounding existing landform and mature structural boundary woodland belts which occupy the rising limestone slopes, beyond which the surrounding landscape is typically agricultural (pastoral), topographically representing a distinctive rolling drumlin landscape before become flatter as land falls northward and westwards

towards the coastline. Immediately local field parcels are typically irregular, being defined by a combination of hedgerows, stone walls and occasional small mixed woodland blocks.

7.5.22 The M6 motorway corridor dissects the landscape north to south close to the western boundary of the site. Elsewhere, local roadways serve the settlements of Carnforth, Over Kellet and Nether Kellet.

7.5.23 Both operational and historic mineral workings are typical features within the surrounding landscape. Dunald Mill Quarry lies to the south of Nether Kellet and a number of other historic workings in the area have been restored to leisure / recreation afteruses.

7.5.24 The local landscape is well served by public rights of way and cycles routes - the closest being footpaths 1-24-FP-7 and 1-22-FP 5 which run along sections of the eastern boundary of the site and southern boundary of Back Lane Quarry.

7.5.25 The site is relatively discretely set and contained within its previously extracted void. The majority of the site being operational ground with landforms comprising extraction, disturbed ground / previously extracted land, tracks, tips, stocks, processing plant and associated activities and access road. There is generally a strong vegetation structure around the western, northern and eastern site boundaries which combines with landform to contain the landscape unit at this scale.

7.5.26 Please note that based upon desktop and site survey works we consider that the site and land to the east of the M6 corridor should actually be considered as located within the 13c Drumlin Field – Docker – Kellet – Lancaster LCA rather than 12a Carnforth – Galgate – Cockerham area. We have considered the potential effects of the proposed development on both.

Landscape Sensitivity

7.5.27 Based upon the desktop and site survey works undertaken, we consider that the sensitivity of local landscape character areas to a hard rock extraction development are:

- LCA 13c: Drumlin Field – Docker – Kellet – Lancaster – Medium Sensitivity;
- LCA 12a: Carnforth – Galgate – Cockerham – Medium Sensitivity;
- LCA 12b: Warton – Borwick – Medium Sensitivity;
- LCA 18b: Hest Bank – Silverdale Meadows – High Sensitivity;

- The Site and its immediate area – Low Sensitivity

7.5.28 The assessment relates to the condition / quality and robustness of the Landscape Character areas, the elements and features which comprise the areas and the built morphology of landuses. The large scale and size of the existing / proposed development, and its potential effects on character has also been considered.

Potential Changes to Landscape Character associated with the proposed development

7.5.29 Specifically, in respect to the application under consideration, changes to landscape elements and features that have the potential to temporarily degrade the landscape character during the operational/phased period include:

- lower ground levels (through mineral extraction);
- the creation of temporary areas of disturbed ground;
- the temporary retention and new establishment of waste storage bunds;
- the continued movement within the landscape / change in local tranquillity, associated with extraction and the transportation of extracted rock to the existing permitted Quarry plant site; and
- Rebound of groundwater to establish the permitted water body.

7.5.30 Landscape character mitigation/enhancement measures proposed and integrated within the scheme include:

During the operational period

- Maintaining site peripheral vegetation structure which screens the quarry;
- Continuation of management of Site peripheral woodland and associated land;
- Implementation of progressive restoration where possible.

Post Restoration

- Creation of new wildlife habitat for which detailed habitat plans and protective species enhancement measures will be implemented;
- Establishment of long-term aftercare and management plan to ensure the quality and maintenance of the Site restored land uses;
- Creation of a public multi-use path off the Kellet Road vehicle access into the site to a new viewpoint;
- Establishment of lakeside shallows, reeds & ephemeral margins;

- Planting a new block of native woodland adjacent to Slack Wood;
- Retention of existing viewpoint and access on the eastern boundary of the site; and
- The existing tip will be allowed to naturally regenerate offering potential for BNG.

Assessment of the Proposed Development's Impact on Landscape Character

7.5.31 Table 7.1 provides a summary of the local landscape character areas, their assessed sensitivity to a limestone / hard rock mineral development, the specific magnitude of effect associated with the application scheme and the overall level of Significance of Effect during both the operational period and at post restoration.

Landscape Character Area	Assessed Sensitivity to change from the Proposed Development	Assessed Magnitude of Effect during the operational period	Level of Significance of Effect during the Operational Period	Assessed Magnitude of Effect Post Restoration	Level of Significance of Effect during Post Restoration
13c	Medium	Medium	Moderate Adverse	Neutral	Neutral
12a	Medium	Medium	Moderate Adverse	Neutral	Neutral
12b	Medium	Neutral	Neutral	Neutral	Neutral
18b	High	Low	Slight Adverse	Neutral	Neutral
Site/Immediate area	Low	Medium	Slight Adverse	Neutral	Neutral

Table 7.1: Assessment of Proposed Developments Impacts on Landscape

7.5.32 The nature of "effect" (magnitude) is determined by comparing the effect of the Proposed Development on the landscape character of the Site and the surrounding areas. Based upon the detailed operational (construction) proposals including mitigation measures during the operational period of the Proposed Development, we assess that the magnitude of the proposals impact during the temporary operational period will be Neutral to Moderate Adverse effect on LCAs. Given the nature of local topography/landform and vegetation cover the Site's location is generally discrete from other local landscape characters. The magnitude of effect resulting from the Proposed Development is "in effect" a continuation of existing permitted activities over an additional 16 years and to include deepening the permitted quarry from 38mAOD to -37mAOD. It is considered that the general nature, scale and form of these activities is consistent with the permitted

development in respect of influences on magnitude. The additional length of time to extract and process the material is, however, considered as a "long term" period of time and as such is assessed as a Medium Adverse Level of Effect of Magnitude. We consider that the overall Magnitude of Effect is Not High because of the combined judgements about the size and scale of the effect, and the contained extent of the area over which it occurs; as well as its potential to affect the character areas it is both located within and the other surrounding character areas.

7.5.33 The combined sensitivity of the LCAs with the magnitude therefore results in 12a Carnforth – Galgate – Cockerham and 13c Drumlin Field – Docker – Kellet – Lancaster predicted to receive a Moderate Adverse Level of Significance of Effect during the operational period of the quarry. Please note this is Not a Significant Adverse Level of Effect.

7.5.34 LCA 18b Hest Bank – Silverdale Meadows appears to include geographical areas of Strickland Wood and Warton Hill. From this higher ground located ~2.5km north west there is an amount of LCA intervisibility which we consider results in a Very Low Magnitude of effect. The combined High Sensitivity of this character area with the Very Low Magnitude of Effect results in a Slight Adverse Level of Significance of Effect. This is not a Significant Adverse Level of Effect.

7.5.35 The sensitivity to change associated with the deepening / lateral extension is assessed as Low, in respect of the current Site identity and its immediate setting. The magnitude of effect is considered Medium Adverse (principally resulting from the time element). This results in a Slight Adverse Level of Significance of Effect. This is Not a Significant Adverse Level of Effect.

7.5.36 It is assessed that Neutral Levels of Significance of Effect will result from the proposed development on LCA 12b: Warton – Borwick.

7.5.37 At Post Restoration the proposed development will result in a landscape character the same / very similar to the permitted scheme. This will comprise a waterbody, quarried faces and benches, retention of strong western, northern and eastern vegetation structure with products of calcareous grassland and minor areas of shallows. Approximately 4.8Ha of additional native woodland will be established. We therefore assess that at Post Restoration the proposed development will result in a Neutral Effect on landscape character compared to the permitted scheme.

Summary Conclusions in respect of Landscape Character

7.5.38 We assess that the development proposals will not result in any significant adverse impacts at either the operational or restoration stages of the Proposed Development.

7.6 Visual Matters

7.6.1 Desktop and Site survey works have identified the areas of landscape and visual receptor locations from which the existing Site and the Proposed Development may be visible along with the different groups of people who may experience views of the development and its specific elements and features, along with the viewpoints where they will be affected and the nature of the views at these points.

7.6.2 This baseline and assessment work has been carried out by initially mapping the geographical extent of the study area where receptors have the potential to view the current Site and the Proposed Development. This was carried out digitally through the production of Zones of Theoretical Visual Influence (ZTVI).

7.6.3 A current situation ZTVI was initially carried out and is illustrated on Drawing Number KD.BKLN.D.1.028. As can be seen from this Drawing within Technical Appendix C, the existing Leapers Wood Quarry ZTVI is relatively large in respect of potential high and mid to high magnitude of impact levels. The geographical areas affected being the quarry site itself, along with Aggregate Industries' adjoining Back Lane Quarry and the immediate surroundings; including, Kellet Road and local sections of PROW to the north, the majority of Over Kellet village, an approximate 2km section of the M6 to the west / north west, along with large residential areas of Carnforth. Mid-levels of magnitude of impact are again extensive, spread over 4km to the north and west and 2 to 3km to the east and south, including the village of Nether Kellet. Land within both the Forest of Bowland National Landscape to the east/south east and Arnside / Silverdale National Landscape to the west and north west are highlighted as potentially receiving mid-levels of magnitude of impact from the current quarry development.

7.6.4 Drawing KD.BKLN.D.1.029 illustrates the Zone of Theoretical Visibility associated with the Proposed Development. This is based upon the proposed deepening of mineral extraction down to -37maOD. As can be seen from this computer model drawing, when compared to the Current Situation ZTVI there is no noticeable difference between the existing and proposed developments ZTVI.

7.6.5 The Post Restoration ZTVI as illustrated on KD.BKLN.D.1.031 again demonstrates no noticeable change in ZTVI when compared to the existing current situation. The consistency of the computer modelled ZTVIs associated with the Current Situation, Proposed Development and Post Restoration demonstrating the proposed development will not result in any additional geographical areas and associated potential receptors receiving views of the quarry and its activities, nor a change in the level of magnitude of effect the receptors currently receive.

7.6.6 The Site survey considered the viewpoint from which the current situation and the proposed will actually be seen by differing groups of people. These groups included:

- Residential visual receptors in private properties;
- Public viewpoints e.g. public rights of way, inland waterways and public open space (POS);
- Places where people work and;
- Transport routes where there may be views from private vehicles and from different forms of public transport.

7.6.7 Based upon the above desktop research and assessment works a detailed visual Site survey took place being guided by both the current and proposed ZTVIs. Both ZTVI mapping and Site surveys assume that the observers eye height is some 1.6m above ground level, based upon the midpoint of average heights for men and women.

7.6.8 Drawing Number KD.BKLN.D.1.027 within Technical Appendix C also illustrates the location of representative visual receptor location points. These receptor locations have been used to describe the types and levels of potential visual change and effect to local receptors. The visual receptor locations are illustrated looking towards the Site on Photographic Sheets 1 to 10 (see Technical Appendix C). These illustrate representative visual receptor location points of existing and potential views of the Site and the development and site activities.

7.6.9 Table 7.2 summarises the representative visual receptors identified and the effects that have been considered with an assessment of their significance based upon the methodology described within Technical Appendix C.

7.6.10 This is first determined by assessing the Sensitivity of Visual Receptors to change from this type of development proposal (Table 7.2) and then the Magnitude of the visual effect, its size/scale, geographical extent, duration, and reversibility (Table 7.3). A judgement on the sensitivity of visual receptors and magnitude of the effect

are then combined to assess the overall significance of visual impact/effects. (Table 7.4)

7.6.11 The susceptibility of visual receptors to changes in view and visual amenity is mainly a function of "the occupation or activity of people experiencing the view at particular locations and the extent to which their attention or interest may therefore be focused on the views and visual amenity they experience at particular locations" (GLVIA page 113).

Receptor No	Description of Visual Receptor	Assessed Susceptibility to change of Visual Receptors	Assessed Value of View	Overall Assessment of Sensitivity of Visual Receptor
1	Users of Main Road at office entrance to High Roads, Back Lane Quarry	Low	Low	Low
2	Holiday visitors to Hawthorns Park (Holiday Homes). Located south of Back Lane Quarry southern boundary	High	High	High
3	Residential Receptors within the village of Nether Kellet	High	High	High
4	Users of PROW Ref FP0122005	Medium	Medium	Medium
5	Users of PROW Ref FP124007	Medium	Medium	Medium
6	Residential receptors located within the north of Nether Kellet	High	High	High
7	Users of PROW Ref FP0103018 / FP0122006 over M6	Medium	Medium	Medium
8	Users of Kellet Road adjacent to the entrance of Tarmac Leapers Wood Quarry	Low	Low	Low
9	Meadow View visitors/ holiday park lodges	High	High	High
10	Users of Dunald Mill Lane	Low	Low	Low
11	Residential receptors at Scargill Farm	High	High	High

Receptor No	Description of Visual Receptor	Assessed Susceptibility to change of Visual Receptors	Assessed Value of View	Overall Assessment of Sensitivity of Visual Receptor
12	Users of Main Road to the west of Nether Kellet	Low	Low	Low
13	Residents of Bolton-le-Sands	High	Medium	High
14	Residential receptors off Longfield Drive, Carnforth	Low	Low	Low
15	Users of PROW Ref FP0103005	High	Medium	High
16	Users of PROW Bay Cycle Way	Medium	Medium	Medium
17	Users of PROW Ref FP0135003 off Crag Road	Medium	Medium	Medium
18	Visitors to Warton Crag Quarry Trail and Nature Reserve	High	High	High
19	Visitors to Warton Crag Quarry Trail and Nature Reserve	High	High	High
20	Visitors to Warton Crag Kiln off PROW Ref FP0135004	High	High	High
21	Residential Receptors within Warton	High	Medium	High
22	Residential Receptors off North Road, Carnforth	High	High	High
23	Residential receptors within Over Kellet	High	High	High
24	Visitors to quarry viewpoint east of Leapers Wood Quarry	Medium	Medium	Medium
25	Users of PROW Ref FP0124007 walking around the north and north eastern boundaries of the site	Medium	Medium	Medium
26	Users of Capernwray Road	Low	Low	Low
27	Users of Kellet Lane	Low	Low	Low

Receptor No	Description of Visual Receptor	Assessed Susceptibility to change of Visual Receptors	Assessed Value of View	Overall Assessment of Sensitivity of Visual Receptor
28	Residential Receptors off Highfield Road and Windemere Road, Carnforth	High	High	High
29	Users of Kirkby Lonsdale Road within National Landscape	High	High	High
30	Users of Kirkby Lonsdale Road within National Landscape	High	High	High
31	Users of PROW Ref FP0115015 within National Landscape	High	High	High

Table 7.2: Susceptibility of Visual Receptors to Change

7.6.12 Each of the potential visual receptor locations were visited to understand the nature and scope of the existing / potential views of the Site and the proposed development.

7.6.13 Local visual receptors have a variety of assessed sensitivities to change resulting from the proposed development within this locality. Residential receptors having the greatest sensitivity to change, i.e. High, with users of the local road network being assessed as having the lowest sensitivity to change i.e. Low as a result of their transient nature and limited time duration of view of the Site/ Proposed Development.

7.6.14 Table 7.3 details the visual nature of the Proposed Development and assesses its general potential for magnitude of change / effect.

Type	Assessment
Development	The proposed development is for the deepening of the existing quarry. Visually the majority of change will be at the base of the existing quarry extraction void. No new fixed or mobile plant will be required. Rock extraction will be carried out over 5No phases. The existing quarry tip will be restored within Phase 1 to a final restoration landform, and through a combination of natural regeneration and planting a new woodland block established. It is Tarmac's intention to utilise all rock extracted for mineral products. If, however, a small amount of waste is generated it will be placed in a series of temporary tips within the quarry void. Quarry restoration will be the same / very similar to the permitted scheme, to a mix of woodland, marginal aquatics and open water. Viewpoints will be provided with public access. The quarry will be subject to long-term aftercare and management
Size/scale	The overall visual size and scale of the Proposed Development is large. This mirrors the existing situation. The visual elements and features which comprise the development being engineered quarried faces and benches, engineered form waste tip, build structures of plant, weighbridge and offices and stocks. The overall site area being ~48.35Ha. Onsite operational mitigation to minimise the potential for adverse visual effects include the natural site peripheral landform and its height, working below the skyline and peripheral woodland
Geographical extent	The ZTVI associated with the Current Site Situation and the Proposed Development is considered large, however based upon both desktop and site survey works potential geographical influence of the site is much smaller. The main reason for this being associated with the strong vegetation structure located both surrounding the site and within the local area. The urban morphology of local residential dwellings, settlements and industrial areas within Carnforth also prevents / restricts the potential for visual effects from the site, as does local topographical / landform variations. It is noted that there is no noticeable difference between the Current ZTVI of the quarry and that of the Proposed Development
Duration	Temporary: The Proposed Development will take place progressively over a period of 16 years. Due to the length of this period of operational activity it is considered that the duration is Long Term
Assessed General Magnitude of effect to local Visual Receptors	It is assessed that the proposed remedial / restoration works will result in mainly neutral effects during the phased operational period with a low number of visual receptors with existing / potential views of the proposed development. At post restoration it is assessed that the receptors will receive a Neutral visual effect compared to the existing current situation / permitted scheme

Table 7.3 Assessed Magnitude of Effect

Visual Mitigation and Enhancement Measures

7.6.15 It should be noted that the proposed development is, in effect, a continuation of the existing rock extraction, processing, stocking and waste generation process, involving existing fixed and mobile plant and HGV movements. There will be no new fixed or mobile plant structures.

7.6.16 Additional visual and landscape mitigation and enhancement will include:

- Strengthening / species diversification of all existing site boundary planting;
- Within Phase 1, the existing quarry tip located within the western area of the quarry will be regraded and through both natural regeneration and direct planting a new block of woodland that amounts to 4.8Ha will be established;
- An existing public viewpoint will be retained to the east of the quarry and a further viewpoint provided within the north west of the site;
- Provision of a long-term Aftercare and Management Plan to ensure the visual screening of the Site and its long term visual integration into its local landscape setting.

Assessed Overall Significance of Visual Effects

7.6.17 The Overall Significance of Visual Effects is achieved by combining the separate judgements about sensitivity of the visual receptor and the magnitude of the Proposed Development (including any mitigation measures) on visual impacts/effects. See Table 7.4 below.

7.6.18 Significance of visual effects is not absolute and can only be defined in relation to each development and its specific location. In making a judgement about the significance of visual effects it is noted that:

- Effects on people (receptors) who are particularly sensitive to change in views and visual amenity are more likely to be significant;
- Effects on people at recognised and important viewpoints or from recognised scenic routes are more likely to be significant;
- Large-scale changes which introduce new, non-characteristic or discordant or intrusive elements into the view are more likely to be significant than small changes or changes involving features already present within the view.

Ref	Description of Visual Receptor	Receptors Assessed Sensitivity to change	Assessed Magnitude resulting from the Proposed Development	Level of Assessed Significance of visual effect from Proposed Development
1	Users of Main Road at office entrance to High Roads, Back Lane Quarry	Low	None	Neutral
2	Holiday visitors to Hawthorns Park (Holiday Homes). Located south of Back Lane Quarry southern boundary	High	None	Neutral
3	Residential Receptors within the village of Nether Kellet	High	None	Neutral
4	Users of PROW Ref FP0122005	Medium	Medium	Moderate Adverse
5	Users of PROW Ref FP124007	Medium	Very Low	Minimal Adverse
6	Residential receptors located within the north of Nether Kellet	High	None	Neutral
7	Users of PROW Ref FP0103018 / FP0122006 over M6	Medium	None	Neutral
8	Users of Kellet Road adjacent to the entrance of Tarmac Leapers Wood Quarry	Low	Very Low	Minimal Adverse
9	Meadow View visitors/ holiday park lodges	High	None	Neutral
10	Users of Dunald Mill Lane	Low	Very Low	Minimal Adverse
11	Residential receptors at Scargill Farm	High	None	Neutral
12	Users of Main Road to the west of Nether Kellet	Low	None	Neutral

Ref	Description of Visual Receptor	Receptors Assessed Sensitivity to change	Assessed Magnitude resulting from the Proposed Development	Level of Assessed Significance of visual effect from Proposed Development
13	Residents of Bolton-le-Sands	High	None	Neutral
14	Residential receptors off Longfield Drive, Carnforth	High	Very Low	Slight Adverse
15	Users of PROW Ref FP0103005	High	None	Neutral
16	Users of PROW Bay Cycle Way	Medium	Very Low	Minimal Adverse
17	Users of PROW Ref FP0135003 off Crag Road	High	Very Low	Slight Adverse
18	Visitors to Warton Crag Quarry Trail and Nature Reserve	High	Very Low	Slight Adverse
19	Visitors to Warton Crag Quarry Trail and Nature Reserve	High	Very Low	Slight Adverse
20	Visitors to Warton Crag Kiln off PROW Ref FP0135004	High	Very Low	Slight Adverse
21	Residential Receptors within Warton	High	None	Neutral
22	Residential Receptors off North Road, Carnforth	High	None	Neutral
23	Residential receptors within Over Kellet	High	None	Neutral
24	Visitors to quarry viewpoint east of Leapers Wood Quarry.	Medium	Medium	Moderate Beneficial
25	Users of PROW Ref FP0124007 walking around the north and north-eastern boundaries of the site	Medium	None	Neutral

Ref	Description of Visual Receptor	Receptors Assessed Sensitivity to change	Assessed Magnitude resulting from the Proposed Development	Level of Assessed Significance of visual effect from Proposed Development
26	Users of Capernwray Road	Low	None	Neutral
27	Users of Kellet Lane	Low	None	Neutral
28	Residential Receptors off Highfield Road and Windemere Road, Carnforth	High	None	Neutral
29	Users of Kirkby Lonsdale Road within National Landscape	High	None	Neutral
30	Users of Kirkby Lonsdale Road within National Landscape	High	None	Neutral
31	Users of PROW Ref FP0115015 within National Landscape	High	None	Neutral

Table 7.4 Assessed Overall Significance of Visual Effects

Visual Matters Assessment

7.6.19 It is assessed that **No** representative visual receptors will receive a Significant Adverse level of visual effects (i.e., a Severe, Major or Notable Effect) from the Proposed Development during its operational period.

7.6.20 During the operational stage it is assessed that 1No. receptor will receive a Moderate Adverse Effect, 5No. receptors will receive a Slight Adverse Effect, no receptor will receive a Very Slight Adverse Effect, 4No receptors will receive a Minimal Adverse Effect and 20No receptors will receive a Neutral Effect. 1No receptor will receive a Moderate Beneficial Effect.

7.6.21 The representative visual receptor (location) from where a Moderate Adverse visual effect is assessed to occur at viewpoint Ref. 4. Views from PROW FP0122005 can look north directly over the screened Back Lane Quarry towards the extracted northern benches and faces of Leapers Wood Quarry. The exposed rock is not a skyline feature as receptors view the Leapers, Bowman Stout and Slack's Woods

above the top quarry face. The length of PROW from which this view may be obtained is 50-100m. Receptor views are transitionary as users of the PROW pass by.

7.6.22 The sources of the Slight and Minimal Adverse effects relate to generally wide views of the existing quarry waste tip and boundary distinctive / minor views of Leapers Wood Quarry faces. It is noted that these views are generally from receptor locations that observe the quarry as part of a much wider panoramic view of which the quarry is a very small element. The actual deepening works will not be observed apart from the Back Lane and Leapers Wood Quarry viewpoint (Receptor No. 24) to the east of the site. It is this receptor which is judged as receiving a Moderate Beneficial Level of Significance. This is because the location has been specifically created to view the quarry with permissive access. It is considered that receptors who visit this location wish to observe the quarry operations.

7.6.23 From a combination of desktop and site survey works and subsequent assessment it is determined that both the current Leapers Wood Quarry and the Proposed Development are very well screened within the landscape and its wider setting. The actual potential numbers of visual receptors of the site and proposed development is small. Those receptors with existing and potential views of the Proposed Development include residential, leisure, users of the local public rights of way and road network. The magnitude of effect these receptors receive from the existing quarry / Proposed Development i.e. the combined judgement about the size and scale of effect, the extent of the area over which it occurs, whether it is reversable or irreversible and whether it is short or long term in duration is a maximum of Medium magnitude (1No. Receptor). The resulting Adverse Effect on receptors being a maximum of Moderate Adverse. Where the quarry is visible the majority of receptors will receive a light to Minimal Adverse effect. The reasons for this are principally that all proposed development works associated with this application are on existing disturbed quarry land / where quarrying activities take place. The main works are associated with the deepening of the base of extraction, with the existing permitted quarry already being set down and screened within a void. Surrounding higher ground and landform features combine with western, eastern, and northern site peripheral vegetation, which also provides strong screening benefits. The screening benefits of the vegetation being maintained through both additional planting of native species with associated potential for Biodiversity Net

Gain and a commitment to a long-term Aftercare and Management Plan for vegetation within the site.

7.6.24 The proposed development is based upon both the retention and continuation of currently permitted on site activities and quarry elements and features in combination with the Proposed development. The assessed effects being a result of the actual visual disturbance and/or change and the increased amount of time associated with the application. If the proposed development was assessed against the Current Situation or the Permitted Leapers Wood Quarry development (without the increase in time element), the change / effect of visual impact during the operational period would have been Neutral.

7.6.25 The assessed impact upon receptors Post Restoration again will be Neutral when compared to the Current Situation / Permitted scheme (without the increase in time element). Even with the increase in time to complete restoration it is still assessed that due to a combination of the very well screened existing quarry and proposed development that visual restoration benefits will be Neutral to Slight Beneficial.

7.7 Potential for Cumulative Landscape and Visual Effects

7.7.1 As required under EIA Regulations and requested by Lancashire County Council the potential for cumulative impacts has been considered. A definition of cumulative effects being: "the additional changes caused by a proposed development in conjunction with similar development or as the combined effect of a set of development, taken together" (SNH,2012:4). Cumulative Landscape Effects are defined as effects that "can impact on either the physical fabric or character of the landscape, or any special values attached to it" (SNH,2012:10).

7.7.2 In discussions with the client and the project coordinators it is considered that other sites of the same type of development located within the local landscape character setting are: Back Lane Quarry (located immediately south of the proposed Leapers Wood Quarry development), Dunald Mill Quarry (located ~0.5km south of Back Lane Quarry) and adjacent Breedon Carnforth Concrete Plant site / mothballed quarry off Long Dales Lane. Located ~9.2km north of Back Lane is Aggregate Industries Holme Park Quarry, and ~2.3km north is the restored Jackdaw Quarry which now operates as a Lodge Retreat and Diving Centre.

7.7.3 Other developments within the study area which could result in direct or indirect consequences in combination with the above at Leapers Wood Quarry proposed

development include the large scale industrial complex of Carnforth National Grid Compressor Station. The combined effects of all the past, present and future proposals have been considered. Specifically in respect of the Dunald Mill developments, Jackdaw Quarry Lodge Retreat and Holme Park Quarry, these are assessed as standalone / isolated development within the landscape with no intervisibility within the character areas to Leapers Wood Quarry. Back Lane Quarry is contained within the same landscape character land unit as Leapers Wood Quarry / the proposed development. Proposals for deepening are integrated and intertwined within the contained Site local character. Taking the above into consideration, and in accordance with paragraph 7.5 of GLVIA3, we assess that there will be No likely cumulative significant effects on landscape character receptors as a result of either impacts on the physical fabric of the landscape or the value attached to it, nor on the magnitude of effect of visual receptors.

7.8 Overall Conclusion

7.8.1 The Proposed Development seeks permission to allow for the deepening of the existing Leapers Wood Quarry from 38mADO to -37mAOD. The proposals will result in the release of approximately 26mt of additional limestone, assuming joint working of the boundary between Back Lane and Leapers Wood Quarries. The proposed development will be completed and restored (interim) by 31st December 2065.

7.8.2 As stated, the nature of the application is principally for deepening the existing operational disturbance and therefore the effects of quarrying activities are already present in the landscape. These effects have been assessed and in essence there is a Neutral Change of levels of significance of effect between the current situation / permitted scheme and the Proposed Development on both landscape character and visual receptors. What will change is the time element with development taking a further 16 years. The effects of this have been considered along with the potential for resulting cumulative impacts. The site is not located within a designated landscape e.g. National Park or National Landscape. It is however, located approximately 1.8km to the south and east of Arnside / Silverdale National Landscape, and 1.7km to the west of the Forest of Bowland National Landscape. Given a combination of positioning and elevation there is opportunity for intervisibility between these designated areas and the site. However, given the proposed deepening nature of the application together with intervening landform

and vegetation structure it is assessed that the proposed development will not harm the setting of these National Landscapes.

7.8.3 In respect of Landscape Character, the quarry site is located within the Landscape Strategy for Lancashire – Landscape Character Assessment Character Area – 12a: Low Coastal Drumlins - Carnforth – Galgate – Cockerham, and partially within adjacent 13c: Drumlin Fields – Docker – Kellet – Lancaster LCA. Both the character areas are assessed as medium sensitivity to the type of Proposed Development (including existing quarry activities). It is assessed that during the extended operational period of the Proposed Development that the magnitude of effect will be medium. When combining the judgements on sensitivity and magnitude the resulting level of significance of effect is assessed as Moderate Adverse. This is not a significant level of effect.

7.8.4 At Post Restoration the proposed development will result in a landscape character the same / very similar to the permitted scheme. This will comprise a waterbody, quarried faces and benches, retention of strong western, northern and eastern vegetation structure with products of calcareous grassland and minor areas of shallows. Approximately 4.8Ha of additional native woodland will be established. We therefore assess that at Post Restoration the proposed development will result in a Neutral Effect on landscape character compared to the permitted scheme.

7.8.5 Visually, the site is generally very discrete and not observed apart from upper quarry faces as a result of localised landform and topography and adjacent local woods / vegetation structure. The visual nature of the development will principally be deepening the existing quarry void.

7.8.6 It is assessed that **No** representative visual receptors will receive a Significant Adverse level of visual effects (i.e. a Severe, Major or Notable Effect) from the proposed development during its operational period. It is assessed that receptors using a short section of PROW FP0122005 will receive a Moderate Adverse Effect from existing Leapers Wood Quarry benches and faces. Views will be transitionary as receptors pass by.

7.8.7 During the operational stage it is assessed that 5No. receptors will receive a Slight Adverse Effect, 4No receptors will receive a Minimal Adverse Effect and 20No receptors will receive a Neutral Effect. 1No receptor will receive a Moderate Beneficial Effect. This Beneficial effect being to users of the specifically designed and positioned permissive Back Lane and Leapers Wood Quarry viewpoint.

7.8.8 The main sources of the effects are the previously quarried northern faces and benches of Leapers Wood Quarry. It is noted that potential receptors of these elements are generally from mid to longer distances. Views being panoramic of which the elements of Back Lane Quarry occupy a small visual proportion.

7.8.9 The potential for cumulative adverse effect has been considered in respect of the Proposed Development and other similar local quarries and large scale developments. Taking the above into consideration and in accordance with statutory receptors and good practice guidance we assess that there will be no likely cumulative significant effects on Landscape Character or visual receptors.

7.8.10 Baseline and assessment works have been carried out to provide information to address and comply with national and Lancashire planning policies and in conclusion, based upon landscape and visual grounds, the site is a good location for continued mineral extraction and will not result in any significant adverse impacts on landscape or visual receptors during the operational period. At final restoration and post restoration the scheme is considered to have a Neutral effect compared to the permitted scheme baseline.

8 ECOLOGY AND BIODIVERSITY

8.1 Introduction

8.1.1 This chapter of the ES has been prepared to assess the impact of the proposed development on ecological features of value, including potential effects upon statutory and non-statutory designated sites, habitats of nature conservation interest, legally protected and notable species.

8.1.2 The chapter has been prepared with reference to the Chartered Institute of Ecology and Environmental Management's Ecological Impact Assessment Guidelines (CIEEM, 2018, updated 2022[1]). In accordance with this guidance, the chapter describes the assessment methodology; identifies the baseline conditions; the likely significant environmental effects; the mitigation measures required to prevent, reduce, or offset any significant adverse effects; and the likely residual effects after these measures have been employed.

8.1.3 The site is approximately 48 hectares (ha) in size and comprises lowland mixed deciduous woodland, mixed plantation woodland, hedgerows, dense scrub, calcareous grassland, improved pasture, open mosaic habitat and inland rock and scree.

8.1.4 The site is situated within a predominantly arable / agricultural pasture landscape, with Carnforth town to the north-west and Back Lane Quarry (an active limestone quarry) to the south.

8.1.5 The baseline ecological surveys include fieldwork undertaken in 2021/2022. For specific information relating to the baseline information, including the detailed methods, results, mitigation and associated drawings, please see the Preliminary Ecological Appraisal (PEA) within Technical Appendix D.

1 CIEEM (2018) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine version 1.1. Chartered Institute of Ecology and Environmental Management, Winchester.

8.2 Policy & Legislative Context

Legislative Context

Introduction

8.2.1 The relevant legislative context includes the following:

- The Conservation of Habitats & Species Regulations 2017[2];
- The EC Habitats Directive (Directive 92/43/EEC)[3] as translated into UK law by The Conservation of Habitat and Species Regulations 2017;
- The EC Birds Directive (Directive 79/409/EEC)[4]; as translated into UK law by The Conservation of Habitat and Species Regulations 2017;
- The Countryside and Rights of Way Act (CRoW) 2000;
- Wildlife and Countryside Act 1981 (as amended) (WCA)[5];
- The Environment Act 2021[6];
- Natural Environment and Rural Communities Act 2006 (NERC)[7];
- The Hedgerow Regulations 1997[8]; and
- The Protection of Badgers Act 1992[9].

Conservation of Habitats & Species Regulation 2017

8.2.2 The Conservation of Habitats & Species Regulations 2017 transposes the European Council Directive 92/43/EEC (EC Habitats Directive) into national law. The purpose of this legislation is to provide protection for natural habitats, wild flora and fauna of international importance. A number of species are afforded wide-ranging protection under Schedule 2 of the Regulations.

8.2.3 Part 2 of the Regulations affords protection to sites of International importance for habitats or species which rely on these habitats, such as: RAMSAR sites; SAC (Special Areas of Conservation), and SPA (Special Protection Areas). Part 3 of the Regulations provides protection for species (plant and animals) as listed on Schedules 2 and 4 that are considered to be of importance. Part 5 of the Regulations provides a mechanism by which a licence can be obtained for operations that would

2 HMSO. The Conservation of Habitats and Species Regulations 2017 – No.1012.

3 EC (1992) Council Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora (The EC Habitats Directive)

4 EC (1979), Council Directive 79/409/EEC on the Conservation of wild birds (EC Birds Directive).

5 HMSO. The Wildlife and Countryside Act 1981 (as amended).

6 UK Government (2021). Environment Act 2021. [Online]. Available at: https://www.legislation.gov.uk/ukpga/2021/30/contents/enacted

7 HMSO. (2006), Natural Environment and Rural Communities Act.

8 HMSO. The Hedgerows Regulations 1997.

9 HMSO. The Protection of Badgers Act 1992 (as amended).

otherwise be unlawful under the Regulations.

The Wildlife and Countryside Act 1981 (as amended)

8.2.4 The Wildlife and Countryside Act 1981 (as amended) provides special protection of selected species. Under Section 1(1) and 1(2), all British bird species, their nests and eggs (excluding some pest and game species) are protected from intentional killing, injury or damage. Under Sections 1(4) and 1(5), special penalties are applied to bird species included in Schedule 1 of the Act and protection is extended for these species to disturbance whilst building, in or near a nest and disturbance to dependent young. Schedule 5 provides special protection to animal species other than birds, which are protected through paragraph 9(4) of the Act, against damage to "any structure or place which any wild animal (included in the schedule) uses for shelter and protection" and against disturbance whilst in such places. The Countryside and Rights of Way Act 2000 (CRoW Act) amends Section 1(5) of the Wildlife and Countryside Act 1981 by introducing a new offence of "reckless" disturbance to protected wildlife and making certain offences punishable by imprisonment.

8.2.5 Invasive species are covered under Schedule 9 of the Act, which makes it illegal to spread any part of a listed plant. Part 2 of the Act provides protection for areas of the countryside recognised for their nature conservation or geological value, including Sites of Special Scientific Interest (SSSIs) and National Parks.

Natural Environment and Rural Communities (NERC) Act 2006

8.2.6 The NERC Act provides protection for habitats or species that are considered to be of principal importance to biodiversity. The legislation requires public authorities, including local planning authorities, to conserve biodiversity when exercising their functions. A list of habitats/species of principal importance, based on the former UK Biodiversity Action Plan (BAP) lists of priority habitats and species, have been produced by the Secretary of State in consultation with Natural England.

The Protection of Badgers Act 1992

8.2.7 The Protection of Badgers Act 1992 provides protection to badgers and their setts. This legislation is primarily concerned with animal welfare issues and the need to protect badgers from activities such as baiting and deliberate harm. The Act makes it an offence to:

- Wilfully kill, injure, take, possess or cruelly ill-treat a badger (*Meles meles*),

or attempt to do so; and

- to intentionally or recklessly interfere with a sett (this includes disturbing badgers whilst they are occupying a sett, as well as damaging or destroying a sett or obstructing access to it).

The Hedgerow Regulations 1997

8.2.8 The Hedgerow Regulations make provision for the protection of important hedgerows in England and Wales. The Regulations apply to hedgerows described in Regulation 3 (in particular to hedgerows which are 20 metres or more long or which meet another hedgerow at each end and which, in each case, are on or adjacent to land used for certain specified purposes).

8.2.9 Before removing any hedgerow, including a stretch of hedgerow, to which these Regulations apply the owner (or in certain cases a relevant utility operator) must notify the local planning authority (Regulation 5). The hedgerow may then not be removed if the local planning authority serves a hedgerow retention notice, which may be done only if the hedgerow is important according to the criteria set out in Regulation 4 and Schedules 1 to 3. The requirement for the owner (or utility operator) to notify the local planning authority does not apply to the permitted work described in Regulation 6 (including for carrying out development for which planning permission has been granted or is deemed to have been granted).

The Environment Act 2021

8.2.10 This Act makes provisions for targets, plans and policies for improving the natural environment; for statements and reports about environmental protection; for the Office for Environmental Protection; about waste and resource efficiency; about air quality; for the recall of products that fail to meet environmental standards; about water; about nature and biodiversity; for conservation covenants; about the regulation of chemicals; and for connected purposes (UK Government, 2021).

8.2.11 The Act also targets four key areas for the recovery of habitats. Additionally, it enables ministers to set legally binding long-term targets, the progress of which they are required to report to Parliament (UK Government, 2021).

8.2.12 Under the Act, all planning permissions granted in England (with some exemptions) will have to deliver at least 10% biodiversity net gain from 12 February 2024. Transitional arrangements have been put in place which means that if planning permission was granted before 12 February 2024 (and that permission was not

subject to BNG), then section 73 applications would also be exempt from mandatory BNG requirements (GOV.UK, 2024).

Policy Context

Introduction

8.2.13 The Environmental Impact Assessment Directive (85/337/EEC) states that the direct and indirect effects of development should be assessed in terms of their impact on specific factors. Based on the factors identified in Article 3 of the EIA Regulations, this ecology and biodiversity chapter assesses the direct and indirect effects of the proposal on species and habitats.

8.2.14 The Development Plan contains policies and text concerning ecological impact issues in connection with development proposals. In particular:

- National Planning Policy (NPPF) (revised December 2023) – Sections 15 and 17;
- Planning Practice Guidance (related to minerals, adopted in 2014);
- The Town and Country Planning Act (1990) – Section 62 and 73;
- Joint Lancashire Minerals and Waste Development Framework Core Strategy DPD (Adopted February 2009);
- Joint Lancashire Minerals and Waste Local Plan – Site Allocation and Development Management Policies (Adopted September 2013);
- Lancaster Local Plan Part One: Strategic Policies & Land Allocations DPD (Adopted July 2020); and
- Lancaster Local Plan Part One: Strategic Policies & Land Allocations DPD (Adopted July 2020).

8.2.15 A full breakdown of the aforementioned policies can be found within the below Policy Audit. These policies are consistent with the advice in NPPF to protect, maintain and enhance nature conservation and biodiversity. The policies seek to protect species and habitats and, through restoration, provide replacement and enhanced habitats.

National Planning Policy Framework

8.2.16 In relation to biodiversity, NPPF (2023) paragraph 180 states that 'Planning policies and decisions should contribute to and enhance the natural and local environment by:

a) *protecting and enhancing valued landscapes, sites of biodiversity or geological value and soils (in a manner commensurate with their statutory status or identified quality in the development plan);*

b) *recognising the intrinsic character and beauty of the countryside, and the wider benefits from natural capital and ecosystem services – including the economic and other benefits of the best and most versatile agricultural land, and of trees and woodland;*

c) *maintaining the character of the undeveloped coast, while improving public access to it where appropriate;*

d) *minimising impacts on and providing net gains for biodiversity, including by establishing coherent ecological networks that are more resilient to current and future pressures'.*

e) *preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans; and*

f) *remediating and mitigating despoiled, degraded, derelict, contaminated and unstable land, where appropriate.*

8.2.17 NPPF paragraph 186 advises that the following principles should be applied by the Local Planning Authority when determining planning applications:

a) *if significant harm to biodiversity resulting from a development cannot be avoided (through locating on an alternative site with less harmful impacts), adequately mitigated, or, as a last resort, compensated for, then planning permission should be refused;*

b) *development on land within or outside a Site of Special Scientific Interest, and which is likely to have an adverse effect on it (either individually or in combination with other developments), should not normally be permitted. The only exception is where the benefits of the development in the location proposed clearly outweigh both its likely impact on the features of the site that make it of special scientific interest, and any broader impacts on the national network of Sites of Special Scientific Interest;*

c) *development resulting in the loss or deterioration of irreplaceable habitats (such as ancient woodland and ancient or veteran trees) should be refused, unless there are wholly exceptional reasons and a suitable compensation strategy exists; and*

d) *development whose primary objective is to conserve or enhance biodiversity should be supported; while opportunities to improve biodiversity in and around developments should be integrated as part of their design, especially where this can secure measurable net gains for biodiversity or enhance public access to nature where this is appropriate.*

Local Policy

8.2.18 Relevant local policies and text concerning ecological impact issues in connection with development proposals, include:

- Joint Lancashire Minerals and Waste Development Framework Core Strategy DPD (Adopted February 2009)[10];
- Joint Lancashire Minerals and Waste Local Plan – Site Allocation and Development Management Policies (Adopted September 2013)[11];
- Lancaster Local Plan Part One: Strategic Policies & Land Allocations DPD (Adopted July 2020)[12]; and
- Lancaster Local Plan Part One: Strategic Policies & Land Allocations DPD (Adopted July 2020)[13].

8.2.19 A summary of local policies that are relevant to this application can be found below. These policies are consistent with the advice in NPPF to protect, maintain and enhance nature conservation and biodiversity. The policies seek to protect species and habitats and, through restoration, provide replacement and enhanced habitats.

Joint Lancashire Minerals and Waste Development Framework Core Strategy DPD

8.2.20 To guide the vision, the local council have identified a number of core objectives, the most relevant being:

- Objective 5: To support high standards of working practices and

10 https://www.lancashire.gov.uk/media/191785/CORE.pdf (part1)
https://www.lancashire.gov.uk/media/191788/CORE2.pdf (part 2)
11 https://www.lancashire.gov.uk/media/228119/Local-Plan-Part-One-website-1-.pdf (part 1)
https://www.lancashire.gov.uk/media/228122/Local-Plan-Part-Two-3-.pdf (part 2)
12 https://www.lancaster.gov.uk/assets/attach/7739/SPLA-DPD-July-2020.pdf
13 https://www.lancaster.gov.uk/assets/attach/7740/DM-DPD-July-2020.pdf

environmental protection and take an integrated and innovative approach to enhancing the quality of land and our landscapes during extraction and in restoration for beneficial after-use, including potential benefits to biodiversity, amenity and access to the countryside.

8.2.21 Under Policy CS5 'Achieving sustainable minerals production' and CS9 'Achieving sustainable waste management', proposals should ensure that:

- Our natural resources including water, air, soil and biodiversity are protected from harm and opportunities are taken to enhance them; and
- Sensitive environmental restoration and aftercare of sites takes place, appropriate to the landscape character of the locality and the delivery of national and local biodiversity action plans. Where appropriate, this will include improvements to public access to the former workings to realise their amenity value.

Joint Lancashire Minerals and Waste Local Plan – Site Allocation and Development Management Policies

8.2.22 Policy DM2 (Development Management) sets out the parameters for minerals and waste management operations. Minerals and waste developments will be supported that can demonstrate a positive contribution to the:

- Biodiversity, geodiversity and landscape character; and
- Reduction of carbon emissions.

8.2.23 Policy DM3 (Planning Obligations) where planning obligations are required to make a development acceptable in terms of its social, economic and environmental impacts, the MPA / WPA will seek to ensure the provision of, where appropriate:

- Long term aftercare or management; and
- Compensatory provision elsewhere for ecological mitigation.

Lancaster Local Plan Part One: Strategic Policies & Land Allocations DPD

8.2.24 Policy SP8 (Protecting the Natural Environment) seeks to ensure that the natural environment is protected, in particular biodiversity and geodiversity. Development should address any potential flood risk issues, taking into consideration the effects of climate change. The district's biodiversity and geodiversity should be maintained and enhanced through the appropriate location of uses, sympathetic design, sustainable construction techniques and appropriate mitigation measures.

Lancaster Local Plan Part One: Strategic Policies & Land Allocations DPD

8.2.25 Policy DM44 (The Protection and Enhancement of Biodiversity) requires proposals to protect and enhance biodiversity and/or geodiversity and minimise both direct and indirect impacts. Where possible, a net gain of biodiversity assets should be delivered. Where harm is identified, developers must demonstrate how the harm will be mitigated or compensated for in line with the mitigation hierarchy.

8.2.26 Developments affecting environmentally sensitive sites and species will not be permitted where there is an adverse effect, unless the benefits of the proposal outweigh the potential adverse effects. If the adverse effects are unavoidable a development proposal will be required to demonstrate that:

- Adverse effects are minimised;
- Provision is made for mitigation and compensation measures, such as on-site landscape works, off-site habitat creation, species relocation and ongoing management as appropriate, such that there is a clear net gain for biodiversity; and
- The biodiversity value of the site is not compromised, both on its own and as part of the wider network of sites.

8.3 Methodology and Scope

Introduction

8.3.1 This assessment has been undertaken in accordance with the latest CIEEM guidelines (CIEEM, 2018). Baseline information and potential impacts have been quantified as far as practical to inform the assessment, supported by professional judgement and experience as appropriate. Where uncertainties exist, a precautionary approach has been adopted and a 'worse case' scenario approach assumed for the purposes of assessing impacts and recommending mitigation.

8.3.2 The significance of ecological impacts in relation to a proposal has been considered in relation to the value/importance of affected ecological features and the predicted magnitude of impact upon them.

8.3.3 The assessment considers all activities associated with the operational and restoration phases of the scheme that are likely to have direct, indirect or cumulative impacts on ecological features (designated sites, habitats and species). This assessment is informed by a PEA undertaken in 2021 and 2022. This was undertaken by South Lakes Ecology.

Zone of Influence

8.3.4 The CIEEM guidelines require the identification of a 'zone of influence' (ZoI). This is defined as the area over which ecological features may be affected by biophysical changes as a result of the proposed project and associated activities. This is likely to extend beyond the project site, for example where there are ecological or hydrological links beyond the site boundaries.

8.3.5 The ZoI for the proposed development considers the following:

- All ecological features occurring within the area to be worked will be affected by changes in land cover caused by vegetation clearance and soil stripping (and associated mounds if placed into storage), excavation and then restoration;
- Noise, dust and changes in human activity associated with the quarrying operations may also affect species in adjacent habitats;
- Dewatering operations may have consequences for water-dependent habitats and species in the surrounding area;
- The proposed extension of time for the quarry will utilise existing infrastructure (for example access and processing plant) which limits the potential consequences for ecological features from this aspect of the proposals; and
- Consideration of the project in relation to more mobile species, populations and breeding territories (such as birds).

8.3.6 Specific study areas were identified for the desk study and baseline field surveys to inform the valuation of ecological features and the selection of 'key' ecological features material to the assessment.

Desk Study

8.3.7 A desktop study has been undertaken, by a third-party consultancy (Technical Appendix D), to identify the presence of sensitive ecological receptors at the site and within the surrounding area. Data has been obtained from a range of information sources including:

- Natural England and JNCC websites were used to obtain information regarding the statutory and non-statutory conservation designations within the area; and
- Lancashire Environmental Records Network (LERN) provide further

background ecological data for the area, including records for protected species and biological Heritage Sites.

8.3.8 Further inspection of previous survey reports, colour 1:25,000 OS base maps and aerial photographs from Google Earth has also been completed to provide additional context and identify any features of potential importance for nature conservation.

8.3.9 Further consideration of potential zones of influence in relation to statutory designated sites of international and national importance has been carried out. This was through Natural England's SSSI Impact Risk Zone Tool[14] which outlines the likely zone of influence from impacts from a range of development types.

Field Surveys

8.3.10 South Lakes Ecology were commissioned by Heatons to undertake the following works:

- A desk-based study using the organisations detailed above;
- a phase 1 habitat survey undertaken in April 2021 and further updated in September 2022 to record the nature and extent for vegetation within and adjacent to the redline boundary.

8.3.11 Further detailed information regarding the field surveys can be found in Technical Appendix D.

Impact Assessment Process

8.3.12 The impact assessment process involves:

- Identifying and characterising impacts;
- Incorporating measures to avoid and mitigate (reduce) these impacts;
- Assessing the significance of any residual effects after mitigation;
- Identifying appropriate compensation measures to offset significant residual effects; and
- Identifying opportunities for ecological enhancement.

8.3.13 The starting point for the assessment of impacts is to determine the value of ecological features and, as such, identify those which should be subject to detailed assessment. Ecological features can be important for a variety of reasons, for example, the quality of designated sites or habitats, habitat / species rarity, or their

14 https://data.gov.uk/dataset/5ae2af0c-1363-4d40-9d1a-e5a1381449f8/sssi-impact-risk-zones

rate of decline (CIEEM, 2018/2022).

Determining Importance

8.3.14 CIEEM have identified various characteristics that can be used to identify ecological features or features likely to be important in terms of biodiversity. These include:

- Animal or plant species that are rare or uncommon, either internationally, nationally or more locally;
- Ecosystems and their component parts, which provide the habitats required by the above species, populations and/or assemblages;
- Endemic species or locally distinct sub-populations of a species;
- Habitat diversity, connectivity and or/synergistic associations (e.g. networks of hedgerows and areas of species-rich pasture that provide important feeding habitat for a rare species such as greater horseshoe bat);
- Notably large populations of animals or concentrations of animals considered uncommon or threatened in a wider context;
- Plant communities (and their associated animals) that are considered to be typical valued natural/semi-natural vegetation types – these will include examples of natural species-poor communities;
- Species on the edge on their range, particularly where their distribution is changing as a result of global trends and climate change;
- Species-rich assemblages of plants and animals; and
- Typical faunal assemblages that are characteristic of homogenous habitats.

8.3.15 Once an ecological feature has been identified as being important, guidelines promote the use of characterising this feature with the relevant geographic frame of reference. This allows the scale of significance of effects to be presented in a meaningful way and provides a focus of maintaining a feature at an appropriate scale. Table 8.1 below gives examples of how a particular feature might be given a particular geographic frame of reference, however, the examples given should be considered a guide and the specific feature should be considered in context.

Geographic Scale of Reference	Examples
International	An internationally designated site or candidate site (SPA, pSPA, SAC, cSAC, pSAC, Ramsar site, Biogenetic Reserve) or an area which meets the published selection criteria for such designation, irrespective of whether or not it has yet been notified. A viable area of a habitat type listed in Annex I of the Habitats Directive or smaller areas of such habitat which are essential to maintain the viability of a larger whole. Any regularly occurring population of an internationally important species, which is threatened or rare in the UK (i.e. it is a UK Red Data Book species or listed as occurring in 15 or fewer 10km squares in the UK) or of uncertain conservation status or of global conservation concern. Any regularly occurring, nationally significant population/number of any internationally important species.
National	A nationally designated site (SSSI, NNR, Marine Nature Reserve) or a discrete area, which meets the published selection criteria for national designation (e.g. SSSI selection guidelines) irrespective of whether or not it has yet been notified. Any regularly occurring population of a nationally important species which is threatened or rare in the region or county (local BAP). A regularly occurring, regionally or county significant population/number or any nationally important species.
Regional	Viable areas of key habitat identified as being of Regional value in the appropriate Natural Area profile. Any regularly occurring, locally significant population of a species listed as being nationally scarce which occurs in 16-100 10km squares in the UK, or in a Regional BAP or relevant Natural Area on account of its regional rarity or localisation. A regularly occurring, locally significant number of a regionally important species. Sites which exceed the County-level designations but fall short of SSSI selection guidelines, where these occur.
County[15]	Semi-natural ancient woodland greater than 0.25ha. County sites and other sites which the designating authority has determined meet the published ecological selection criteria for designation, including Local Nature Reserves and Local Wildlife Sites selected on County ecological criteria (County sites will often have been identified in local plans). A viable area of a priority habitat identified as a habitat of Principal Importance or smaller areas of such habitat which are essential to maintain the viability of a larger whole. A viable area of habitat identified in a County BAP or any regularly occurring, locally significant population of a species which is listed in a County level “red data book” or BAP on account of its regional rarity or localisation. A regularly occurring, locally significant number of a County important species.

15 County hereafter also includes, Metropolitan, District, Borough or City (usually defined by the Local Planning Authority or council area)

Geographic Scale of Reference	Examples
Local	Semi-natural ancient woodland smaller than 0.25 ha or replanted Ancient Woodland (PAWS). Areas of habitat identified in a local BAP or in the relevant Natural Area profile. County sites that no longer meet the published ecological selection criteria for designation, including Local Nature Reserves selected on county ecological criteria (County sites, where they exist, will often have been identified in local plans). Sites/features that are scarce within the county or which appreciably enrich the county habitat resource. A diverse and/or ecologically valuable hedgerow network, which may not qualify as being of County BAP quality. A regularly occurring, significant number of a locally important (BAP) species during a critical phase of its life cycle. Areas of habitat considered to appreciably enrich the habitat resource within the context of the local area.

Table 8.1: Geographic frame and reference

8.3.16 If an ecological feature is considered to be important at a negligible or site level only, then the proposed development is not anticipated to have an effect that would be of relevance to the decision maker in terms of the EIA Regulations. Exceptions to this would be if the species, population or habitat in question was identified as having a high social or economic value or if they are afforded legal protection. While the assessment does include protected species that receive statutory protection and are of material consideration at the local level, the presence of such a species does not necessarily infer value in relation to the proposed scheme but only to the level of protection it receives.

8.3.17 As such, the value of the proposed scheme for protected species is considered by the specific ecological feature, taking into account the level of activity, the level of protection it receives and the overall value of habitat to that species within the Site.

Determining Impacts and Effects

8.3.18 The CIEEM guidelines (CIEEM, 2018/2022), define an impact as an influence on an ecological feature. The effect is the outcome of the influence on the ecological feature. As part of the EcIA it is important to assess whether or not an impact is defined as an effect (negative or positive) on the integrity of a defined site or ecosystem and/or the conservation status of a habitat or species within a given geographical area.

8.3.19 Impacts should be identified and understood to be able to determine the likely effect (consequence) of that impact in relation to the ecological feature.

8.3.20 As part of the process of determining whether there is likely to be an effect on the status of an ecological feature, the following questions are considered:

- Will any site/ecosystem process be removed or changed?
- What will be the effect on the nature, extent, structure and function of component habitats?
- What will be the effect on the average population size and viability of the component species?

8.3.21 A description of parameters that are considered when assessing the degree and type of change are detailed in Table 8.2 below.

Parameter for describing impacts on ecological structure and function	Definition of the parameter
Positive or Negative	Whether the impact has a positive or adverse effect
Extent	The area of which the effect occurs
Magnitude	The size or amount of an effect
Duration	The time for which the effect is predicted to last prior to recovery or replacement of the resource or feature
Reversibility	Whether the effect is permanent (i.e. irreversible) or temporary (i.e. reversible)
Timing and Frequency	How often the effect occurs (e.g. repeated noise from piling work) and when it occurs (e.g. vegetation clearance undertaken outside of the bird breeding season

Table 8.2: Parameters used to describe effects

8.3.22 In addition to considering the effect on the ecological feature, an assessment of the significance of the residual effect (for the type/nature of change), is provided in Table 8.3 and described with an indication of likelihood.

Impact Classification	Explanation
Significant Adverse Effect	Likely to create a significant negative effect, including loss, or long-term or irreversible damage on the status of the ecological feature
Not Significant Adverse Effect	Likely to create a negative effect without causing long-term or irreversible damage to the status of the ecological feature
Neutral	Effects are either absent or such that there is no overall net change to the ecological feature
Not Significant Positive Effect	Likely to create a beneficial effect on an ecological feature or providing a new lower value ecological feature without improving its conservation status
Significant Positive Effect	The activity is likely to create a significant beneficial effect, including long-term enhancement and favourable conditions for an existing ecological feature

Table 8.3: Classification of the significance of the effects

8.3.23 Once an effect is considered to be significant, then the scale of effect is assessed on a geographical scale (i.e. international, national, regional, district, etc.), see Table 8.2 above for details. For example, the effect may not be significant at a county scale, but significant at a more local scale.

Mitigation, Compensation and Enhancement

8.3.24 For the purpose of the ES chapter, impacts on ecological features are generally assessed without mitigation in place. Although, in some situations, it is impossible to separate the mitigation as this is embedded into the scheme. In these situations, it will be acknowledged and just the residual effects considered.

8.3.25 Mitigation or compensation is given for significant effects on features of nature conservation importance. In line with current CIEEM guidelines, the mitigation proposals for the proposed development should aim to:

- Avoid negative ecological effects – especially those that could be significant;
- Reduce negative effects that cannot be avoided; and
- Compensate for any remaining significant ecological effects.

8.3.26 Mitigation measures and compensation within this scheme are heavily intertwined as a result of good site design.

Limitations

8.3.27 The desk study data is third party controlled data, purchased for the purposes of this report only. Heatons cannot vouch for its accuracy and cannot be held liable for any error(s) in these data.

8.3.28 The initial Phase 1 Habitat Survey was undertaken during April 2021, which is within the optimal period for this survey type. However, it was mentioned within the limitations of the PEA report (South Lakes Ecology, 2022) that the time of year was not ideal for assessing botanical quality of grasslands, as many plants had just come into leaf which made it difficult to identify species of interest. Woodland ground flora were easier to identify as they were in full flower. As a result a further survey was undertaken in September 2022 where the botanical quality grasslands were more evident than in the initial survey. Therefore, it was considered that an assessment could be made on the habitats on site.

8.3.29 Pedestrian access was only permitted outside the main working area of the quarry. Therefore, binoculars were used to assess the habitat beyond the deer fence. Where habitats could not be directly accessed, other sources of information (previous surveys, reports, etc.) were used to guide the mapping. It is possible that small areas (less than the minimal mapping unit (of 25m²)) may have been missed, but overall these constraints are not considered to have impacted the conclusions of the PEA report.

8.4 Baseline Conditions

Designated Sites

8.4.1 There are five international statutory designated sites (Natura 2000 sites) for nature conservation within 10km of the site boundary, the closest being Morecambe Bay (Special Area of Conservation (SAC), Special Protection Areas (SPA), RAMSAR and Sites of Special Scientific Interest (SSSI)) which is located approximately 2.3km to the west of the site boundary. The conservation value of these sites is assessed as being of **International** importance.

8.4.2 10 statutory designated sites are within 5km of the site boundary, the closest being Thwaite House SSSI which is approximately 900m to the west of the site boundary. The conservation value of these sites is assessed as being of **National** importance.

8.4.3 26 non-statutory designated sites (Biological Heritage Sites (BHS)) are located within the 2km search radius of the site, of which 15 are located within 1km.

Leapers Wood, Bowman Stout Wood and Slacks Wood are located within the site boundary, with the next nearest being Long Riddings and Kit Bill Wood adjacent to the site. The conservation value of these areas is assessed as being of **County** importance.

8.4.4 A summary of the above sites is provided in Table 8.4 below.

Site name	Designation	Interest Features	Distance from site boundary
International Statutory Designated Sites			
Morecambe Bay	SAC, SPA, RAMSAR, SSSI	One of the two largest intertidal estuarine flats in Britain. The saltmarshes have diverse vegetation, supporting a number of rare and uncommon plants. The estuarine system of flats and marshes is dynamic with shifting channels and phases of erosion and accretion. On the northern and eastern sides of the Bay sand flats were bordered by extensive areas of saltmarsh which were covered only by the highest tides. International significance for wintering wading birds and national significance for wintering wildfowl.	2.3km west
Leighton Moss	SPA, RAMSAR, SSSI	The largest reedbed in north-west England. Large areas of open water were surrounded by extensive reedbeds in which areas of willow scrub and mixed fen vegetation also occur. A typical and varied fen flora has developed in part, whilst the reedbed shows all stages of seral transition from open water through to woodland.	4.8km north-west
Morecambe Bay Pavements	SAC	The general character of the area includes: • Inland water bodies (Standing water, Running water); • Bogs, Marshes, Water fringed vegetation, Fens; • Heath, Scrub, Maquis and Garrigue, Phygrana; • Dry grassland, Steppes; • Broad-leaved deciduous woodland; • Coniferous woodland; and • Inland rocks, Screes, Sands, Permanent Snow and ice.	4.5km north-west

Site name	Designation	Interest Features	Distance from site boundary
Calf Hill and Cragg Woods	SAC	The general character of the area includes: • Broad-leaved deciduous woodland; and • Coniferous woodland.	7.9km south-east
Bowland Fells	SPA	The area supports the largest expanse of blanket bog and heather moorland in Lancashire. International significance for breeding birds.	8.2km to the south-east
Statutory Designated Sites			
Thwaite House Moss	SSSI	The area is a nationally important mosaic of fen habitats, comprising semi-natural fen woodland (displaying transitional succession), species-rich fen meadow and tall-herb fen.	1km south-west
Crag Bank	SSSI	The area comprised boulder clay ridges and marshy grassland on calcareous peaty soil. The area contains two nationally rare communities and several species which area rare or limited in Lancashire. The area is poorly drained. The area is intersected by a shallow watercourse (the Black Dike). Other habitats found included purple moor-grass.	1.8km west
Morecambe Bay	SAC, SPA, SSSI, Ramsar	Mentioned above.	1.9km west
Warton Crag	SSSI, LNR	The area support best example of limestone grassland in Lancashire, other habitats include limestone pavement, calcareous woodland, neutral grassland. British Red Data Book vascular plant species.	2.7km north-west
Warton Crag Quarry	LNR	Botanical and butterflies	2.8km north-west
Burton Wood	SSSI	The area contains good example of deciduous woodland types.	3.5km north-east
Cringlebarrow and Deepdale	SSSI	The area consists of calcareous hazel-ash woodland and sessile oak-ash-lime woodland.	4.7km north-west
Leighton Moss	SAC, SSSI	Mentioned above.	5km north-west
Non-statutory Designated Sites			
Leapers Wood, Bowman Stout Wood and Slacks Wood	BHS	Comprises semi-natural ancient woodland on limestone. An area of limestone pavement is also found here.	Within site

Site name	Designation	Interest Features	Distance from site boundary
Long Riddings Wood	BHS	Comprises semi-natural ancient woodland and an active limestone quarry.	Adjacent south-west boundary
Kit Bill Wood	BHS	Comprises semi-natural ancient woodland on limestone.	Adjacent south-east boundary
Kellet Road Verges	BHS	Comprises species-rich roadside verges on either side of Kellet Road bridge across the M6.	50m north
Helks Wood	BHS	Comprises small semi-natural ancient woodland on limestone. An area of limestone pavement is also found here.	150m south
Helks Wood Farm Pasture	BHS	Comprises a field of permanent species-rich limestone grassland pasture lying on limestone. A small area of pasture with limestone crags is also found here.	200m east
Limestone Pavement and Crags, South of Cock's Wood	BHS	Comprises small area of limestone pavement and crags situated in a field adjoining Cock's Wood. A field is also situated here, which is managed as pasture and most of the grassland is improved.	250m east
Cock's Wood	BHS	Comprises a semi-natural woodland which supports a rich herb layer including many species indicative of ancient woodland.	250m north
Lundsfield Quarry North	BHS	Habitat mosaic	600m west
Hawthorns Rocks	BHS	Comprises small area of species-rich semi-natural limestone grassland pasture on limestone outcrops.	600m south
Over Kellet Crags	BHS	Comprises a pond and surrounding habitat, including tall-herb fen vegetation.	650m east
Lundsfield Quarry Central	BHS	Comprises an area of disused sand and gravel workings. The land has colonised slowly by natural regeneration and now supports a complex mosaic of habitats including species-rich grassland, wetland, open ground, scrub and scattered trees. Additional habitats include verge, hedgebank and hedgerows.	700m west
Lancaster Canal	BHS	Comprises entire length of the Lancaster Canal. The canal is the largest and most species-rich waterbody in the county. Supporting a very rich assemblage of plants and animals characteristic of slow-flowing waterbodies.	700m west

Site name	Designation	Interest Features	Distance from site boundary
Long Dales Lane Fields	BHS	Comprises a group of fields managed as permanent pasture with hedgerows and scattered trees, where underlying limestone is exposed both as natural outcrops and as a result of former quarrying. A mosaic of neutral grassland with species-rich calcareous grassland occurs.	750m south
Over Kellet Pond	BHS	Comprises limestone pavement, crags and rock outcrops together with associated grassland, trees and shrubs. The grassland includes a mosaic of neutral grassland and semi-natural calcareous grassland.	750m east
Whorley's Moss	BHS	Comprises of small alder-carr woodland that has developed from a former mossland.	1km south-west
Lundsfield Quarry South	BHS	Habitat Mosaic	1km south-west
Intack Wood	BHS	Comprises small, wet, semi-natural woodland with a stream and numerous small pools.	1.1km south-east
Thwaite End Pasture	BHS	Comprises pasture of semi-natural neutral grassland supporting a rich diversity of grasses, sedges and herbs, indicative of traditional, low intensive management. A stream and a wooded bank provide additional interest.	1.2km south-west
Swantley	BHS	Comprises west facing limestone cliff and disjunct limestone outcrops with some ancient semi-natural limestone grassland, together with a band of acidic sandstone outcrops.	1.3km south-east
Dunald Mill Crags	BHS	Comprises small area of ancient semi-natural limestone grassland associated with a linear outcrop of partially exposed limestone.	1.4km south
Steamtown	BHS	Comprises of semi-natural calcareous and neutral grassland situated alongside old railway tracks. The area supports an exceptionally rich flora with a high diversity of species, many typical of calcareous conditions.	1.4km to the west
Carnforth Ironworks	BHS	Comprises slag heaps from the former Carnforth Ironworks and similar habitat alongside the adjoining railway. Areas of species-rich grassland were present on the banks and ridges in glades amidst stands of dense scrub and trees.	1.4km to the north-west
Dunald Mill Hole	BHS	Comprises small linear species-rich neutral grassland field, bisected by a flowing stream.	1.5km to the south-east

Site name	Designation	Interest Features	Distance from site boundary
		Other habitats found included trees and scrub.	
Hawksheads Woodlands	BHS	Comprises of a large secondary woodland with a shrub layer and ground flora which comprises some ancient woodland indicator species.	1.8km to the south-west
Crawstone Wood	BHS	Comprises mainly semi-natural woodland. The ground flora comprises some ancient woodland indicator species.	1.9km to the south-west

Table 8.4: Summary of Designated Sites within the 2km Search Radius

Priority Habitats

8.4.5 The following areas of priority habitat were returned within the 2km search radius, see Table 8.5.

Habitat type	Closest distance to site
Ancient Semi-Natural Woodland	Located within the site boundary
Ancient Replanted Woodland	Located within the site boundary
Deciduous Woodland	Located within the site boundary
Limestone Pavement	Located within the site boundary
Open Habitat Mosaic	Located within the site boundary
Good Quality Semi-Improved Grassland	Adjacent to southern boundary
Traditional Orchard	10m to the north
Lowland Calcareous Grassland	630m to the north-east
Reedbeds	780m to the south-west
Lowland Meadows	790m to the south-west
Lowland Fens	950m to the south-west
Coastal and Floodplain Grazing Marsh	1.1km to the north-west
Forestry Commission Legal Boundary	1.8km to the north-east
Coastal Saltmarsh	1.9km to the north-west
Natura Sites	2km to the north-west

Table 8.5: Summary of the priority habitats within the 2km search radius

8.4.6 The conservation value for all seven traditional orchard sites is assessed as **National** Importance.

Habitats

8.4.7 The following habitats were recorded within and adjacent to the site boundary during the phase 1 habitat surveys undertaken by South Lakes Ecology and reported in the PEA found in Technical Appendix D.

Lowland mixed deciduous woodland

8.4.8 This habitat dominates the periphery of the quarry. Canopy species are predominantly ash *Fraxinus excelsior* and sycamore *Acer pseudoplatanus* with wych elm *Ulmus glabra*, small leaved lime *Tilia cordata*, oak *Quercus spp*. and birch species *Betula spp*. Understorey species comprise hawthorn *Crataegus monogyna* and hazel *Corylus avellana*, with some holly *Ilex aquifolium* and rowan *Sorbus aucuparia*. There are two areas of ancient woodland, and one area of replanted ancient woodland – all of which comprise the Leapers Wood, Bowman Stout Wood and Slack Wood Biological Heritage Site.

8.4.9 Limestone outcrops are frequent in the undisturbed sections of woodland, and small areas of limestone pavement are still evident in the woodland to the west of the quarry access road. Ground flora is typical of established woodland with bluebell *Hyacinthoides non-scripta*, primrose *Primula vulgaris*, dog's mercury *Mercurialis perennis*, wood anemone *Anemone nemorosa*, ramsons *Allium ursinum* and ground ivy *Glechoma hederacea*. There is evidence of rabbit grazing and other terrestrial mammal activity in the woods.

8.4.10 These areas have a mixture of ages of trees, with some regeneration. There were no veteran trees, and few mature trees have features suitable for hole nesting birds and roosting bats. There is fallen and standing deadwood present, and sites appear to be lightly managed. There is a band of standing dead and dying trees along the southern edge of Bowman Stout Wood and Slack Wood.

8.4.11 The conservation value of the lowland mixed deciduous woodland is assessed as **National** importance. This is due to the habitat containing ancient woodland as well as being a UK BAP and local BAP priority habitat of importance. The habitat also provides a high ecological value for various fauna species.

Mixed Plantation Woodland

8.4.12 There is a large area of planted woodland alongside the M6 to the west, linking the

semi-natural woodland above with newly planted areas (over open mosaic habitat) and planted woodland bordering the adjacent Back Lane Quarry. Most trees are quite even aged, with some older trees and some scrub regeneration in canopy gaps. Species include ash, sycamore, alder *Alnus cordata* (non-native) and birch, with some conifers. Willow species *Salix spp.,* wych elm, hawthorn and hazel are also present in the understorey. Ground flora is variable and includes bramble *Rubus fruticosus* and common nettle *Urtica dioica* in open areas, with bare ground in more densely shaded places.

8.4.13 The conservation value of the mixed plantation woodland is assessed as **County** importance. This is due to the habitat being a UK BAP and local BAP priority habitat of importance.

Dense Scrub

8.4.14 There are two main areas of dense scrub to the west of the quarry buildings. One area near to the access road comprises self-seeded scrub and young trees such as sycamore, hazel, ash, willow and birch as well as some bramble and buddleia *Buddleja davidii*. It is a dense patch and well-suited to nesting birds.

8.4.15 The second area is between Leapers Wood Quarry and Back Lane Quarry and is dominated by mature buddleia with some willows. There is little ground vegetation as the scrub has established on tipped material.

8.4.16 The conservation value of the dense / continuous scrub is assessed as **Local** importance. This is due to the connectivity they provide within the site and the local surrounding areas and the ecological value for various fauna species.

Calcareous Grassland

8.4.17 The underlying bedrock of the site is limestone, and much of the ground flora reflects this. Woodland and scrub are dominant on the site, but along the track at the top of the quarry cliffs is a linear stretch of species poor limestone grassland. It is dominated by grasses and bramble has established in places. Species include oat grass *Arrhenatherum elatius*, Yorkshire fog *Holcus lanatus*, false brome *Brachypodium sylvaticum*, cocksfoot *Dactylis glomerata*, wild thyme *Thymus polytrichus*, great burnet *Sanguisorba officinalis*, eyebright *Euphrasia spp*., lady's bedstraw *Galium verum*, common cats-ear *Hypochaeris radicata*, fairy flax *Linum catharticum*, yellow oat grass *Trisetum* flavescens, wild strawberry *Fragaria vesca*, barren strawberry *Potentilla sterilis*, mouse-ear hawkweed *Pilosella officinarum*,

sedges *Carex spp*., St. Johns wort *Hypericum perforatum*, bird's foot trefoil *Lotus corniculatus* and ground ivy as well as woodland ground flora species. The track is only accessed on foot at present, so the grassland is undisturbed – but there is a lot of encroachment by bramble.

8.4.18 The conservation value of the calcareous grassland is assessed as **County** importance. This is due to the habitat being a UK BAP and local BAP priority habitat of importance.

Open Mosaic Habitat

8.4.19 This is vegetation establishing on recently disturbed ground, such as spoil, gravels and tipped material. An area of this is present along the northern and western edges of the quarry (above the working area). The northern area is quite small and calcareous grassland community is establishing surrounded by bare ground and tipped material.

8.4.20 To the west is an extensive area of this habitat mosaic on tipped material and rubble. There are patches of woodland ground flora such as bluebell, dog's mercury and primrose, as well as patches of establishing grassland with bugle *Ajuga reptans*, wild strawberry, wood sage *Teucrium scorodonia*, common dog violet *Viola riviniana* and lady's mantle *Alchemilla mollis* evident at this stage of the season. Other areas are bare, or with scattered colonists such as coltsfoot *Tussilago farfara* and teasel *Dipsacus fullonum* and young scrub (especially buddleia).

8.4.21 The conservation value of the open mosaic habitat is assessed as **National** importance. This is due to the habitat being a UK BAP priority habitat of importance. The habitat also provides a high ecological value for various fauna species.

Improved Pasture

8.4.22 There is an area of improved sheep grazed pasture at the northern edge of the site, which is contiguous with pasture to the west. This has little value to wildlife, though the boundary hedges are of interest.

8.4.23 The conservation value of the improved grassland is assessed as **Site** importance. This is due to its poor condition. Therefore, it has been scoped out of further assessment.

Inland Rock and Scree

8.4.24 Surrounding the working area of the quarry are limestone cliffs with varying

degrees of vegetation. The cliffs at the eastern end of the quarry appear to have been undisturbed for a period and have some vegetation developing in crevices and ledges. The cliffs along the northern edge of the quarry are clearer and appear to be more recently worked.

8.4.25 The conservation value of the inland rock and scree is assessed as **Local** importance. This is due to the habitat providing ecological value for various fauna species.

Standing Water

8.4.26 One small sump/settling pond was found within the quarry. It was fenced and held a small amount of water during the phase 1 habitat survey.

8.4.27 The conservation value of the standing is assessed as **Site** importance. Therefore, it has been scoped out of further assessment.

Hedgerows

8.4.28 Tall hedgerows are present either side of the access road to the quarry from the B6254 Carnforth Road. To the west the hedgerow is predominantly hawthorn. To the east it is developing into a line of trees with hawthorn, cherry and sycamore. A hawthorn hedgerow forms the boundary between the improved pasture and main road, and a defunct hawthorn hedge forms the northern boundary of the site.

8.4.29 The habitat is a UK BAP priority habitat of importance. Therefore, the conservation status for this hedgerow is assessed of **County** importance.

Protected Species

8.4.30 Records of protected species were obtained from the LERN. A number of species of conservation importance or otherwise notable were recorded within the 2km search radius of the site. A summary of these records is provided in Technical Appendix D.

Great Crested Newt

8.4.31 LERN data search returned 20 records for Great Crested Newt (GCN) within 2km of the site boundary. The closest record was located approximately 700m from the site boundary to the north-east and the most recent record was dated from 2014.

8.4.32 MAGIC returned three records for GCN Class Survey Licence Returns (CSLR) within 2km of the site boundary. The closest was located approximately 560m to the north-east of the site. The record was positive presence of GCN, dated from 2016.

8.4.33 One small settling / sump pond was noted during the phase 1 habitat survey. The pond was turbid with little water present. Additionally, there was not considered to be a network of nearby suitable ponds, thus further reducing the likelihood of amphibians utilising the pond. The Habitat Suitability Index (HSI) calculation generated a score of 0.48 (poor).

8.4.34 The proposed workings, involve deepening of the existing Leapers Wood Quarry, which will only require the removal of the active quarry habitat within the site boundary. Due to lack of records of GCN, and ponds within 500m of the site boundary and the waterbody within the site providing poor suitability for GCN. GCN are highly unlikely to be present within the site boundary, therefore, have been scoped out of further assessment.

Reptiles

8.4.35 LERN returned four records for common lizard *Zootoca vivipara* within 2km of the site boundary. The closest record was located approximately 1.6km from the site boundary and the most recent record was dated from 1993.

8.4.36 LERN returned two records for slow worm *Anguis fragilis* within 2km of the site boundary. The closest record was located approximately 1.3km from the site boundary and the most recent record was dated from 1993.

8.4.37 The periphery habitats are considered to provide some suitability for reptiles, however, are surrounded by low-suitability habitat. In addition, no local records have been noted for 40 years. Habitat impacted by the proposed mineral extraction is restricted to active quarry and hard standing only. Therefore, it is considered highly unlikely that reptiles will be impacted by the development and have been scoped out of further assessment.

Bats

8.4.38 LERN returned numerous records for eight bat species within 2km of the site boundary. Closest records for bats were returned approximately 200m to the north-east of the site boundary, species found included pipistrelle species *Pipistrellus spp*. Other species recorded included *myotis spp*., daubenton's bat *Myotis daubentonii*, natterer's bat *Myotis nattereri*, noctule bat *Nyctalus noctula*, nathusius' pipistrelle *Pipistrellus nathusii*, common pipistrelle *Pipistrellus pipistrellus*, soprano pipistrelle *Pipistrellus pygmaeus*, and brown long-eared bat *Plecotus auritus*.

Roosting

8.4.39 None of the buildings on site have particular suitability for roosting bats. Bats may use the cracks and fissures in the quarry walls to roost during the active season, and possibly to hibernate. However, this is an active site where regular and frequent levels of disturbance are present with the faces having been recently blasted (at least three times per month), which causes very high levels of disturbance and also causes dust to be released into the environment, settling within suitable crevices. These factors are considered to substantially reduce the suitability of the quarry faces to support roosting bats.

8.4.40 Bats also use trees to roost, though there were few trees with good potential roost features in the woodland – most are still relatively young and clean stemmed, though the dieback of trees along the top of the quarry may create some.

8.4.41 With the consideration of the above assessment criteria and the conservation value for roosting bats it is therefore assessed as up to **Local** importance, following the guidance detailed in 'Valuing Bats in Ecological Impact Assessment' (Wray, et al., 2010).

Foraging / Commuting

8.4.42 The site provides good foraging potential for bats around the woodland edges, and there are some sheltered flight lines around most of the site. A total of eight species of bat have been recorded roosting and foraging in the general areas around Leapers Wood Quarry.

8.4.43 The majority of the site is considered to provide optimal foraging / commuting habitat for bats and the woodland, scrub, hedgerows and grassland are to be retained. As a result of this and following the guidance detailed in 'Valuing Bats in Ecological Impact Assessment' (Wray, et al., 2010), the conservation importance for foraging / commuting bats are assessed as up to **County** importance.

<u>Badgers</u>

8.4.44 Refer to Technical Appendix D for further details on badgers.

8.4.45 No suitable badger habitat will be directly impacted by the proposed works. It is considered highly likely that the species are currently disturbed on occasion by blasting and ongoing quarrying activities. Thus, the further works were not considered to increase the current levels of disturbance on site. However, mitigation is provided below to ensure the risk of harm to badgers is minimised

throughout the works.

8.4.46 The conservation importance value for this species is assessed as **Local** importance.

Otters

8.4.47 LERN returned 11 records for otters *Lutra lutra* within 2km of the site boundary. The closest record was located approximately 600m to the south-west of the site boundary and the most recent record was dated from 2019.

8.4.48 Limited suitable habitat for either species was noted within the site boundary, or within close proximity to the site boundary. It is considered highly unlikely that the species will be present within the site boundary and therefore have been scoped out of the assessment.

Water voles

8.4.49 LERN returned no records for water voles *Arvicola amphibius* within 2km of the site boundary.

8.4.50 Limited suitable habitat for either species was noted within the site boundary, or within close proximity to the site boundary. It is considered highly unlikely that the species will be present within the site boundary and therefore has been scoped out of further assessment.

Other Mammals

8.4.51 LERN returned 17 records for hedgehog *Erinaceus europaeu*s within 2km of the site boundary. The closest record was located approximately 100m to the south-west of the site boundary and the most recent record was dated from 2019.

8.4.52 Quarry staff from Back Lane Quarry (south of the site) describe a crossing point where mammals are often seen moving between the southern areas of woodland around Back Lane Quarry and the woodland around Leapers Wood.

8.4.53 Evidence of light rabbit grazing was noted throughout the Phase 1 Habitat Survey.

8.4.54 The woodland, hedgerows, grassland, scrub and open mosaic habitat provide some suitable habitat for foraging, refuge and hibernation mammals. However, the connectivity to the wider landscape is limited due to the presence of the M6 and Kellet Road within close proximity to the site boundary. The proposed mineral extraction will be restricted to the existing quarry, which is considered to be largely unsuitable for various mammal species. Therefore, it is considered that there will be a negligible impact to other mammal species, thus have been scoped out of

further assessment.

Birds

8.4.55 LERN returned 64 bird species records found within the 2km search radius surrounding the site. This included 15 red listed Birds of Conservation Concern (BoCC) and 21 amber listed BoCC. Additionally, MAGIC identified that the site contains two grassland assemblage farmland birds. Additionally, MAGIC identified several specific farmland birds, including curlew *Numenius arquata*, lapwing *Vanellus vanellus* and tree sparrow *Passer montanus*.

8.4.56 Records were returned for nesting peregrine falcons within the adjacent Back Lane Quarry, which were dated from 1990.

8.4.57 The woodland, scrub, hedgerow, grassland, open mosaic habitat, quarry (including quarry faces) provides suitable habitat for a variety of common and opportunistic nesting species. Most of the quarry cliffs, most notably along the northern and eastern edge of the working area, is deemed suitable for nesting raptors, such as peregrine falcon, kestrel *Falco tinnunculus* and raven. No notable species were observed during the Phase 1 Habitat Surveys conducted by South Lakes Ecology. Species observed / heard utilising the woodland included spotted flycatcher *Muscicapa striata*, willow warbler *Phylloscopus trochilus*, bullfinch *Pyrrhula pyrrhula*, tawny owl *Strix Aluco*, song thrush *Turdus philomelos*, wren *Troglodytes troglodytes*, chiffchaff *Phylloscopus collybita* and sparrowhawk *Accipiter nisus*. Other species noted utilising the rest of the site included dunnock *Prunella modularis*, blackbird *Turdus merula*, great tit *Parus major*, blue tit *Cyanistes caeruleus* and chaffinch *Fringilla coelebs*.

8.4.58 Peregrine falcons were recorded successfully breeding in the adjacent Back Lane Quarry in spring 2022 (breeding bird survey carried out by South Lakes Ecology in relation to Back Lane Quarry). This species tends to return to the same nest site, but due to the dynamic nature of the site there is always scope for them to re-locate to use a nest site on the Leapers Wood side of the quarry void.

8.4.59 Oystercatcher *Haematopus Ostralegus* was seen in the previous (2009) fieldwork, but not observed during site visits in 2021/ 2022. The habitat (open stony ground) on site is still broadly suitable for this species.

8.4.60 Due to the species recorded within the site during the Phase 1 Habitat Survey and the mosaic of habitat present within the site, the conservation importance value

for this species group is assessed as **Local** importance.

Invertebrates

8.4.61 LERN returned records for multiple notable records, species returned included dingy skipper *Erynnis tages*, ringlet *Aphantopus hyperantus*, small heath *Coenonympha pamphilus*, northern brown argus *Aricia Artaxerxes* and wall *Lasiommata megera*. The minimum distance from site was approximately 700m to the south-west. Further information can be found in Technical Appendix D.

8.4.62 The bare ground, limestone grassland and deciduous woodland can all provide good quality habitat for invertebrates, including notable species. Only widespread species were observed during the surveys (orange tip butterfly, specked wood butterfly, small tortoise shell, admiral butterfly, peacock butterfly and white tailed bumblebee).

8.4.63 Due to the suitable habitats onsite and that the records of notable NERC invertebrate species are within close proximity to the site, indicating that they are likely to be utilising the site, the conservation importance value for this species is assessed as **Local** importance.

Summary of Ecological Features

8.4.64 Table 8.6 summarises all important ecological features identified within the respective zones of influence, together with the geographic context of their importance.

Ecological Feature	**Geographic Context of Importance and / or Protected Status**
Designated Sites	Up to International
Priority Habitats	National
Lowland Mixed Deciduous Woodland	National
Open Mosaic Habitat	National
BHS	County
Mixed Plantation Woodland	County
Calcareous Grassland	County
Hedgerows	County

Ecological Feature	Geographic Context of Importance and / or Protected Status
Dense Scrub	Local
Inland Rock and Scree	Local
Standing Water	Local
Bats	Local
Badger	Local
Birds	Local
Invertebrates	Local

Table 8.6: Summary of ecological features requiring detailed assessment

8.5 Integrated Mitigation

8.5.1 Environmental elements have been considered during the development of the restoration scheme, to avoid and reduce potential impacts on biodiversity. This approach has led to a range of mitigation measures capable of reducing the magnitude of impacts being embedded within the restoration design or captured within the proposed operational practices. Measures specifically related to the protection of ecological sites, habitats and protected species were detailed in the following sections.

Proposed Restoration

8.5.2 The following mitigation measures have been incorporated into the proposed restoration.

Inland Rock and Scree

8.5.3 The current works involve deepening the existing quarry operations by an additional depth of 75m. During the mineral extraction, a number of the existing rock faces and shelves will be removed and then replaced as the works progress. As part of the restoration proposals the void will then be infilled with water to create a large lake. A number of faces and shelves will be retained around the periphery and left to naturally generate replacing the habitats lost during extraction.

Reedbeds

8.5.4 The restoration scheme includes the plantation of reedbeds in a block along the southern – eastern boundary of the proposed waterbody within the centre of the site. The created reedbeds will include the planting of native species in keeping with the local character. See Lancashire County Council (n.d.) for list of species local to the area.

Bats

8.5.5 The proposed restoration has been designed to retain areas of open quarry faces to ensure that suitable bat roosting habitat is available on site.

8.5.6 In addition, suitable foraging habitat has been incorporated within the restoration proposals through the creation of open water, calcareous grassland and scrub habitat.

Birds

8.5.7 The proposed restoration has been designed to retain areas of open quarry faces to ensure that suitable nesting habitat is available for raptors, such as peregrine falcon, kestrel and raven.

8.5.8 In addition, lakeside shallows have also been incorporated into the proposed restoration design to provide suitable oystercatcher habitat.

Invertebrates

8.5.9 The proposed restoration has been designed to ensure that a complex topography is maintained on site, with a variety of different habitat types. Scattered trees and scrub, calcareous grassland, sparsely vegetated slopes, loose rock, bare cliffs and slopes provide a wide range of niches providing suitable foraging habitat, sources of nectar and pollen and also nesting sites for a variety of invertebrates.

8.5.10 Additionally, areas of optimal invertebrate habitat, such as the open mosaic habitat will be retained and appropriately managed as part of the restoration proposals.

<u>Essential Mitigation – Operational Phase of Mineral Extraction</u>

Habitats

8.5.11 The operational phase would be subject to measures and procedures as set out within a Biodiversity Management and Action Plan (BMAP). The BMAP will include a range of measures to mitigate potential impacts on ecological habitats, protected

species and the water environment, which accord with legal compliance and good practice guidance. The BMAP would include measures to minimise dust deposition, air pollution, pollution incident, light spillage, and noise and vibration which would all assist in minimising impacts upon ecological receptors, in particular priority and notable habitats within the zone of influence.

Species

8.5.12 The following mitigation measures would be in place to reduce the effect of potentially significant operational impacts on ecological species.

Bats (Roosting, Foraging and Commuting)

8.5.13 Measures would be implemented during the operational phase to minimise impacts on foraging and commuting bats. This includes:

- Keeping lighting to a minimum with limited night-time working, where possible, and reducing lighting within or adjacent to habitats of value to bats. Any lighting used would be directional and positioned sympathetically to minimise light spill.

Badgers

8.5.14 Mineral extraction areas, soil storage and access roads would be managed to take account of any active existing setts and commuting routes. The protection of badgers during the mineral operations would also include the provision of ramps within open excavations to avoid badger entrapment, reduction in speed limits, and appropriate storage methods for potentially harmful chemicals.

Birds

8.5.15 Peregrines typically nest in hard rock quarries, above quarry workings. They are a schedule 1 listed species which under the Wildlife and Countryside Act 1981/ Schedule 1 – Part 1 states: 'It is illegal for any person to intentionally or recklessly disturb any wild bird included in Schedule 1 while it is building a nest or is in, on or near a nest containing eggs or young; or disturb dependent young of such a bird'.

8.5.16 Leapers Wood Quarry has potential nesting options for cliff nesting species, including peregrines (see paragraph 8.4.58 for further information). As a result, any proposed increase in quarry blasting activity or blasting of new areas not active within the last 6 months should be accompanied by a nesting bird check if blasting is undertaken between March – August, inclusive. During the nesting bird check, a

toolbox talk will be delivered to all relevant staff on site, outlining suitable nesting sites, and ID features of peregrines and other raptors.

Enhancements – Biodiversity Net Gain

8.5.17 Enhancements have been incorporated within the restoration proposals to ensure that a net gain is achieved. The Natural England Metric 4.0 has been utilised to determine the following results:

FINAL RESULTS		
Total net unit change (Including all on-site & off-site habitat retention, creation & enhancement)	*Habitat units*	23.48
	Hedgerow units	0.00
	Watercourse units	0.00
Total net % change (Including all on-site & off-site habitat retention, creation & enhancement)	*Habitat units*	5.27%
	Hedgerow units	0.00%
	Watercourse units	0.00%
Trading rules satisfied?	Yes ✓	

Table 8.7: Results from the BNG Calculations

8.5.18 This includes incorporating:

- Open Mosaic Habitat - an area of partially restored land was located to the west of the current mineral extraction. However, due to the area being previously worked, and the substrate beneath, an area of open mosaic habitat has formed. Due to this providing a mosaic of periphery habitat types, in an area dominated by woodland habitat, it is considered to enhance the site by providing various different habitat types and ecotones;
- Mixed Plantation Woodland – an area of mixed plantation woodland was located to the west of the site. Enhancements to this woodland will include the creation of dead wood, removal of trees with ash dieback and the removal of non-native invasive species; and
- Dense Scrub – a small patch of dense scrub was located towards the south-west of the site boundary. This patch of scrub will be left to naturally regenerate into broadleaved woodland and managed to achieve good condition.

8.5.19 In addition to the enhancements above, there will be the creation of the following habitats:

- Marl lake – upon completion of mineral extraction, a waterbody will form within the quarry void due to ingress from rainfall, groundwater and fissure / cave systems;
- Reedbeds – upon completion of mineral extraction, small areas of reedbed will form around the peripheries of the lake; and
- Other inland rock and scree – upon completion of mineral extraction, exposed quarry benches will be retained and left to naturally regenerate.

8.5.20 New habitat creation will provide opportunities for species within the site. In addition to these enhancements, which were embedded into the proposed works, a range of additional ecological enhancement measures will be delivered as part of the proposed development, as identified below. Further details will be set out in a Biodiversity Management and Action Plan (BMAP). However, as an indicative guide:

- Inclusion of plant species of known wildlife value within the landscaping scheme, including night-scented varieties to benefit bats, fruit bearing varieties to benefit birds and nectar-rich varieties for invertebrates;
- Provision of new bat roosting opportunities (i.e. bat boxes). These will be a purpose built, durable and long-lasting variety such as Schwegler or 'Habibat' or equivalent;
- Provision of new bird nesting opportunities (i.e. nesting boxes). These will be a purpose built, durable and long-lasting variety such as Schwegler or 'Habibat' or equivalent; and
- Creation of log piles and / or brash piles to provide hibernacula for reptiles and amphibians.

8.6 Assessment of Environmental Effects

Assumptions

8.6.1 The following assumptions have been made during the assessment of potential effects of the proposed development on important ecological features. Although 'assumed' and therefore taken as part of the pre-mitigation scenario, these measures were referenced in the preceding sections which were integral to the mitigation strategy.

8.6.2 It is assumed that a BMAP will be prepared. In addition to the extraction phase impact avoidance and mitigation measures identified in the following sections, the BMAP will detail standard environmental control measures, including, though not limited to, the following:

- Implementation of protection measures for the root protection areas of retained trees and hedgerows, in accordance with BS 5837:2012;
- If a protected / notable species is uncovered or becomes entrapped during the works, a suitably qualified ecologist should be contacted for further advice;
- Standard best practice operational phase pollution prevention and control measures; and
- Sensitive working methods and timing to avoid direct impacts to protected and notable species.

8.6.3 It is assumed ongoing groundwater monitoring will be undertaken to allow for continued assessment of any potential impact from dewatering, especially regarding Thwaite House Moss (SSSI) (Hafren Water, 2023).

8.6.4 It is assumed that mobile plant will be regularly serviced and equipped with effective exhausts to prevent fume emissions as well as vehicle speed controls on access and other trafficked areas in order to reduce fugitive dust generation (Stone, 2023).

8.6.5 It is assumed that the habitats retained and created as part of the proposed works will be managed in keeping with the Biodiversity Management Plan (BMP) created for the site.

Potential Impact and Ecological Effects

8.6.6 The prediction of impacts and the assessment of effects has taken account of the mitigation measures and the compensation measures identified above.

International Statutory Designated Sites

8.6.7 There are five international statutory designated site within 10km of the site boundary. Morecambe Bay (Special Area of Conservation (SAC), Special Protection Areas (SPA), RAMSAR and Sites of Special Scientific Interest (SSSI)) which is located approximately 2.3km to the west of the site boundary. There would be no direct change to the land cover, habitats and features within Morecambe Bay.

8.6.8 Hydrological assessments were undertaken to determine impacts to Morecambe Bay. The designated site is partially supported by the River Keer, River Leven and the River Kent, all which are supported by regional scale surface water catchments. The contribution of groundwater baseflow from the limestone bedrock to the catchment of the River Keer is considered to be negligible in the scale of the overall

catchments which supports flows into Morecambe Bay.

8.6.9 Noise assessments concluded that the proposed works will not result in the exceedance of the 55dB noise limit. Utilising the Waterbird Disturbance and Mitigation Toolkit (Cutts, et al., 2013), it is considered that the noise produced from the works will not cause the behavioural response to the bird species cited, therefore, resulting in a negligible impact to a receptor of international value.

8.6.10 As the current proposed works involve the deepening of the existing quarry, it is assumed that no further dust will be created than what is currently being produced. Therefore, it is considered that dust pollution towards Morecambe Bay (SAC, SPA, RAMSAR and SSSI) during the proposed extraction works is negligible.

8.6.11 The remaining four international Statutory Designated Sites (Leighton Moss (SPA, RAMSAR and SSSI), Morecambe Bay Pavements (SAC), Calf Hill and Cragg Woods (SAC) and Bowland Fells (SPA)) are located a minimum distance of 5km from the site. Due to distance and significant barriers (M6 and A683), adverse impacts to the other designated sites are not anticipated.

Statutory Designated Sites

8.6.12 There are eight statutory designated sites within the 5km search radius, Thwaite House Moss SSSI was the closest, located approximately 900m to the west of the site boundary. There will be no direct change to the land cover, habitats and features within Thwaite House Moss SSSI.

8.6.13 Hydrological assessments were undertaken to determine any impacts to Thwaite House Moss SSSI. It was considered that the site was not directly supported by groundwater from the limestone bedrock beneath the quarry. Therefore, an adverse impact is not anticipated.

8.6.14 As stated within the noise impact assessment report produced by Advance Environmental Limited (2023), the proposed operations will not alter the existing operations on site and those operations will be no nearer to the nearest noise sensitive receptors than the current situation. With the only change from the current situation being the ground height, the distance from the ongoing operations to the nearest receptors will only increase (Advance Environmental Limited, 2023). As a result, noise is considered to have a negligible impact on the SSSI.

8.6.15 Based on the results of the dust impact assessment, it is considered that the impact

of dust towards the SSSI is considered to be negligible due to the predicted levels of dust not achieving a level of concern (i.e. 1000 mg m^{-2} day^{-1} (Environment Agency, 2013)).

8.6.16 The remaining seven SSSIs are located a minimum of 1.5km from the site boundary. Due to significant barriers (M6 and A683) and distance, it is considered that an adverse impact on the other SSSIs are not anticipated.

Non-statutory Designated Sites

8.6.17 There are 26 non-statutory designated sites within the 2km search radius, Leapers Wood, Bowman Stout Wood and Slacks Wood (BHS) are located within the site boundary. It is understood that with the current proposed works, no direct change to the land cover, habitats and features of any of the BHS within the site boundary, or in the search area, are anticipated. However, without appropriate mitigation measures, it is likely that indirect impacts are anticipated. Therefore, best practice measures to mitigate dust and air emissions will be identified and set out in the BMAP.

Priority Habitats

8.6.18 Multiple priority habitats were noted within the site boundary, with an additional nine located within 2km from the site boundary. The proposed deepening of the quarry will not result in the direct land take of any priority habitats within the site boundary. However, indirect impacts may arise, therefore best practice mitigation measures will be identified and set out in the BMAP.

Habitats

8.6.19 The operational impacts of the proposed works result in a loss of existing quarry habitat only. Table 8.7 details the impacts of the habitats outside the mineral extraction boundary as part of the proposed works.

Ecological Feature	Direct Impact	Indirect Impact	Proposed Restoration
Lowland Mixed Deciduous Woodland	No direct impact	Any indirect impacts noted will be managed through the implementation of a BMAP. Therefore,	Retained and managed as Lowland Mixed Deciduous Woodland
Mixed Plantation Woodland	No direct impact		Retained and managed as mixed Plantation Woodland

Ecological Feature	Direct Impact	Indirect Impact	Proposed Restoration
Dense Scrub	No direct impact	an adverse impact is not anticipated	Retained and enhanced to Woodland
Calcareous Grassland	No direct impact		Retained, further creation of naturally regenerated grassland on exposed rock benches
Open Mosaic Habitat	No direct impact		Retained and managed as open mosaic habitat
Hedgerows	No direct impact		Retained and managed as hedgerows
Active worked quarry	Direct impact	N/A	Replaced by Marl Lake

Table 8.7: Summary of the impacts of proposed works on the habitats noted within the site boundary

8.6.20 The mineral extraction boundary is restricted to existing quarry habitat only and all other habitats within the site boundary will be retained and implemented into the proposed restoration plan. Additionally, all indirect impacts will be managed through implementation of a BMAP. Therefore, it is considered that the works would have a **negligible** impact on receptors up to **National** value.

Inland Rock and Scree (Active Quarry)

8.6.21 The operational impacts of the proposed development result in a loss of existing quarry habitat only. All mineral extraction will be restricted to existing working areas of the quarry. The majority of the quarry habitat will be lost as part of the proposals and replaced with standing water with shallow margins and reedbed habitat. The quarry habitat is considered to largely provide limited ecological value due to it being regularly blasted and worked as part of the existing permissions on site. The quarry faces, and shelves are considered to provide some ecological value as they have become partially vegetated. A number of these faces will be retained and others will be created as part of the restoration proposals. Therefore, **the loss of this habitat will result in a beneficial impact** to a receptor of local value due to the retention of more ecologically valuable parts of the habitat and the creation of wetland. Additionally, on the assumption of the details in paragraph 8.6.4 are followed, it is considered that in terms of dust and air pollution the proposals would have a **negligible impact**.

Species

Bats

8.6.22 The mineral extraction operations and processing operations will not change from the current situation. Furthermore, the quarry face subject to further mineral extraction is blasted at least three times a month. Each blast results in significant levels of noise (up to 121dB) and vibration across both the exposed face and across the site itself. Due to the level of frequent disturbance across the site, it is considered that the suitability of these cracks and fissures for bats is negligible. Therefore, with the above conclusion and as long as measures detailed in paragraph 8.5.11 are followed, it is considered that an adverse impact is not anticipated on a receptor of **County** value.

8.6.23 As part of the restoration scheme habitats lost will be replaced with suitable habitats for bats, such as lake, reedbeds and other inland rock and scree. Furthermore, some of the retained habitats on site are set to be enhanced once the works have been completed. Therefore, once the proposed reedbeds, woodland and open mosaic habitat have matured and/or reached their desired condition, it is considered that in the **long-term the proposal will result in a beneficial impact** on a receptor of **County** value.

Badgers

8.6.24 No suitable badger habitat will be directly impacted by the proposed works. It is considered highly likely that the species are currently disturbed on occasion by blasting and ongoing quarrying activities. Therefore, the proposed deepening of the quarry is considered unlikely to result in any additional disturbance. Provided that the mitigation measures outlined within the BMAP are also implemented during the mineral extraction, it is considered that the proposals would have a **negligible** impact on a receptor of **Local** value.

Birds

8.6.25 Most of the quarry cliffs were deemed suitable for nesting raptors, such as peregrine falcon, kestrel and raven. Additionally peregrine falcon have been noted to nest within the adjacent Back Lane Quarry. Without mitigation, there is the potential for direct impact on nesting / breeding birds throughout the mineral extraction phases. Provided the mitigation measures detailed within the BMAP are followed during the mineral extraction, and suitable habitat is retained / created as

part of the restoration proposals, it is considered that the works would have a **negligible impact** on a receptor of **Local** value.

Invertebrates

8.6.26 The active quarry habitat provides limited suitable habitats for invertebrate species, therefore the proposed deepening of the quarry is considered highly unlikely to impact invertebrates. Additionally, the proposed restoration has been designed to ensure that a variety of different habitats are created and retained across the site, providing significant sources of nectar and pollen. Therefore, it is considered that the works would have a **beneficial impact** on a receptor of **Local** value.

8.7 Additional Mitigation

8.7.1 Provided the design and mitigation measures outlined in Section 8.5 are implemented, significant effects range from **negligible** to **beneficial**. Therefore, no further additional mitigation measures have been identified.

8.8 Residual Environmental Effects

8.8.1 Table 8.8 below summarises the assessment of the potential impacts on each important ecological feature, proposed mitigation and assessed residual effects.

Important Ecological Feature	**Potential Impacts**	**Initial Classification of Effect (with embedded mitigation)**	**Additional Mitigation**	**Residual Effect Significance**
International Statutory Designated Sites	No direct impact. **Potential for indirect impact due to changes in air quality (dust)**	Negligible. **Implementation of BMAP**	No additional mitigation required	Negligible
Statutory Designated Sites	No direct effects Potential for indirect effects due to changes air quality (dust)	Negligible Implementation of a BMAP	No additional mitigation required	Negligible
Non statutory designated sites	No direct effects Potential for indirect effects due to changes in air quality (dust)	Negligible Implementation of a BMAP	No additional mitigation required	Negligible

Important Ecological Feature	Potential Impacts	Initial Classification of Effect (with embedded mitigation)	Additional Mitigation	Residual Effect Significance
Priority Habitats	No direct effect Potential for indirect effects due to changes in air quality (dust)	Negligible Creation of naturally regenerated benches and faces as well as enhancement of woodland and open mosaic habitat as part of the proposed restoration proposals. Implementation of a BMAP.	No additional mitigation required	Beneficial effect
Lowland Mixed Deciduous Woodland	No direct effect Potential for indirect effects due to changes in air quality (dust)	Negligible Enhancement of woodland as part of the proposed restoration proposals. Implementation of a BMAP.	No additional mitigation required	Beneficial effect
Mixed Plantation Woodland	No direct effect Potential for indirect effects due to changes in air quality (dust)	Negligible Enhancement of woodland as part of the proposed restoration proposals. Implementation of a BMAP	No additional mitigation required	Beneficial effect
Dense Scrub	No direct effect Potential for indirect effects due to changes in air quality (dust)	Negligible Implementation of a BMAP	No additional mitigation required	Negligible
Calcareous Grassland	No direct effect Potential for indirect effects due to changes in air quality (dust)	Negligible Creation of naturally regenerated benches and faces as part of the proposed restoration proposals. Implementation of a BMAP	No additional mitigation required	Beneficial effect

Important Ecological Feature	Potential Impacts	Initial Classification of Effect (with embedded mitigation)	Additional Mitigation	Residual Effect Significance
Open Mosaic Habitat	No direct effect Potential for indirect effects due to changes in air quality (dust)	Negligible Creation of naturally regenerated benches and faces as well as enhancement of open mosaic habitat as part of the proposed restoration proposals. Implementation of a BMAP	No additional mitigation required	Beneficial effect
Hedgerows	No direct effect Potential for indirect effects due to changes in air quality (dust)	Negligible Implementation of a BMAP	No additional mitigation required	Negligible
Inland Rock and Scree (Active Quarry)	Loss of existing quarry habitat through deepening	Beneficial impact Creation of wetland habitat and naturally generated benches and faces as well as enhancement of open mosaic habitat as part of restoration proposals	No additional mitigation required	Beneficial impact
Bats	Loss of suitable habitat. Potential for direct and indirect impacts from blasting, dust, light, vibration and noise	Negligible. Mosaic of suitable habitat habitats created and retained areas enhanced as part of the restoration proposals (woodland, wetland, open mosaic habitat and naturally generated benches and faces). Implementation of BMAP.	Further surveys and mitigation if required.	Beneficial effect.
Badger	No direct effects Indirect effects through general quarrying processes	Negligible Implementation of a BMAP	No additional mitigation required	Negligible

Important Ecological Feature	Potential Impacts	Initial Classification of Effect (with embedded mitigation)	Additional Mitigation	Residual Effect Significance
Birds	Loss of nesting habitat / disturbance during nesting season	Negligible Implementation of a BMAP and suitable habitats incorporated into restoration proposals	No additional mitigation required	Negligible
Invertebrates	Loss of suitable habitat	Beneficial impact Mosaic of suitable habitats created and enhanced (woodland, wetland, open mosaic habitat and naturally generated benches and faces) as part of the restoration proposals	No additional mitigation required	Negligible

Table 8.18: Assessment of potential impacts on each important feature

8.9 Conclusions

Compensation

8.9.1 No significant residual negative effects on important ecological features were anticipated to result from the proposed works, following the inclusion of impact, avoidance and mitigation measures described above. As such, no compensatory measures were proposed.

Climate Change

8.9.2 The baseline surveys identified that, in general, the majority of species and habitats were not isolated within the landscape or at the edge of their range or threatened to a level where climate change may act on their wider population status / distribution.

Monitoring

8.9.3 The monitoring strategy will be developed during the life of the project in consultation with the suitable environmental body who will be managing the site post completion. The monitoring strategy should be detailed within the BMP. The contributions of experts to the development of the strategy will be used to

guarantee that the most appropriate system of monitoring is implemented. This system will be regularly reviewed by the suitable environmental body when it is managing the site post completion.

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9 TRANSPORT

9.1 Introduction

9.1.1 Tetra Tech was appointed by Tarmac to prepare a Transport Assessment (TA) in support of this planning application for the deepening and an extension of time at Leapers Wood Quarry. The proposed development will include the deepening of the existing working and an extension of time. The proposals will not result in an increased rate of mineral output. The TA is provided at Technical Appendix E.

9.1.2 The highway network near the site is maintained by Lancashire County Council (LCC) in their capacity as the local highway authority. Lancashire County Council are also the Mineral Planning Authority responsible for the determination of the planning application. The site lies within the Lancaster City Council district.

Scope of Transport Assessment

9.1.3 An email was sent to LCC in June 2022 to agree the scope of the TA. A response was received in June 2022 and is presented in Appendix B of the TA within Technical Appendix E. LCC also provided a scoping opinion in December 2021 (see Appendix B). The TA takes into consideration the scoping responses from LCC and has been prepared in general accordance with the National Planning Policy Framework (NPPF) and Planning Practice 'Travel Plans, Transport Assessments and Statements'.

9.1.4 The TA report demonstrates that the site can be accessed in a safe and suitable manner and that access can be achieved in accordance with appropriate design standards.

Report Layout

9.1.5 The TA investigates the highways and transportation issues associated with the proposed development. The structure of the report is as follows:

- Section 2 describes relevant planning policy and design guidance.
- Section 3 describes existing conditions.
- Section 4 outlines the development proposals.
- Section 5 outlines the future assessment year, background traffic growth and committed development traffic.
- Section 6 summarises the development trip generation and distribution calculations.

- Section 7 assesses junction capacity.
- Section 8 summarises the report.

9.2 Planning Policy and Design Guidance

9.2.1 Consideration has been given to the following documents:

Policy

- National Planning Policy Framework [NPPF] (MHCLG, 2021)
- Joint Lancashire Minerals and Waste Development Framework Core Strategy DPD (Lancashire County Council, Blackpool Council and Blackburn and Darwen Borough Council, 2009)
- Joint Lancashire Aggregate Assessment (Lancashire County Council, Blackpool Council and Blackburn and Darwen Borough Council, 2021)
- Infrastructure and Planning Annex 1 Highways (LCC, 2017)

Design Guidance

- Design Manual for Roads and Bridges [DMRB] (National Highways)
- Travel Plans, Transport Assessments and Statements (MHCLG, 2014)

National Planning Policy

9.2.2 The NPPF sets out the Government's planning policies for England and how these should be applied. An updated version of the NPPF was published in December 2023. At the heart of the NPPF is a presumption in favour of sustainable development. In terms of transport, Paragraph 114 states that:

"In assessing sites that may be allocated for development in plans, or specific applications for development, it should be ensured that:

a) appropriate opportunities to promote sustainable transport modes can be – or have been – taken up, given the type of development and its location;
b) safe and suitable access to the site can be achieved for all users;
c) the design of streets, parking areas, other transport elements and the content of the associated standards reflects current national guidance, including the National Design Guide and the National Model Design Code; and
d) any significant impacts from the development on the transport network (in terms of capacity and congestion), or on highway safety, can be cost effectively mitigated to an acceptable degree.

9.2.3 Paragraph 115 goes on to state that "Development should only be prevented or refused on highways grounds if there would be an unacceptable impact on highway safety, or the residual cumulative impacts on the road network would be severe."

9.2.4 In order to address this, applications for development should give priority to pedestrian, cycle and public transport movements; address the needs of people with disabilities and reduced mobility; create places that are safe, secure and attractive; allow for the efficient delivery of goods, service and emergency vehicles; and be designed to enable charging of plug-in vehicles.

Joint Lancashire Minerals and Waste Development Core Strategy

9.2.5 The Joint Lancashire Minerals and Waste Development Framework Core Strategy DPD has the following objectives:

- To identify and safeguard mineral resources for specific purposes which meet a proven and sustainable need, recognising their environmental, cultural and landscape value and their potential for future working.
- To provide a sustainable supply of locally sourced minerals, sufficient to meet our local, regional, and national needs.
- To provide certainty for businesses, operators, and the public by identifying sites and areas for new mineral extraction, whilst seeking to conserve and enhance Lancashire's environmental assets and ensure a high quality of life for all.
- To support high standards of working practices and environmental protection and take an integrated and innovative approach to enhancing the quality of land and our landscapes during extraction and in restoration for beneficial after-use, including potential benefits to biodiversity, amenity, and access to the countryside.
- To encourage and enable local communities, businesses, and local authorities to work together in coming to decisions and delivering solutions for sustainable resource management.

9.2.6 Section 8 of the Joint Lancashire Minerals and Waste Core Strategy sets out the approach to site identification and assessment.

9.2.7 Policy CS1 of the Joint Lancashire Minerals and Waste Core Strategy focuses on safeguarding Lancashire's mineral resources. It states that "minerals will be extracted only where they meet a proven need for materials with those particular specifications" It also states that "mineral resources with potential for extraction in

the future will be identified and as Mineral Safeguarding Areas and protected from permanent sterilisation by other development".

9.2.8 Policy CS3 of the Joint Lancashire Minerals and Waste Core Strategy focuses on meeting the demand for new minerals. It states that "provision will be met using existing reserves with planning permission and no additional land will be made available for extraction before 2021".

Joint Lancashire Local Aggregate Assessment

9.2.9 The Joint Lancashire Local Aggregate Assessment contains information on the past 10 years data for aggregate sales. It also assesses the adequacy of mineral supply.

9.2.10 Section 5.2 of the document assesses the adequacy of limestone supply and states "it is estimated that Leapers Wood Quarry is likely to be worked out before the end of its planning permission".

9.2.11 Section 5.4 of the Joint Lancashire Local Aggregate Assessment focuses on meeting forecast demand for limestone. It states that "There is a need to consider the permitted reserves ability to meet forecast demand and if Leapers Wood Quarry is exhausted sooner, this is likely to bring considerations forwards". It goes on to state that "should existing quarries be unable to increase production to compensate it will affect the availability of supplies to local markets".

Infrastructure and Planning Annex 1 Highways

9.2.12 The Infrastructure and Planning (Annex 1 Highways) sets out Lancashire County Council's approach to considering the potential impact of proposed developments upon the highways infrastructure within the local area of development.

9.2.13 The document states that developments should:

- Ensure safe access and egress;
- Minimise development-related impacts such as traffic congestion.

Design Manual for Roads and Bridges

9.2.14 The DMRB is a suite of design guidance documents published by National Highways. They provide both statutory requirements and guidance for the design, maintenance and assessment of motorways and all-purpose trunk roads in England, Wales, and Scotland.

Travel Plans, Transport Assessments and Statements Planning Practice Guidance

9.2.15 The Planning Practice Guidance provides information relating to the preparation of a TA, including when they are required, the scope of the report and what information to include. The TA has been prepared in accordance with the Planning Practice Guidance.

Summary

9.2.16 The proposed development will be designed in accordance with policy objectives set out in national and local documentation.

9.3 Existing Conditions

Existing Site

9.3.1 As shown in Photograph 9.1, the site is located on a parcel of land to the south of Kellet Road. To the north, the existing site is bound by woodland and agricultural land. To the south the site is bound by Back Lane Quarry (operated by Aggregate Industries), Back Lane and the M6. To the east lies further agricultural land and Nether Kellet Road.

9.3.2 Kellet Road bounds the site to the north and is aligned in an approximate east-west direction. Kellet Road meets the Kellet Road / B6601 junction approximately 85m west of the existing site access and provides access to the M6 (J35) and the A601(M) via the B6601. There are two vehicular access points for a residential dwelling on the northern side of Kellet Road approximately 50m and 80m east of the site access.

Photograph 9.1: Existing Site Access

Existing Site Operations

9.3.3 Leapers Wood Quarry is a limestone quarry that supplies high grade limestone aggregate for strategic projects throughout the region.

9.3.4 The average yearly output from the site is around 800,000 tpa. The existing permission for the site restricts working to a maximum depth of 38mAOD via planning condition. The existing permission also limits the timescales for extraction and restoration of the site to 19 September 2048 and 19 September 2049, respectively (Ref: 01/03/1185/1).

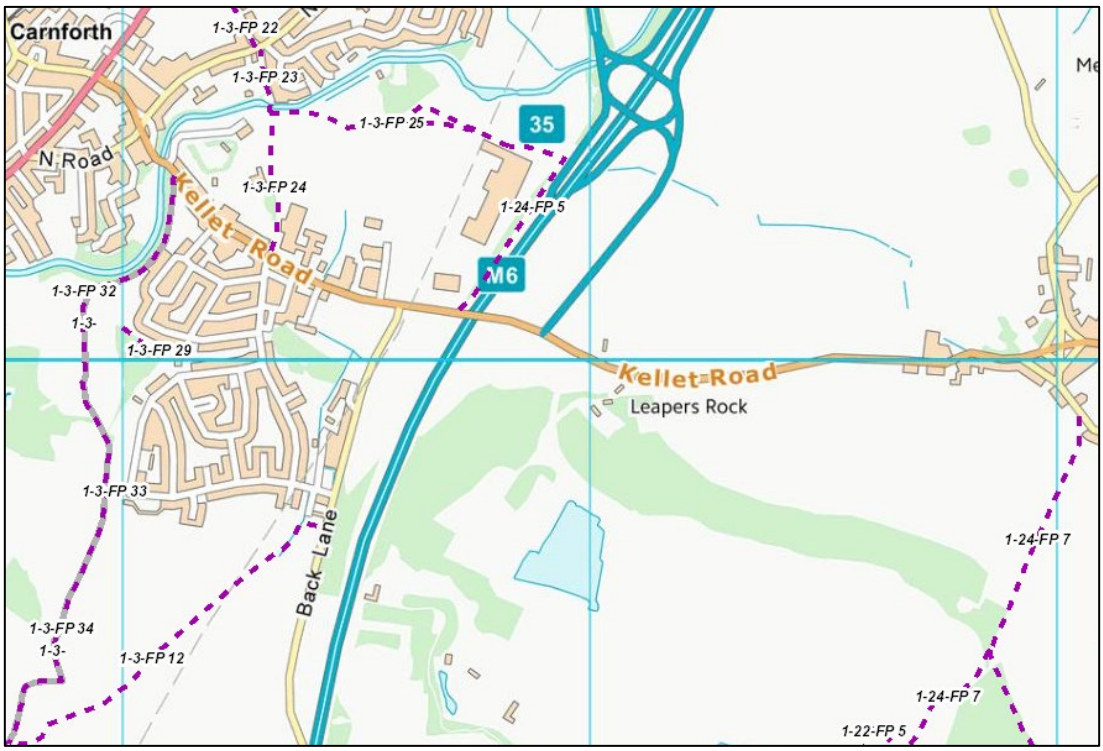
Pedestrian Accessibility

Pedestrian Infrastructure

9.3.5 A continuous footway is provided alongside the northern side of Kellet Road (see photograph 9.2). There are no footways provided on the southern side of Kellet Road. A dropped kerb crossing is provided at the Kellet Road / B6601 junction.

Photograph 9.2: Footways on Kellet Road

9.3.6 Public Rights of Way (PRoW) in the vicinity of the site are shown in Figure 9.1. The PRoW labelled as 1-24-FP5 provides a pedestrian link between Kellet Road and North Road in Carnforth to the west of the site. As shown in Figure 9.1 there are further Public Rights of Way that run from Kellet Road to Carnforth as well as links towards Bolton-le-Sands to the south west of the site.



Source: Lancashire County Council Website

Figure 9.1: PROW in the vicinity of the site

Pedestrian Catchment Area

9.3.7 In terms of what constitutes a reasonable walking distance it is necessary to consider what is realistic for a walking trip. The Institution of Highways and Transportation (IHT) document 'Guidelines for Providing for Journeys on Foot' (2000) states that "walking accounts for over a quarter of all journeys and four fifths of journeys less than one mile". The document also provides guidance on acceptable walking distances and suggests that a preferred maximum walking distance of 2km is applicable for commuting.

9.3.8 It can therefore be concluded that distances up to 2km can be considered reasonable to be undertaken on foot, and that walking is a realistic mode to consider for trips within this distance. Whilst this does not preclude pedestrians from undertaking longer journeys, it is considered that a distance of 2km is reasonable. Based on an average walking speed of 1.4 m/s it can be concluded that a 2km walk would take approximately 24 minutes.

9.3.9 A 2km catchment centred on the site is shown in Figure 2 of the TA (see Technical Appendix E). The catchment demonstrates that all of Carnforth and Over Kellet are

within 2km of the site. As a result, some residential areas and amenities are located within a reasonable walking distance to the site. The level of pedestrian accessibility may help encourage a proportion of shorter trips to / from the area to be made on foot.

Cyclist Accessibility

Cycle Infrastructure

9.3.10 There are no formal cycle facilities on Kellet Road and therefore cyclists are required to travel within the carriageway. Approximately 400m west of the site access Kellet Road is marked as a 'on road' cycle route between the Kellet Road / Back Lane junction towards Carnforth.

Cycle Catchment Area

9.3.11 In a similar way to pedestrian trip lengths, the length of cycling trips will be governed by the routes that are available and trip length, although several factors often mitigate for or against making these trips.

9.3.12 Local Transport Note 2/08 'Cycle Infrastructure Design' (DfT, 2008) states that "many utility cycle journeys are under three miles… although, for commuter journeys, a trip distance of over five miles is not uncommon". It can therefore be concluded that 3 miles, which is equivalent to approximately 5km, represents a reasonable typical cycling distance.

9.3.13 Figure 2 within the TA (see Technical Appendix E) shows a 5km catchment centred on the site. The 5km catchment includes all of Nether Kellet and Warton. The 5km catchment also includes some of Bolton-le-Sands and Tewitfield. As with walking, cycling should also therefore be encouraged as an appropriate mode of travel for local trips.

Public Transport Accessibility

9.3.14 The nearest bus stops to the site are shown in Figure 1 (see Technical Appendix E). The nearest set of bus stops are located on Back Lane approximately 400m southwest of the site access. The bus stop on the western side of Back Lane comprises of a shelter with seating and timetable information (see Photograph 9.3). The bus stop on the eastern side of Back Lane comprises of a flag of pole with timetable information (see Photograph 9.4).

9.3.15 Additional bus stops, served by bus services with an increased frequency, are located on Kellet Road approximately 750m west of the site access. The bus stops on both sides of the carriageway comprise of a flag and pole with timetable information. Bus services stopping on Back Lane and Kellet Road are summarised in Table 9.1. The services are operated by Stagecoach and Travellers Choice.

Photograph 9.3: Northbound bus stop on Back Lane

Photograph 9.4: Southbound bus stop on Back Lane

Service	Bus Stop	Mon - Fri Frequency			Sat Frequency	Sun Frequency
		7am – 9am	9am – 4pm	4pm - 6pm	9am – 6pm	9am – 6pm
49 (Lancaster – Warton)	Back Lane, Kellet Road	1 Bus	60 minutes	2 Buses	60 Minutes	0
49 (Warton-Lancaster)	Back Lane, Kellet Road	1 Bus	60 Minutes	2 Buses	60 Minutes	0
5 (Overton – Carnforth)	Kellet Road	1 Bus	60 Minutes	60 Minutes	60 Minutes	60 Minutes
5 (Carnforth-Overton)	Kellet Road	60 Minutes	60 Minutes	60 Minutes	60 Minutes	60 Minutes
55 (Lancaster City Centre – Carnforth)	Kellet Road	2 Buses	1 Bus	0	0	0
55 (Carnforth-Lancaster City Centre)	Kellet Road	1 Bus	2 buses	0	0	0

Table 9.1: Summary of Bus Services Stopping at Back Lane and Kellet Road

9.3.16 As shown in Table 9.1 there are three bus routes that stop close to the site. The most frequent bus route is route 5, which operates between Carnforth, Bolton-le-Sands, Morecambe, Heysham and Overton. Bus route 5 operates Monday to Sunday with a frequency of one bus every 60 minutes between 09:00 and 18:00.

9.3.17 Bus route 49 is also a regular service which operates throughout the week and provides a good frequency of services during the peak and interpeak hours when employees are likely to travel to / from the site.

9.3.18 Bus routes X1 and X20 are regular services which operate throughout the week and provide a good frequency of services during the peak and interpeak hours when employees are likely to travel to / from the site. Travel by bus is therefore a genuine alternative to the private car and should assist in encouraging a modal shift away from the private car.

Rail Services

9.3.19 The nearest train station is Carnforth which is located approximately 1.4km northwest of the site. Trains operate throughout the day to destinations including Lancaster, Barrow in Furness, and Morecambe catering for peak commuter travel as well as shift work and other associated journeys. Table 9.2 shows the first and last weekday trains at Carnforth station.

Train	Arrivals from Lancaster	Departures to Lancaster	Arrivals from Barrow-in-Furness	Departures to Barrow-in-Furness	Arrivals from Morecambe	Departures to Morecambe
First Train	23:42	05:32	06:39	05:49	06:58	05:32
Last Train	05:17	23:38	22:37	22:30	22:29	21:37

Table 9.2: Summary of Train Services Operating from Carnforth Train Station

9.3.20 On weekdays, there are trains to Lancaster every 30-45 minutes, trains to Barrow-in-Furness every 60-120 minutes and trains to Morecambe every 45-60 minutes. Trains to Lancaster have an approximate 10-minute duration, trains to Barrow-in Furness an approximate 50-minute duration and trains to Morecambe an approximate 40-minute duration. At the weekend there are trains to Barrow-in-Furness and Morecambe every 60 to 120 minutes. On Saturdays there are trains to Lancaster every 40-60 minutes and on Sundays there are trains to Lancaster every 60 minutes.

9.3.21 Travel by train provides a genuine alternative to the private car and should assist in encouraging a modal shift away from the private car.

Highway Network

9.3.22 Kellet Road is a single carriageway road subject to the National Speed Limit (see Photographs 9.5 and 9.6). Approximately 340m west of the site the speed limit on Kellet Road changes to 30mph (towards Carnforth town centre).

9.3.23 Kellet Road, which bounds the site to the north, extends between the Market Street / North Road / Kellet Road junction in Carnforth to the west of the site to the village of Over Kellet to the east of the site. At this point Kellet Road becomes Kirkby Lonsdale Road and continues northeast to meet the A65 in Kirby Lonsdale.

9.3.24 To the west of the site Kellet Road meets the B6601 / Kellet Road junction. The B6601 provides access to the M6 (J35) and the A601(M). The M6 provides access to Lancaster approximately 6km southwest of the site before continuing south towards Preston. To the north the M6 provides access to Penrith and Carlisle.

Photograph 9.5: Kellet Road (view to the east of the site)

Photograph 9.6: Kellet Road (view to the west of the site)

Background Traffic Flows

9.3.25 Traffic data has been obtained and is presented in the TA at Technical Appendix E. A 24-hour full classified turning count was undertaken at the existing site access on Kellet Road on Tuesday 28th June 2022.

9.3.26 A 24-hour full classified turning count was also commissioned at the Kellet Road/B6601 Junction by Focus Transport Planning in August 2022.

Collision Analysis

9.3.27 Personal Injury Collision (PIC) data has been obtained from Crashmap for the most recently available five-year period between 2017 and 2021. The study area comprises of Kellet Road in the vicinity of the site, the B6601 and the M6 junction 35 roundabout.

9.3.28 Collision data is presented in Appendix D of the TA within Technical Appendix E and Table 9.3 summarises the recorded PICs.

Year	Severity			Total
	Slight	Serious	Fatal	
2017	3	1	0	4
2018	1	0	0	1
2019	4	0	1	5
2020	1	0	1	2
2021	0	1	0	1

Table 9.3: Personal Injury Collisions 2017 to 2021

9.3.29 In total there were thirteen collisions that occurred within the study area and of these, nine were slight in severity, two were recorded as serious in severity and two resulted in fatalities.

9.3.30 One slight severity collision occurred on Kellet Road close to the B6601 / Kellet Road junction. The collision involved two vehicles and had three casualties.

9.3.31 All of the remaining 12 collisions occurred at or on the approach to the M6 (J35) / A601 (M) / B6601 roundabout.

9.3.32 One of the fatal collisions occurred on the B6601 approximately 20m south of the M6 (J35) / A601 (M) / B6601 roundabout. The collision involved one vehicle and

had a single casualty. The remaining fatal collision occurred on the M6 southbound off-slip. The collision involved three vehicles and had a single casualty.

9.3.33 A serious severity collision occurred on the B6601 approximately 80m south of the M6 (J35) / A601 (M) / B6601 roundabout. The collision involved two vehicles and had two casualties. The remaining serious severity collision occurred on the M6 northbound carriageway at the M6 (J35) / A601 (M) / B6601 roundabout. The collision involved two vehicles and had three casualties.

9.3.34 The remaining eight collisions were all slight in severity and occurred at the M6 (J35) / A601 (M) / B6601 roundabout. Three of the slight severity collisions recorded at this location occurred on the M6 northbound off-slip and two occurred on the M6 northbound carriageway at the M6 (J35) / A601 (M) / B6601 roundabout.

9.3.35 The above PICs do not suggest any spatial clustering or trends. It is concluded that there are no existing road safety problems that are likely to be exacerbated by the proposed development.

9.4 Development Proposals

Development Details

9.4.1 The proposed development relates to the deepening of Leapers Wood Quarry from its existing permitted depth of 38mAOD to -37mAOD and a time extension of quarry and restoration operations until 31 December 2064 and 31 December 2065 respectively. The final restoration of the site would be completed by the end of 2078, in conjunction with the restoration of the adjacent Back Lane Quarry.

9.4.2 The existing annual sales from the site of approximately 800,000 tpa would remain unchanged.

9.4.3 The existing hours of operation will remain as approved, and no new infrastructure is proposed on site as part of the proposals.

Proposed Site Access

Vehicles

9.4.4 Vehicular access into the site will be provided by the existing ghost island junction on Kellet Road.

9.4.5 Drawing number B040370-TTE-00-ZZ-DR-S-003 contained in Appendix E of the TA (Technical Appendix E) shows the site access arrangement and visibility splays.

9.4.6 Visibility splays cannot be achieved in accordance with the speed limit (2.4 x 215m for road subject to the national speed limit). However on-site observations indicate speeds are below the speed limit, there is no increase in trip generation and no road safety issues noted in the vicinity of the site therefore shorter visibility splays are considered appropriate.

9.4.7 The site access has the following key characteristics:

- Approximate 7.0m carriageway width;
- Approximate 12m radii on the entry and 12m on the exit;
- Visibility to the east is 2.4 x 175m (measured on site); and
- Visibility to the west is 2.4 x 115m (measured on site).

9.4.8 The access is an established junction and on-site observations indicate that it operates satisfactorily.

9.4.9 The junction has been tracked using the largest available articulated vehicle (an articulated vehicle with a 16.5m length) and demonstrates that there will be no problems for HGVs manoeuvring in and out of the site. The vehicle tracking drawing is presented in Appendix E of the TA (Technical Appendix E). No improvements are proposed to the existing junction.

Pedestrians

9.4.10 Pedestrians will gain access to the development via the same route as vehicular traffic.

Staff Numbers and Shift Times

9.4.11 Tarmac has confirmed that 11 employees are working at Leapers Wood. Contractors also occasionally visit the site on a daily basis.

9.4.12 Tarmac has also provided an indication of typical shift times based on existing operations. A summary is provided below:

- Monday to Friday – shifts start around 06:00 and end around 16:30
- Saturday – shifts start around 06:00 and end around 10:30

Parking

9.4.13 A large section of unmarked parking space is provided for HGVs and staff / visitors to park their vehicles within the site.

Service and Emergency Vehicles

9.4.14 Service and emergency vehicles are able to gain access to the development via the existing site entrance from Kellet Road, using the same route as other vehicular traffic.

People with Disabilities and Other Mobility Impairments

9.4.15 Access for people with disabilities and other mobility impairments is undertaken in accordance with the requirements of the 2010 Equality Act and in accordance with current good practice as embodied within the DfT's 'Inclusive Mobility' document.

9.4.16 This approach ensures that the completed development is fully inclusive and meets the needs of all users, including those with disabilities or temporary mobility impairments.

9.4.17 The requirement to design for disabled people permeates all aspects of the development and includes access to and movement within the site, but also the interface between the development and the surrounding highway network and in particular, the pedestrian routes and public transport facilities.

9.5 Future Traffic Flows

Forecast Growth

9.5.1 Traffic growth factors for a 2028 and 2050 future design year have been derived using the TEMPro software, for the 'Lancaster 002' Middle Super Output Area (MSOA). The future year of 2028 would be four years after submission of the planning application for the site and the future year of 2050 would be close to the end of the proposed extraction period / an appropriate future year in line with TA guidelines. The TEMPro outputs are presented in Appendix F of Technical Appendix E and the resulting growth factors are as follows:

- Morning peak hour 2022–2023 = 1.009
- Evening peak hour 2022–2023 = 1.0009
- Morning peak hour 2022-2028 = 1.0531
- Evening peak hour 2022-2028 = 1.5085
- Morning peak hour 2028-2050 = 1.1546

- Evening peak hour 2028-2050 = 1.1509

9.5.2 The growth factors have been applied to the base traffic flows to give 2028 and 2050 background traffic flows as shown in the traffic flow diagrams in Appendix F of Technical Appendix E.

Committed Developments

9.5.3 Committed schemes are defined as developments or transport schemes which have current planning consent, but which are unimplemented or incomplete, and could in the future have a significant impact on transport conditions or the layout of the local highway network.

9.5.4 The planning portal on Lancaster City Council's website has been reviewed and the following committed developments have been considered in this TA:

- 16/00335/OUT – Outline application for the erection of up to 158 dwellings with associated new vehicular access, incorporating roundabout and access road, and pedestrian/cycle access points.
- 18/00365/OUT – Outline application for residential development comprising 213 dwellings (Use Class C3) with associated vehicular and cycle/pedestrian access to Scotland Road and cycle/pedestrian access to Carnforth Brow/Netherbeck, public open space, creation of wetlands area, construction of attenuation basins, erection of sub-station, installation of a pumping station and associated earth works and land regrading and landscaping.

9.5.5 In addition, the following planning application has been submitted but at the time of writing this TA, the application has yet to be determined:

- 21/00899/HYB - Hybrid Application comprising a full application for the erection of 81 dwellings with associated vehicular access, incorporating a signalised junction, together with pedestrian and cycle access points, associated earthworks, roads, parking and drainage infrastructure and an outline application for the erection of up to 114 dwellings, including public open space provision and associated infrastructure.

9.5.6 The TAs for each of the above developments have been reviewed and the development traffic flows have been obtained. Where the study areas for the committed developments include the same junctions as in the Leapers Wood Quarry TA, these flows have then been added to background traffic flows at each

TA assessment year. Where the study area for the committed developments do not include the same junctions as in the TA, the distribution of committed development traffic Is unknown and as such, it is assumed that growth in traffic from the committed development will be accounted for in the general background traffic growth factors used in the TA.

9.5.7 In terms of application 22/00562/VCN that has yet to be determined, there is no TA or transport related inputs available to view on the City Council's planning portal. As a result, the distribution of the development traffic associated with the application is unknown. It is therefore assumed that growth in traffic from the development will be accounted for in the general background traffic growth factors used in the Leapers Wood Quarry TA.

9.5.8 With regard to planning application 21/00899/HYB that has yet to be determined, the TA has been reviewed and the study area includes development traffic going to / from the M6 (J35) / A601 (M) / B6601 roundabout via the B6601. However, the study area for the committed development does not include the same junctions as in the Leapers Wood Quarry TA, therefore the distribution of committed development traffic Is unknown and as such, it is assumed that growth in traffic from the committed development will be accounted for in the general background traffic growth factors used in the TA for this application.

Committed Development – Back Lane Quarry

9.5.9 The development flows associated with the working scheme for Back Lane Quarry have been obtained and added to background traffic flows at each TA assessment year. Traffic flows associated with Back Lane Quarry can be found in the traffic flow diagrams contained in Appendix F of the TA.

9.6 Trip Generation and Distribution

Trip Generation

9.6.1 Tarmac have confirmed that the proposed development will not increase the output of material and would not generate any new or additional trips. Although the quarry will not generate any new or additional trips, at present the quarry is not operating at its maximum capacity. The existing trip generation (recorded as part of the June 2022 traffic survey) has therefore been growthed in order to reflect the trip generation associated with the quarry operating at is maximum capacity (in line with the average yearly output of around 800,000 tpa).

Existing Trip Generation

9.6.2 Existing daily trip generation as observed during the count is detailed in Table 9.4.

Time Period	Inbound (HGVs)	Outbound (HGVs)	Inbound (Vehicles)	Outbound (Vehicles)
00:00-01:00	0	0	0	0
01:00-02:00	0	0	0	0
02:00-03:00	0	0	0	0
03:00-04:00	0	0	0	0
04:00-05:00	0	0	1	0
05:00-06:00	3	0	14	0
06:00-07:00	12	11	2	0
07:00-08:00	16	16	1	0
08:00-09:00	6	10	2	1
09:00-10:00	7	8	0	0
10:00-11:00	10	7	3	5
11:00-12:00	4	6	3	0
12:00-13:00	8	7	3	1
13:00-14:00	7	5	3	6
14:00-15:00	5	9	1	2
15:00-16:00	5	4	4	3
16:00-17:00	0	1	0	16
17:00-18:00	0	0	1	3
18:00-19:00	1	0	0	1
19:00-20:00	0	0	1	0
20:00-21:00	0	0	0	1
21:00-22:00	0	0	0	0
22:00-23:00	0	0	0	0
23:00-00:00	0	0	0	0
Total	84	84	39	39

Table 9.4: Existing Trip Generation – Leapers Wood Quarry

HGV's

9.6.3 As shown in Table 9.4, Leapers Wood Quarry currently generates 168 HGV movements per day (84 two-way trips). As a worst-case scenario, it is assumed that HGV movements typically take place over a 5-day week. The majority of HGV movements occur between 06:00 and 16:00 with the most HGV trips per hour recorded between 07:00 and 08:00.

Staff Trips / Contractor Movements

9.6.4 As shown in Table 9.5, there are 78 staff / contractor movements associated with Leapers Wood Quarry (39c two-way trips). The majority of staff arrive at the site between 05:00 and 06:00 (14 one-way trips) and depart between 16:00 and 17:00 (16 one-way trips).

Future HGV Trip Generation

9.6.5 Existing daily HGV trip generation observed during the count has been growthed in order to reflect the trip generation associated with Leapers Wood Quarry when it is operating at its maximum capacity (see Table 9.5). Tarmac have provided details of HGV movements associated with the busiest year (2021) in comparison to HGV movements in the year the baseline survey took place (2022). HGV movements in 2021 (when the quarry was operating at its maximum capacity) are approximately 46% higher than recorded / forecasted HGV movements associated with the quarry in 2022. The existing daily trip generation observed during the count in 2022 has therefore been increased by 46% to reflect the trip generation associated with Leapers Wood Quarry when it is operating at its maximum capacity.

9.6.6 As a worst-case scenario, it is assumed that HGV movements typically take place over a 5-day week. It is assumed that no additional staff will be employed as part of the proposals and therefore vehicle trip generation will remain unchanged (see Table 9.4). Full traffic flow calculations are presented in Appendix F of the TA.

Time Period	Inbound (HGVs)	Outbound (HGVs)
00:00-01:00	0	0
01:00-02:00	0	0
02:00-03:00	0	0
03:00-04:00	0	0
04:00-05:00	0	0
05:00-06:00	1	0
06:00-07:00	5	5
07:00-08:00	7	7
08:00-09:00	3	5
09:00-10:00	3	4
10:00-11:00	5	3
11:00-12:00	2	3
12:00-13:00	4	3
13:00-14:00	3	2
14:00-15:00	2	4
15:00-16:00	2	2
16:00-17:00	0	0
17:00-18:00	0	0
18:00-19:00	0	0
19:00-20:00	0	0
20:00-21:00	0	0
21:00-22:00	0	0
22:00-23:00	0	0
23:00-00:00	0	0
Total	38	38

Table 9.5: Future Trip Generation – Leapers Wood Quarry

9.6.7 As shown in Table 9.5, Leapers Wood Quarry when operating at its maximum permitted capacity will generate an additional 76 HGV movements per day (38 two-way trips) based on a worst-case scenario where HGV movements take place over a 5-day week. The majority of HGV movements occur between 06:00 and 16:00 with the most HGV trips per hour recorded between 07:00 and 08:00.

Total Trip Generation

9.6.8 The total daily trip generation is presented in Table 9.6.

Time Period	Inbound (HGVs)	Outbound (HGVs)	Inbound (Vehicles)	Outbound (Vehicles)
00:00-01:00	0	0	0	0
01:00-02:00	0	0	0	0
02:00-03:00	0	0	0	0
03:00-04:00	0	0	0	0
04:00-05:00	0	0	1	0
05:00-06:00	4	0	14	0
06:00-07:00	17	16	2	0
07:00-08:00	23	23	1	0
08:00-09:00	9	15	2	1
09:00-10:00	10	12	0	0
10:00-11:00	15	10	3	5
11:00-12:00	6	9	3	0
12:00-13:00	12	10	3	1
13:00-14:00	10	7	3	6
14:00-15:00	7	13	1	2
15:00-16:00	7	6	4	3
16:00-17:00	0	1	0	16
17:00-18:00	0	0	1	3
18:00-19:00	1	0	0	1
19:00-20:00	0	0	1	0
20:00-21:00	0	0	0	1
21:00-22:00	0	0	0	0
22:00-23:00	0	0	0	0
23:00-00:00	0	0	0	0
Total	122	122	39	39

Table 9.6: Total Daily Trip Generation (Quarry Operating at Full Capacity)

HGVs

9.6.9 As shown in Table 9.6, Leapers Wood Quarry when operating at its maximum permitted capacity will generate 244 HGV movements per day (122 two-way trips). As a worst-case scenario, it is assumed that HGV movements typically take place

over a 5-day week. The majority of HGV movements occur between 06:00 and 16:00 with the most HGV trips per hour recorded between 07:00 and 08:00.

Staff Trips / Contractor Movements

9.6.10 The number of staff employed at the site will remain the same therefore no additional vehicle trips will be generated.

Total Trips

9.6.11 In total Leapers Wood Quarry will generate approximately 322 movements per day (161 two-way trips).

Trip Distribution

HGVs

9.6.12 All HGV trips will travel to / from Kellet Road West towards the Kellet Road / B6601 junction and beyond to the M6 junction 35 (existing trip distribution is presented in Appendix F of the TA).

Staff Trips

9.6.13 The existing trip distribution indicates that 10% of development trips associated with staff will be to / from Kellet Road east (4 trips) and 90% will be to / from Kellet Road west (35 trips).

9.7 Highway Impact

Introduction

9.7.1 Capacity assessments have been undertaken for the morning and evening peak hours at the B6601 / Kellet Road junction and the Kellet Road / Site Access junction. Both junctions have been assessed in the '2028 Background', '2050 Background', '2028 Background plus Proposed Development' and '2050 Background plus Proposed Development' traffic flow scenarios. The B6601 / Kellet Road junction has also been assessed in the '2023 Background' traffic flow scenario.

9.7.2 The assessments have been undertaken using the Junctions 9 computer programme, which is the 'industry standard' traffic modelling computer software package used for assessing the capacity of priority junctions and roundabouts.

9.7.3 A Ratio of Flow to Capacity (RFC) value below 0.85 indicates that a junction operates 'within' capacity. An RFC value between 0.85 and 1.00 indicates that there may be

occasions during the period modelled when queues will develop, and delays occur. An RFC value greater than 1.00 indicates that a junction operates 'above' capacity.

Results

9.7.4 The results of the junctions 9 assessments can be found in Appendix G of the TA within Technical Appendix E. A summary of results for the Kellet Road / Site Access junction is presented in Table 9.7 and a summary of results for the B6601 / Kellet Road junction is presented in Table 9.8.

2028 Base				
Arm	AM		PM	
	RFC	Max Queue	RFC	Max Queue
Site Access	0.02	0.0	0.03	0.0
Kellet Road	0.03	0.0	0.00	0.0
2028 Base Plus Committed Development				
Arm	AM		PM	
	RFC	Max Queue	RFC	Max Queue
Site Access	0.02	0.0	0.03	0.0
Kellet Road	0.03	0.0	0.00	0.0
2028 Base + Committed Development + Proposed Development				
Arm	AM		PM	
	RFC	Max Queue	RFC	Max Queue
Site Access	0.04	0.0	0.04	0.0
Kellet Road	0.05	0.1	0.01	0.0
2050 Base				
Arm	AM		PM	
	RFC	Max Queue	RFC	Max Queue
Site Access	0.03	0.0	0.03	0.0
Kellet Road	0.03	0.0	0.00	0.0
2050 Base + Committed Development				
Arm	AM		PM	
	RFC	Max Queue	RFC	Max Queue
Site Access	0.03	0.0	0.03	0.0
Kellet Road	0.03	0.0	0.00	0.0
2050 Base + Committed Development + Proposed Development				
Arm	AM		PM	
	RFC	Max Queue	RFC	Max Queue
Site Access	0.05	0.1	0.05	0.1
Kellet Road	0.06	0.1	0.01	0.0

Table 9.7: Kellet Road / Site Access Junction Capacity Assessment Results

9.7.5 As demonstrated by the results in Table 9.7, the Kellet Road / Site Access junction will operate with spare capacity in 2028 and 2050, inclusive of background traffic growth, committed development and with the addition of the proposed development traffic.

2023 Base				
Arm	AM		PM	
	RFC	Max Queue	RFC	Max Queue
B6601	0.74	2.7	1.10	33.1
Kellet Road	0.24	0.3	0.11	0.1
2023 Base + Committed Development				
Arm	AM		PM	
	RFC	Max Queue	RFC	Max Queue
B6601	0.84	4.6	1.10	33.7
Kellet Road	0.25	0.3	0.	0.1
2023 + Committed Development + Proposed Development				
Arm	AM		PM	
	RFC	Max Queue	RFC	Max Queue
B6601	0.87	5.3	1.11	35.7
Kellet Road	0.28	0.4	0.13	0.1
2028 Base				
Arm	AM		PM	
	RFC	Max Queue	RFC	Max Queue
B6601	0.79	3.5	1.15	44.9
Kellet Road	0.25	0.3	0.12	0.1
2028 Base + Committed Development				
Arm	AM		PM	
	RFC	Max Queue	RFC	Max Queue
B6601	0.89	6.3	1.15	45.6
Kellet Road	0.27	0.4	0.12	0.1
2028 Base + Committed Development + Proposed Development				
Arm	AM		PM	
	RFC	Max Queue	RFC	Max Queue
B6601	0.92	7.8	1.16	48.0
Kellet Road	0.29	0.4	0.13	0.1
2050 Base				
Arm	AM		PM	
	RFC	Max Queue	RFC	Max Queue
B6601	1.00	14.1	1.36	112.9
Kellet Road	0.30	0.4	0.14	0.2
2050 Base + Committed Development				
Arm	AM		PM	
	RFC	Max Queue	RFC	Max Queue
B6601	1.09	27.2	1.36	114.2
Kellet Road	0.32	0.5	0.14	0.2
2050 Base + Committed Development + Proposed Development				
Arm	AM		PM	
	RFC	Max Queue	RFC	Max Queue
B6601	1.13	33.7	1.39	121.5
Kellet Road	0.35	0.6	0.15	0.2

Table 9.8: B6601 / Kellet Road Junction Capacity Assessment Results

9.7.6 As shown in Table 9.8, the B6601 / Kellet Road junction is shown to operate above capacity in the 2023 PM Peak prior to the addition of the proposed development traffic. The B6601 arm of the junction is shown to have RFC of 1.10 and a maximum queue length of 33.1 in the '2023 Base' PM peak scenario. With the addition of the development traffic, the B6601 arm of the junction is shown to have an RFC of 1.11 and a maximum queue length of 35.7. The worsening of junction performance as a result of the proposed development is considered minimal with RFC values only increasing by a small amount (RFC values increase by 0.01 and maximum queue lengths increase by 2.6). The impact of the development at this location is therefore not considered severe and no mitigation is proposed.

9.7.7 Furthermore, the extension of time for quarrying at Leapers Wood Quarry will not result in an increased rate of mineral output and no additional HGV trips are proposed (when the quarry is operating at its maximum capacity).

Highway impact at off-site junctions

9.7.8 To show the impact that the proposed development will have on the surrounding highway network, the 2023, 2028 and 2050 base flows have been compared to the proposed development traffic. Table 9.9 shows the change in traffic flows at the B6601 / Kellet Road junction and the percentage change when comparing 'with' and 'without' development flows.

Junction	AM Peak Hour			PM Peak Hour		
	2023 Without Development Flows	**Development Flows (PCUs)**	**% Change**	**2023 Without Development Flows**	**Development Flows (PCUs)**	**% Change**
B6601 / Kellet Road	1163	29	2.49%	1095	13	1.19%
Junction	**AM Peak Hour**			**PM Peak Hour**		
	2028 Without Development Flows	**Development Flows (PCUs)**	**% Change**	**2028 Without Development Flows**	**Development Flows (PCUs)**	**% Change**
B6601 / Kellet Road	1210	29	2.40%	1140	13	1.14%
Junction	**AM Peak Hour**			**PM Peak Hour**		
	2050 Without Development Flows	**Development Flows (PCUs)**	**% Change**	**2050 Without Development Flows**	**Development Flows (PCUs)**	**% Change**
B6601 / Kellet Road	1386	29	2.10%	1312	13	0.99%

Table 9.9: Highway Impact at the B6601 / Kellet Road junction

9.7.9 As shown in Table 9.9, the estimated increase in traffic at the B6601 / Kellet Road junction is minimal, particularly when considered alongside the 2050 'without development' traffic flows. The increase at this junction is considered to be

negligible as day-to-day variation could result in a larger increase in traffic flows than the proposed increase in traffic associated with the extension of time at Leapers Wood Quarry. It is therefore concluded that the proposed development will not have a 'severe' impact upon the operation of off-site junctions in the TA study area.

Traffic Related Environmental Impacts

9.7.10 The Institute of Environmental Assessment (IEMA) Guidance Note "Guidelines for the Environmental Assessment of Road Traffic" sets out when traffic related environmental impacts can be scoped out further. The guidance states to 'include highway links where traffic flows will increase by more than 30% (or the number of heavy goods vehicles will increase by more than 30%). The percentage highway impact on Kellet Road is:

- 6.5% in the morning peak hour.
- 3.1% in the evening peak hour.

9.7.11 In this case, the increase in traffic flows is no more than 30% or more on any highway links within the vicinity of the proposed development site. The above scenario is assessed as a 'worst case scenario' and includes HGV trips as well as light vehicle trips associated with the site.

9.7.12 Whilst the proposals will increase the number of HGVs on Kellet Road, this is not considered to be significant and will take place on a short section of road where there are not considered to be any sensitive environmental receptors within the immediate vicinity. There is therefore no need for further assessment.

9.7.13 Generally, the site will therefore fall below the threshold for requiring any further assessments of the environmental impacts of traffic and the development will have no demonstrable impact on severance, driver delay, pedestrian delay, amenity, fear and intimidation. In any event, there are no sensitive receptors in terms of schools, housing etc. which might be affected. On this basis it is concluded that the proposals will have no material impact in this regard.

9.8 Conclusions

9.8.1 Vehicular access into the site will be provided by the existing ghost island junction on Kellet Road.

9.8.2 The site is located approximately 400m from the nearest set of bus stops on Back Lane. These bus stops are served by bus route 49. Additional bus stops are located

on Kellet Road approximately 750m west of the site access. These bus stops are served by the more frequent bus services (route numbers: 5 and 55).

9.8.3 A review of Personal Injury Collision data confirms that there are no existing road safety issues which could be exacerbated by the development proposals.

9.8.4 Tarmac have provided information about existing vehicle movements, staff numbers and shift times at Leapers Wood Quarry.

9.8.5 Tarmac have confirmed that the proposed development will not generate any new trips. The proposed development will include the deepening of the existing working and will not result in an increased rate of mineral output.

9.8.6 Based on the findings of the TA which supports this ES, it is considered that the proposed development would not have a severe impact on the highway network and is in accordance with relevant policy and design guidance. Given the findings of the TA, it is considered that the proposed development is acceptable in transport terms and it is concluded that the proposals are acceptable in terms of road safety and amenity.

10 NOISE

10.1 Introduction

10.1.1 A Noise Impact Assessment has been undertaken to accompany the planning application and is provided at Technical Appendix F of this ES. The assessment is summarised and discussed within this ES chapter.

10.1.2 The application boundary is not to increase from the area already permitted under the extant planning permission for the site (ref: 01/03/1185 - original planning permission ref 1/86/760) and therefore the workings will be no closer to the nearest dwellings.

10.1.3 As the operations are to continue in the existing extraction area to a greater depth (a further 75m to -37mAOD from the currently permitted floor of 38mAOD), there will be no requirement for soil stripping or bund formation operations that are considered temporary operations (with a higher site noise limit) in Planning Practice Guidance (Minerals).

10.1.4 The mineral extraction operations and processing operations will not change from the current situation.

10.1.5 The access arrangements will remain as for the current operations on site.

10.1.6 It is not proposed to vary the operating hours of the site from those permitted in the current planning permission for the site (ref: 01/03/1185).

10.1.7 Following completion of the mineral extraction works, the void will be restored as per the proposed revised restoration scheme.

10.1.8 The purpose of the noise assessment is to establish that the noise impact of the continuation of the existing site operations with mineral extraction to a greater depth and for a longer duration, would not generate noise levels at the nearest noise sensitive properties that would exceed the existing site noise limits (specified within extant planning permission conditions).

10.1.9 Site noise monitoring data at the nearest residential location where monitoring has been undertaken for Back Lane Quarry has been reviewed to establish the ongoing compliance of noise from both sites with the extant site noise limit.

10.1.10 Consideration of the site plans and the topography, to explain why there is a potential increase in noise attenuation due to the greater depth of workings, has

been included in the assessment to demonstrate that site noise levels will not increase.

10.1.11 A glossary of acoustic terms is included as Appendix A of the Noise Impact Assessment report. Plans showing the application boundary and the phasing (as well as the nearest noise sensitive receptors/dwellings) are included as Appendix B of Technical Appendix F.

10.2 Site Description

10.2.1 The site is bounded to the south by the adjoining Back Lane Quarry operated by Aggregate Industries UK Limited, to the east by woodland, to the north by woodland/agricultural land and to the west by woodland, with the M6 beyond.

10.2.2 Leapers Wood Quarry and Back Lane Quarry to the south, have a common nominal boundary separating the two sites. A concurrent application is being submitted on behalf of Aggregate Industries for the deepening of the workings at Back Lane Quarry to the same depth to allow for joint working of the boundary between the two quarries. This application is considered in the section of this assessment relating to cumulative impact.

10.2.3 Carnforth is located to the west of the site and is the nearest substantial residential area with the nearest dwellings on the edge of the town being around 400m to the north-west of the extraction area beyond the M6 motorway on Windermere Road.

10.2.4 There are a small number of isolated residential properties located within 1km of the site.

10.2.5 The nearest residential and noise sensitive receptors, including Hawthorns Caravan Park, Newlands Darm and Wayside, are located at least 600m to the south-west and south-east of the site beyond the workings at Back Lane Quarry.

10.2.6 The nearest properties to the north of the site are approximately 200 to 300m from the workings adjacent to the access road. These properties (Green Meadow and Railsbeck) are in the control of the Applicant.

10.2.7 The nearest unrelated dwellings to the site are those in and on the outskirts of Over Kellet to the north-east, with the nearest properties (including Kirk House) around 500 to 550m from the closest point of the site boundary.

10.2.8 Other properties including Kit Bill Lodge, The Helks and an adjacent residential property lie around 300 to 350m east of the extraction area.

10.2.9 The site access is from the north-west on Kellet Road.

10.2.10 The site includes processing operations (crushing and screening) within the extraction void and on the western side of the site and a concrete plant.

10.2.11 The nearest Listed Building to the site is the Grade II* listed 'Church of St Cuthbert' located approximately 500m to the east of the site. The nearest listed building in residential use is Grade II listed 'Birkland Barrow Farmhouse' located around 600m to the east.

10.2.12 There are two Sites of Special Scientific Interest (SSSI) within 2km of the site.

10.2.13 Crag Bank SSSI is a 3.7 hectare biological designation located around 1.5 km to the west of the site. Thwaite House Moss SSSI is a 7.25 hectare biological designation approximately 1km to the south-west of the site.

10.2.14 The Forest of Bowland National Landscape and the Arnside and Silverdale National Landscape lie around 1.7km to the east and 1.8km to the west respectively.

10.2.15 There are no points of public access into the site at Leapers Wood Quarry. A Public Footpath (PROW ref: 1-24-FP 7) runs north to south along the eastern side of Kit Bill Wood, east of Leapers Wood Quarry reaching Main Road. Here it runs parallel with Main Road before heading east to west (PROW ref: 1-22-FP 5) across the agricultural fields to the south of Back Lane Quarry.

10.2.16 A plan showing the application boundary including the plant site, the extraction area and the nearest residential receptors at which site noise is routinely monitored for Back Lane Quarry is included in Technical Appendix F.

10.3 Existing Site Noise Limits

10.3.1 The site falls within the jurisdiction of Lancashire County Council and is currently operated under a planning permission granted in October 2005 (ref: 01/03/1185 - original planning permission ref 1/86/760).

10.3.2 The planning permission allows for quarrying operations to continue on the site until 19 September 2048 (with restoration to be completed within a year).

10.3.3 The extant planning permission contains the following conditions relating to noise including Condition 21 stipulating site noise limits for routine operations and Condition 25 requiring a scheme and programme of noise monitoring scheme relating to properties from which noise complaints are received:-

"Noise

20. All plant, equipment and machinery used in connection with the operation and maintenance of the site shall be equipped with effective silencing equipment or sound proofing equipment to the standard of design set out in the manufacturers specification and shall be maintained in accordance with that specification at all times throughout the development.

21. Noise emitted from the site shall not exceed 55dB $L_{Aeq\ (1\ hour)\ (free\ field)}$ when measured from any of the following properties at the point closest to the noise source.

a) Green Meadow NGR 517 700

b) Railsbeck NGR 510 700

c) 94 Windermere Road NGR 505 696

d) Kirk House NGR 524 695

e) Helks Wood Farm NGR 521 691

22. Notwithstanding condition 21, outside of the hours of 0700 to 2200 hours Monday to Friday (except public holidays), 0700 to 1300 on Saturdays and at any time on Sundays and Public Holidays, noise emitted from the site shall not exceed 42 dB $L_{Aeq\ (1\ hour)\ (free\ field)}$ as defined in this permission when measured from any of the properties listed in condition 21.

23. The noise limits set out in condition 21 above shall not apply during the stripping of soils or overburden on the site, the construction of storage mounds for these materials and their respreading during restoration of the site or the construction of landscape or baffle mounds. Noise from any of these activities shall not exceed 70dB LAeq (1 hour) (free field), as defined in this permission as measured from any of the properties identified in condition 21 at a point closest to the noise source. This condition shall only apply for not more than 20 days in one calendar year unless otherwise agreed in writing by the County Planning Authority. A written record shall be made of the dates that these activities are taking place and shall be made available to the County Planning Authority on request.

24. Within six months of the date of this schedule of conditions, details of the types of reversing warning systems to be fitted to all mobile plant used at the site shall be submitted for approval in writing of the County Planning Authority. The scheme shall make provision for non audible or white noise reversing alarms to be used on mobile plant/machinery on the site. The approved reversing alarms shall be installed on all existing plant and equipment within 6 months of the approval and to all new plant and equipment before it is used on site.

25. Within six months of the date of this schedule of conditions, a scheme and programme of noise monitoring for the site shall be submitted to the County Planning Authority for approval in writing. The scheme and programme shall provide for the following:

a) A programme of noise monitoring at the properties listed in condition 22 above or any other property from which a noise complaint is received.

b) The equipment to be used and the information to be recorded including weather conditions, activities taking place at the site and the plant equipment being used during the monitoring period.

c) The frequency of monitoring.

d) Details for the reporting of results to the County Planning Authority.

e) Procedures to be adopted if noise levels are recorded above the levels identified in conditions 21 and 22 above.

f) A timescale for the implementation of the monitoring scheme."

10.3.4 A scoping report relating to this application was prepared by Heaton Planning and submitted to Lancashire County Council in September 2021 and contained the following text relating to noise:

"5.7 Noise

Existing Baseline

5.7.1 Current noise levels from the site are controlled by conditions 20 to 25 of the 2005 ROMP (01/03/1185). Noise levels must not exceed 55dB LAeq(1 hour) when measured from the following properties, as stipulated by condition 21:

Green Meadow

Raisbeck

94 Windermere Road

Kirk House

Helks Wood Farm

5.7.2 A Noise Monitoring Scheme is in place as per the requirements of condition 25.

Potential Effects

5.7.3 It is considered that the existing noise control measures which have been implemented by the Applicant will ensure that any future residual noise impact is adequately mitigated.

Scope of Assessment

5.7.4 An assessment will be prepared setting out the existing methods and procedures adopted by the applicant to minimise the impact of noise arising from the existing operations."

10.3.5 In response to this scoping report, Lancashire County Council provided the following advice in a Scoping Opinion document dated 20 December 2021:

"Noise

The proposals in your scoping report dealing with noise impacts are considered to be acceptable subject to the following comments:

- *The scoping report states that the assessment will set out the existing methods and procedures adopted to minimise the impact of noise arising from the existing operations. There is no mention of any survey proposals to establish back ground noise levels at the potentially affected properties and then to assess likely impacts from the quarry operation. The methodology contained within BS4242:2014+A1:2019 'Methods for rating and assessing industrial and commercial sound' should be used.*
- *The existing noise limits would not assist with satisfactorily determining whether noise from the proposals in the EIA scoping report would meet current NPPF and Noise Policy Statement for England objectives. Furthermore, since the original planning conditions were imposed, the*

technical guidance has changed. The existing planning condition includes a noise limitation which is expressed only in terms of a 55 dB(A) limit. There is an argument that this may not comply with the policy on noise from mineral workings in the Planning Practice Guidance. This states that noise from mineral workings should not exceed the background level by more than 10 dB(A) and that in any event the 55 dB(A) level should not be exceeded. Therefore, the background noise +10 dB(A) is the preferred approach. The assessment should consider whether that limit can be complied with.

- *There are no conditions on hours of working on the existing permission except in relation to blasting and soil stripping. It is assumed that the operator will wish to retain this flexibility. If this is the case, issues are raised regarding the impacts of night time noise. The assessment should include a survey of background noise at this location so that the potential impacts of night time working can be assessed."*

10.3.6 The use of BS4142: 1997+A1: 2019 is not appropriate for the assessment of noise from mineral workings and the standard specifically states that it should not be used for activities where other guidance is already in place (such as Planning Practice Guidance – Minerals). However, the standard does provide advice regarding noise measurements and establishing representative background sound levels which can apply to mineral sites.

10.3.7 The advice in Planning Practice Guidance – Minerals (PPGM) does suggest site noise limits as described in the Scoping Opinion and this is the appropriate means of determining whether a minerals site can be worked within environmentally acceptable levels.

10.3.8 However, in the case of Leapers Wood Quarry, there are already site noise limits in place as permitted until the end of 2048. Although the concern raised by Lancashire County Council would normally be valid for a new application, in this instance, the workings will significantly lower at the time the current permission ends and therefore there will be no adverse noise impact from the deepening of the workings.

10.3.9 It is also relevant that the nearest receptors to Leapers Wood Quarry are reasonably close to the M6 motorway and it is likely that road traffic noise will be the most significant contributor to background sound levels in the area resulting in

consistently raised background sound levels, which could result in PPGM site noise levels closer to the existing 55 dB $L_{Aeq, 1\ hour\ free\ field}$ limit.

10.3.10 It is therefore not proposed to alter the existing conditions relating to noise or the site noise limits and this assessment considers those limits to remain valid and consequently the noise impact of the proposals is assessed in the context of those limits and existing site noise levels.

10.3.11 Due to there being no record of complaints regarding noise from the Leapers Wood Quarry, there has been no noise monitoring undertaken as per the noise monitoring scheme.

10.3.12 However, the following noise monitoring location referenced in the planning permission for the Leapers Wood Quarry is used for site noise monitoring for Back Lane Quarry on an annual basis:

- Helks Wood Farm.

10.4 Review of Site Noise Monitoring

10.4.1 Although no site noise monitoring has been undertaken for the Leapers Wood Quarry site due to there being no complaints received relating to noise, site noise monitoring has been undertaken at Back Lane Quarry for Aggregate Industries on an annual basis at one of the locations common to the planning conditions for both sites.

10.4.2 Site noise monitoring at the nearest noise sensitive receptors to Back Lane Quarry has been undertaken by Advance Environmental Limited on behalf of the operator for around twenty years.

10.4.3 The measurements for Back Lane Quarry were undertaken at the monitoring locations in the presence of a suitably trained technician whilst the quarry was fully operational and were made in accordance with the methods outlined in BS 4142: 2014, 'Method for rating industrial and commercial sound' (British Standards Institution) and BS5228-1:2009 + A1:2014, Code of practice for noise and vibration control on construction and open sites. Annex G (British Standards Institution).

10.4.4 The data from the last three years of noise monitoring data at Helks Wood Farm (one of the receptors away from the M6 motorway) has been summarised in the following table for comparison with the site noise limit.

Location	Measured Noise Level dB $L_{Aeq,\ 15\ minutes\ free\ field}$			Site Noise Limit dB $L_{Aeq,\ 1\ hour\ free\ field}$
	August 2020	August 2021	July 2022	
Helks Wood Farm	44	42	47	55
	41	44	44	

Table 10.1: Recent Noise Monitoring Data

10.4.5 As can be seen from the table the overall measured noise levels, including extraneous noise (LAeq), are well below the site noise limits during all the measurement periods examined.

10.4.6 The Equivalent Continuous Noise Level, $L_{Aeq,\ T}$, is the preferred unit for assessing noise sources. It is the value of a continuous level that would have equivalent energy to the continuously varying noise over the specified period 'T'. This unit is recommended internationally for the description of environmental noise and is in general use. It is the chosen unit of BS 5228 for Construction and Open site noise; Planning Practice Guidance for Minerals and BS 7445 for the Description and Measurement of Environmental Noise.

10.4.7 Observations made by the technician during the surveys indicated that site noise from Back Lane Quarry and Leapers Wood Quarry was inaudible at Helks Wood Farm in 2020. Site noise from Back Lane Quarry was just audible at Helks Wood Farm with Leapers Wood Quarry activity inaudible in 2021. Back Lane Quarry activity was audible at Helks Wood Farm with Leapers Wood Quarry inaudible in 2022.

10.4.8 Based on the ongoing site noise monitoring data, site noise is inaudible from Leapers Wood Quarry and is therefore demonstrated to be well below the site noise limits stipulated in the latest planning permission for the site (which is the same for both sites) as was the cumulative noise level from both sites.

10.5 Consideration of Increased Depth/Barrier Attenuation

10.5.1 The proposed deepening of the mineral extraction area and amended end date of the site operations do not alter the working area of the site. The site operations will not change and those operations will be no nearer to the nearest noise sensitive receptors than is currently the case.

10.5.2 With the only change from the current scenario being the ground height for the mineral extraction operations, the distance from the ongoing operations to the nearest receptors will only increase.

10.5.3 As well as a small increase in working distance, there is the potential for greater noise attenuation at the receptors due to the working face of the quarry/topography because of the increased path difference.

10.5.4 The calculation of barrier attenuation is mainly based on the path difference between the direct path from source to receptor and the altered path over the barrier. As the depth of working increases, this difference will also increase resulting in greater attenuation.

10.5.5 The calculation method for external noise propagation in BS5228-1:2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites – Part 1: Noise' calculates the adjustment for screening/barrier attenuation as follows:

$10\log_{10}(3 + 20 \times$ PATH DIFFERENCE $\times 2 \times$ OCTAVE BAND DATA $/ 340)$

or the upper limit as defined in Figure 3 in BS5228 Annex F.

10.5.6 Due to the depth of working considered in this instance, the limit of the barrier attenuation allowed for in the calculations is reached and therefore it is necessary to examine the influence of an increase in path difference in more general terms.

10.5.7 The path difference is calculated based on Figure 3 in BS5228 Annex F (i.e. the sum of the two slanted distances over the barrier minus the single non-slanted distance without the barrier in place).

10.5.8 The octave band data is that input for the plant item in each band and this is conducted for all bands considered and then summed logarithmically.

10.5.9 Any increase in the depth of working will increase the path difference and result in potentially greater noise attenuation. An increase of up to 75 metres in depth from the permitted floor of the quarry (not the current working level) would result in highly significant barrier attenuation as well as a substantial increase in distance between source and receiver.

10.5.10 As site noise monitoring over the last twenty years has indicated that site noise (even at the top of the mineral) from both sites has complied with the site noise limits throughout the life of the site (with no complaints regarding noise having been received) and working at greater depth will result in potentially greater barrier

attenuation for the nearest dwellings to the site, the proposed deepening and continued mineral extraction operations should not constitute an increase in site noise levels or an adverse impact on the dwellings.

10.6 Cumulative Noise Impact

10.6.1 Leapers Wood Quarry is located immediately adjacent to and north of Back Lane Quarry (operated by Aggregate Industries), sharing a common boundary to the south of Leapers Wood Quarry.

10.6.2 The two sites are separated by a nominal boundary that is proposed to be worked as part of this application and the similar concurrent application by Aggregate Industries for deepening of the workings (and a time extension) at Back Lane Quarry.

10.6.3 Both sites are subject to the same site noise limit of 55 dB $L_{Aeq,\ 1\ hour\ free\ field}$ and the permissions on noise for the two sites share three common receptors.

10.6.4 Site noise monitoring at Back Lane Quarry demonstrates that those site noise limits have been consistently complied with over the past twenty years. Site noise monitoring at Leapers Wood Quarry has not been required over this period as there have been no complaints regarding noise at the site.

10.6.5 The site noise monitoring for Back Lane Quarry has shown that the overall measured noise levels (including both sites and extraneous noise such as M6 road traffic noise) are significantly below the site noise limits for both sites.

10.6.6 The applications for both sites do not involve any intensification in site operations, no changes to the processing plant site and associated plant items, no changes to the access to either site and no alteration to the operating hours.

10.6.7 As such, the only change in the workings will be the depth of working, with an increase in depth only resulting in lower site noise levels at the nearest dwellings to either site.

10.6.8 As both sites are satisfying the noise conditions in the permissions that are in place until 2048, with regard to cumulative noise levels and the deeper workings would increase the barrier attenuation and therefore reduce the site noise levels at the nearest dwellings due to mineral extraction, there is expected to be no adverse impact on the nearest noise sensitive receptors to the site from the proposed deepening of both quarries.

10.7 Summary and Conclusions

10.7.1 The application boundary would not increase from the area already permitted under the latest planning permission for the site as granted in 2006 site (ref: 01/03/1185) and therefore the workings would be no closer to the nearest dwellings to the site.

10.7.2 As the operations are to continue in the existing extraction area to a greater depth, there would be no requirement for soil stripping or bund formation operations that are considered temporary operations (with a higher site noise limit) in Planning Practice Guidance (Minerals).

10.7.3 The mineral extraction operations and processing operations would not change from the current situation.

10.7.4 Following completion of the mineral extraction works, the void would be restored as per the proposed revised restoration scheme.

10.7.5 The purpose of this assessment is to establish that the noise impact of the continuation of the existing site operations with mineral extraction to a greater depth, would not generate noise levels at the nearest noise sensitive properties that would exceed the existing site noise limits as required by extant planning permission conditions or increase the current noise levels from the site.

10.7.6 Site noise monitoring data at the nearest residential location where monitoring has been undertaken for Back Lane Quarry has confirmed the ongoing compliance of site noise with the extant site noise limit.

10.7.7 Consideration of the site plans and the topography, to explain why there is a potential increase in noise attenuation due to the greater depth of workings, has been included in the assessment to demonstrate that site noise levels would not increase from the current situation.

10.7.8 Site noise monitoring over the last twenty years at Back Lane Quarry has indicated that site noise (even at the top of the mineral) has complied with the site noise limits throughout the life of the site. Allied to this, working at greater depth would result in potentially greater barrier attenuation for the nearest dwellings to the site and therefore the proposed deepening and continued mineral extraction operations should not constitute an increase in site noise levels or an adverse impact on the dwellings.

10.7.9 The site can therefore continue to be worked within environmentally acceptable noise levels.

10.7.10 The cumulative impact of the continuing operations at Leapers Wood Quarry with the operations at the adjacent Back Lane Quarry has also been examined and also shown to be of no impact on the current noise levels from both sites.

11 AIR QUALITY & DUST

11.1 Introduction

11.1.1 An Air Quality and Dust Assessment has been undertaken to accompany the planning application. The assessment is summarised and discussed within this ES chapter.

11.1.2 The proposed development is a Section 73 Planning Application for the deepening of the existing quarry and an extension of time for mineral extraction and restoration operations. Both the footprint of the quarry and the output of material will be unchanged by this application. The application is made in conjunction with Back Lane Quarry, to the south, which is operated by Aggregate Industries. The extraction areas of the two operations are connected and form a single quarry void but will continue to operate as two entities.

11.1.3 The current excavations at Leapers Wood and Back Lane Quarries extend to a floor elevation of approximately 45m AOD and 55m AOD respectively. The proposed floor elevation of the final combined excavation will be -37m AOD.

11.1.4 This section of the Environmental Statement assesses the potential impact of dust associated with the extraction of mineral within Leapers Wood Quarry. This assessment is undertaken in accordance with requirements specified within National Planning Policy Framework 2023, and its supporting document, the Planning Practice Guidance, 2014 (references 1 and 2, section 11.10). The latter requires consideration of potential impacts from deposited dust and PM_{10} concentrations associated with mineral sites.

11.1.5 The primary impact from quarry operations is the generation of mineral dusts. Extraction, transportation, stockpiling/tipping and processing activities can produce fugitive emissions of these dusts. There are three separate potential impacts associated with fugitive dust emissions:

- Annoyance due to dust soiling;
- The risk of health effects due to increased exposure to PM_{10}; and
- Harm to ecological receptors.

11.1.6 However, their impact may be minimised by using a number of established mitigation methods. In addition, the local geology, hydrogeology and local topography, along with the physical properties of the extracted material, dictate the potential for a site to generate dust. Consequently, the Air Quality Assessment

includes the identification of potential sources of particle pollution and locally sensitive receptors. If mineral dusts rapidly accumulate on a surface they have the potential to cause a statutory nuisance. Therefore, this application assesses potential dust generation and its possible impact on the local area. It also recommends the implementation of a proactive monitoring scheme in order to demonstrate compliance with appropriate air quality standards and dust deposition criterion.

11.2 Policy and Standards

11.2.1 The primary guidance on aspects of controlling and mitigating the environmental effects of minerals extraction in respect of dust is set out in the NPPF (2023). Technical guidance on dust and air quality is provided in more detail in the accompanying online document; Planning Practice Guidance, 2014. This document requires the consideration of deposited dust and PM_{10}. On dust assessment studies specifically, the Minerals section states that:

"There are five key stages to a dust assessment study:

- *Establish baseline conditions of the existing dust climate around the site.*
- *Identify site activities that could lead to dust emissions without mitigation.*
- *Identify site parameters which may increase potential impact from dust.*
- *Recommend mitigation measures.*
- *Make proposals to monitor and report dust emissions to ensure compliance with appropriate environmental standards and enable an effective response to complaints".*

11.2.2 Detailed guidance for describing dust impacts is provided by the Institute of Air Quality Management: Guidance on the Assessment of Mineral Dust Impacts for Planning, 2016. This suggests that the requirements to undertake a detailed assessment may be based on the distance from a mineral site to potential sensitive receptors. It states that adverse dust impacts are uncommon for hard-rock quarries beyond 400 metres from the nearest dust generating activities.

11.2.3 Consideration must also be given to pertinent air pollutants as defined within the Air Quality Strategy for England, Scotland, Wales and Northern Ireland (AQS). This sets objectives for pollutants that have the potential to give cause for concern. The pollutants contained in current regulation include: nitrogen dioxide, particles (PM_{10}

and $PM_{2.5}$), sulphur dioxide, carbon monoxide, lead, benzene, 1-3 butadiene, whilst pollutants that have objectives set but are not currently included in regulation include polycyclic aromatic hydrocarbons (PAHs) and ozone. Local authorities are required to periodically review and assess the current and future quality of air in their areas. Where it is determined that an air quality objective is not likely to be met within a relevant time-period, the authority must designate an Air Quality Management Area (AQMA).

Dust deposition

11.2.4 Dust is traditionally defined as particulate matter in the size range of 1 to 75µm (microns). It is generally perceived as being a nuisance when a deposit accumulates and rapidly soils a surface at nearby receptors such as residential properties or business premises. However, the level at which soiling becomes a nuisance is highly subjective. The assessment of nuisance may be left to the discretion of Environmental Health officials, but empirical data derived from dust deposition gauges are more frequently used to assess the level of impact. Deposition gauges allow the measurement of the mean rate of dust deposition, which may be compared with 'custom and practice' threshold values. These suggest a mean rate of 200 milligrams for a square metre per day ($mg/m^2/day$) to be adequate criteria on which to base an assessment (Good Practice Guide: Control and Measurement of Nuisance Dust and PM_{10} from the Extractive Industries, Minerals Industry Research Organisation – MIRO - 2011). Values may also be considered against median deposition rates reported from across the UK (reference 5, section 11.10). These are reported as $38mg/m^2/day$ for 'open country', $56mg/m^2/day$ for the 'outskirt of town and residential areas' with $90mg/m^2/day$ being recorded for 'commercial centres'. These figures are based on the frisbee dust deposit gauge.

Fine particles (PM_{10} and $PM_{2.5}$)

11.2.5 Particulate matters with an aerodynamic size equivalent of 10µm (microns) or less have the potential to cause adverse health effects in susceptible individuals. Effects include respiratory morbidity, cardiovascular illness, asthma and mortality. These particles can enter the thoracic region of the respiratory system, and indeed, the fraction smaller than 1µm may penetrate the alveoli of the lung.

11.2.6 Particulate matter may be created through chemical reactions of atmospheric gases, be directly emitted into the air as soot and flyash from combustion sources, be mineral-based particles derived from agricultural, construction and mining

activities or may be from non-anthropogenic sources such as sea salt and biological detritus. These particles are collectively termed PM_{10} and can be local, regional and transboundary phenomena.

11.2.7 The current AQS objectives are based on gravimetric analysis or an acknowledged equivalent for the measurement of PM_{10} and are presented in Table 11.1.

Pollutant	Concentration	Measured as
PM_{10}	50µg/m^3 not to be exceeded more than 35 times per year	24-hour mean
	40 µg/m^3	Annual mean

Table 11.1: AQS Objectives for PM_{10}

11.2.8 Additional air quality targets in the Environment Act 2021 include maximum concentration and population exposure reduction targets for $PM_{2.5}$. These are presented below in Table 11.2. However, when considering the impact on PM, the Institute of Air Quality Management: Guidance on the Assessment of Mineral Dust Impacts for Planning, states: *"For quarries most of this suspended dust will be in the coarse sub-fraction ($PM_{2.5}$ - PM_{10}), rather than in the fine ($PM_{2.5}$) fraction"*.

Pollutant	Concentration	Measured as
$PM_{2.5}$	10 µg/m^3	Annual mean by 2040
		Population exposure reduction target of 35% by 2040 (2018 baseline)

Table 11.2: Air Quality Targets proposed in the Environment Act for $PM_{2.5}$

11.2.9 The Planning Practice Guidance (2014) recommends consideration of PM_{10} if an actual source of emission is within 1000m of potentially sensitive receptors. However, it should be noted that beyond 400 metres, the extracted hard rock is highly unlikely to generate a significant impact on local PM_{10}. Institute of Air Quality Management (IAQM) guidance suggests that where *"receptors are located between … 400m … and 1km of operations (for hard rock sites), it would normally be assumed that a detailed disamenity dust impact assessment is not required"*.

Nitrogen dioxide

11.2.10 Oxides of nitrogen are principally comprised of nitric oxide (NO) and nitrogen dioxide (NO_2). Oxides of nitrogen, termed NO_x, are typically derived from the

combination of atmospheric nitrogen and oxygen in the high temperature combustion of fuels such as petrol and diesel. NO_x is therefore frequently associated with emissions from vehicles. The majority of NO_x is emitted from combustion processes as NO (typically over 90%), a relatively innocuous substance that rapidly oxidises to NO_2 in ambient air. However, only NO_2 is associated with adverse health effects such as respiratory morbidity. As a result, NO_2 measurements are included within the NAQS. This currently sets an annual mean of 40µg/m^3 and an hourly mean of 200µg/m^3, not to be exceeded more than 18 times per year.

11.3 Potential Dust Generation and Impact

11.3.1 Dust can be generated by numerous activities associated with mining and quarrying. It can potentially be derived from soil stripping and overburden removal; the extraction of the limestone; transportation of material on-site; material processing; wind erosion from dry, unvegetated surfaces; vehicle movements and their exhaust emissions. The guiding principle in relation to dust and the extractive industries is presented in NPPF (reference 1, section 11.10) being to "ensure that any unavoidable …. dust and particle emissions ….. are controlled, mitigated or removed at source". The following potential sources are generic and based on information specified within The Environmental Effects of Dust from Surface Mineral Workings, 1995 (reference 6, section 11.10).

Soil stripping and overburden removal

11.3.2 Soil stripping and any overburden removed prior to mineral extraction can generate mineral dust. However, the need for this work will be negligible as the application is for the deepening of limestone extraction rather than any lateral extension to the quarry.

Mineral extraction

11.3.3 Limestone extraction will continue to be undertaken within the curtilage of existing operations. It will represent a progressive deepening of the quarry and an extension of time rather than the physical lateral extension of operations. It is not proposed to modify current working practices which include the mechanical extraction of the limestone undertaken by drilling, blasting and removal of rock from working phases by hydraulic excavators. The total production of limestone from the current and proposed operations is approximately 800,000 tonnes per annum. The quarry will continue to be worked with benches down to an ultimate depth of -37m AOD. Front

end loaders will continue to load the extracted stone into dump trucks. This will be taken to the existing processing plant during Phases 1 to 3, and processed adjacent to the quarry face during Phases 4 and 5. These operations have the potential to generate dust especially from upper bench workings. However, provided the appropriate mitigation measures outlined in section 11.7 are implemented, dust generation should be negligible. Potential fugitive dust emissions from this source will be reduced as the material is extracted at increased depth.

Mineral processing

11.3.4 During development Phases 1 to 3, the extracted mineral will continue to be processed on-site within the Leapers Wood Quarry processing plant, temporarily stockpiled and loaded into road going HGVs for transport off site. During Phase 4, the processing plant will be decommissioned and removed from the site to avoid the sterilisation of the underlying mineral resource. During Phases 4 and 5, material will be processed using temporary mobile plant in the quarry void adjacent to the quarry face. Mineral will be temporarily stocked within the void prior to exportation to point of sale using road-going HGVs.

Wind erosion from dry, unvegetated surfaces

11.3.5 There is the potential for roadways and unvegetated surfaces to produce dust emissions during dry, windy conditions. This would require mitigation measures outlined in section 11.7.

Vehicle movements and their exhaust emissions

11.3.6 The transportation of material from the working face to the primary crusher will continue to utilise dump trucks. The movement of these along internal haul roads can be the most significant source of dust generation. Recommendations regarding dust suppression for the haul roads, vehicles and mobile plant are covered in section 11.7. Uncleaned vehicles leaving the site have the potential to deposit mud and dirt along the access road and public highway. Subsequent vehicle movements have the potential to produce an impact from re-suspended dust. However, wheel cleaning facilities should minimise any impact. Management and mitigation measures are outlined in section 11.7.

11.3.7 The proposed deepening of Leapers Wood Quarry will not result in any change in current operational activities in terms of the quantities of mineral exported. Therefore, HGV vehicle movements off-site and onto the public highway will

remain unchanged. As there will be no additional traffic on the public highway, the impact associated with current vehicle emissions will be neutral in respect of this application. However, during the life of the site it is proposed that vehicles will be continuously upgraded as standards and technology dictate, which should ensure improved efficiency and a corresponding reduction in both exhaust emissions and the resultant carbon footprint of the operations.

11.3.8 The IAQM provides guidance on indicative criteria for requiring an air quality assessment in their Land-Use Planning Development Control: Planning For Air Quality (reference 9, section 11.10). For sites that are not located within an Air Quality Management Area (AQMA), these are 500 light duty vehicles (LDVs) annual average daily traffic (AADT) and/or 100 Heavy Duty Vehicles or HDVs (HGVs). Where there is an AQMA this is reduced to 100 LDVs and 25 HDVs as the AADT.

11.3.9 The nearest AQMA is the A6 and Market Street in the centre of Carnforth, approximately 1.2 km northwest. This was declared for exceeding annual mean NO_2 and does not represent the major transport link for HGV exports from Leapers Wood Quarry. There are no AQMAs declared by the Local Authority in the immediate vicinity of the site, and with no increase in vehicle numbers associated with the proposed scheme, it is not necessary to undertake a traffic related air quality impact assessment.

Restoration of site

11.3.10 The site will ultimately be restored to create a large water body with associated wildlife habitats and leisure land uses. These activities should not result in any notable additional impact upon the local air quality or dust environment.

11.4 Dust Assessment Methodology

11.4.1 Models are frequently used to predict the impact of particles from roads and process stacks. These have been formulated to provide an indication of air quality based on aspects such as vehicle flow, mix and speed, meteorological conditions, height and air flow. However, modelling fugitive emissions of dust from the mineral industries is less accurate. The calculation of emissions is confounded by the type of material being excavated, the potentially large and constantly variable particle size range, and most significantly the effectiveness of dust suppression.

11.4.2 The methodology applied in this assessment to examine the potential impact from fugitive dust emissions is semi-quantitative. It considers the significance of an

environmental impact to be determined by both the magnitude of the impact and by the sensitivity of the receptor. Sensitivity criteria are based on IAQM guidance for different receptors to disamenity (dust soiling), human health (PM_{10}) and ecological effects.

11.4.3 Examples of receptor sensitivity for assessing the impact from dust soiling, the impact on human health and ecological effects are presented below in Tables 11.3, 11.4 and 11.5. They are based on recent IAQM Guidance on the Assessment of Mineral Dust Impacts for Planning, 2016. These represent updated sensitivity categories and differ from those traditionally used, which were provided in The Environmental Effects of Dust from Surface Mineral Workings (reference 6, section 11.10). The update now categorises the sensitivity of residential receptors as being 'high'.

High Sensitivity	Medium Sensitivity	Low Sensitivity
Residential properties Hi-tech industries Car showrooms Medium and long-term car parking	Offices / places of work Parks Food retailers Glasshouses and nurseries Horticultural land	Farms Playing fields Public footpaths Roads Short term car parks

Table 11.3: Sensitivity to dust soiling

High Sensitivity	Medium Sensitivity	Low Sensitivity
Residential properties Hospitals and clinics Retirement homes Schools	Offices / places of work Parks Warehouses Industrial units	Playing fields Public footpaths Parks Shopping streets

Table 11.4: Sensitivity of people to health effects (PM_{10})

High Sensitivity	Medium Sensitivity	Low Sensitivity
SAC designated for acid heathland adjacent to mineral site releasing alkaline dusts	Nationally designated site that may be affected by dust deposition including SSSI	Local nature reserve with dust sensitive features

Table 11.5: Sensitivities of receptors to ecological effects

11.4.4 The type, size, shape and density of dust particles combined with wind speed, direction, rainfall, local topography and hydrogeology are parameters that can dictate the dispersion of dust emissions. However, in general, smaller particles have the potential to be entrained within airflow for longer, thereby dispersing over a wider area.

11.4.5 Guidance provided by the Institute of Air Quality Management (IAQM) states that *"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 activities"* (reference 3, section 11.10).

11.4.6 IAQM guidance continues: *"In the absence of other information it is commonly accepted that the greatest impacts will be within 100m of the source and this can be both large (>30µm) and small dust particles. The greatest potential for high rates of dust deposition and elevated PM_{10} concentrations occurs within this distance. Intermediate-sized particles (10 to 30µm) may travel up to 400m with occasional elevated levels of dust and PM_{10} possible. Particles less than 10µm have the potential to persist beyond 400m but with minimal significance due to dispersion"*.

11.4.7 However, the distances specified should not be considered to be quantitatively delineated categories. Whilst the greatest impact would be within 100m of the source, the highest levels of dust would be experienced immediately adjacent to the source. Likewise, the concentration of dust will dilute and disperse progressively within any defined categories such as 100 to 200m and 200 to 400m. This effect was described succinctly in former planning guidance for surface mineral sites (reference 6, section 11.10) which stated: "Concentrations (of dust) decrease rapidly on moving away from the source, due to dispersion and dilution".

11.4.8 The above criteria are a key component for assessing the magnitude of potential impacts of the proposed development. They are incorporated in the methodology criteria for assessing magnitudes of impact, presented in Table 11.6.

Magnitude	Description	Examples
Substantial	Impact resulting in a considerable change in environmental conditions with severe undesirable consequences on the receiving environment as a result of the development	• Area affected is within 100m from an active construction / mineral site with impact decreasing as a function of distance. • Large risk that emissions will generate statutory nuisance complaints, resulting in formal action. • Large risk that emissions will generate exceedances of the air quality criterion
Moderate	Impact resulting in a discernible change in environmental conditions with undesirable conditions or possibly causing statutory objectives to be exceeded, as a result of the development	• Area affected is between 100m and 200m of a major active mineral site with impact decreasing as a function of distance. • Medium risk that emissions will generate statutory nuisance complaints, resulting in formal action. • Medium risk that emissions will generate exceedances of the air quality criterion
Slight	Impact resulting in a discernible change in environmental conditions. Slow accumulation of dust observed on clean surfaces but not substantially greater than area background, i.e. conditions can be tolerated, as a result of the development	• Area affected is between 200m and 400m of a major active mineral site with impact decreasing as a function of distance. • Small risk that emissions will generate statutory nuisance complaints, resulting in formal action. • Small risk that emissions will generate exceedances of the air quality criterion
Negligible	No discernible change in environmental condition, as a result of the development	• Area affected from only minor construction activity or is over 400m from any major mineral activity. • Little or no cause for nuisance complaints to be made. • Minimal risk that emissions will generate any exceedance of the air quality criterion

Table 11.6: Methodology for Assessing Magnitude of Impacts on Air Quality

11.4.9 The significance of the relationship between magnitude of impact and the sensitivity of the receptor may be positive or negative. In general, a receptor with a high sensitivity when subject to a high dust impact will experience a major adverse effect and conversely a low sensitivity receptor subject to a low or negligible dust impact will experience a minimal or insignificant effect. Between these extremes are various combinations that will give rise to a gradation of effects for which no descriptor terms have been universally agreed. Impact significance criteria for this assessment are based upon the configuration used in IAQM guidance. These are presented below in Table 11.7.

Magnitude of impact	Sensitivity		
	High	Medium	Low
Substantial	Major	Intermediate	Slight
Moderate	Intermediate	Slight	Insignificant
Slight	Slight	Insignificant	Insignificant
Negligible	Insignificant	Insignificant	Insignificant

Table 11.7: Impact significance matrix – nuisance criteria

11.5 Locations of Potential Dust Impact

11.5.1 The continued extraction of limestone will be within the current permitted limits at Leapers Wood Quarry. There is no lateral extension, the proposal is for the deepening of the existing void. This will be undertaken in five phases of extraction followed by final restoration. The most sensitive locations for potential dust impact will, therefore, be the same as for the existing quarry, albeit dependent on the specific operational phase of the development. The nearest sensitive receptors within 400 metres of the boundary of both the current and proposed quarry operations are presented below in Table 11.8.

Dust Receptor	Potential Sensitivity	Approximate Distance from Nearest Potential Dust Generating Activity to Nearest Receptor, Compass Direction and Development Phase		
		Development Phase	Distance (m)	Direction
Raisbeck	High	Quarry entrance	60	ENE
		Current		
		1	270	N
		2	330	N
		5	360	N
			360	N
Helks Wood Farm	High / low	Current	260	ESE
		1	280	ESE
		2	320	ESE
		3	400	ESE
		4	400	ESE

Table 11.8: Nearest sensitive receptors within 400m to the potential impact from dust soiling and PM_{10} derived from current and future operations in the vicinity of Leapers Wood Quarry

11.5.2 There are a number of receptors with a 'high' sensitivity to dust deposition and PM_{10} concentrations identified in the vicinity of Leapers Wood Quarry. They consist of residential properties and farmhouses. Farm buildings and farmland are also

present but are considered to have a 'low' sensitivity, and therefore identified as having an **insignificant** impact from dust.

11.5.3 There are a number of residential receptors within 400m of the operational boundary of the existing quarry footprint. The proposed development of the quarry is to increase its depth and the duration of extraction. As such, the lateral parameters of the quarry will not change and the distance between the quarry and these receptors will also be unchanged.

11.5.4 Helks Wood Farm is located 260m east-southeast of the perimeter of current operations. The distance to the nearest mineral extraction for Phase 1 will increase to 330m, with Phase 2 at 360m, a distance of 400m for Phases 3 and 4 and in excess of 400m from the nearest quarry face of Phase 5. Using the impact criteria presented in Tables 11.3 to 11.7 there is the potential for a **slight** impact from dust at this receptor. However, there is a high degree of screening by mature woodland between the quarry and receptor, whilst the deepening of the quarry and the application of appropriate mitigation measures outlined in section 11.7 should effectively ameliorate the impact of dust.

11.5.5 Railsbeck is the nearest property to the north of the site at a distance of approximately 250m from the workings and 60m from the access road. However, this property is in the control of the Applicant. Nonetheless, for completeness, it has been included in this assessment. The proximity of the access road will remain unchanged for Phases 1 to 4 with vehicles exiting through Back Lane Quarry during Phase 5. The distance to the receptor along with the volume of vehicle movements will remain unchanged by this application. Using the impact criteria in tables 11.3 to 11.7 there is the potential for a **slight** impact from dust at this receptor without the application of appropriate mitigation. The predominant westerly / south-westerly winds have the potential to disperse any dust in the direction of this receptor. However, there is a high degree of screening by mature woodland on the screening bund between the quarry and receptor, whilst the deepening of the quarry and the application of appropriate mitigation measures outlined in section 11.7 should effectively ameliorate the impact of dust. Furthermore, the majority of limestone extraction will be at considerably greater distances than is currently the case.

11.5.6 The nearest dwellings to the north-east that are not in the ownership of the Applicant are those in and on the outskirts of Over Kellet. The nearest is 430m from the closest point of the site boundary, and as such can therefore be screened out.

11.5.7 The deposition of dust can also impact agricultural and ecologically sensitive habitats. This can result from the chemical or physical effects of particles on the vegetation surface or from changes in soil chemistry (see reference 8, section 11.10). Chemical effects are usually associated with highly alkaline or highly acid dusts that are typically derived from limestone quarries and coal workings. Physical effects of dust can include abrasion of leaf surfaces, shading and the blockage of stomata.

11.5.8 Experimental values reported to impact on vegetation from caustic and toxic sources range from 70 to 5000 mg/m^2/day for 'road dust' and 600 to 7000 mg/m^2/day for limestone and cement dusts. However, the 'road dusts' levels were derived from purely experimental data, which would probably have been influenced by hydrocarbons and in the period when the research was undertaken, lead-based products derived from vehicle exhaust emissions. These potentially toxic compounds are frequently adsorbed onto ultra-fine particulate matter associated with fuel combustion products. However, these levels will not be pertinent to mineral extraction at Leapers Wood Quarry as 'road dust' is not a relevant particle type associated with limestone. Nevertheless, the limestone itself is alkaline which has the potential to cause a toxic impact on the surrounding vegetation if the rate of dust deposition is high. However, the rates of deposition for limestone dust that can potentially cause an impact are notably high (600 to 7000 mg/m^2/day) and the likelihood of a significant effect is therefore very low. Notwithstanding this, any potential impact must be considered.

11.5.9 No statutory or non-statutory designated ecologically sensitive habitats have been identified within a 400m radius of Leapers Wood Quarry. The nearest ecologically sensitive habitat is Thwaite House Moss SSSI at approximately 1km to the south-west of the site.

11.5.10 This assessment also considers the impact of the development on local air quality. The nearest Air Quality Management Area (AQMA) is the A6 and Market Street in the centre of Carnforth, approximately 1.2 km northwest.

11.6 Assessment of Baseline Conditions

Dust deposition

11.6.1 Baseline monitoring was undertaken at receptors in the vicinity of current operations for both Leapers Wood and Back Lane Quarries. Measurements used frisbee-type dust deposit gauges with foam inserts and bird guards. These gauges

are used to establish the mean rate of environmental dust deposition, a technique that examines the potential nuisance caused by the soiling of surfaces. This was undertaken between 26th July 2022 and 18th January 2023 at 4 receptors in the vicinity of the quarries:

- Helks Wood Farm, 260m to the east of both Back Lane and Leapers Wood;
- Hawthorns Caravan Park, 210m to the south of Back Lane;
- Woodland View, 540m to the northeast of Leapers Wood; and
- Raisbeck, 250m to the northwest of Leapers Wood Quarry and 60m northeast of Leapers Wood Quarry exit.

11.6.2 Dust samples were typically collected on a monthly basis. The mean rates of dust deposition are presented below in Table 11.9.

	26/07/22 to 25/08/22 (mg/m²d)	25/08/22 to 22/09/22 (mg/m²d)	22/09/22 to 17/10/22 (mg/m²d)	17/10/22 to 23/11/22 (mg/m²d)	23/11/22 to 18/01/23 (mg/m²d)	Mean 26/07/22 to 18/01/23 (mg/m²d)
1. Helks Wood Farm	59	29	16	43	24	34
2. Hawthorns Caravan Park	45	31	23	29	24	30
3. No. 3 Woodlands View	47	21	23	28	36	31
4. Raisbeck	76	35	38	31	28	42

Table 11.9: Mean rates of dust deposition in the vicinity of Back Lane and Leapers Wood Quarries, 26 July 2022 to 18 January 2023

11.6.3 The gauges recorded generally compatible values at all locations with monthly mean rates of dust deposition that ranged from 16 to 76 mg/m^2/day and overall means of 30 to 42 mg/m^2/day. The first batch of samples recorded the highest values, especially at Helks Wood Farm and Raisbeck. Subsequent batches recorded a maximum value of 43 mg/m^2/day. Overall, these figures correlate with published median levels of deposition experienced from across the United Kingdom for 'open country', which reports 38 mg/m^2/day, based on frisbee-type gauges. The consistently low values indicated that there were no significant inputs of dust from nearby sources at these locations during the baseline monitoring exercise.

11.6.4 To determine if there was any limestone dust present within these samples, a few drops of dilute hydrochloric acid were added to a portion of each filter sample whilst under examination using optical microscopy. If there was any effervescence, this indicated the presence of limestone. A summary of the observations is reported below in Table 11.10. A small quantity of limestone was present in a few samples, although not in the sample from batch 1 at Raisbeck, which recorded the highest rate of dust deposition during the monitoring campaign. The sample which effervesces most vigorously, and therefore had the highest proportion of limestone present, was batch 2 from Raisbeck. However, even this did not represent a notably high component, whilst the rate of dust deposition was low.

	26/07/22 to 25/08/22 Effervescence	25/08/22 to 22/09/22 Effervescence	22/09/22 to 17/10/22 Effervescence	17/10/22 to 23/11/22 Effervescence	23/11/22 to 18/01/23 Effervescence
1. Helks Wood Farm	slight	slight	X	v. slight	X
2. Hawthorns Caravan Park	slight	X	X	X	X
3. No. 3 Woodlands View	slight	v. slight	X	X	v. slight
4. Raisbeck	X	some	v. slight	X	v. slight

Table 11.10: Presence of limestone in samples of deposited dust collected in the vicinity of Leapers Wood and Back Lane Quarries, 26 July 2022 to 18 January 2023

Fine particles (PM_{10} and $PM_{2.5}$)

11.6.5 The measurement of fine particles was undertaken at two locations between 1st July and 23rd September 2021 using an Aeroqual Dust Sentry PM_{10} monitor and an Aeroqual Dust Profiler, which provides simultaneous measurements of TSP, PM_{10}, $PM_{2.5}$ and PM_1. These indicative monitors provide real-time data and may be utilised as a site management tool. Equipment was installed at secure locations that provided access and had a power supply. The Dust Sentry was located at Helks Wood Farm, 260m east of Leapers Wood Quarry, whilst the Dust Profiler was located at a residential property in Hall Garth Gardens, Over Kellet, approximately 800m northeast of Leapers Wood Quarry and 1 km from Back Lane Quarry. This latter location was selected by the Parish Council as being representative of

potential exposure within the Over Kellet community.

11.6.6 Daily mean PM_{10} data derived from the indicative monitors is provided below in graphical format in Figure 11.1. This is compared with data from Automatic Urban and Rural Network (AURN) sites across the area. Although values are not directly compatible due to the 'indicative' nature, it places the data within the context of regional concentrations. AURN sites include Blackpool (an urban background site approximately 35 kilometres south-southwest) and Preston (an urban background site approximately 35 kilometres south). Although the values from Helks Farm and Over Kellet are lower, reflecting the 'indicative' nature of the equipment, they tend to follow the regional fluctuations of PM_{10}. They do not demonstrate any elevated values or patterns that deviate to indicate any measurable local influences. This implies the quarries did not produce an undue influence at the monitoring location during this period. There were no exceedences of the 50µg/m^3 daily NAQS Objective for PM_{10} at any locations.

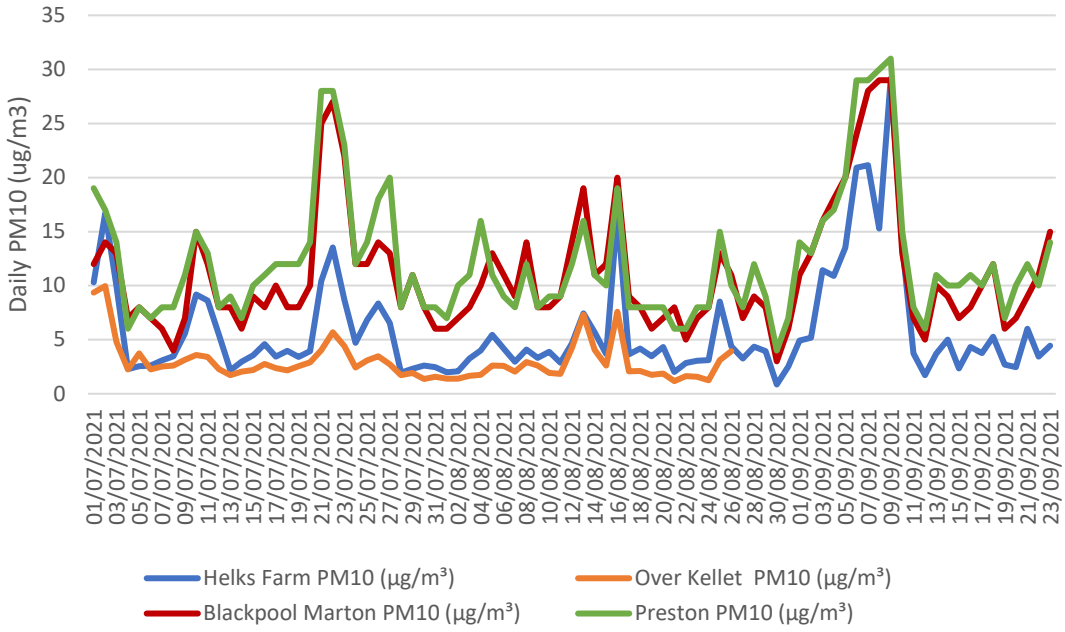


Figure 11.1: Comparison of daily PM_{10} from Helks Farm and Over Kellet with AURN data from Blackpool and Preston

11.6.7 The Aeroqual Dust Profiler, located at a residential property in Hall Garth Gardens, Over Kellet, provided simultaneous measurements of TSP, PM_{10}, $PM_{2.5}$ and PM_1. Successful measurements were undertaken between 1st July and 26th August

2021, after which the equipment malfunctioned, and any data was lost. Results of daily means are presented in graphical format in Figure 11.2 and demonstrate most of the particles occurred within the PM_1 size fraction. Although all recorded values are low, which indicated the air quality to be excellent, it must be emphasised that this is an indicative monitor, with associated limitations on data quantification.

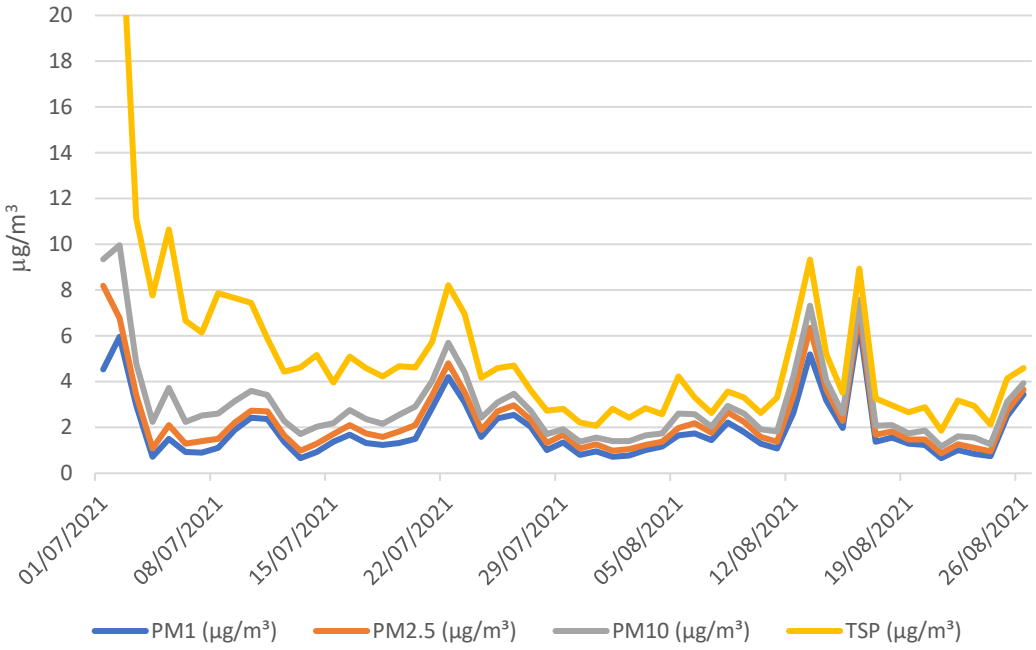


Figure 11.2: Comparison of daily TSP, PM_{10}, $PM_{2.5}$ and PM_1 from Over Kellet

11.7 Mitigation Measures

11.7.1 The following suppression methodologies, which are derived from and are mutual to established documentation, are recommended for the site: (see references 3, 5, 6 and 7, section 11.10).

- The adoption of best practicable means will be implemented to ensure dust and fumes from the site are effectively suppressed;
- Mobile plant should be regularly serviced and equipped with effective exhausts to prevent fume emissions;
- Haul roads should be adequately maintained;
- Water bowsers will be used during dry conditions on the access road and any other trafficked areas;
- Vehicle speed control on access and other trafficked areas will be

implemented by the Site Manager and must be adhered to with due regard to weather and ground conditions in order to reduce fugitive dust generation. A maximum speed of 15mph will be implemented;

- The Site Manager shall ensure that all commercial vehicles pass through a wheel washing facility prior to leaving the site to prevent the deposition of material onto the public highway;
- All vehicles leaving the site onto the public highway shall be suitably sheeted.
- In the unlikely event that dust or mud from the site has been deposited on the public highway, a road sweeper will be employed;
- The Site Manager or instructed site personnel will undertake regular inspections of the public highway in order to identify the need for any cleaning requirements. Observations from all inspections will be logged;
- Loading and unloading of vehicles should ensure drop heights are minimised. This is especially pertinent during the development of the upper benches, and in the vicinity of the quarry plant and stocking area;
- Water sprays or surface binders will be utilised to maintain damp surfaces on exposed tip and stockpile faces and any exposed friable surfaces during dry and windy weather;
- Best practicable means will be used to minimise the impact of dust generated from blasting operations. These include the use of filtration equipment on the exhaust emissions from drill rigs and the removal of any loose material from the area of blast prior to detonation;
- All site employees will receive appropriate training in order to ensure that they are conversant with the site dust control strategy; and
- Staff induction will include awareness of track-out of dust or mud from the site and to report signs of materials deposited on the public highway to the Site Manager or instructed site personnel. This will be documented and archived.

11.7.2 In addition to the application of routine mitigation, the specific dust amelioration measures presented will be dependent upon the daily management of the mineral site.

11.8 Human Health

11.8.1 A Scoping Opinion Request was made by the Applicant on 29 September 2021 via preparation of a Scoping Report. Within this, it was proposed that human health

will be considered within specific topic chapters as appropriate. A Scoping Opinion was received on 20 December 2021 in response to the Scoping Report prepared by the Applicant.

11.8.2 While the Scoping Opinion did not ask for a separate population and health ES chapter or Health Impact Assessment (HIA), the following points relating to human health were made:

'Given the concerns that have been raised in the local area regarding health impacts of dust, the assessment should also consider health related air quality issues. The Scoping Report only mentions PM_{10} impacts but from the health perspective, $PM_{2.5}$ should also be assessed. Given the small particle size, $PM_{2.5}$ dust particles can potentially be carried over a wider area than the 400m distance quoted in the Scoping Report.

Any assessment of $PM_{2.5}$ should take account of any levels provided in WHO guidance or any levels that may be contained in guidance published pursuant to the Environment Act 2021.'

11.8.3 Consequently, in conjunction with this air quality / dust chapter, a comprehensive Air Quality and Health Briefing Note has been produced. The full technical note is at Technical Appendix G. The Briefing Note explores the concerns raised, and provides information to firstly distinguish between potential hazard and risk, explain how and where well-known hazards are addressed through mitigation measures, and offer additional narrative to put potential health risk into context.

11.9 Cumulative and In-Combination Impacts

Air Quality and Dust

11.9.1 The application at Leapers Wood Quarry is a Section 73 planning application for the deepening of the existing quarry and an extension of time for mineral extraction and restoration operations. It is made in conjunction with an application at Back Lane Quarry, to the south, which is operated by Aggregate Industries. The extraction areas of the two operations are connected and form a single quarry void but will continue to operate as two entities.

11.9.2 The current excavations at Leapers Wood and Back Lane Quarries extend to a floor elevation of approximately 45mAOD and 55mAOD respectively. The proposed floor elevation of the final combined excavation will be -37mAOD.

11.9.3 The applications are for extraction to be undertaken at increased depths at both

quarries with no lateral extensions to the workings. It may therefore be extrapolated that there will be no change in dust impact provided effective mitigation regimes are upheld.

11.9.4 The existing annual outputs of product will also be retained at both quarries. As such there will be no change in vehicle movements from these operations along the public highway. Therefore, there will be no undue impact on air quality pollutants from vehicle exhaust emissions.

Human Health

11.9.5 The only development considered within the cumulative assessment is Back Lane Quarry, located to the south of Leapers Wood Quarry.

11.9.6 As with the application for Leapers Wood Quarry, the application at Back Lane Quarry would not include any lateral extension to the workings, and the annual outputs of aggregate would remain the same as is currently consented.

11.9.7 As a result, it can be concluded that with the implementation of the appropriate mitigation measures already in place, the cumulative impact on air quality would be negligible, and the associated impact on health would therefore also be negligible.

11.10 Conclusions

Air Quality and Dust

11.10.1 This Air Quality and Dust Assessment was undertaken as part of a planning application for the deepening of the existing Leapers Wood Quarry and an extension of time for mineral extraction and restoration operations. Both the footprint of the quarry and the output of material will be unchanged by this application. The application is made in conjunction with Back Lane Quarry, to the south. The extraction areas of the two operations are connected and form a single quarry void but will continue to operate as two entities.

11.10.2 Mineral extraction will continue within the current permitted limit of extraction. The period of baseline measurements for dust deposition and PM_{10} concentrations has indicated a slight impact from the quarry at the monitoring locations. As the stand-off distances between mineral extraction and receptors will be unchanged by the development, it is considered that that the impact from dust will not increase. Indeed, the site will benefit from the extraction of mineral being undertaken at increased depth, which will afford a degree of natural dust

mitigation. Therefore, providing correct dust management procedures are enforced, the extraction, processing, stocking, restoration and movement of material on the application site will not generate excessive levels of fugitive dust.

11.10.3 Nevertheless, to ensure effective adherence of mitigation, it is recommended that a detailed scheme of dust management and monitoring be prepared pursuant of planning approval. This will be prepared by the Applicant and will set out in further detail the procedures to be employed which will, as a minimum, contain all the measures recommended in this assessment. The scheme will recommend the implementation of a proactive monitoring strategy for nuisance dust and the measurement of PM_{10} / $PM_{2.5}$ in order to demonstrate compliance with appropriate air quality standards and dust deposition criterion. Monitoring should ideally be undertaken at the nearest / most sensitive receptors to the quarry with the resultant data disseminated to the Regulatory Authorities. PM measurements will utilise equipment that complies with the requirements of the Air Quality Strategy.

11.10.4 The amount of mineral exported from the quarry will also remain unchanged from current volumes. As such there will be no undue impact on air quality pollutants along the public highway from vehicle exhaust emissions.

Human Health

11.10.5 Public health statistics show that respiratory health in the area is good and there is no evidence of any impact from current operations.

11.10.6 There are a range of mitigation measures which are currently being implemented at Leapers Wood Quarry and contribute to baseline air quality in the local area remaining well within AQS objective thresholds, which are set to protect the environment and human health.

11.10.7 Provided that appropriate mitigation measures continue to be implemented, dust generation from the continuation of activities would be negligible and there would be no change in health risk.

11.11 References

1. National Planning Policy Framework, 2021
Department for Communities and Local Government, 2021

2. Planning Practice Guidance
Department for Communities and Local Government, 2014

3. Institute of Air Quality Management
Guidance on the Assessment of Mineral Dust Impacts for Planning, 2016

4. The Air Quality Strategy for England, Scotland, Wales and Northern Ireland
DEFRA: 2007.

5. Minerals Industry Research Organisation
Good Practice Guide: Control and Measurement of Nuisance Dust and PM_{10} from the Extractive Industries, 2011.

6. The Environmental Effects of Dust from Surface Mineral Workings, *Dept. of Environment Minerals Division, 1995.*

7. MPS2 - Minerals Policy Statement 2: Controlling and Mitigating the Environmental Effects of Minerals Extraction in England, Annex 1: Dust.
Office of the Deputy Prime Minister, 2005

8. Farmer, A.M.: The Effects of Dust on Vegetation and its Consequences for Nature Conservation in Great Britain
Nature Conservancy Council, CSD Note Number 57, 1991).

9. Land-Use Planning & Development Control: Planning for Air Quality, (January 2017)
Environmental Protection UK and Institute of Air Quality Management

12 GROUNDBORNE VIBRATION AND OVERPRESSURE

12.1 Introduction

12.1.1 A Groundborne Vibration and Air Overpressure Assessment has been prepared to accompany the planning application and is provided within Technical Appendix H of this ES. The assessment is summarised and discussed within this ES chapter.

12.1.2 The application boundary is not to increase from the area already permitted and therefore the workings will be no closer to the nearest dwellings.

12.1.3 The extraction of mineral will continue to be extracted by drilling and blasting and then loaded and hauled by dump trucks to the existing processing plant for processing.

12.1.4 Operations are to continue in the existing extraction area but to a greater depth (a further 75 metres to -37mAOD from the currently permitted floor of 38mAOD).

12.1.5 It is not proposed to vary the operating hours from those permitted in the current planning permission for the site.

12.1.6 The intention of the assessment is to establish that the impact of groundborne vibration and air overpressure from blasting operations as a consequence of the continuation of existing site operations would not be expected to result in any additional impact on nearby sensitive properties. Levels of groundborne vibration and air overpressure would be controlled to ensure compliance with extant planning permission conditions.

12.2 Site Description

12.2.1 Leapers Wood Quarry is bounded to the south by the adjoining Back Lane Quarry, to the north and east by woodland and to the west by woodland, with the M6 beyond.

12.2.2 Back Lane Quarry is operated by Aggregate Industries and is immediately adjacent to the site with a common nominal boundary separating the two sites. A concurrent application is being submitted on behalf of Aggregate Industries for the deepening of the workings at Back Lane Quarry to the same depth to allow for joint working of the shared boundary between the two quarries.

12.2.3 Carnforth is located to the west of the site and is the nearest substantial residential area with the nearest dwellings on the edge of the town being around 400 metres to the north-west of the current permitted extraction area beyond the M6

motorway.

12.2.4 There are isolated residential properties located within 1km of the site.

12.2.5 The nearest residential receptors to the south-west and south-east of the site beyond the workings at Back Lane Quarry include the Hawthorns Caravan Park, Newlands Farm and Wayside at a distance of around 600m.

12.2.6 The nearest properties to the north of the site are approximately 200 to 300mfrom the workings adjacent to the access road. These properties are Green Meadow (uninhabited at the time of the assessment) and Raisbeck.

12.2.7 The nearest dwellings to the north-east on the outskirts of Over Kellet, which include Kirk House, are around 500 to 550m from the closest point of the site boundary.

12.2.8 Other properties including Kit Bill Lodge, The Helks and an adjacent residential property lie around 300 to 350m east of the extraction area.

12.2.9 A number of the above properties are already recognised as being the closest to Leapers Wood Quarry, as such, they are subject to extant planning conditions and are used for demonstrating compliance with respective groundborne vibration limits.

12.2.10 The site access is from the B6254 Kellet Road.

12.3 Legislative and Policy Context

National Planning Policy Framework (NPPF)

12.3.1 The National Planning Policy Framework (NPPF) sets out the Government's planning policies for England. The latest version was published in December 2023.

12.3.2 At the heart of the NPPF is a presumption in favour of sustainable development.

12.3.3 Section 15 of the NPPF (Conserving and Enhancing the Natural Environment), although not specifically referring to the impacts of blasting and vibration, does refer to other related sensory impacts, in particular noise, in the following paragraphs:

'180. Planning policies and decisions should contribute to and enhance the natural and local environment by…

(e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil,

air, water or noise pollution or land instability…'

'191. Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;

b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason…'

12.3.4 Paragraph 193 refers to the integration of new development with existing businesses and facilities and states:

'*Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or 'agent of change') should be required to provide suitable mitigation before the development has been completed.*'

National Planning Practice Guidance - Minerals (NPPGM)

12.3.5 The 'Minerals' chapter of the Planning Practice Guidance, under the heading 'Assessing environmental impacts from minerals extraction' refers to blast vibration under the sub heading; 'What are the environmental issues of minerals working that should be addressed by mineral planning authorities?'. However, in contrast to its sensory impact counterparts noise, dust and air quality, no further assessment framework or guidance is provided in the NPPGM.

12.3.6 The chapter therefore refers to guidance contained in British Standards and other research documents and recommends vibration criteria which accords with that provided by Mineral Planning Guidance notes MPG 9 and 14, which were withdrawn in 2014 and not replaced.

12.4 Effects of Blasting

12.4.1 When an explosive detonates within a borehole stress waves are generated causing very localised distortion and cracking. Outside of this immediate vicinity, however, permanent deformation does not occur. Instead, the rapidly decaying stress waves cause the ground to exhibit elastic properties whereby the rock particles are returned to their original position following the passage of the stress waves. Such vibration is always generated even by the best designed and executed of blasts and will radiate away from the blast site attenuating as distance increases.

12.4.2 With experience and knowledge of the factors which influence ground vibration, such as blast type and design, site geology and receiving structure, the magnitude and significance of these waves can be accurately predicted at any location.

12.4.3 Vibration is also generated within the atmosphere where the term 'air overpressure' is used to encompass both its audible and sub-audible frequency components. Again, experience and knowledge of blast type and design enables prediction of levels and an assessment of their significance. In this instance, predictions can be made less certain by the fact that air overpressure levels may be significantly influenced by atmospheric conditions. Hence the most effective method of control is its minimisation at source.

12.4.4 It is important to note that for any given blast it is very much in the operator's interest to always reduce vibration, both ground and airborne, to the minimum possible as this substantially increases the efficiency and hence economics of blasting operations.

12.4.5 The deepening of workings would be conducted in a similar manner to the existing Leapers Wood Quarry development. However, the optimum blast design will vary from blast to blast and will be decided by the operator with reference to the site specific conditions and in order to comply with the recommended vibration criteria.

12.5 Blast Vibration Terminology

Ground Vibration

12.5.1 Vibration can be generated within the ground by a dynamic source of sufficient energy. It will be composed of various wave types of differing characteristics and significance collectively known as seismic waves.

12.5.2 These seismic waves will spread radially from the vibration source decaying rapidly as distance increases.

12.5.3 There are four interrelated parameters that may be used in order to define ground vibration magnitude at any location. These are:

Displacement - the distance that a particle moves before returning to its original position, measured in millimetres (mm).

Velocity - the rate at which particle displacement changes, measured in millimetres per second (mms^{-1}).

Acceleration - the rate at which the particle velocity changes, measured in millimetres per second squared (mms^{-2}) or in terms of the acceleration due to the earth's gravity (g).

Frequency - the number of oscillations per second that a particle undergoes, measured in Hertz (Hz).

12.5.4 Much investigation has been undertaken, both practical and theoretical, into the damage potential of blast induced ground vibration. Among the most eminent of such research authorities are the United States Bureau of Mines (USBM), Langefors and Kihlström, and Edwards and Northwood. All have concluded that the vibration parameter best suited as a damage index is particle velocity.

12.5.5 Studies by the USBM have clearly shown the importance of adopting a monitoring approach that also includes frequency.

12.5.6 Thus the parameters most commonly used in assessing the significance of an impulsive vibration are those of particle velocity and frequency which are related for sinusoidal motion as follows:-

$$PV = 2 \pi f a$$

where PV = particle velocity

π = pi

f = frequency

a = amplitude

12.5.7 It is the maximum value of particle velocity in a vibration event, termed the peak particle velocity, that is of most significance and this will usually be measured in three independent, mutually perpendicular directions at any one location in order to ensure that the true peak value is captured. These directions are longitudinal (or radial), vertical and transverse.

12.5.8 Such maximum of any one plane measurements is the accepted standard worldwide and as recommended by the British Standards Institution and the International Standards Institute amongst others. It is also the basis for all the recognised investigations into satisfactory vibration levels with respect to damage of structures and human perception.

12.5.9 British Standard 7385-2: 1993 'Evaluation and measurement for vibration in buildings - Guide to damage levels from groundborne vibration' states that there is little probability of fatigue damage occurring in residential building structures due to blasting. The increase of the component stress levels due to imposed vibration is relatively nominal and the number of cycles applied at a repeated high level of vibration is relatively low. Non-structural components (such as plaster) should incur dynamic stresses which are typically well below, i.e. only 5% of, component yield and ultimate strengths.

12.5.10 All research and previous work undertaken has indicated that any vibration induced damage will occur immediately if the damage threshold has been exceeded and that there is no evidence of long term effects.

Airborne Vibration

12.5.11 Whenever an explosive is detonated transient airborne pressure waves are generated.

12.5.12 As these waves pass a given position, the pressure of the air rises very rapidly to a value above the atmospheric or ambient pressure. It then falls more slowly to a value below atmospheric before returning to the ambient value after a series of oscillations. The maximum pressure above atmospheric is known as the peak air overpressure.

12.5.13 These pressure waves will comprise of energy over a wide frequency range. Energy above 20 Hz is perceptible to the human ear as sound, whilst that below 20 Hz is inaudible, however, it can be sensed in the form of concussion. The sound and concussion together are known as air overpressure which is measured in terms of decibels (dB) or pounds per square inch (p.s.i.) over the required frequency range.

12.5.14 The decibel scale expresses the logarithm of the ratio of a level (greater or less) relative to a given base value. In acoustics, this reference value is taken as 20×10^{-6} Pascals, which is accepted as the threshold of human hearing.

12.5.15 Air overpressure (AOP) is therefore defined as:

$$\text{AOP, dB} = 20 \text{ Log } \frac{\text{Measured pressure}}{\text{Reference pressure}}$$

12.5.16 Since both high and low frequencies are of importance, no frequency weighting network is applied, unlike in the case of noise measurement when an A - weighted filter is employed.

12.5.17 All frequency components, both audible and inaudible, can cause a structure to vibrate in a way which can be confused with the effects of ground vibrations.

12.5.18 The lower, inaudible, frequencies are much less attenuated by distance, buildings and natural barriers. Consequently, air overpressure effects at these frequencies can be significant over greater distances, and more readily excite a response within structures.

12.5.19 Should there be perceptible effects they are commonly due to the air overpressure inducing vibrations of a higher, audible frequency within a property and it is these secondary rattles of windows or crockery that can give rise to comment.

12.5.20 In a blast, airborne pressure waves are produced from five main sources:

- Rock displacement from the face;
- Ground induced airborne vibration;
- Release of gases through natural fissures;
- Release of gases through stemming; and
- Insufficiently confined explosive charges.

12.5.21 Meteorological factors over which an operator has no control can influence the intensity of air overpressure levels at any given location. Thus, wind speed and direction, temperature and humidity at various altitudes can have an effect upon air overpressure.

12.6 Vibration Criteria

Damage Levels

Ground Vibration

12.6.1 Various authorities around the world have undertaken detailed research into determining the vibration levels necessary for the possible onset of damage to property. The United States Bureau of Mines (USBM) have reviewed all relevant published data, both theoretical and practical, to augment their own considerable

research. They are, therefore, considered to be the foremost authority on this subject.

12.6.2 When defining damage to residential type structures the following classifications are used:

- Cosmetic or threshold - the formation of hairline cracks or the growth of existing cracks in plaster, drywall surfaces or mortar joints.
- Minor - the formation of large cracks or loosening and falling of plaster on drywall surfaces, or cracks through bricks/concrete blocks.
- Major or structural - damage to structural elements of a building.

12.6.3 Published damage criteria will not necessarily differentiate between these damage types but rather give levels to preclude cosmetic damage and therefore automatically prevent any more severe damage.

12.6.4 The comprehensive research programme undertaken by the USBM in the late 1970s (R.I. 8507, 1980) determined that vibration values well in excess of 50mms^{-1} are necessary to produce structural damage to residential type structures. The onset of cosmetic damage can be associated with lower vibration levels, especially at very low vibration frequencies, and a limit of 12.7mms^{-1} is therefore recommended for such relatively unusual vibration. For the type of vibration associated with open pit blasting in this country, the safe vibration levels are seen to be from 19 - 50 mms^{-1}.

12.6.5 A further USBM publication (Bureau of Mines Technology Transfer Seminar, 1987) states that these safe vibration levels are '….*for the worst case of structure conditions*….', and that they are '….*independent of the number of blasting events and their durations'*, and that no damage has occurred in any of the published data at vibration levels less than 12.7 mms^{-1}.

12.6.6 A later publication on this subject (S.E.E. Conference, 1991) reconfirms these safe vibration criteria and states that '… *these studies have since been widely adopted by the users and regulators of explosives to develop and demonstrate safe blasting practices*.' and that '*In the ten years since their publication, nothing has appeared to replace them or even significantly add to the data base*.'

12.6.7 Indeed, within the UK, the Transport and Road Research Laboratory in their Report No. 53 of 1986 recommend the use of these USBM safe vibration criteria for blasting adjacent to residential type structures.

12.6.8 In addition, the British Standards Institution's structural damage committee have investigated blast induced vibration with respect to its damage potential. They contacted some 224 organisations, mainly British, and found no evidence of any blast induced damage at levels less than those recommended by the USBM.

12.6.9 This investigation culminated in British Standard 7385-2: 1993 'Evaluation and measurement for vibration in buildings - Guide to damage levels from groundborne vibration'.

12.6.10 British Standard 7385-2 gives guide values to prevent cosmetic damage to property. Between 4 Hz and 15 Hz, a guide value of 15 - 20 mms^{-1} is recommended, whilst above 40 Hz the guide value is 50 mms^{-1}. These vibration criteria reconfirm those of the USBM.

12.6.11 Any doubt that such low levels of vibration are perfectly safe should be dispelled by considering the strain induced within a residential type property from daily environmental changes and domestic activities. This is confirmed within the 1987 USBM publication which quotes that daily changes in humidity and temperature can readily induce strain of the order that is equivalent to blast induced vibration of from 30 - 75 mms^{-1}. Typical domestic activities will produce strain levels corresponding to vibration of up to 20 mms^{-1} and greater.

12.6.12 It is for this reason that many domestic properties will exhibit cracks that may be wrongly attributed to blasting activities. There are many additional reasons why properties will develop cracks, for example:

- Fatigue and ageing of wall coverings;
- Drying out of plaster finishes;
- Shrinkage and swelling of wood;
- Chemical changes in mortar, bricks, plaster and stucco;
- Structural overloading; and
- Differential foundation settlement - particularly after times of prolonged dry spells.

Air Overpressure

12.6.13 Comprehensive investigations into the nature and effects of air overpressure with particular reference to its damage potential have been undertaken by the USBM who has also reviewed all other published data on this subject (R.I. 8485, 1980).

12.6.14 The weakest parts of most structures that are exposed to air overpressure are

windows. Poorly mounted, and hence prestressed windows might crack at around 150 dB (0.1 p.s.i.) with most cracking at 170 dB (1.0 p.s.i.). Structural damage can be expected at 180 dB (3.0 p.s.i.).

12.6.15 The latest recommendations by the USBM are reproduced in Table 12.1. The criteria set is based on minimal probability of the most superficial type of damage in residential-type structures, the single best descriptor being recommended as the 2 Hz high pass system.

Instrument Response	Maximum Recommended Level (dB)
0.1 Hz high pass	**134**
2.0 Hz high pass	**133**
5.0 or 6.0 Hz high pass	**129**
C- Slow	**105 dB (C)**

Table 12.1: United States Bureau of Mines published criteria for air overpressure

Perception Levels

12.6.16 The fact that the human body is very sensitive to vibration can result in subjective concern being expressed at energy levels well below the threshold of damage.

12.6.17 A person will generally become aware of blast induced vibration at levels of around 1.5 mms^{-1}, although under some circumstances this can be as low as 0.5 mms^{-1}. Even though such vibration is routinely generated within any property and is also entirely safe, when it is induced by blasting activities it is not unusual for such a level to give rise to subjective concern. Such concern is also frequently the result of the recent discovery of cracked plaster or brickwork that in fact has either been present for some time or has occurred due to natural processes.

12.6.18 From experience, virtually all complaints regarding blasting arise because of the concern over the possibility of damage to owner-occupied properties. Such complaints are largely independent of the vibration level. In fact, once an individual's perception threshold is attained, complaints can result from 3% to 4% of the total number of blasts, irrespective of their magnitude.

12.6.19 Government guidance was provided on this subject and given within Minerals Planning Guidance Note No. 9 'Planning and Compensation Act 1991: Interim Development Order Permissions (IDOS) - Conditions. Department of the Environment, Welsh Office, 1992' and Minerals Planning Guidance Note No. 14 'Environment Act 1995: Review of Mineral Planning Permissions. Department of

the Environment, Welsh Office, 1995'. The documents suggested a range of between 6 to 10 mms^{-1} at a 95% confidence level as measured over any period of 6 months at vibration sensitive buildings with no individual blast exceeding 12 mms^{-1}.

12.6.20 The documents are still widely referenced despite being withdrawn and as yet not replaced.

12.6.21 These same criteria are also recommended within the 1998 Department of the Environment Transport and The Regions (DETR) research publication 'The Environmental Effects of Production Blasting from Surface Mineral Workings'.

12.6.22 This same DETR publication also notes that '*It would appear that over the years conditions have become progressively more stringent. No doubt this is as a result of MPAs seeking to reduce the number of complaints and by operators seeking to resolve issues more quickly. However, a reduction in complaints will not necessarily follow.*'

12.6.23 Indeed, one of the principal findings of the study which led to this publication is '*Once the threshold of perception had been crossed the magnitude of vibration seemed to bear little relation to the level of resulting complaint*'.

12.6.24 An explanation of the necessity to use explosives and the likely effects as perceived by a site's neighbours can allay the concern of a significant proportion of those inhabitants of neighbouring property. It is invariably the case that an operator will consider the perception threshold level prior to the design of each and every blast at a particular site.

12.6.25 The British Standards Institution has produced a document relevant to such a discussion entitled British Standard 6472-2: 2008 'Guide to evaluation of human exposure to vibration in buildings – Blast-induced vibration''. This document discusses how and where to measure blast-induced vibration and gives maximum satisfactory magnitudes of vibration with respect to human response. Satisfactory magnitudes are given as 6 to 10 mms^{-1} at a 90% confidence level as measured outside of a building on a well-founded hard surface as close to the building as possible.

12.7 Prediction and Control of Vibration Levels

Ground Vibration

12.7.1 The accepted method of predicting peak particle velocity for any given situation is

to use a scaling approach utilising separation distances and instantaneous charge weights. This method allows the derivation of the site specific relationship between ground vibration level and separation distance from a blast.

12.7.2 A scaled distance value for any location may be calculated as follows:

Scaled Distance (SD) = $DW^{-½}$ in $mkg^{-½}$

where D = Separation distance (blast to receiver) in metres

W = Maximum Instantaneous Charge (MIC) in kg

i.e. maximum weight of explosive per delay interval in kg

12.7.3 For each measurement location the maximum peak particle velocity from either the longitudinal, vertical or transverse axis is plotted against its respective scaled distance value on logarithmic graph paper.

12.7.4 An empirical relationship derived by the USBM relates ground vibration level to scaled distance as follows:

$$PV = a\,(SD)^{b}$$

where PV = Maximum Peak Particle Velocity in mms^{-1}

SD = Scaled Distance in $mkg^{-½}$

a, b = Dimensionless Site Factors

12.7.5 The site factors a and b allow for the influence of local geology upon vibration attenuation as well as geometrical spreading. The values of a and b are derived for a specific site from least squares regression analysis of the logarithmic plot of peak particle velocity against scaled distance which results in the mathematical best fit straight line where:

a is the peak particle velocity intercept at unity scaled distance

and b is the slope of the regression line

12.7.6 In almost all cases, a certain amount of data scatter will be evident, and as such

statistical confidence levels are also calculated and plotted.

12.7.7 The statistical method adopted in assessing the vibration data is that used by Lucole and Dowding. The data is presented in the form of a graph showing the attenuation of ground vibration with scaled distance and results from log - normal modelling of the velocity distribution at any given scaled distance. The best fit or mean (50%) line as well as the upper 95% confidence level are plotted.

12.7.8 The process for calculating the best fit line is the least squares analysis method. The upper 95% confidence level is found by multiplying the mean line value by 1.645 times 10 raised to the power of the standard deviation of the data above the mean line. A log - normal distribution of vibration data will mean that the peak particle velocity at any scaled distance tends to group at lower values.

12.7.9 From the logarithmic plot of peak particle velocity against scaled distance, for any required vibration level it is possible to relate the maximum instantaneous charge and separation distance as follows:

Maximum Instantaneous Charge (MIC) = $(D/SD)^2$

where D = Separation distance (blast to receiver) in metres

SD = Scaled Distance in mkg-½ corresponding to vibration level required

12.7.10 The scaled distance approach assumes that blast design remains similar between those shots used to determine the scaling relationship between vibration level and separation distance and those for which prediction is required. For prediction purposes, the scaling relationship will be most accurate when calculations are derived from similar charge weight and distance values.

12.7.11 The main factors in blast design that can affect the scaling relationship are the maximum instantaneous charge weight, blast ratio, free face reflection, delay interval, initiation direction and blast geometry associated with burden, spacing, stemming and subdrill.

12.7.12 Although the instantaneous explosive charge weight has perhaps the greatest effect upon vibration level, it cannot be considered alone, and is connected to most aspects of blast design through the parameter blast ratio.

12.7.13 The blast ratio is a measure of the amount of work expected per unit of explosive,

measured for example in tonnes of rock per kilograme of explosive detonated (tonnes/kg), and results from virtually all aspects of a blast design i.e. hole diameter, depth, burden, spacing, loading density and initiation technique.

12.7.14 The scaled distance approach is also strictly valid only for the specific geology in the direction monitored. This is evident when considering the main mechanisms which contribute to ground motion dissipation:

- Damping of ground vibrations, causing lower ground vibration frequencies with increasing distance.
- Discontinuities causing reflection, refraction and diffraction.
- Internal friction causing frequency dependent attenuation, which is greater for coarser grained rocks.
- Geometrical spreading.

12.7.15 In practice similar rates of vibration attenuation may occur in different directions, however, where necessary these factors should be routinely checked by monitoring, especially on sites where geology is known to alter.

12.7.16 Where it is predicted that the received levels of vibration will exceed the relevant criteria the operator will have to reduce the maximum instantaneous explosive charge weight. One method of achieving such a reduction is to deck the explosives within the borehole. This technique splits the column of explosives in two, separated by inert material. If blasting is required at closer distances than that where double decking would be a successful strategy, other charge reduction methods would have to be employed. These could be more complex decking strategies or changes to the blast geometry and / or the use of smaller diameter boreholes.

Airborne Vibration

12.7.17 Airborne vibration waves can be considered as sound waves of a higher intensity and will, therefore, be transmitted through the atmosphere in a similar manner. Thus meteorological conditions such as wind speed, wind direction, temperature, humidity and cloud cover and how these vary with altitude, can affect the level of the air overpressure value experienced at a distance from any blast.

12.7.18 If a blast is fired in a motionless atmosphere in which the temperature remains constant with altitude then the air overpressure intensity will decrease purely as a function of distance. In fact, each time the distance doubles the air overpressure

level will decrease by 6 dB. However, such conditions are very rare and it is more likely that a combination of the factors mentioned above will increase the expected intensity in some areas and decrease it in others.

12.7.19 Given sufficient meteorological data it is possible to predict these increases or decreases. However, to be of use this data must be both site specific and of relevance to the proposed blasting time. In practice this is not possible because the data is obtained from meteorological stations at some distance from the blast site and necessarily at some time before the blast is to be detonated. The ever changing British weather therefore causes such data to be rather limited in value and its use clearly counterproductive if it is not relevant to the blast site at the detonation time. In addition, it would not normally be safe practice to leave charged holes standing for an unknown period of time.

12.7.20 It is because of the variability of British weather that it is standard good practice to control air overpressure at source and hence minimise its magnitude at distance, even under relatively unfavourable conditions.

12.7.21 Such a procedure is recommended by the Government in their latest publications on this subject; MPG 9 and MPG 14, where it is suggested that no air overpressure limit be defined but rather that methods to be employed to minimise air overpressure are submitted for approval. This approach is also recommended within the previously mentioned 1998 DETR publication.

12.7.22 Such control is achieved in a well-designed and executed blast in which all explosive material is adequately confined. Thus particular attention must be given to accurate face profiling and the subsequent drilling and correct placement of explosive within any borehole, having due regard to any localised weaknesses in the strata including overbreak from a previous shot, clay joints and fissured ground.

12.7.23 Stemming material should be of sufficient quantity and quality to adequately confine the explosives, and care should be taken in deciding upon the optimum detonation technique for the specific site circumstances.

12.7.24 Although there will always be a significant variation in observed air overpressure levels at a particular site, it is possible to predict a range of likely values given sufficient background information and/or experience. In this respect, past recordings may be analysed according to the cube root scaled distance approach to provide a useful indication of future levels.

12.8 Assessment of Blast Induced Groundborne Vibration Levels

12.8.1 Blasting procedures and protocols currently employed at Leapers Wood Quarry will be maintained for all future blasting operations to ensure the impact of groundborne vibration and air overpressure criteria is in line with current guidance, British Standards and planning policy.

12.8.2 Blasting operations in quarries can be extremely dangerous if the operation is not carried out correctly. The procedures and protocols currently implemented are designed to minimise health and safety risk whilst also maximising the efficiency and hence economics of blasting. This in turn minimises the environmental impact of blasting operations.

12.8.3 In order to minimise such risks and effects, full attention will be given to pre-profiling and accuracy of burden and spacing, size of blast, drilling accuracy, initiation system (whereby electronic initiation may give a benefit in some instances), initiation sequence, delay between holes (ie duration of blast), MIC etc. Further consideration will be given to the time of blast, the frequency and regularity of blasting and monitoring.

12.8.4 Currently, all blasts at Leapers Wood Quarry are monitored, generally, at the nearest potentially vibration sensitive property to any blasting event. This practice will continue.

12.8.5 A review of data collected over the past three years from blasting events at Leapers Wood Quarry showed that all measured blasts were found to comply with the current permitted blasting limits.

12.8.6 It would be usual to use the measurement data obtained from compliance monitoring of blasting operations over a period of time to generate a regression curve plot for blasting at Leapers Wood Quarry. The use of the USBM formula to predict vibration levels calls for the maximum peak particle velocity (PPV) to be plotted against scaled distance (SD) in a logarithmic manner. The latter is defined as:

$$\text{Scaled Distance } (mkg^{-½}) = \frac{\text{blast/receiver separation distance (m)}}{\text{(MIC)}}$$

where MIC is the maximum instantaneous charge weight in kg

12.8.7 The measured PPV's would be logarithmically plotted against their respective SD's

and the line of best fit (50% confidence) would be drawn and the upper 95 % confidence level calculated. This would enable the predicted maximum MIC's for given distances to be determined. However, much of the data collected has been from monitoring at the same or similar location (from a distance perspective) which would not provide a representative spread of data for regression analysis purposes.

12.8.8 Current blasting practices at the site include predictive modelling which equally ensures that compliance with the recommended vibration criteria is achieved. It is therefore the intention that the current procedures used to predict vibration levels shall be adopted for all future blasts at the site. This includes:

- Identifying and agreeing with the regulatory authorities potentially sensitive properties;
- Utilising the latest blast design software that interfaces with laser profiling scanners;
- Accurately identifying the quarry blast area, undertaking a pre-survey and accurately determining the distance to nearest sensitive property, which shall be accurately determined using the survey data;
- Calculating the scaled distance (SD) value from the measured distance and proposed maximum instantaneous explosive charge weight (MIC);
- Using the SD to predict the expected peak particle velocity (PPV) (expressed @ 95% confidence) at the identified sensitive property;
- When necessary, accordingly reducing the MIC and recalculating the SD until the predicted PPV is below the permissible levels.

12.8.9 It is therefore concluded that current blasting practices at the site will ensure that compliance with the recommended vibration criteria will be achieved from continued operations at the quarry. Data then obtained by direct measurement of blasting operations in this area will enable the site to update the regression analysis graph, which can then be used to inform all future blast designs. It is therefore considered that no significant effects would result from the proposed development.

12.9 Cumulative Impact

12.9.1 With the implementation of appropriate control, the cumulative impact of blasting as a consequence of the proposed concurrent deepening of both Leapers Wood and Back Lane quarries, will be negligible with maintenance, if not improvement to the current status quo due to the increased depth of working. No significant

cumulative effects are therefore predicted.

12.10 Conclusions

12.10.1 In order to regularise a criterion for restricting vibration levels from production blasting whilst addressing the need to protect amenity for nearby residents, it is recommended that the current criterion of 6.0 mm per second (mms^{-1}) for 95% of events is considered a satisfactory magnitude for vibration from blasting at Leapers Wood Quarry.

12.10.2 All blasts shall be designed to ensure that ground vibration levels arising from blasting shall not exceed a peak particle velocity of $6mms^{-1}$ in any mutually perpendicular plane and calculated with a 95% confidence limit. No individual blast shall exceed a peak particle velocity of 9 mms^{-1} as measured at any vibration sensitive property which is not under the direct control of the Applicant / operator.

12.10.3 All vibration will be of a relatively low order of magnitude and would be entirely safe with respect to the possibility of the most cosmetic of plaster cracks.

12.10.4 All vibration will also be well below those levels recommended for blast induced vibration as being satisfactory within the previously discussed British Standard Guide BS 6472-2: 2008.

12.10.5 With such low ground vibration levels accompanying air overpressure would also be of a very low and hence safe level, although will be perceptible on occasions at the closest properties.

12.10.6 If the Applicant / operator accords with the recommendations given, there is no reason for blasting operations resulting from the proposed deepening of Leapers Wood Quarry to give rise to any adverse or significant impacts due to increased vibration at any of the dwellings or structures in the vicinity. In fact, for blasting operations in the current void, any resultant effects should be lower.

13 WATER ENVIRONMENT

13.1 Introduction

13.1.1 A Flood Risk Assessment and Hydrogeological Impact Assessment have been undertaken to accompany the planning application and are provided as Technical Appendices I and J of this ES. The assessments have been summarised and discussed within this ES chapter.

13.1.2 A combined working scheme for both Leapers Wood and Back Lane Quarries, comprising a single quarry void and working to -37mAOD, is proposed within the planning application.

13.1.3 The characteristics of the water environment and environmental setting were investigated using existing data and reports, walkovers, assessment of site data, field testing, discussion with site personnel and site visits. The potential effects of the proposed development upon the extant water environment have been assessed by reference to baseline data and a series of matrices developed to ensure a rigorous and consistent approach. Mitigation measures have been proposed, where appropriate.

13.1.4 The overall objective of the assessments was to define the hydrological and hydrogeological conditions relating to the site and its environs and to identify potential impacts that may arise due to the proposed, future mineral extraction and associated water management.

13.2 Baseline conditions

13.2.1 The quarry is situated in the western section of an upland area that is bounded by the valleys of the River Lune and the River Keer, some 3.7 km south and 1.5 km north of the site respectively. The eastern limits of the coastal plain, which extends to Morecambe Bay, form the western boundary of the upland area.

13.2.2 The site is located within the surface water catchment of the River Keer, which flows generally westwards and discharges into Morecambe Bay. Land immediately to the southeast of the site is within the catchment of the River Lune. Both the Keer and the Lune are designated as Main Rivers by the Environment Agency (EA).

13.2.3 The closest watercourse to the site, the Nether Beck, is located on the opposite side of the M6 Motorway to the quarry. It flows generally northwards, via several

culverts and beneath the Lancaster Canal, ultimately discharging into the River Keer.

13.2.4 Up-catchment, an un-named stream is sourced from seepages from the Pendle Grit Member and Peat deposits. It sinks to ground at a large cave, known as Dunald Mill Hole, located approximately 1.1 km to the south of the site.

13.2.5 Thirty-seven waterbodies exist within a 2km radius of the site, the three largest of which are Peddar Potts Reservoir, within the dormant Dunald Mill Quarry and within the restored Overhead Quarry.

13.2.6 Data relating to licensed and unlicensed abstractions within a 2km radius of the centre of the quarry were obtained from the EA and Lancaster City Council. No abstractions from surface water were identified.

13.2.7 The regional bedrock geology comprises a vertically extensive sequence of sedimentary strata of Carboniferous age. The principal lithologies in the immediate vicinity of the quarry comprise limestone, and are sub-divided into the Park and overlying Urswick Formations. The majority of future mineral extraction, both permitted and proposed, will be from the Lower Park Limestone Formation. The majority of vertical and sub-vertical fractures and joints recorded are very small scale (millimetre) and infilled with brown or orange-yellow stained clay.

13.2.8 The Urswick Limestone comprises thick, well-bedded, pale grey grainstones or calcarenites, commonly with darker mottling and a rubbly texture, with thin beds of grey and varicoloured clay. The Park Limestone is an unbedded or poorly bedded, pale grey or pale yellowish grey bioclastic and peloidal grainstone or biocalcarenite.

13.2.9 Geological faults within the region are orientated predominantly northwest to southeast. A regional scale fault, which has a broadly north-south orientation, is located approximately 2km to the east of the site.

13.2.10 Caves and other palaeokarst features are exposed within quarry faces, a few of which transmit water; however most are clay-filled. They are situated at varying elevations, including some significantly above the current watertable.

13.2.11 On areas of lower elevation to the west of the M6 motorway the bedrock geology is almost completely obscured by extensive superficial deposits. They are highly variable, both horizontally and vertically. The closest such deposits are situated some 50-100m to the north of the quarry void and extend across the coastal plain. They are overlain by laterally and vertically extensive clayey-silty tidal flats and

older marine deposits. The Millstone Grit Group bedrock occurs at depth beneath the coastal plain.

13.2.12 The majority of bedrock units within the vicinity of the site are designated as Secondary 'A' Aquifers by the EA. These are defined as 'permeable layers that can support local water supplies and may form an important source of baseflow to rivers'.

13.2.13 Carboniferous Limestone has a low primary porosity, and groundwater flow occurs mainly via fractures and conduits/caves. On a scale of tens of metres, groundwater flow within the fracture network approximates to that within a porous media and a conformable piezometric surface can be defined.

13.2.14 Observations within the quarry void have not noted significant groundwater seepage from fractures. Mineral investigation boreholes across both quarries, which extend to -55.8mAOD (18 m below the proposed depth of extraction at -37mAOD), recorded thin, infilled fractures. Fracture apertures are anticipated to decline with increased depth. The limestone at depth was proven to be 'massive', with negligible fracturing or fissuring.

13.2.15 Groundwater levels have been monitored since 1993 to the Present Day within 27 boreholes at Leapers Wood Quarry and 8 boreholes within Back Lane Quarry. A comprehensive data set of groundwater levels therefore exists.

13.2.16 Prior to 2012, groundwater elevations were at 75mAOD in the eastern extremities of the quarries, and 19-35mAOD towards the western site boundary. Pre-dewatering, the groundwater flow direction within the vicinity of the quarries was west-northwestwards.

13.2.17 Dewatering has been undertaken at Leapers Wood Quarry from a sump in the west of the site since 2002 and at Back Lane Quarry since 2009. The influence of dewatering at both quarries is apparent on post-2012 groundwater levels with the current water level in 2023 at the base of the quarry void recorded at c40mAOD.

13.2.18 The majority of boreholes exhibit seasonal groundwater level variations of between 2-6m, however a greater range, typically between 10–20m, was observed within some historical boreholes.

13.2.19 Tracer testing was undertaken in 1999, 2002, and 2023 as part of groundwater investigations at Leapers Wood and Back Lane Quarries. Fluocapteur monitoring devices and water samples were collected from targeted springs and watercourses

before and after the introduction of tracer. During all tests, tracer deployed at the three proposed water discharge locations was conveyed rapidly northwards, taking between 25-72 hours to issue to surface water, 1–1.25 km north of the sites. The speed of this conveyance and quantity of tracer dye recovered, indicates the presence of a discrete groundwater flow path, or paths, to the resurgence point.

13.2.20 In 2002, dye deployed in the Leapers Wood sinkhole was observed visually in the River Keer and was followed upstream along a tributary watercourse to a spring resurgence adjacent to a property known as Elpha, approximately 1 – 1.5km north of the sites. In the 2023 tracer test, a significant detection of dye from all three discharge locations was also observed immediately down-stream of this spring. The large quantity of dye observed during both tests indicates that the majority of water from all three of the proposed quarry discharge points is conveyed to this spring resurgence.

13.2.21 No tracer was detected at the monitoring locations immediately downstream of the Thwaite House Moss Site of Special Scientific Interest (SSSI), Crag Bank SSSI or close to the Over Kellet Pond Local Nature Reserve. These sites are therefore not supported by groundwater egress connected to the proposed discharge locations. The results from all tracer tests demonstrated that there is no evidence that water discharged into the mass of the limestone, flows to spring resurgences on the coastal plain.

13.2.22 The coastal plain is underlain by marine sediments (clay, silts and sands) and till (micrite/boulder clay). The low hydraulic conductivity of both the superficial deposits and bedrock underlying the coastal plain is such that there is anticipated to be negligible hydraulic connectivity between seawater and groundwater within the bedrock. Consequently, the potential for significant saline groundwater intrusion beneath the coastline is small.

13.2.23 Leapers Wood Quarry extracts limestone from the Park and Urswick Limestone Formations of the Great Scar Limestone Group. Mineral evaluation boreholes indicate that this formation persists to at least -55.8mAOD, approximately 18m below the proposed base of the quarry, at -37mAOD.

13.2.24 Due to the relatively small and elevated nature of the area in which the quarries are situated, the only local source of recharge to the groundwater system is rainfall. Due to the laterally extensive till deposits located to the east of the site, rainfall is considered likely to enter the limestone indirectly, via run-off, infiltrating where

bedrock is exposed. Up-catchment stream systems, located to the east of the site, may also provide point sources of recharge to the karst system at locations such as the stream sinking into Dunald Mill Hole Cave system.

13.2.25 A complex karst system exists both locally and regionally. Several previously water-filled conduits have been truncated by mineral extraction. Neither mineral evaluation drilling or downhole geophysical logging has identified water-filled or clay-filled conduits at depth.

13.2.26 The permeability of the limestone estimated from various field tests is expected to be representative of the bulk properties of the limestone within the quarry curtilage. Tracer tracing has indicated that groundwater conveyance within the conduit network is likely to be significantly greater than that of the mass of the limestone.

13.2.27 Long-term groundwater level monitoring indicates that the overall groundwater flow direction within the limestone in the vicinity of the quarries is west-northwestwards, towards the 'trough' of the Nether Kellet Syncline. Tracer tests have demonstrated that the movement of groundwater along the fold axis is driven 'up-plunge' northwards. The groundwater within the limestone is therefore considered to drain to springs to the north of the site, which discharge to tributaries of the River Keer.

13.2.28 The sand and gravel deposits to the west of the quarry comprise a superficial aquifer, which has the potential to store and transmit groundwater. Recharge to this aquifer is by rainfall.

13.2.29 There is no evidence that groundwater within the limestone bedrock flows across the syncline feature within the limestone or to spring resurgences on the coastal plain.

13.3 Water management

13.3.1 Leapers Wood Quarry is currently worked below the piezometric groundwater surface and active dewatering is undertaken to facilitate safe and dry mineral extraction.

13.3.2 Between 2002 and 2018, dewatering was undertaken at Leapers Wood Quarry from a sump in the west of the site. This feature, known as the Western Sump, existed until 2018 and had a water level of approximately 47–48.5 mAOD (spot levels recorded between 2011 and 2014).

13.3.3 Since 2018 dewatering has been undertaken from a smaller sump within the southwestern corner of the quarry void, with a water level of 39.3 mAOD (December 2020). Dewatering of the site is permitted under Transfer Licence NW/073/0622/002, at 1,692m^3/day. This is approximately equivalent to pumping for 24 hours per day at 71 m^3/hour (20 l/s).

13.3.4 Water is used on site at Leapers Wood Quarry to supply a sprinkler system, dust suppression and a wheel wash, licenced by Full Licence NW/073/0622/007. Excess water is discharged via the consented discharge point to the Leapers Wood sinkhole, under Permit reference 017290475/V002. A maximum discharge rate of 2,600 m^3/day (108.4 m^3/hour or 30.1 l/s) is permitted.

13.3.5 It is proposed to continue the current water management regime during future mineral extraction. It is envisaged that water management within Leapers Wood and Back Lane Quarries will be combined in the future. Groundwater ingress and incident rainfall across the quarry will collect within one or more sumps within the quarry void. These sumps will provide settlement capacity, reducing the suspended solid content of the water.

13.3.6 The proposed continuation of sub-watertable mineral extraction will necessitate dewatering at an increased rate. Three potential sources of water ingress to the quarry void exist: direct rainfall, diffuse inflow from the mass of the limestone and conduit flow.

13.3.7 Within the UK, projections of future climate change indicate that there will be more frequent, short duration, high intensity rainfall events and periods of long duration rainfall. The anticipated duration of mineral extraction and restoration (of the combined void) is until the end of 2078. For development with a lifetime between 2061 and 2100 the central climate change allowance of 35% is applicable. However, for robustness and to ensure the water management has considered the maximum predicted volumes, the 'upper' climate change estimate of 50% allowance has been applied to the estimates of storm rainfall run-off.

13.3.8 The volume of rainfall run-off into the combined quarries has been calculated by multiplying the long-term monthly average rainfall by their catchment area. The various surfaces intercepted in the quarries would intercept some of the incident rainfall, and a conservative approach has been applied by assuming that 80% of rainfall is conveyed to the quarry sump. The maximum run-off is anticipated during December, at 27.4 l/s.

13.3.9 The volumes of rainfall-derived water generated during storm events are significantly greater than those under 'average' rainfall conditions. Although the total volume of water from storm events does not present difficulties in the long-term, the short-term containment of storm-derived water has been assessed. Water from storm events would not need to be discharged off-site immediately but would be stored temporarily within the quarry void and subsequently discharged off-site, at a regulated rate.

13.3.10 Pre-dewatering groundwater elevations declined across the quarry void from 75mAOD in the east, to 35mAOD in the west. The floor of the quarry void at the proposed final depth of -37 mAOD will, therefore, be up to 90 m below the 'average' groundwater table.

13.3.11 The volume of groundwater ingress has been determined using a standard method, which equates the quarry void to a large diameter well. The Dupuit-Forcheimer (Thiem-Dupuit) equation, for unconfined flow, and a range of aquifer parameters have been used.

13.3.12 The stream sinking into Dunald Mill Hole Cave is considered to represent the entire headwaters of the catchment flowing into the karst system. For the purpose of the 'worst case assessment' it has been assumed that all of this water could potentially be intercepted by deeper quarry workings.

13.3.13 The maximum instantaneous ingress to the quarry void is the sum of the average groundwater and rainfall ingress. As the maximum average monthly rainfall is experienced in December, data from this month value has been used in the calculations.

13.3.14 Climate change will impact the duration and intensity of storm events, therefore this has been considered. The volumes indicated for the greatest storm event calculated (ie 1 in 100-year event) have also been assessed. The dewatering estimate of 3,145 m^3/day for current quarry conditions at 45mAOD, under average rainfall conditions, does not consider input from the karst system where a cave passage may be truncated. The dewatering estimate at 45mAOD for storm rainfall conditions is 39,650m^3/day.

13.3.15 Based on meter readings of dewatering, volumes from Back Lane and Leapers Wood Quarry (with the quarry floor at 45mAOD) are estimated to be between 1,000-3,500m^3/day (~11.6–40.5 l/s).

13.3.16 As a 'worst case scenario' of the future maximum dewatering discharge, combining average rainfall, groundwater inflow and inflow from the karst system, with the quarry at its full depth, it has been assumed that all of this water could potentially be intercepted by deeper quarry workings.

13.3.17 Water from storm events would not need to be discharged off-site instantaneously but would be temporarily stored within the quarry void and subsequently discharged off-site at the greenfield run-off rate.

13.3.18 Due to the complexity of the geological and hydrogeological setting, the potential impact of dewatering on the surrounding groundwater elevations is highly unlikely to be radial. The impact from drawdown is likely to be constrained due to the presence of the Nether Kellet Syncline to the west, and the major faults present to the northeast, east and southeast. The Sichardt equation has been used to estimate the potential radius of influence from the location of dewatering.

13.3.19 The magnitude of the estimated radius of impact at the current quarry floor elevation of 45mAOD is consistent with the current observations of drawdown. The estimate of potential impact, within a distance of 1.3 km of the dewatering sump, at the maximum proposed quarry depth, is therefore considered to be indicative and should be considered within the context of the complex geological and hydrogeological setting.

13.3.20 Progressive restoration will occur with the final landscaping for restoration of the combined site being completed by the end of 2078. Restoration of the majority of the quarry void will be to open water. Once final extraction depths have been reached, dewatering will cease and the workings will start to fill with water. The rate of inflow will be slow and the timescale for filling of the void commensurately long, due to the low hydraulic conductivity of the limestone and the large capacity of the void.

13.3.21 Proposed outfalls will allow the passive egress of water from the restoration waterbody to ensure that a suitable freeboard remains on its margins. The outfalls would be located at the western extent of Back Lane Quarry void and/or the northwestern extent of Leapers Wood Quarry and would essentially represent a passive continuation of the proposed operational water management. The outfalls would convey water to either the Leapers Wood sinkhole, the Back Lane sinkhole located within the existing lagoon, at an elevation of 43 mAOD, or to the Back Lane

French Drain, located at ~43mAOD. A combination of these could potentially be utilised.

13.3.22 Variation in groundwater fluxes, combined with predicted increased storm water inflows due to climate change, is such that it is anticipated that the level of the restoration waterbody will vary by small amounts temporally. However, the magnitude of such variations will be extremely small, due to the large area of the waterbody in relation to the relatively small volumes of water ingress.

13.4 Flood risk

13.4.1 As the site is over 1 hectare (ha) in size, a Flood Risk Assessment (FRA) has been prepared and is provided at Technical Appendix I of this ES. The FRA is summarised and discussed within this section of the ES and has been completed with due consideration of relevant national and local policies.

13.4.2 The site is located wholly within EA designated Flood Zone 1. This is defined as land having less than a 1 in 1000 chance of fluvial flooding in any year. Mineral extraction and processing is designated as being 'Less Vulnerable' in accordance with the NPPF and PPG. According to Table 3 of the PPG, it is considered appropriate for such development to be located within Flood Zone 1. The Sequential Test is therefore considered to be passed and the Exception Test does not need to be applied.

13.4.3 An allowance for climate change has been incorporated into the drainage strategy.

13.4.4 Tracer tests conducted from the existing and proposed quarry discharge locations have demonstrated that the local groundwater flow is dominated by a karst conduit system. The majority of water discharged from all three of the proposed quarry discharges reaches a single spring resurgence close to a property known as Elpha, approximately 1-1.5 km to the north of the sites and, to a lesser extent, the downstream reaches of the Nether Beck. Downstream from the principal egress point the watercourse flows through agricultural land within the floodplain of the River Keer.

13.4.5 The volume of water that would need to be attenuated if the karst system was intercepted, under storm conditions, has been calculated to represent a worst case scenario. The maximum volume of water required to be attenuated within the quarry void at its maximum operational depth, for the 1 in 100-year event (6-hour duration +50% climate change) is approximately 140,000m³. The base of the quarry void area at the lowest sinking (-37mAOD) will be approximately 27.6 ha. This

water volume equates to a depth of water in the base of the quarry void of 0.5 m, which could be readily accommodated.

13.4.6 Post-restoration, a control structure would regulate the flow rate off-site passively to the greenfield run-off rate (232 l/s) for the combined quarry catchment area.

13.4.7 The maximum volume of water required to be attenuated by the restoration waterbody for the 1 in 100-year event (6-hour duration +50% climate change) is 76,200 m^3. Across the surface of the restoration waterbody this volume equates to a water depth of 0.1 m. A substantial freeboard of 6.9 m to 9.9 m would remain.

13.4.8 The discharge from the quarries is currently, and will continue to be, via conduits within the limestone which egress to springs and/or surface watercourses. There is thus no potential for the proposed discharges to impact groundwater levels within the mass of the limestone and no potential for groundwater flood risk.

13.4.9 The volume of water discharged during mineral extraction will increase from the current rates due to increased groundwater ingress, however discharge rates off-site will be regulated to be at, or below, the greenfield rate.

13.4.10 In the event of an issue with the water management system, such as pump failure, discharge would be suspended temporarily. Groundwater ingress into the quarry void would be slow and could be readily accommodated within the base of the quarry void until active water management could recommence.

13.4.11 The impact of the proposals on fluvial flooding during mineral extraction and restoration is no greater than during the greenfield scenario and mitigation measures are not required.

13.4.12 The EA's 'Risk of Flooding from Surface Water' map shows that the risk of surface water flooding is confined to minor watercourses in areas to the east, north and south of the quarry boundary.

13.4.13 During mineral extraction, ponding may occur on the floor of the quarry void. It will be directed to sumps where it will be managed by the existing water management system. The overall risk of surface water flooding to the operational site, both existing and proposed, is considered to be very low.

13.4.14 The potential flood risk to and from the site is considered to be low and the anticipated water volumes can be readily attenuated on-site or managed by the continuation of use of the extant water management system. Therefore, no additional mitigation measures are required.

13.4.15 The 'first flush' of rainfall generally has a higher silt load than subsequent run-off. This initial flow will be naturally contained within the site. This will be achieved by intercepting groundwater ingress and incident rainfall and directing it to one or more sumps within the quarry void. The sumps will provide settlement capacity, reducing the suspended solid content of the water.

13.5 Potential impacts

13.5.1 The investigation discussed herein has produced a detailed understanding of the water environment in the vicinity of both quarries. An assessment of the potential effects of the proposed vertical extension on the water environment within the combined site areas and its surrounds has been undertaken. Operational and post-restoration scenarios have been considered. Mitigation measures and residual impacts have also been identified.

13.5.2 Small watercourses, springs and waterbodies occur within a 2 km radius of the site. The majority of these features are not supported by groundwater from the limestone bedrock. However, tracer testing demonstrated that although some springs are potentially linked to groundwater rising from limestone bedrock, one is connected to the proposed discharge points from the combined sites.

13.5.3 Considering the significant distance of these receptors from the site, in addition to the geological complexity and extensive geological faulting present within the area, drawdown of the local groundwater table and/or reduced baseflow to groundwater supported features is considered to be highly unlikely.

13.5.4 One licensed abstraction at Back Lane Quarry, and three private groundwater supplies at Northside Caravan Park, Stone Bridge Farm, and Elpha House to the north of the site, are made from the limestone bedrock. The supply at Back Lane Quarry is supported by dewatering water and is located within the proposed Planning Boundary, and has therefore not been considered further within this assessment. Considering the considerable distance of the other receptors from the site (between 1.6–1.7 km), in addition to the geological complexity and extensive faulting present within the area, drawdown impact on these abstractors is considered highly unlikely.

13.5.5 Dewatering has been undertaken at Back Lane Quarry for over 13 years and considerably longer at Leapers Wood Quarry. There have been no known water-related impacts linked to quarry operation or dewatering and there have been no incidents reported to the site operators. Dewatering, and hence any associated

potential impacts, will be time-limited, occurring only over the lifetime of the extractive phase.

13.5.6 The proposed water management strategy will return the majority of dewatering to the aquifer, down-gradient of the site via the Leapers Wood sinkhole, the Back Lane sinkhole and the Back Lane French Drain. This will mitigate any potential reduction in baseflow to groundwater-supported features located along the groundwater flow path within the limestone to the north and northwest of the site.

13.5.7 It is considered that there will be no discernible impacts to any of the identified environmentally sensitive sites, groundwater-supported surface water features or groundwater abstractions as a result of quarry operations.

13.5.8 On-going groundwater monitoring will allow continued assessment of the potential impacts from dewatering.

13.5.9 As with all quarries, their operation can pose a contaminant risk to the water environment through small-scale accidental release of hydrocarbons from mobile plant or chemicals used on-site. Water from dewatering will be discharged off-site. Potential therefore exists for impact on groundwater quality, and groundwater-supported surface water features, from suspended solids and chemical contamination.

13.5.10 Water from dewatering will be settled within a sump in the quarry void prior to discharge off-site. The discharge will be undertaken in compliance with the conditions of an Environmental Permit.

13.5.11 The currently applied spill prevention and emergency spill procedures will remain in place throughout mineral extraction to reduce the risk of hydrocarbons being released into the environment. All fuel and chemicals will be contained within a bunded storage area situated on hardstanding.

13.5.12 Spill kits will be available at key locations on the site and staff trained in their use. Shut-off valves will be installed on the dewatering pipelines, enabling temporary suspension of flow to the lagoons and discharge points until clean-up is achieved.

13.5.13 With the proposed mitigation measures in place, the potential impact on surface water quality due to chemical contamination is considered to be negligible.

13.5.14 Following completion of restoration, dewatering will cease and groundwater levels will recover, forming a waterbody within the quarry void. Its water level will be controlled passively, with discharge off-site limited to the greenfield rate.

Groundwater flows within the mass of the limestone will no longer be influenced by dewatering and will revert to pre-dewatering conditions. Excess water at the passive overflow(s) will be directed to one or more of the off-site discharge locations. The return of groundwater to the aquifer is such that there will be no quantitative impact to groundwater flows post-restoration.

13.5.15 After the completion of restoration works, mobile plant will be removed from the site, thereby removing all associated potential contamination sources.

13.5.16 The water level of the restoration waterbody will be gravity controlled, therefore no pumps or mobile plant will be required on-site post-restoration, and all contamination risk from hydrocarbons will be removed. The size of the proposed restoration waterbody will ensure that there is sufficient settlement to remove suspended solids prior to being discharged off-site.

13.6 Cumulative and In Combination Effects

13.6.1 Cumulative impacts are those which result from incremental changes caused by past, present or future reasonably foreseeable developments. Extraction from the Urswick Limestone Formation was formerly undertaken at Dunald Mill Quarry, located 540m south of the Back Lane and Leapers Wood combined site. Mineral extraction may recommence in the future, but it is not anticipated that this would be concurrent with the proposed development. Consequently, dewatering would not occur simultaneously at both sites and the potential cumulative impacts do not require consideration.

13.7 Mitigation measures

13.7.1 The existing groundwater level monitoring regime will continue. Boreholes that are damaged or lost will be replaced. Monitoring will be conducted monthly and records held on-site.

13.7.2 As with all quarries, there is a risk of small-scale accidental release of chemicals or hydrocarbons from mobile plant or other chemicals used on-site. Adherence to best practice pollution control measures will continue to be employed, thereby ensuring that any residual risk from hydrocarbon or chemical spills will be removed.

13.7.3 As it is considered that there is no risk posed to the water environment from the site post-restoration, mitigation measures are not required.

13.8 Summary

13.8.1 Future mineral extraction is proposed to -37mAOD within a single quarry void. The volume of water entering the quarry void will increase with depth and be derived from three sources: direct rainfall, diffuse flow from the mass of the limestone and conduit flow from truncated karst features. The maximum theoretical volume of water that could occur within the karst system, and that could potentially enter the quarry void, has been calculated. The ingress would be managed via dewatering, with discharge to ground via the Leapers Wood sinkhole, the Back Lane lagoon sinkhole and the Back Lane French Drain, either individually or in combination.

13.8.2 The characteristics of the local groundwater regime within the limestone are influenced principally by topography, geological structure and the hydrogeological characteristics of the different rock types present, including karst features. The overall groundwater flow direction in the immediate vicinity of the quarries is west-northwestwards. The majority of groundwater within the limestone is discharged to a spring located 1.5km to the north of the site. The resultant water discharges to a tributary of the River Keer.

13.8.3 Dewatering of the quarry void will continue, to permit safe and efficient mineral extraction. This will cause temporary lowering of the groundwater table in the vicinity of the site. By returning the majority of water to the aquifer, down-gradient of the site, any reduction in groundwater levels or baseflow to the north and northwest of the site will be mitigated.

13.8.4 Upon cessation of mineral extraction active water management will cease and the quarry void will start to fill with water. Passive outfall structures will be constructed to convey water to the existing discharge points. The design water level of the restoration waterbody is 45mAOD.

13.8.5 Based upon the proposed water management and the characteristics of the structural geology, it is considered that there will be no discernible impacts to any of the identified environmentally sensitive sites or groundwater-supported surface water features or groundwater abstractions. Continuation of the existing groundwater level monitoring regime is proposed.

13.8.6 The implications for flood risk associated with the proposed development have been assessed. The current discharge routes will continue to be used for the duration of mineral extraction. Volume calculations, including allowance for climate change effects, indicate that the total discharge can be restricted to the

greenfield run-off rate throughout the proposed development. During storm events water would be stored temporarily within the quarry void. The latter provides massive flow balancing capacity, thereby allowing subsequent discharge to be undertaken at a controlled, appropriate flow rate.

13.8.7 During the extractive phase, sumps within the quarry will ensure that there is sufficient settlement provision to remove suspended solids from the discharge. Adherence to pollution control and best practice measures are such that there will be no risk of pollution from the accidental release of contaminants. With the proposed controls and mitigation in place, it is anticipated that there would be no discernible impacts to water quality as a result of the proposals.

13.8.8 Future mineral extraction and dewatering may occur at Dunald Mill Quarry but it is not anticipated that this would be concurrent with the proposed development at Leapers Wood and Back Lane Quarries. Consequently, dewatering would not occur simultaneously at both sites and cumulative impacts would not arise.

14 CLIMATE CHANGE

14.1 Introduction

14.1.1 The national Planning Practice Guidance explains why it is important for planning to consider climate change and states that effective spatial planning is an important part of a successful response to climate change as it can influence the emissions of greenhouse gases. It urges Planning Authorities to ensure that the protection of the local environment is considered alongside the broader issues of protecting the global environment.

14.1.2 Addressing climate change is now one of the core land use planning principles which the NPPF expects to underpin both plan-making and decision taking. This chapter considers the potential effects of climate change on the proposed development and sets out the mitigation measures proposed to minimise the likelihood of significant environmental effects. It also considers how the proposed development can minimise its contribution towards climate change through, for example, reducing emissions and energy consumption.

14.2 Policy and Legislative Context

14.2.1 The Development Plan contains policies and text relating to climate change adaption and mitigation. Lancaster District Council's Local Plan Part One 2011-2031 (Strategic Policies and Land Allocations DPD) Policy SP8 'Protecting The Natural Environment' states:

'Lancaster District is not immune to the effects of Climate Change, in particular the associated risks from extreme weather events and increasing levels of rainfall. The Local Plan has been prepared in consultation with the Environment Agency, Lancashire County Council (the Lead Local Flood Authority for Lancaster district) and United Utilities to ensure that flood risk issues are clearly considered and flood resilience is addressed. The impacts of future growth will not create new flooding issues or exacerbate existing problems and seeks to reduce flood risk overall……. The Council will continue to work with all relevant partners to address issues of flood risk, whether from river, sea or other sources, to implement schemes that will reduce overall flood risk or better manage the continuing effects of Climate Change. Development proposals in areas of known flood risk will be expected to consider their direct and indirect impacts on flooding and include appropriate mitigation measures to ensure water is managed correctly.'

14.2.2 Paragraph 10.9 of the Local Plan explains:

'Climate change remains a key issue for the Local Plan to address. This can be achieved through supporting schemes that seek to promote more sustainable forms of transport, sustainable construction methods, the delivery of low carbon and renewable energy, increases and enhancements to green infrastructure, and ensuring that development is adequately protected from flood risk……The district has suffered from extreme weather events and flooding – December 2015 saw significant flooding occur along the River Lune especially to property in Lancaster and Halton and further events in the South Lancaster, Galgate and Halton occurred in November 2017. The Local Plan has been prepared with these risks in mind, with allocations made on land that is not vulnerable to future flooding and with an expectation that development should be designed in such a way as to not create new flooding issues in future or exacerbate current problems'.

14.2.3 In terms of the national planning policy position, chapter 14 of the NPPF 'Meeting the challenge of climate change, flooding and coastal change' sets out the policy relating to the need to plan for climate change. Paragraph 157 of the NPPF states that '*the planning system should support the transition to a low carbon future in a changing climate, taking full account of flood risk and coastal change. It should help to: shape places in ways that contribute to radical reductions in greenhouse gas emissions, minimise vulnerability and improve resilience, encourage the reuse of existing resources, including the conversion of existing buildings; and support renewable and low carbon energy and associated infrastructure*.'

14.3 Baseline Conditions

14.3.1 Leapers Wood Quarry includes an operational limestone quarry, mobile plant, areas of stockpiling, site offices and associated car parking.

14.3.2 The site lies entirely within Flood Zone 1 which is defined as land with the lowest risk of flooding (i.e. land with less than a 0.1% or 1 in 1,000 annual probability of river or sea flooding).

14.3.3 The current quarry is worked dry and the site is therefore dewatered by pumping groundwater from a sump within the quarry void. The risk to the site from groundwater flooding is therefore considered to be very low.

14.4 Integrated Mitigation

14.4.1 The Applicants have fully committed to supporting the UK's ambition of net-zero carbon emissions by 2050 and are making progress across the business and supply chain, using a whole life-cycle approach to design CO_2 out of products and services. This includes:

- working with suppliers to reduce CO_2 from the goods and services Tarmac purchase;
- cutting CO_2 from operations and transport; and
- innovating lower CO_2 products, services and solutions that reduce CO_2 from the construction process or during the use of infrastructure and buildings.

14.4.2 In terms of vehicles and emissions, since the Euro VI emission standards came into force in 2014, all vehicles supplied after September 2014 must comply with the Euro VI requirements. The Company has been strategically replacing HGVs older than 2014 within the fleet at Leapers Wood Quarry.

14.4.3 Mobile and static plant currently used within the quarry are typically diesel powered. The technology associated with electric plant and equipment is developing at a fast pace and it is considered likely that, over the next few years, the use of electric powered plant and equipment will become more viable. The Applicant is closely monitoring the technological improvements and performance of electric powered plant and equipment and is committed to switching from diesel powered plant in the future.

14.4.4 Whilst the site lies within Flood Zone 1 and is therefore at a low risk of flooding from tidal or fluvial sources, there is a need to consider the risk from changes in groundwater levels associated with greater recharge resulting from increased rainfall. The site would continue to be dewatered for the duration of mineral extraction works. This would manage any risks associated with flooding from groundwater sources.

14.5 Assessment of Environmental Effects

14.5.1 Whilst national planning policy states that new development should be located so as to reduce greenhouse gas emissions, minerals are a finite resource that can only be worked where they are found (NPPF).

14.5.2 The proposed development comprises the deepening of the existing mineral extraction operations as well as an extension to the life of the site to allow for the additional extraction activities to be completed.

14.5.3 In terms of carbon emissions and potential effects on climate change, it would be necessary to continue the use of mobile plant to extract the mineral and transport it to the on-site processing facility located in the west of the site. Whilst the proposed development would result in the site being operational for an extended period of time, it would not intensify in the number of mobile plant movements. Given both the currently permitted and proposed timescales for mineral extraction and restoration of the site, it is considered reasonable to assume that technology relating to the viability and performance of electric mobile plant would remove the need for diesel mobile plant to be used on site. The use of electric mobile plant and equipment would significantly reduce the carbon footprint associated with the use of mobile plant and machinery.

14.5.4 Limestone is currently processed on site using aggregate wash plants and screens which are powered by diesel generators. The proposed development would extend the period of time over which the plant and machinery are used but would not result in any significant changes to the use of the processing plant. As with the mobile plant and machinery described above, it is considered reasonable to assume that during the extended operational period, electric powered static plant and machinery would be introduced and eventually be procured as the industry standard. This would significantly reduce the carbon footprint associated with the processing of limestone on site.

14.5.5 In terms of the transportation of limestone from the site, it is not possible to transport materials to or from the site using sustainable modes of transport, for example rail or water. However, it is proposed that the output rate would continue at approximately 0.8mtpa. Therefore, the proposed development would only extend the period of time for the mineral extraction activities and would not result in an intensification in the number of HGVs entering and leaving the site. As discussed above, given both the currently permitted and proposed timescales for mineral extraction, it is considered reasonable to assume that technology will be developed to enable electric HGVs to be logistically and commercially viable for the Applicant's vehicle fleet. The Applicant is already committed to upgrading its commercial fleet of HGVs to minimise the company's carbon footprint and the use of an electric fleet of vehicles in the future would significantly reduce the carbon

emissions associated with the transportation of mineral from Leapers Wood Quarry.

14.5.6 As the proposals would result in the joint boundary between Leapers Wood Quarry and Back Lane Quarry being worked to a depth of -37mAOD, it has been necessary to prepare a revised restoration scheme which encompasses both quarries. However, the revised scheme would not result in a requirement to import restoration materials and would not result in any significant change to the carbon emissions associated with the restoration of the site. Whilst there would be no requirement for inert restoration materials to be imported to the site, the proposed planting and landscaping would result in a relatively small number of vehicles delivering landscaping materials and planting specimens to the quarry. However, these vehicles would also be required to deliver materials for the currently approved restoration scheme and would not therefore represent a significant change in the number of vehicles. As far as possible, the use of larger bulk haulage vehicles would be encouraged to deliver restoration materials to the site, in order to minimise the number of vehicle movements and wherever possible, material would be sourced from local projects in order to minimise vehicle mileage. Furthermore, given the proposed timescale for the complete restoration of the site (i.e by 2078) it is reasonable to assume that electric vehicles would be in commercial use, as standard. This would significantly reduce the carbon emissions associated with the restoration of the site.

14.5.7 In order to minimise emissions associated with their use, all mobile plant and machinery would be regularly serviced and maintained and would be switched off when not in use. Diesel powered mobile plant would be replaced with electric powered plant as soon as the technology and performance allows.

14.5.8 The effects of climate change and the vulnerability of the development proposal to these changes has been considered as part of the preparation of the EIA, particularly in terms of hydrology/ flood risk and ecology (i.e. the impacts of climate change on habitats and species).

14.5.9 The development proposal would not result in any significant impacts with respect to hydrology, hydrogeology or flood risk even when taking account of the predicted likely effects of climate change.

14.5.10 The proposed development would result in the creation of a lake feature with areas of shallows and reedbeds around the periphery. The proposed restoration would

provide enhancements to the ecological value of the site, creating new habitats which would be sustainably managed and maintained throughout the aftercare period. As the lake's aquatic vegetation would benefit from occasional inundation by flood water, it is considered that the effects of climate change, for example increased rainfall, an increased risk of flooding or higher ambient temperatures, would not have any significant direct or indirect environmental effects on the restored site which is classed as 'water compatible development' within the NPPF/PPG.

14.5.11 Taking into consideration the extensive mitigation measures which are integrated into both the current and proposed site operations at Leapers Wood Quarry, it is considered that the proposed development would not have any significant environmental effects in terms of climate change.

14.6 Cumulative and In-Combination Environmental Effects

14.6.1 Back Lane Quarry lies immediately adjacent to the application site. Given the nature and scale of the mineral extraction activities within Back Lane Quarry, and its proximity to Leapers Wood Quarry, the potential for cumulative and in-combination effects has been considered.

14.6.2 Back Lane Quarry currently has permission to extract limestone to a depth of 38mAOD, with a permitted end date of 29 April 2048 for mineral extraction and of 29 April 2049 for restoration. A planning application has been prepared, and is due to be submitted to the MPA, which seeks permission for the deepening of mineral extraction operations to a depth of -37mAOD with an extension of time for mineral extraction until December 2077 and restoration until December 2078. The current activities and proposed development at Back Lane Quarry are therefore similar to those at Leapers Wood Quarry, but with slightly longer timescales for mineral extraction and restoration.

14.6.3 As with the proposals at Leapers Wood Quarry, the operations at Back Lane Quarry require the use of mobile plant and machinery to excavate limestone and transport it to its on-site processing plant. HGVs transport the processed mineral from the site. Currently the majority of HGVs and mobile plant and machinery (including the processing plant) are diesel operated. The proposed development at Back Lane Quarry would result in a deepening of mineral extraction operations and an extension of time over which the quarry would be worked and restored. However,

it would not result in any changes to the extraction rate and therefore there would not be an intensification in the use of mobile plant or HGV movements.

14.6.4 It is considered that in the medium to long term, both Back Lane Quarry and Leapers Wood Quarry will be operated using electric mobile plant and machinery as diesel generated plant is phased out. Furthermore, whilst HGVs associated with the sites are currently diesel operated, it is also considered reasonable to assume that electric HGVs will be used as standard in the future. The cumulative and in-combination effects on climate change associated with the operation of plant and machinery and transporting mineral using HGVs in order to deepen the quarries and operate both sites beyond the currently permitted end dates, are not therefore considered to be significant.

14.6.5 Back Lane Quarry also lies within Flood Zone 1 and the quarry is also worked dry through dewatering of the quarry void. The current and proposed site activities within Back Lane Quarry would not have any cumulative effects in terms of the risk of flooding at Leapers Wood Quarry, or off site within the surrounding area.

14.7 Additional Mitigation

14.7.1 Given the level of mitigation which is integrated within the current and proposed site operations at Leapers Wood Quarry, as well as the Applicant's commitment to the continual improvement of its activities across all business units, it is considered that there is no requirement for additional mitigation.

14.8 Conclusions

14.8.1 In terms of the effects on climate change, taking the above considerations into account, it is evident that the proposed development represents an appropriate continued use of the site whilst avoiding increased vulnerability to the range of impacts arising from climate change.

15 LAND STABILITY

15.1 Introduction

15.1.1 This chapter deals with the stability of the proposed vertical extension of Leapers Wood and Back Lane Quarries and drawings and stability analyses are enclosed at Technical Appendix K.

15.1.2 Leapers Wood Quarry is operated by Tarmac and Back Lane Quarry is operated by Aggregate Industries UK Limited and the quarries are worked independently of each other, however, the final design is for a single combined excavation. The quarries extract Carboniferous Limestone and it is proposed to extend both quarries to a depth of -37mAOD.

15.1.3 The M6 Motorway is situated approximately 250m west of the western boundary of both quarries. There is an inactive waste tip situated beyond the crest of the western slope of Leapers Wood Quarry (which is situated approximately 200m to the east of the M6).

15.1.4 The current excavations at Back Lane and Leapers Wood Quarries extend to a floor elevation of approximately 55mAOD and 45mAOD respectively. The proposed floor elevation of the final combined excavation will be -37mAOD, resulting in a maximum overall depth of excavation of approximately 115m.

15.2 Policy and Legislative Context

15.2.1 Regulation 6 of The Quarries Regulations 1999 requires that the operator take the necessary steps to ensure, so far as is reasonably practicable, that the quarry and its plant are designed, constructed, equipped, commissioned, operated and maintained in such a way that persons at work can perform the work assigned to them without endangering their own health and safety or the health and safety of others.

15.2.2 Regulation 30 of the Quarries Regulations 1999 requires that the operator shall ensure that excavations and tips are designed, constructed, operated and maintained so as to ensure that instability or movement, which is likely to give rise to a risk to the health and safety of the any person, is avoided.

15.3 Site Overview

15.3.1 The quarries are worked in a series of benches using conventional drill and blast techniques with hydraulic excavators and dump trucks. The proposed final design

is shown on Drawing No. 8345-002-01. The excavation profile employed has been used throughout the life of both quarries with only localised modifications necessary from time to time to suit site conditions and with no significant issues relating to instability.

15.3.2 The historical inactive waste Tip No.1 is situated behind the crest of the west slope at Leapers Wood Quarry. The tip has been in existence since the mid 1990s and there has been no recorded evidence of instability associated with the structure. The historical West Tip is situated to the north east of the Back Lane Quarry offices. The tip has been restored since before 2005 and there has been no recorded evidence of instability associated with the structure.

15.4 Proposed Extension Design

15.4.1 A series of phased development designs have been prepared for the combined excavation at Leapers Wood and Back Lane Quarries which are referred to as Phases 1 to 5. Individual LSS models have been provided for each of the phases. The final design phase has been used as the basis of this assessment, see accompanying LSS model entitled: 'Ph5 10 TAC Back Lane 06 Excavation A1 Exhausted and Removal of Tarmac Ramp' (see Technical Appendix K).

15.5 Geology

15.5.1 The sites are covered by BGS Geological Map Sheet 59 Lancaster Solid and Drift Edition (1:50,000).

15.5.2 Leapers Wood and Back Lane Quarries extract Urswick and Park Limestone Formations, which belong to the Lower Carboniferous Series. The Urswick Limestone is described by the BGS as a pale, massive, thickly and well-bedded grainstones or calcarenites, with scattered partings and thin beds of grey and varicoloured clay. The Park Limestone is described as unbedded or poorly bedded, pale grey bioclastic and peloidal grainstone or biocalcarenite, which is partially dolomitised.

15.5.3 The geological sheet for the area shows the site to be located within the Leapers Wood Anticline, which has a north – south trending hinge line and a southerly plunge of 5°.

15.5.4 A number of north-west to south-easterly trending faults are also shown on the geological sheet and have been encountered in the mineral excavations, these are generally inclined towards the north at between 60° and 80°. Several of the faults

are associated with shatter zones, calcite mineralisation and solution cavities.

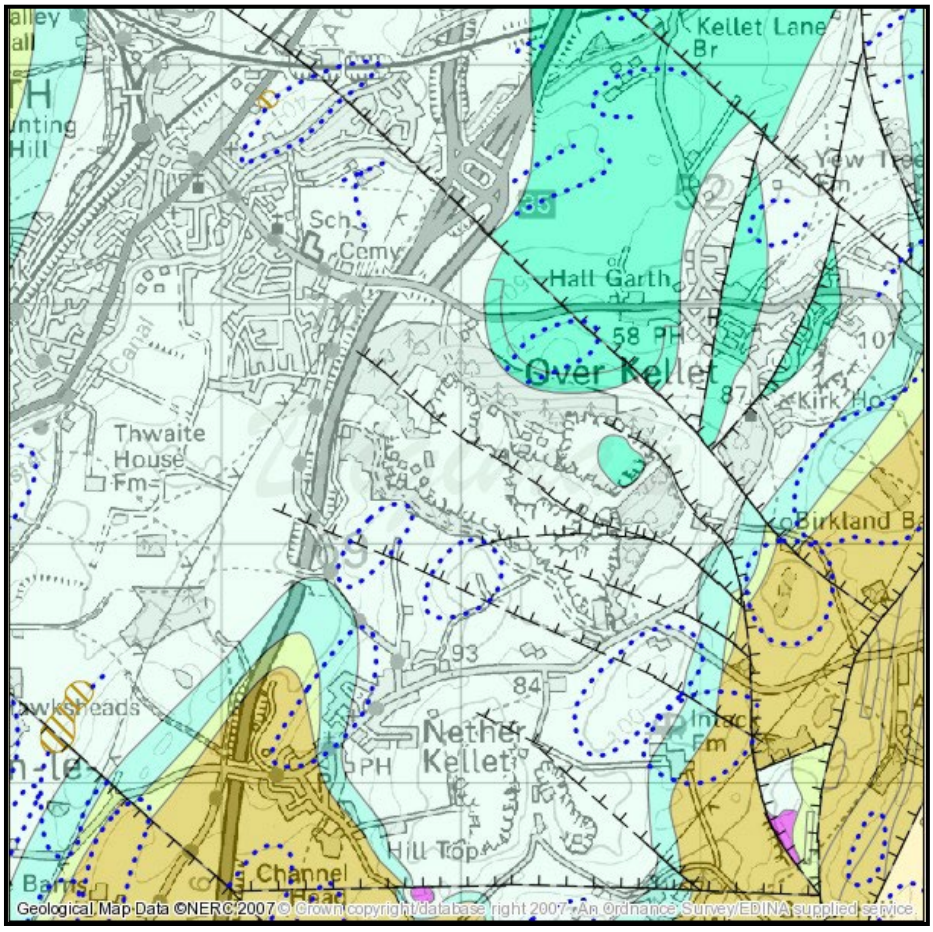


Figure 15.1: Site Geology (C08/027-CSL British Geological Survey. ©NERC. All rights reserved. Reproduced from Sheet 58 by permission of the British Geological Survey. © NERC. All rights reserved)

15.5.5 The north slope of Leapers Wood Quarry follows a line roughly perpendicular to the axis of the North -South trending geological anticline which dominates both sites. The apparent dip of bedding on the western limb of the anticline in the top of the highwall is about 15° to 20° due west southwest. Lower down the highwall slope, an additional component of dip becomes more obvious which averages about 5° due south. This represents the plunge of the anticline.

15.6 Site Investigations

15.6.1 There is a large record of site investigation data that was made available to KGS for the purpose of this assessment for Leapers Wood Quarry and limited amount of data for Back Lane Quarry. A series of exploration boreholes have been drilled at Leapers Wood Quarry, the original phase of drilling was undertaken in 1995, with further phases of drilling being undertaken in 1997 and 2019. The borehole

locations are shown on Drawing No. 8345-002-04 within Technical Appendix K.

15.6.2 The 2019 boreholes predominantly identified light bluish grey strong medium to coarse limestone with zones of brecciated mottled limestone. The minimum elevation proved by the boreholes was c.-24m AOD (BH05) and the proposed final elevation of the combined quarry excavation floor will be -37m AOD.

15.6.3 It is noted that there are no available borehole records to prove ground conditions below the c.-24mAOD elevation to the proposed base of the final excavation at -37mAOD elevation. However, information from the Aggregate Industries' Geology Department indicates that both quarries are located in the Upper Urswick Limestone and a prominent marker horizon, the Woodbine Shale, divides the Upper Urswick Limestone from the Lower Urswick Limestone. No evidence of the Woodbine Shale was observed in BH 4/98 which was terminated at an elevation 0mAOD.

15.6.4 Aggregate Industries work the Lower Urswick Limestone at the nearby Holme Park Quarry and borehole evidence from there suggests there is at least 50m of aggregate quality limestone (Lower Urswick and Park Limestone) below the Woodbine Shale. Thus, for the purpose of this assessment it is assumed that the limestone sequence identified within BH05 will extend to beyond the proposed base of the final excavation at -37m AOD.

15.6.5 Copies of the 2019 borehole logs are presented in Technical Appendix K. A geological characteristic of both sites is the presence of discrete persistent, weak, red clay bands within the overall limestone sequence at Leapers Wood Quarry (identified within the north slope) and shale bands within the north and south slopes at Back Lane Quarry.

15.6.6 Visual observations do not indicate the presence of significant argillaceous horizons within the west quarry faces (much of the limestone sequence which contains these horizons has now been extracted). Furthermore, the 2019 borehole logs do not indicate the presence of such horizons.

15.6.7 The 2019 boreholes were televiewed and discontinuity measurements extracted from the digital data by European Geophysical Services Limited in 2023.

15.6.8 A series of six cored boreholes were carried out at Back Lane Quarry (Nos. 1/98 to 6/98) in February 1998 to primarily determine the degree and extent of dolomitisation of the limestone. The details of the investigation can be found in Scott Doherty Associates Geotechnical Assessment Report dated 2001 (see

Drawing No. 10-120-D-001 which shows the borehole locations).

15.6.9 Extensive geological mapping and discontinuity measurement have been carried out at both quarries by KGS for the purpose of Geotechnical Assessment Reporting[16] under the requirements of The Quarries Regulations 1999.

15.6.10 Additionally, 12 trial pits were excavated at the site of the proposed extension at Tip No.1 in 1993, the findings of which are summarised in the Wimpey Minerals Report dated 1994 (see Section 15.9).

15.6.11 Review of British Geological Survey GeoIndex borehole records within the vicinity of the site did not provide any additional relevant ground information.

15.7 Groundwater

15.7.1 The current water table is understood to be located at c.45mAOD elevation at the western margin of the excavations at Back Lane and Leapers Wood and de-watering is necessary to maintain a dry excavation. In general a small number of higher face exposures show evidence of seepages along discontinuity planes and within fissure / cavity zones although, where observed, flow rates appear low and irregular. There are no surface watercourses or water bodies within or immediately adjacent to the quarry boundary.

15.8 Geotechnical Structure

Back Lane Quarry

15.8.1 The main structural feature is a shallow dome situated in the north-central part of Back Lane Quarry. Measurements taken by Scott Doherty Associates (SDA) in 2001 and 2003 show that the strata are inclined at 5° to 10° (to the horizontal) towards the west, east and south. SDA reported that the strata dip increases to between 15° and 25° (to the horizontal) in the southern part of the Quarry. The two major joint sets identified by SDA are summarised in Table 15.1.

Joint Set	Dip	Azimuth
1	89°	089° (N – S Strike)
2	82°	005° (E – W Strike)

Table 15.1: Discontinuity Data

[16] KGS prepared the 2010 Geotechnical Assessment at Back Lane and continue to prepare the annual Geotechnical Assessment reports for Leapers Wood Quarry.

15.8.2 Additional discontinuity measurements recorded within the central and eastern parts of the quarry in 2010 by KGS are summarised below in the stereoplot which roughly confirms the SDA findings.

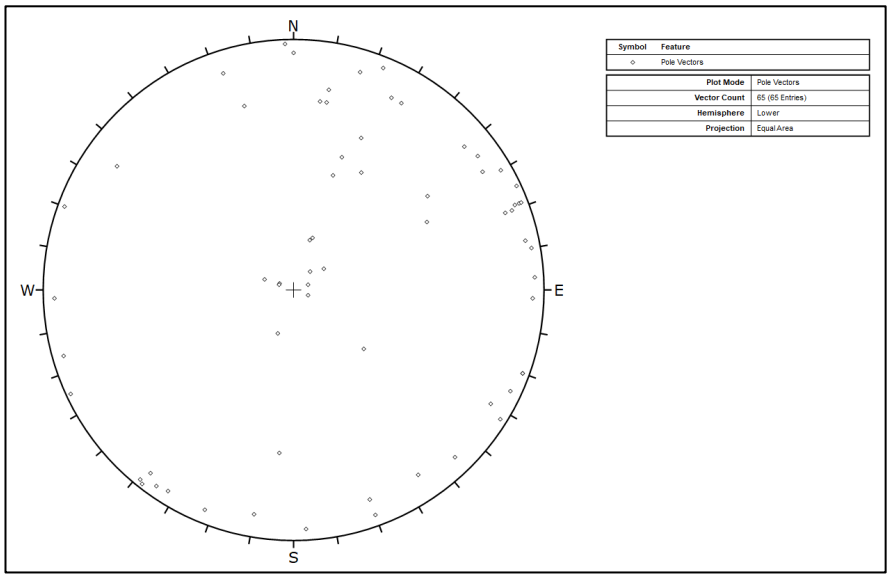


Figure 15.2: Summary Stereoplot of Discontinuity Data (after KGS 2010) Back Lane Quarry

Leapers Wood Quarry

15.8.3 Data shown on stereoplot (Figure 15.3) and Table 15.2 summarise the discontinuity data recorded during previous geotechnical inspections at Leapers Wood Quarry by KGS.

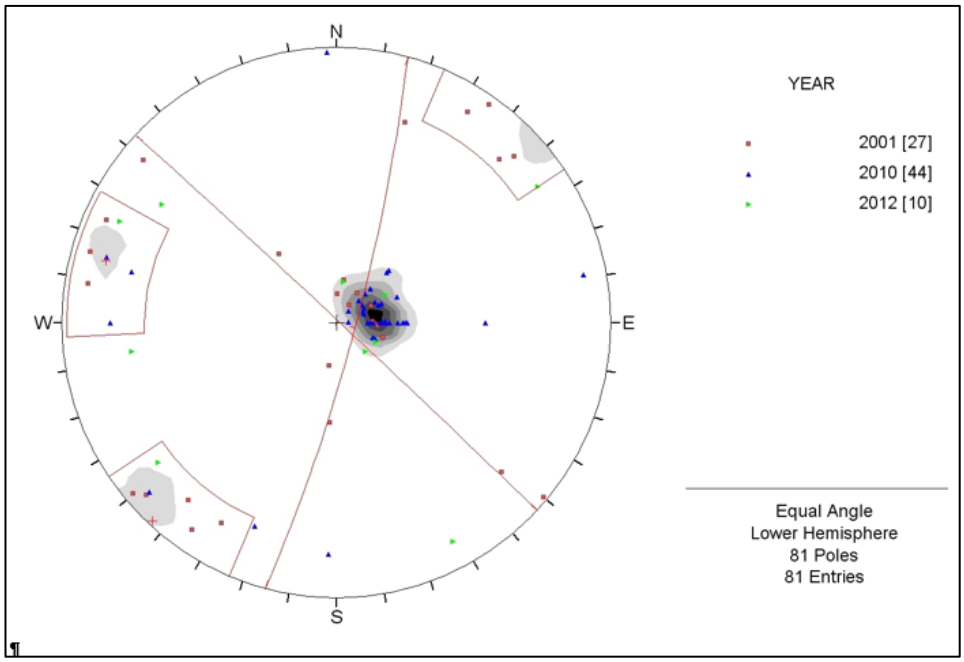


Figure 15.3: Contoured Stereoplot of Discontinuity Data (after KGS 2010) Leapers Wood Quarry

15.8.4 The mean dip and dip directions for the discontinuity sets are summarised in Table 15.2.

Discontinuity	Mean Dip/Dip Direction West Limb (West Quarry)	Mean Dip/Dip Direction West Limb (East Quarry)	Mean Dip/Dip Direction Axis of Anticline	Mean Dip/Dip Direction Eastern Limb
Bedding	18°/267°	15°/332°	12°/181°	12°/086°
Joint Set 1	81°/099°	85°/099°	-	85°/310°
Joint Set 2	84°/233°	77°/011°	89°/218°	89°/218°

Table 15.2: Discontinuity Data Summary Leapers Wood Quarry

15.8.5 The discontinuity data confirms the overall dip of the bedding at the site which dips mainly to the west and southwest within the vicinity of the western slope of the excavation. The rock mass at both quarries is characterised by predominantly sub-horizontal bedding planes bisected by two sub-vertical sets of discontinuities which are orientated approximately perpendicular to each other and result in a generally blocky structure.

15.8.6 Discontinuities are generally pervasive (often extending for the full height of quarry faces), planar to slightly undulating, rough and slightly dilated with little evidence of infill (apart from locally where argillaceous bands have been noted).

15.8.7 Boreholes BH01 and BH03 drilled in 2019 were televiewed and discontinuity measurements extracted. The borehole log for BH01 does not exist, however, the collar was situated at the upper level of the central part of the North Face. Borehole BH03 was situated at the toe of the west slope (approximate collar elevation 47m AOD).

15.8.8 The following stereoplot (Figure 15.4) summarises the representative discontinuity data recorded from BH01.

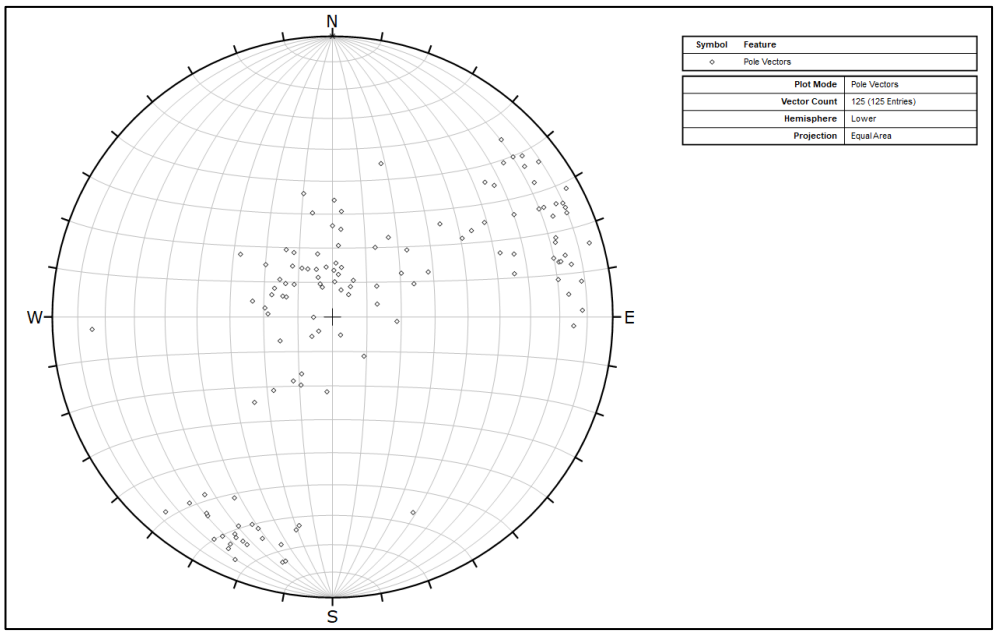


Figure 15.4: BH01 Contoured Stereoplot of Discontinuity Data (after KGS 2023) Leapers Wood Quarry

15.8.9 It can be seen that the pole distribution is not significantly dissimilar to that of the historical KGS data shown in Figure 15.3. The following stereoplot (Figure 15.5) summarises the representative discontinuity data recorded from BH03.

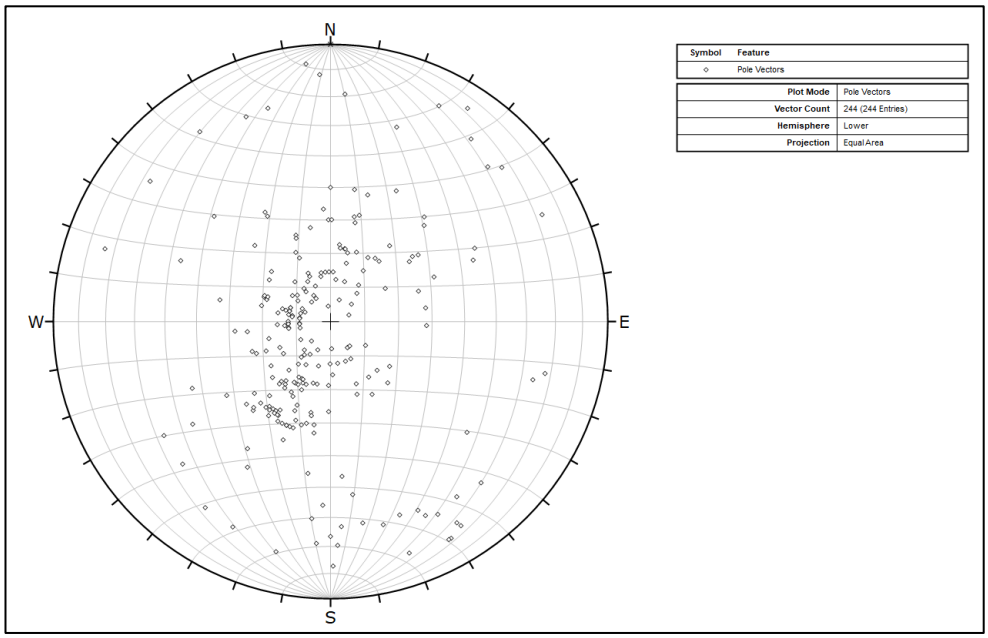


Figure 15.5: BH03 Stereoplot of Discontinuity Data (after KGS 2023) Leapers Wood Quarry

15.8.10 The pole distribution for discontinuities recorded within Borehole BH03 does not closely match the historical data or BH01 shown in Diagram 15.4, however, the

variation in the bedding dip direction may be explained by flexural cambering of the bedding along the western limb of the anticline. Furthermore, the discontinuity data shown in Diagrams 15.4 and 15.5 for Boreholes BH01 and BH03 did not identify many high angle discontinuities which are known to exist within the rock mass at both sites. This may be due to the fact that the boreholes were vertically inclined and thus did not intersect many of the sub-vertical discontinuities.

15.8.11 Thus, in order to provide a more representative discontinuity data set measurements from Boreholes BH01, BH03 and the historical data for Leapers Wood Quarry have been combined into a single data set. See Figure 15.6.

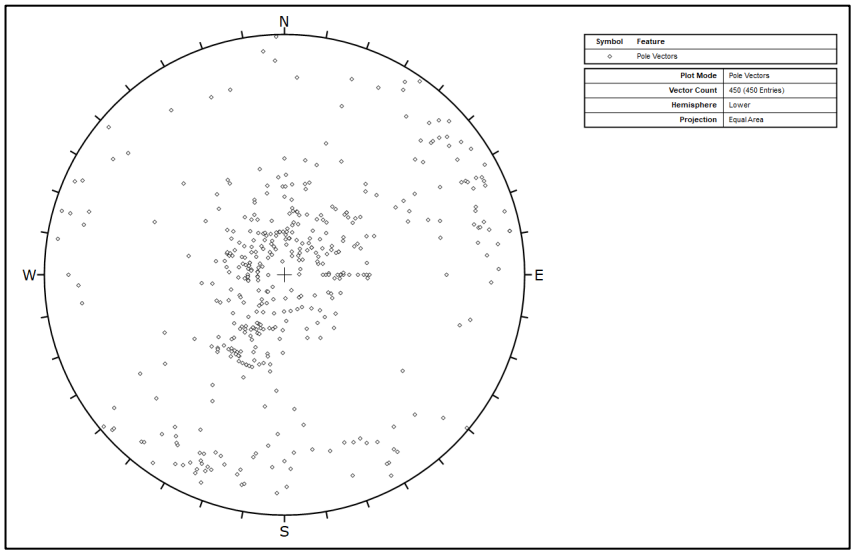


Figure 15.6: Combined Stereoplot of Discontinuity Data (after KGS 2010 and 2023) Leapers Wood Quarry

15.8.12 Given the similarity between the historical discontinuity data recorded at Back Lane and Leapers Wood Quarries and the proximity of the west faces at both excavations, it is considered appropriate to aggregate the above data set (see Figure 15.4) with the Back Lane Quarry discontinuity data (see Figure 15.2) for the purpose of the stability assessment of the western slopes. See Figure 15.7 below.

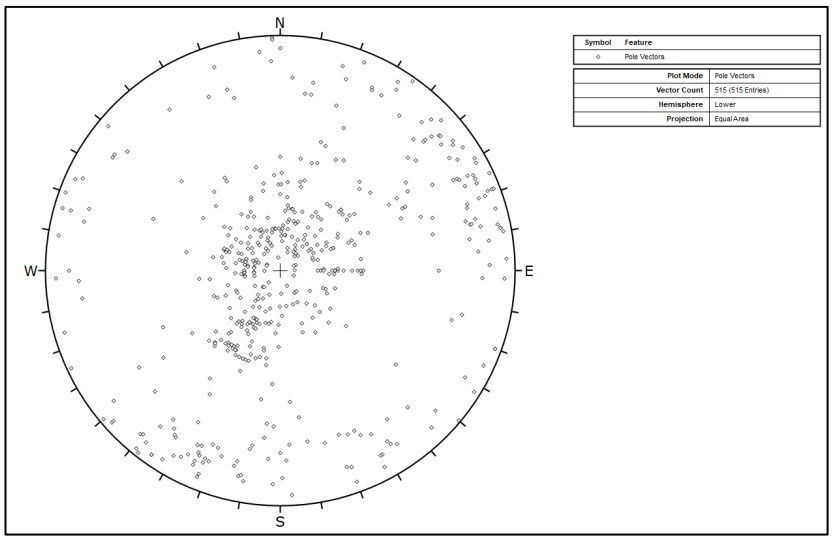


Figure 15.7: Combined Stereoplot of all Discontinuity Data (after KGS 2010 and 2023) Leapers Wood and Back Lane Quarries

15.9 Tip No.1 Ground Conditions

15.9.1 The ground profile on which Tip No.1 has been constructed has been interpreted from information within the 1994 Wimpey Minerals Drawing "Plan of Tip Area showing positions of exploratory holes" Drawing Ref: CBCGEO42/G1[17]. According to the reports, the materials deposited within Tip No.1 prior to 1994 are assumed to be quarry wastes, asphalt filler, concrete and tarmac waste. These were understood to have been tipped onto in situ glacial material (which was proven during a trial pitting exercise in 1994).

15.9.2 The 1994 Wimpey Minerals Report outlined the proposed future extension to Tip No.1 including the creation of an outer bund of competent material to buttress the weaker material placed within the centre of the tip. This design was never undertaken and the material tipped within Tip No.1 since 1994 comprised general quarry waste. The shear strength properties and distribution of the various material types within the body of the tip are not known. There are no boreholes within the area of Tip No.1.

15.9.3 In 1993, 12 trial pits were excavated as part of the ground investigation for the proposed extension to Tip No.1. The positions of these trial pits are located on Drawing No. 12-188-D-004 within Technical Appendix K. According to the 1994

[17] Mines & Quarries (Tips) Regulations Regulation 9 Report on Active Classified Tip at Wimpey Asphalt Ltd Leapers Wood Quarry and Wimpey Asphalt Ltd – Planning Statement for Extension to Leapers Wood Tip No.1 (April 1994) (MRM Partnership)

Wimpey Mineral report, the trial pits uncovered glacial deposits of sandy, silty clay with variable gravel and cobbles overlying the limestone bedrock.

15.9.4 There is no information regarding the pore water pressures within the tip, however, given the generally granular nature of the majority of the tipped materials and the age of the tip, drained conditions are assumed to prevail throughout the structure.

15.10 West Tip

15.10.1 The historical West Tip is located to the north-east of the Back Lane Quarry offices and is understood to have been completely restored prior to 2005, see Drawing No. 8345-002-01 within Technical Appendix K. There is little available historical geological information for the West Tip regarding the composition and distribution of the tipped materials and it is not considered feasible to carry out a meaningful stability assessment of the tip currently.

15.10.2 The western slope has been graded at between 1v:10h (5°) and 1v:3.5h (16°). Given the age of the tip it is assumed that drained ground conditions will prevail throughout the structure. Evidence from previous inspections indicates the vegetated western flank of the West Tip appears stable. Furthermore, it is understood that there has been no recorded historical instability associated with the tip structure.

15.11 Laboratory Testing

15.11.1 No site specific geotechnical laboratory testing information was available at the time of preparation of this report regarding rock discontinuity, shear strength properties and tip material shear strength parameters.

15.12 Blasting Impact

15.12.1 Blasting is undertaken in order to fragment the limestone at both quarries. Vibration limits are in place and strictly monitored as part of the geotechnical appraisal process and planning consent. Vibrations caused by the blasting have never caused any instability outside of the excavations. Furthermore, given the distance to the M6 Motorway, no allowance has been made for the impact of blasting vibrations on the long-term slope stability of the final combined quarry excavation (west slope) or Tip No.1.

15.13 Stability Assessment

15.13.1 This stability assessment addresses the stability of the west slopes at Back Lane and Leapers Wood Quarries, the stability of historical Tip No.1 at Leapers Wood and

how this relates to the nearby M6 motorway.

15.13.2 Kinematic analyses of the rock slopes and limit equilibrium analyses of the tip structure have been carried out.

Kinematic Analyses

15.13.3 The following provides a record of the assumptions relevant to the assessment of ground conditions relating to the stability of the proposed (vertical) extension to the excavation area at Leapers Wood and Back Lane Quarries.

15.13.4 Cross-sections 1-1' to 4-4' through the proposed final design for the excavation are shown on Drawing No. 8345-002-02 and are included at the rear of the stability assessment report (Technical Appendix K). The development proposals include deepening of the existing quarry to a maximum elevation of -37mAOD (approximate minimum current quarry floor elevation ranges between 58m and 45mAOD).

15.13.5 There are no known mine workings in the vicinity of the quarry. Localised evidence of caves (karstic features) have been recorded at both quarries.

15.13.6 Stability analyses have been undertaken to assess the final proposed west excavation slope orientations at the quarry only[18], these are as shown on the Tarmac LSS model entitled 'Ph5 10 TAC Back Lane 06 Excavation A1 Exhausted and Removal of Tarmac Ramp' 'which indicates the final excavation limits and proposed face azimuths (see Drawing No. 8345-002-02 within Technical Appendix K).

15.13.7 The salient details of the proposed final design for Leapers Wood and Back Lane Quarries are summarised below:

- Maximum final floor level of -37mAOD resulting in overall west slope heights of the order of 115m (maximum);
- Individual face height 15m; and
- 7.5m wide intermediate benches formed at an inclination of 70° and 75° to the horizontal.

15.13.8 It is assumed that all final faces will be left in as clean and stable condition as possible; free of all loose rock debris and with minimal fracturing and dilation of natural discontinuities caused by the effects of blasting and/or mechanical excavation. Furthermore, it is assumed that the faces will not be subject to

[18] It is considered that the other quarry faces will have no bearing on the stability of the west slope and the M6 Motorway.

excessive groundwater pressures.

15.13.9 It is understood that restoration of the combined final excavation will be to open water and when dewatering of the void ceases the excavation will be allowed to flood. It is anticipated that overtopping of the void will occur at the c.52m AOD elevation at this time.

15.13.10 Kinematic analyses have been carried out for the proposed combined final design for Back Lane and Leapers Wood Quarries based on the aggregated discontinuity set described in Section 15.5 (see stereoplot of the aggregated discontinuity data set).

15.13.11 The following final face azimuths have been assessed:

- West Face 1 (azimuth = 077°)
- West Face 2 (azimuth = 095°)
- West Face 3 (azimuth = 110°)
- West Face 4 (azimuth = 120°)
- West Face 5 (azimuth = 155°)
- West Face 6 (azimuth = 181°)

15.13.12 The proposed face orientations and final design are shown on Drawing No. 8345-002-03.

15.13.13 The analyses were undertaken using the Dips (Version 8.2) software (developed by Rocscience Inc.). The techniques adopted are presented in Matheson (1985)[19]. The angle of friction acting along the discontinuities has been taken as Ø = 35° (after Matheson 1983[20]). Final face angles of 70° and 75° have been adopted throughout the analyses.

15.13.14 Discontinuity analysis is used as a basis for assessment, to assist in the Engineers' judgement and interpretation of potential failure mechanisms. The results are based upon the general findings of the kinematic analyses and the judgement of the Geotechnical Specialist.

15.13.15 Details of the analyses are included at the rear of the report (Technical Appendix K) and summarised in Table 15.3.

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19 **Matheson, G.D. (1985)** The Stability of Slopes Exposing Rock. Proc. International Symposium on Failures in Earthworks, Institution of Civil Engineers, London.

20 **Matheson, G.D. (1983)** Rock Stability Assessment in Preliminary Investigations – Graphical Methods. Depts. of the Environment and Transport, Transport Research Laboratory, LR 1039.

Face	Azimuth	Potential Failure Mechanism			Face Angle
		Plane	Wedge	Toppling	
Northern Extension Area					
West 1	077°	Li	Li	Li-Mi	70°
West 2	095°	Li-Mi	Li	Li	75°
West 3	110°	Li	Li	Li	75°
West 4	120°	Li	Li	Li	70°
West 5	155°	Li	Li	Li	75°
West 6	181°	Li-Mi	Li	Li	75°

Table 15.3: Summary of Kinematic Analyses

Key:

Failure Potential: L = Low
M = Moderate
H = High

Severity (scale of failure): 1 = Major (potential for multi-bench failure)
i = Minor (potential for localised, bench-scale failure)

15.13.16 The findings of the analyses indicate a low potential for wedge and toppling instability from all proposed face azimuths for the western slopes.

15.13.17 The analyses also indicate a generally low to moderate potential for plane failure. However, it is noted that where plane failure is reported, it is anticipated to be associated with moderately steeply inclined discontinuities (and not bedding planes) and that as such, bench scale failures would likely occur during mucking of the blast pile.

15.13.18 Given the assumed ground conditions encountered at the site it is considered that the findings of the kinematic analyses indicate that the proposed structure will be overall stable and that there should be no adverse effect on the National Highways asset (M6).

Tip No.1 Stability Analyses

15.13.19 The Rocscience Inc. SLIDE software package was used to carry out stability analyses for the historical Tip No.1.

15.13.20 Limiting equilibrium theory has been used to assess the stability of the ground model. The theory estimates the resisting forces (for maintaining the stable slopes)

and disturbing forces (inducing the slopes to fail) within ground and then calculates the ratio of the resisting over the disturbing forces. This ratio is known as the Factor of Safety (FoS); a ratio greater than 1.0 indicating that the slopes are marginally stable or stable and values of less than 1.0 indicating that the slopes are or could become potentially unstable.

15.13.21 Within the tip structure analysed, rotational failure is considered to be the most likely form of instability. The stability of the relevant slip surfaces have been analysed using vertical slice limit equilibrium methods (using the Bishop simplified method). The Rust Environmental[21] design report indicates that the footprint area of the tip extension was to be benched. Although the waste materials were not placed in accordance with the specification, historical records indicate no evidence of translational sliding at the base of the tip and thus this condition has not been assessed given the relatively shallow topological gradient of the footprint area and the assumed shear strength of the foundation strata and tipped materials.

15.13.22 The following shear strength parameters have been assumed for the analyses:

Material[22]	Cohesion (C) kN/m²	Internal friction (Ø) degrees	Unit weight (ɣ) kN/m³
Tip Material	0	35	22
Glacial Drift	0	28	18
Limestone Bedrock	500	40	22

Table 15.4: Summary of Assumed Shear Strength Parameters

15.13.23 The shear strength and density parameters used have been assumed by KGS, based upon knowledge of similar materials and ground conditions elsewhere and with reference to outline parameters given in the HMSO Tips Handbook[22].

15.13.24 Groundwater conditions are as shown on the cross section 5-5' and 6-6', however, a pore water pressure coefficient of ru = 0.1 has also been assessed.

15.13.25 Stability analyses have been undertaken using Rocscience SLIDE v.6.0 and the results of the analyses are contained within Technical Appendix K and summarised

21 Rust Environmental Report for Leapers Wood Quarry Western Embankment (Nov 1995) Drawing No. ECMBLO33/G/7.

22 **HMSO (1991)** Handbook on the design of tips and related structures. Geoffrey Walton Practice, HMSO, London

in Table 15.5 below.

Slope Reference (Dwg No. 8535-002-001-002)	Comment	Minimum FoS	Summary Plot
Section 5-5'	Global stability, r_u = 0 and 0.1	1.70, 1.58	Figures 15.1 and 15.2
Section 6-6'	Global stability, r_u = 0 and 0.1	1.69, 1.50	Figures 15.3 and 15.4

Table 15.5: Summary of Stability Analyses Results Tip No.1

15.13.26 The results of the analyses indicate that the tip is overall stable and historical observations confirm this finding. A Factor of Safety value of c.1.50 is usually considered appropriate in such circumstances.

15.13.27 Given the ground conditions encountered at the site it is considered that the calculated Factor of Safety values are adequate for the as-built tip structure and that there should be no adverse effect on the M6 motorway National Highways asset.

15.14 Monitoring

15.14.1 Daily visual inspections of excavations are undertaken by Tarmac / Aggregate Industries personnel as required by The Quarries Regulations 1999 to identify any evidence of instability or variation in expected ground conditions.

15.14.2 Geotechnical Assessments by a Geotechnical Specialist would be undertaken throughout the life of extraction at both sites.

16 SOCIO ECONOMIC

16.1 Introduction

16.1.1 This assessment describes current economic and social conditions in the area around Over Kellet as a precursor to considering likely impacts on the local economy and its population if the proposed application is, or is not, approved.

16.1.2 No evaluation has been made of any effects on the existing social infrastructure (e.g. schools, health facilities etc.), which would be expected to be very small.

16.2 Legislation and Policy Context

16.2.1 The NPPF recognises the importance of minerals in paragraph 215 and states that '*it is essential that there is a sufficient supply of minerals to provide the infrastructure, buildings, energy and goods that the country needs. Since minerals are a finite natural resource, and can only be worked where they are found, best use needs to be made of them to secure their long-term conservation'*. It goes on to state, in paragraph 217, that '*when determining planning applications, great weight should be given to the benefits of mineral extraction, including to the economy'*.

16.2.2 Lancaster City Council's adopted Local Plan also acknowledges the economic value of mineral extraction in policy DM47 which supports, inter alia, *'essential operations for agriculture, horticulture, equine related activities, allocated mineral extraction or waste management facilities and essential infrastructure where there is a proven and justified need'*.

16.2.3 National and local planning policy supports the sustainable management of minerals, recognising that minerals represent a valuable but finite resource which, in many cases, should be safeguarded to avoid sterilisation from development. The economic and social contribution that minerals provide is thus acknowledged at both a national and local level.

16.3 Description of the Proposed Development Scheme

16.3.1 The proposal comprises a deepening of the currently permitted mineral extraction operations and an extension of time to allow the mineral reserves to be fully worked and the site restored. The proposal is fully described in both the application documents and this ES.

16.4 Geographical scope of assessment

16.4.1 The geographical scope of the assessment concentrates on the area most directly affected by the quarrying activities at Leapers Wood Quarry, which is located in the North West of England. It is defined by reference to geographical units for which economic and socio-economic data are available.

16.4.2 The quarry is located in the Halton-with-Aughton and Kellet electoral ward which is bordered by the following wards:

- Upper Lune Valley
- Lower Lune Valley
- Warton
- Carnforth
- Bolton and Slyne
- Skerton

16.4.3 Lancashire County forms the upper-tier authority and Lancaster City forms the lower-tier authority for administrative purposes.

16.5 Baseline local economic and socio-economic indicators

16.5.1 Economic and socio-economic data used to describe and understand the conditions around Leapers Wood Quarry can be gathered from several online sources including Office for National Statistics (ONS) and NOMIS which use Census data. Unfortunately, different sources use different geographical reporting units, and report data from different years. Nevertheless, taken in conjunction they provide a representative picture of the local economy.

16.5.2 Census data from the most recent census (2021) has been used.

16.6 Population and Employment

16.6.1 Halton-with-Aughton and Kellet Ward has a population of approximately 5,000 which represents approximately 9.5% of Lancaster District and 0.4% of the total population of Lancashire County.

16.6.2 Unemployment levels in Lancaster (3.2%) are lower than the UK average (3.5%) (ONS – 2021 Census), however the rates of employment are not consistent across the authority area.

16.6.3 According to the 2021 Census, the percentage of unemployed people aged 16 and over in Halton-with-Aughton and Kellet is 1.1% (ONS – 2021 Census). Looking at the

immediate surrounding area, the unemployment rates are as follows:

- Upper Lune Valley – 1.3%
- Lower Lune Valley – 1%
- Warton – 1%
- Carnforth – 1.7%
- Bolton and Slyne – 1.3%
- Skerton – 3.2%

16.6.4 The area around the site collectively has unemployment rates between 1% and 3.2%. The mean unemployment rate is 1.6%, which is lower than the district and the national average.

16.6.5 The latest ONS Statistical Bulletin (September 2023) shows a national unemployment figure of 4.3%, which is substantially less than the 2011 census records (7.4%). Using this figure, unemployment levels in the area surrounding the site are lower than the national average and the District average.

16.6.6 It should be noted that these latest employment figures are subject to some statistical variation due to operational changes made to the Labour Force Survey as a result of Covid-19 restrictions.

16.7 The role of minerals within the wider economy

16.7.1 It is necessary to turn to national data to obtain a better picture of the relative weight and importance of quarrying in the wider economy.

16.7.2 Table 16.1 below provides data on gross value added (GVA) and employment, by sector of the economy. Gross value added (GVA) is defined by the Office for National Statistics as 'The value generated by any unit engaged in production, and the contributions of individual sectors or industries to gross domestic product. It is measured at basic prices, excluding taxes less subsidies on products.' GVA provides a good measure of economic productivity, together with the calculated GVA per employee. This last column of figures is important for any assessment of the effects of changes in quarrying output.

16.7.3 Employment data in Table 16.1 is based on Labour Market Figures from the Office for National Statistics published in 2023. The GVA figures are latest available and are taken from the 'Regional gross value added (balanced) by industry: all ITL regions' dataset. Employment figures are from the Office of National Environmental Statement Page | 356 Statistics dataset 'JOBS02 Workforce jobs by

industry (not seasonally adjusted) – Figures for September 2023'.

16.7.4 The datasets provide current data from 2023 and, therefore, the figures are sufficiently compatible to provide the general impression of the value of GVA and employment market for different sectors.

Industry Sector	GVA at Current Basic Prices (£ Million) ONS Blue Book 2023	Employment (,000) ONS Workforce Jobs by Industry (not Seasonally Adjusted) September 2023	GVA per Employee (£)
Agriculture	16,206	405	£40,015
Production (Include Mining manufacturing and utilities shown in boxes below)	259,522	3,051	£85,061
Mining and quarrying	14,584	53	£275,170
Manufacturing (figures form part of the 'Production' figures)	197,646	2,611	£75,697
Electricity, gas, steam and air conditioning supply / Water supply, sewerage, waste mgmt and remediation (figures form part of the 'Production' figures)	47,292	387	£122,202
Construction	119,920	2,248	£53,345
Distribution, hotels transport and restaurants	335,709	9,358	£35,874
Information and communication	131,244	1,671	£78,542
Financial and insurance	185,434	1,151	£161,107
Real estate	266,136	686	£387,953
Professional and support	264,877	6,601	£40,127
Government, health and education (incl. defence)	405,455	9,537	£42,514
Other Services (incl. Art, entertainment, recreation, Other Service activities et al)	62,133	2,052	£30,279
Totals All Industries	**2,046,636**	**31,055**	**£65,904**

Table 16.1: Structure of the UK Economy

16.7.5 As can be seen, with the exception of real estate, the extractive industries are much more capital intensive than any other sector of the British economy, with very high levels of labour productivity (measured by GVA per employee) as a consequence.

16.7.6 Table 16.2 below shows how the different sectors of the British economy interact with each other. Each column in Table 16.2 shows where the particular sector of the economy spent its money (on both capital investment goods and operating costs) in order to generate its own outputs. These purchases of goods and services are known as 'intermediate consumption'. Thus, for example, it shows that in order

to produce a GVA figure of £14 billion (see Table 16.1), the mining and quarrying sector purchased a total of £5 billion's worth of intermediate consumption, with spending particularly high in the transport and construction sectors.

	Agriculture	Production	Construction	Distrib, transport, hotels etc	Information & communication	Financial and insurance	Real estate	Professional and support activities	Gov, health & education	Other services
PRODUCTS										
Agriculture [A]	6 246	17 458	-	618	-	2	65	-	80	63
Production [B-E]	8 409	367 066	57 463	99 070	16 041	8 583	5 463	26 135	75 138	14 615
Other Mining & Quarry Products	*-*	*3102*	*1873*	*10*	*-*	*1*	*21*	*190*	*5*	*-*
Construction [F]	353	7 816	96 507	5 117	177	4 787	18 953	3 527	7 223	349
Distribution, transp, hotels	1 389	23 737	1 339	76 591	5 697	17 617	684	18 503	15 250	2 254
Information and communication [J]	465	8 272	2 641	11 955	34 882	20 785	1 893	11 425	11 123	4 190
Financial and insurance [K]	1 395	18 151	4 514	13 071	2 866	39 145	27 991	9 098	10 320	1 485
Real estate [L]	-	1 875	395	17 849	3 583	4 050	1 914	5 850	8 587	1 489
Professional and support activities [M-N]	1 837	41 941	16 618	55 125	24 720	46 022	8 383	93 386	38 383	14 367
Government, health & education [O-Q]	27	5 325	1 189	6 479	678	2 539	3 124	5 885	32 118	280
Other services [R-T]	71	310	1	196	2 385	1 617	29	773	5 277	7 897
Total consumption	20 192	491 951	180 667	286 071	91 029	145 147	68 499	174 582	203 499	46 989
Taxes *less* subsidies on production	-1 992	4 797	1 232	15 408	342	3 264	- 337	3 256	979	1 263
Compensation of employees	4 726	133 438	52 432	216 719	74 071	69 040	15 018	146 013	260 973	36 720

	Agriculture	Production	Construction	Distrib, transport, hotels etc	Information & communication	Financial and insurance	Real estate	Professional and support activities	Gov, health & education	Other services
Gross operating surplus	10 926	109 750	58 570	89 223	51 875	61 245	236 597	86 612	76 180	28 354
GVA at basic prices	13 660	247 985	112 234	321 350	126 288	133 549	251 278	235 881	338 132	66 337
Output at basic prices	**33 852**	**739 936**	**292 901**	**607 421**	**217 317**	**278 696**	**319 777**	**410 463**	**541 631**	**113 326**

Table 16.2: Structure of the UK Economy

16.7.7 This data is important, since it provides an indication of the indirect effects of quarrying operations, including how the additional expenditure generated from this activity is likely to be distributed across other parts of the local economy, and hence whether jobs could be retained or generated in these sectors.

16.8 Current economic importance

Processes and employment

16.8.1 Leapers Wood Quarry has been operating for many years and is one of a very limited number of quarries able to meet the carboniferous limestone aggregate demand of the north-west England market. The site currently sells approximately 0.8 million tonnes per annum (mtpa) of high-quality limestone aggregate.

16.8.2 The site has 11 direct employees with significant indirect employment in haulage, goods and services, comprising:

- Up to 40 regular drivers visiting the site day to day;
- Contractors including BAM Ritchie for blasting (approx. 4 people); and
- Around 10 regular miscellaneous contractors.

16.8.3 Therefore, the quarry is a significant contributor to the local economy, providing mineral to support the construction industry and job opportunities both within the locality and the wider region.

16.9 Development proposal and future economic and social conditions

16.9.1 This section seeks to estimate the economic impacts of deepening extraction levels and extending the time of quarrying activities at the site. Although no additional jobs will be created above those previously required to operate the site, the Applicants seek to protect existing jobs for approximately an additional number of years if the scheme is approved. The appropriate comparison is therefore between the proposed development and 'do nothing' scenario (eventual cessation of quarrying and associated business activities on site).

16.9.2 Should permission be granted for the proposed development, as well as the direct benefits to the Applicants and the employment effects which benefit their contracted workforce, there will be a series of spin-off benefits which are referred to as 'indirect effects'. These arise because the Applicant's and/or operator's expenditure induces their suppliers to sustain their production to meet the needs of the site. In a 'virtuous circle', any sales made by the site's suppliers generate more business for the firms which in turn supply them. These effects are referred to as 'indirect effects' and occur down the supply chain. An example of such use is the individual hauliers that deliver materials from the site.

16.9.3 Finally, there are 'induced effects', which arise from the income earned by local employees being spent on household and personal goods and services within the local economy. The extent of this effect is a matter of some debate and difficult to predict in an accurate way.

16.9.4 In an assessment of purely local effects, it is also important to recognise that some of the benefits (direct, indirect and induced) will not accrue to the local economy by, for example, the Applicants and/or operators purchasing a major item of capital equipment from another region, or by some of the workers and their families spending their wages on holidays in other regions, or abroad. Such effects are referred to as leakage, displacement, and substitution of benefits.

16.9.5 Leakage refers to the proportion of outputs that benefit persons and companies outside the local area. Displacement reflects the degree to which retained production at the site is offset by reduced opportunities for expansion elsewhere. Substitution occurs when a firm substitutes one activity for a similar activity (such as recruiting a jobless person while another employee loses a job, to take advantage of public sector assistance). These factors should be taken into account when estimating the local impacts of the direct, indirect and induced effects of any

development. Guidance provided by English Partnerships in their 'Additionality Guide - Fourth Edition', dated October 2014, is often used to estimate the appropriate factor by which indirect and induced effects should be reduced in order to estimate the local impacts of a development scheme.

16.10 Direct Economic Effects

16.10.1 As the proposed development includes an extension of time to the mineral extraction and restoration works at the site, the proposal would sustain and protect jobs that could otherwise eventually be lost. As the site's employees generally come from the local area, the limestone quarry comprises an important local employment stream and granting permission for an extended operational period will secure and prolong these jobs. The value of the proposed development is therefore clear at a local level.

16.10.2 The Applicant, who is also the operator, contributes to spending on external suppliers, goods and services to support the continued operation of the site, as well as contributing to the national and local tax base. The Applicants' spending figure has not been calculated, however, the overall contribution is considered below.

16.11 Indirect Economic Effects

16.11.1 In theory, it would be possible to allocate the Applicant's spending to different economic sectors (manufacturing industry, utility services, construction etc), using a different multiplier for each sector. In practice, because many of the main suppliers span different sectors (by providing design advice and maintenance services as well as hardware), this is potentially misleading. It has been concluded that it would be more appropriate to use an average factor which applies across all economic sectors, namely the figure of £65,904 per employee (Source: ONS Blue Book 2023 and ONS Workforce Jobs by Industry September 2023). This is a lower figure than would apply to manufacturing industry, information and communication, and the financial and insurance sectors, but higher than that applicable to agriculture, construction, government, health and education (including defence), professional and support, and other services.

16.11.2 Using the GVA figures set out in Table 16.1, there is, on average, £275,170 in GVA for each employee. The site has 11 direct employees which generates a total of £3,025,000 GVA. The simple calculation of £3,025,000/65,904 per employee generates a figure of 46 (no.) employees further down the supply chain whose jobs depend to some degree on the site operations. This is not to suggest that the

continued closure of the site would lead to the loss of 46 (no.) employees, but at the very least, some disruption to employment would be expected.

16.12 Induced Effects

16.12.1 In the absence of detailed data on the consumption patterns of local employees, it is usual to estimate induced effects by making use of the same guidance from English Partnerships as referred to above. This suggests that an uplift figure of 10% could be applied to existing employment figures to identify an induced employment effect. Hence if the direct employment effect is to retain 11 jobs and the indirect effect is to retain 46 (no.) indirectly affected jobs, then uplifting this total by 10% would provide a reasonable estimate of 6 (no.) jobs for the induced employment benefit.

16.13 Overall Employment Effects

16.13.1 The overall local employment significance of the operation is therefore estimated as 11 plus 46 (no.) plus 6 (no.) = 63 jobs. As explained above, were non-quarrying jobs at the site and other jobs more widely in Lancashire to be lost, the effects of this would be much greater.

16.14 Conclusions

16.14.1 The site contains a large proven saleable resource of limestone to be sold, processed and distributed within the north west region. The mineral resource is therefore of economic value to the local and regional economy of Lancashire.

16.14.2 In combination with retaining existing jobs, new jobs are likely to be directly and indirectly generated by the proposed development due to the additional years of operation. The proposals will enable employment to be maintained across a range of industries which are supported both directly by limestone extraction and ancillary operations, and in-directly from investment and expenditure from the Applicant.

16.14.3 In addition to the direct and indirect benefits of the proposal, it will also induce benefits to the local and national economy through a multiplier effect. The overall contribution to the local economy from the site is significant.

17 ACCIDENTS AND HAZARDS

17.1 Summary

17.1.1 The site operators (Applicants) are committed to achieving the highest standards of health and safety for its operations, sites, workforce, contractors, customers and the general public.

17.1.2 A company wide Health and Safety Management System is in place. This helps ensure that the risk of accidents happening is minimised as far as practicably possible.

17.1.3 It is considered that the likely potential impact of the proposed development, in terms of the risk of accidents, will be very low with effects of negligible significance.

17.1.4 The assessments undertaken have not identified any significant potential for accidents. Therefore, no additional mitigation measures are considered necessary over and above those which are inherent within the proposed development design.

18 CUMULATIVE AND IN-COMBINATION EFFECTS

18.1 Introduction

18.1.1 This section of the ES addresses the cumulative impacts of the proposed development to examine if any changes would arise from the proposal that, when combined with other developments and activities in the area, would in some way result in the proposed scheme being unacceptable.

18.1.2 Throughout this ES and associated technical appendices, the impacts that the development could potentially have on the site and the surrounding area have been assessed. The technical reports also consider the potential for cumulative effects. This section summarises the conclusions of those reports with respect to the potential for cumulative effects.

18.1.3 Cumulative impacts relate to the way in which different impacts can affect a particular environmental resource or location incrementally. In essence, cumulative impacts are those which result from incremental changes caused by other past, present or reasonably foreseeable developments, together with 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.

18.2 Policy Context

18.2.1 The issue of cumulative impact is addressed within the NPPF which states that when determining applications for mineral development, Local Planning Authorities should take into account the cumulative effects of multiple impacts from individual sites and/or from a number of sites in a locality.

18.3 Methodology and Scope

Methodology

18.3.1 Although the NPPF requires consideration of cumulative effects, there is no national or local guidance as to how this should be carried out.

18.3.2 Schedule 4, Part 1, Paragraph 4 of the EIA Regulations requires the likely effects of the 'development' and the likely effects of other developments in the geographical area of the site to be considered in order to determine the likelihood of cumulative effects, i.e. the cumulative impacts and the impact interactions.

18.3.3 The EIA Regulations require consideration of developments that have been undertaken recently or are currently under construction, those for which planning permission exists or those which could be reasonably considered to be coming forward.

18.3.4 In that regard this assessment of cumulative effects will have regard to:

- successive effects;
- simultaneous effects from concurrent developments, and
- combined effects from the same development.

18.3.5 Regard will also be had to the potential for the proposal to give rise to a series of benefits (positive impacts) which could potentially offset or outweigh any harm which might be brought about by the proposed development. In this regard the cumulative impact assessment will therefore consider the potential cumulative benefits of the scheme.

18.3.6 A search of developments has been undertaken through a search of:

- planning applications and permissions listed on the Public Access website; and
- designated sites in Local Development Framework and Emerging Local Plan Documents.

18.3.7 The search covered:

- projects that are under construction;
- permitted applications that have not been implemented;
- submitted applications not yet determined;
- projects in the National Infrastructure's programme of projects; and
- projects identified in the relevant Development Plan (and emerging development plans).

18.3.8 Sites within approximately 2km of the site were considered. The search incorporated a 5 year period, which covered projects that received consent over 3 years ago and which have either been implemented but not yet fully constructed, or are yet to be implemented.

18.3.9 The sections below summarise the findings of the technical assessments which have been carried out as part of the EIA in relation to the potential for cumulative effects.

18.4 Landscape and Visual

18.4.1 The potential for cumulative impacts has been considered. A definition of cumulative effects being: "*the additional changes caused by a proposed development in conjunction with similar development or as the combined effect of a set of development, taken together*" (SNH,2012:4). Cumulative landscape effects being defined as effects that "*can impact on either the physical fabric or character of the landscape, or any special values attached to it"* (SNH,2012:10).

18.4.2 In discussions with the Applicant and the project coordinators it is considered that other sites of the same type of development located within the local landscape character setting are: Back Lane Quarry (located immediately south of Leapers Wood Quarry), Dunald Mill Quarry (located ~0.7km south of Leapers Wood Quarry) and Breedon Carnforth Concrete Plant site / mothballed quarry off Long Dales Lane. Located ~9.2km north of Back Lane is Aggregate Industries' Holme Park Quarry, and ~2.3km north is the restored Jackdaw Quarry which now operates as a Lodge Retreat and Diving Centre.

18.4.3 Other developments within the study area which could result in direct or indirect consequences in combination with the proposed development at Leapers Wood Quarry include the large scale industrial complex of Carnforth National Grid Compressor Station.

18.4.4 The combined effects of all the past, present and future proposals have been considered. Specifically in respect of the Dunald Mill developments, Jackdaw Quarry Lodge Retreat and Holme Park Quarry, these are assessed as standalone / isolated development within the landscape with no intervisibility within the character areas to Leapers Wood Quarry. Back Lane Quarry is contained within the same landscape character land unit as Leapers Wood Quarry / the proposed development. Proposals for deepening are integrated and intertwined within the contained site local character. Taking the above into consideration, and in accordance with paragraph 7.5 of GLVIA3, it is assessed that there will be No likely cumulative significant effects on landscape character receptors as a result of either impacts on the physical fabric of the landscape or the value attached to it, nor on the magnitude of effect of visual receptors.

18.5 Ecology and Biodiversity

18.5.1 No significant cumulative or in-combination effects would result from the proposed development.

18.6 Transport

18.6.1 No significant cumulative or in-combination effects would result from the proposed development.

18.7 Noise

18.7.1 Leapers Wood Quarry is located immediately adjacent to Back Lane Quarry, operated by Aggregate Industries, sharing a common boundary to the south of Leapers Wood Quarry.

18.7.2 The two sites are separated by a nominal boundary that is proposed to be worked as part of this application and the similar concurrent application by Aggregate Industries for deepening of the workings (and a time extension) at Back Lane Quarry.

18.7.3 Both sites are subject to the same site noise limit of 55 dB $L_{Aeq,\ 1\ hour\ free\ field}$ and the permissions on noise for the two sites share three common receptors.

18.7.4 Site noise monitoring at Leapers Wood Quarry has not been required over this period as there have been no complaints regarding noise at the site.

18.7.5 Site noise monitoring at Back Lane Quarry demonstrates that those site noise limits have been consistently complied with over the past twenty years.

18.7.6 The site noise monitoring for Back Lane Quarry has shown that the overall measured noise levels (including both sites and extraneous noise such as M6 road traffic noise) are significantly below the site noise limits for both sites.

18.7.7 The applications for both sites do not involve any increase in site operations, no changes to the processing plant site and associated plant items, no changes to the access to either site and no alteration to the operating hours.

18.7.8 As such, the only change in the workings will be the depth of working, with an increase in depth only resulting in lower site noise levels at the nearest dwellings to either site.

18.7.9 Both sites are satisfying the noise conditions in the permissions that are in place until 2048 and, with regard to cumulative noise levels the deeper workings would increase the barrier attenuation and therefore reduce the site noise levels at the nearest dwellings associated with mineral extraction. It is therefore considered that there is expected to be no adverse impact on the nearest noise sensitive receptors to the site from the proposed deepening of both quarries.

18.8 Air Quality and Dust

18.8.1 The current excavations at Leapers Wood and Back Lane Quarries extend to a floor elevation of approximately 45mAOD and 55mAOD respectively. The proposed floor elevation of the final combined excavation will be -37mAOD.

18.8.2 The applications are for extraction to be undertaken at increased depths at both quarries with no lateral extensions to the workings. It may therefore be extrapolated that there will be no change in dust impact provided effective mitigation regimes are upheld.

18.8.3 The existing annual outputs of product will also be retained at both quarries. As such there will be no change in vehicle movements from these operations along the public highway. Therefore, there will be no undue impact on air quality pollutants from vehicle exhaust emissions.

18.9 Human Health

18.9.1 The only development considered within the cumulative assessment is Back Lane Quarry, which is located to the south of Leapers Wood Quarry.

18.9.2 As with the application for Leapers Wood Quarry, the application at Back Lane Quarry would not include any lateral extension to the workings, and the annual outputs of aggregate would remain the same as is currently consented.

18.9.3 As a result, it can be concluded that with the implementation of the appropriate mitigation measures which are already in place, the impact on air quality would be negligible, and the associated impact on health would therefore also be negligible.

18.10 Groundborne Vibration and Overpressure

18.10.1 With the implementation of appropriate control measures, the cumulative impact of blasting as a consequence of the proposed concurrent deepening of both Leapers Wood and Back Lane Quarries will be negligible with maintenance, if not improvement to the current status quo. No significant cumulative effects are therefore predicted.

18.11 Water Environment

18.11.1 Extraction from the Urswick Limestone Formation was formerly undertaken at Dunald Mill Quarry, located 540m south of the Back Lane and Leapers Wood combined site. Mineral extraction may recommence in the future, but it is not anticipated that this would be concurrent with the proposed development.

Consequently, dewatering would not occur simultaneously at both sites and the potential cumulative impacts do not require consideration.

18.12 Climate Change

18.12.1 Back Lane Quarry lies immediately adjacent to the application site. Given the nature and scale of the mineral extraction activities within Back Lane Quarry, and its proximity to Leapers Wood Quarry, the potential for cumulative and in-combination climate change effects has been considered.

18.12.2 Back Lane Quarry currently has permission to extract limestone to a depth of 38mAOD, with a permitted end date of 29 April 2048 for mineral extraction and of 29 April 2049 for restoration. A planning application has been prepared, and is due to be submitted to the MPA, which seeks permission for the deepening of mineral extraction operations to a depth of -37mAOD with an extension of time for mineral extraction until December 2077 and restoration until December 2078. The current activities and proposed development at Back Lane Quarry are therefore similar to those at Leapers Wood Quarry.

18.12.3 As with the proposals at Back Lane Quarry, the operations at Leapers Wood Quarry require the use of mobile plant and machinery to excavate limestone and transport it to its on-site processing plant. HGVs transport the processed mineral from the site. Currently the majority of HGVs and mobile plant and machinery (including the processing plant) are diesel operated. The proposed development at Leapers Wood Quarry would result in a deepening of mineral extraction operations and an extension of time over which the quarry would be worked and restored. However, it would not result in any changes to the extraction rate and therefore there would not be an intensification in the use of mobile plant or HGV movements.

18.12.4 It is considered that in the medium to long term, both Back Lane Quarry and Leapers Wood Quarry will be operated using electric mobile plant and machinery as diesel generated plant is phased out. Furthermore, whilst HGVs associated with the sites are currently diesel operated, it is also considered reasonable to assume that electric HGVs will be used as standard in the future. The cumulative and in-combination effects on climate change associated with the operation of plant and machinery and transporting mineral using HGVs in order to deepen the quarries and operate both sites beyond the currently permitted end dates, are not therefore considered to be significant.

18.12.5 Back Lane Quarry also lies within Flood Zone 1 and the quarry is also worked dry through dewatering of the quarry void. The current and proposed site activities within Back Lane Quarry would not have any cumulative effects in terms of the risk of flooding at Leapers Wood Quarry, or off site within the surrounding area.

18.13 Conclusions

18.13.1 In accordance with the requirements of the NPPF, an assessment of cumulative effects has been undertaken which has assessed the potential for the proposed development to give rise to environmental effects which, when combined with environmental effects associated with other developments within the area, may result in significant cumulative or in-combination effects.

18.13.2 The assessment of cumulative effects has demonstrated that there would be no significant cumulative effects arising from the proposed development.

19 CONCLUSIONS

19.1.1 This ES has been prepared in accordance with the EIA Regulations. The ES sets out baseline and background environmental information and also sets out the details of the development having regard to the location, scale and nature of the proposals.

19.1.2 This ES identifies the likely significant impacts and the relevant national and Development Plan policies that will be used in the determination of the application. In this regard the proposal is considered to be compliant with the main planning policy tests set out in the Development Plan and advice set out in national planning policy.

19.1.3 The working of Leapers Wood Quarry is coordinated with the development of Aggregate Industries' adjoining Back Lane Quarry which also proposes to deepen the extraction area to the same depth. It is important that the working and restoration of both quarry operations are closely coordinated as the site is essentially a single void.

19.1.4 The site is a strategic supplier of high-grade aggregates, essential for the repair, maintenance and improvement of the built environment in the region.

19.1.5 Minerals are a finite natural resource and can only be worked where they are found. Carboniferous limestone resources are extremely limited within Lancashire and northwest of England, being confined to the Carnforth area in the north of the county and the Clitheroe area to the south. Carboniferous limestone resources are otherwise generally very heavily constrained by National Parks and National Landscapes.

19.1.6 It is considered preferable for the existing quarries to seek permission to extract additional minerals from a deeper depth, rather than to pursue a lateral extension to the existing workings. It is therefore essential that the long-term plans for the site are considered now to ensure that the mineral resource available is not unnecessarily sterilised or compromised and that continuity of supply is secured.

19.1.7 No unacceptable impacts have been identified in relation to residential amenity, air quality, designated nature conservation sites, ecology and biodiversity, the water environment, landscape character or the highway network.

19.1.8 The mitigation of potential impacts through the imposition of planning conditions and appropriate planning agreements is in accordance with Development Plan

policy and national planning advice. No significant residual or cumulative environmental impacts are anticipated to result from the development.

19.1.9 The proposed scheme will bring about a number of environmental and significant economic benefits. This includes providing an essential supply of carboniferous limestone aggregate and associated products, helping to meet the need for crushed rock within the region, alongside significant benefits to the local economy from the jobs created and local expenditure.

19.1.10 This ES has considered the potential environmental and local amenity effects of the proposal and has concluded that, subject to the imposition of established mitigation measures that can be secured via planning condition, no unacceptable adverse impacts would arise.

19.1.11 In overall conclusion, it is considered that the proposals are environmentally acceptable and support the economic, social and environmental roles of sustainable development required in the NPPF.