ENVIRONMENTAL IMPACT ASSESSMENT REPORT

To Accompany a Planning Application
For a Quarry Development
Located At
Rhine,
Killoe,
Co. Longford.

AN COIMISIÚN PLEANÁLA
21 AUG 2025
LTR DATED ____ FROM RT
LDG-
ACP- 323378-25

Prepared For

RHYNE ROCK
STONE - CONCRETE - PLANT HIRE - MUCK AWAY

Prepared By
Earth Science Partnership
June 2024

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1.0 INTRODUCTION

This Environmental Impact Assessment Report (EIAR) has been prepared to accompany an application to Longford Co. Co. for planning permission under Section 34 of the Planning & Development Act 2000 (as amended) in respect of a proposed quarry development located at Rhine, Killoe, Co. Longford. The planning application is being submitted on behalf of Blessington Stone & Concrete Plant Hire Ltd trading as Rhyne Rock.

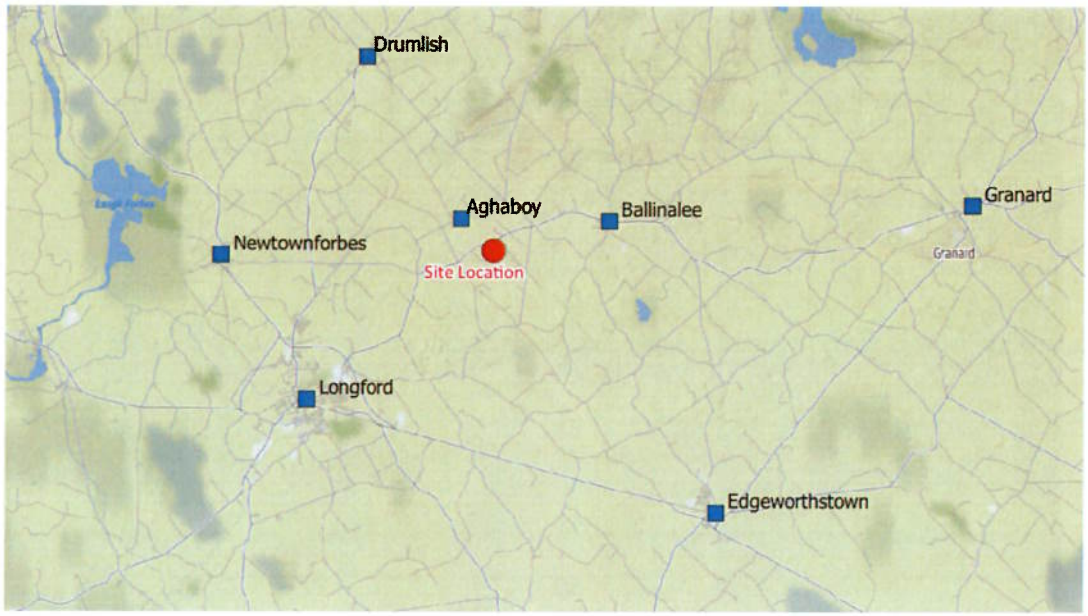
The development consists of a total area of 18.6 hectares and comprises of the following:

- Extraction of rock by blasting means down to a level of 20mOD from an area of approximately 14.2 Hectares.
- Erection of a concrete batching plant, processing plant, block yard, storage sheds, workshop, office buildings, weighbridge, wheelwash, settlement lagoon and all other associated ancillary facilities at the proposed manufacturing area of approximately 2.1 Hectares.
- Landscaping consisting of Planted Berms Surround (1.6 Hectares).
- Entrance and access road from the public road to the manufacturing area (0.7 Hectares).
- Landscaping and restoration of the site on completion of extraction.
- The planning permission is for a 25-year period.
- The planning application is accompanied by an Environmental Impact Assessment Report (EIAR) and a Natura Impact Statement (NIS).

1.1 Site Location

The application site is located at Rhine, Killoe, Co. Longford as detailed in Plate 1.1. The closest urban centres are the villages of Aghaboy and Ballinalee located 1.4km to the north west and 3.5km to the east respectively. Longford town is located 7km to the south west.

Plate 1.1: Site Location



1.2 Application Site

The application site consists of an 18.6 Hectare greenfield site located in close proximity to an existing quarry owned and operated by Rhyne Rock (Plate 1.2). The reserve of material at the existing quarry is nearly exhausted therefore the applicant is applying for planning permission for the proposed development to authorise a reserve of material which will meet the demand for material over a long-term period. Should the proposed development site be granted planning permission, operations at the existing quarry will cease once the proposed development site becomes fully operational. The existing quarry will be restored in line with a restoration plan agreed with Longford County Council.

Plate 1.2: Application Site & Existing Quarry

The existing greenfield site has an elevation range between 55mOD and 70mOD. The proposed development consists of an extraction area where material will be extracted by blasting means over 12 phases down to a level of 20mOD and a manufacturing area where material will be processed into various grades of aggregate and sold to market or used to manufacture ready-mix concrete and concrete products.

Access to the application site will be via the L5097 Local Road off the R194 Regional Road which connects the towns of Longford and Granard. A haul road will be constructed along the northern and western boundaries of the application site which will link the manufacturing area to the L5097 Local Road.

The proposed manufacturing area will consist of the processing plant, concrete batching plant, block yard, storage sheds, workshop, office buildings, weighbridge, wheelwash, settlement lagoon and all other associated ancillary facilities. The plant and machinery at the existing quarry would be relocated to the proposed development should planning permission be granted and the existing quarry development will be restored.

1.3 The Rationale for the Application

The applicant operates an existing quarry which is located just 200 metres northeast of the proposed development as indicated on Plate 1.2. The existing quarry produces a range of quarry materials and concrete products to serve the demand from existing customers.

This existing quarry is now almost exhausted, and the quarry owner needs to find an alternative source of material in the same area to provide a continuous supply to the local market. The proposed development will replace the existing quarry and there will be no intensification of use/output from the proposed development.

The proposed development will also incorporate a new concrete manufacturing area to replace the existing manufacturing area at the existing quarry. In simple terms the proposed development will replace the existing quarry, which will be fully decommissioned and closed once the proposed development is operational.

1.4 The Applicant

Rhyne Rock Ltd. is a family-owned business that has grown into one of the largest suppliers of all types of crushed rock, road chippings, bulk excavation and ready-mix concrete in the Co. Longford area. They also operate a quarry near Drumlish with both Drumlish and the existing quarry at Killoe situated close to the major towns in the County. The company has developed a customer base that includes government departments, well known building firms, civil engineering contractors and a host of valued customers in the agricultural and private sectors. The company's success has been built on producing high quality products at competitive prices allied with high levels of customer service.

1.5 EIAR Methodology

The primary objective of the EIAR is to identify baseline environmental and socio-economic conditions in the vicinity of the proposed development, predict potential beneficial and/or adverse effects of the proposed development and propose appropriate mitigating measures where necessary. The following regulations and guidelines were considered as part of the preparation of this EIAR:

- Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (EIAR) (EPA, May 2022)
- Draft Revised Guidelines on the Information to be contained In Environmental Impact Statements (EPA September 2015)
- Draft Advice Notes for Preparing Environmental Impact Statements (EPA September 2015)

- Guidance for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment (Department of the Environment, Community and Local Government, 2013)
- Advice Notes on Current Practice (in the Preparation of Environmental Impact Statements (EPA 2003)
- Guidelines on the information to be contained in Environmental Impact Statements (EPA 2002)

Information on the project and the receiving environment was obtained through a number of means including:

- Site visits and field surveys
- Site assessments (geology, water, noise, air etc.)
- Aerial photographs
- Longford County Council
- Review of existing data for the general area of the site
- Review of previous studies carried out at the site and locality
- Consultation with interested parties

1.6 Environmental Impact Assessment Report

This EIAR is prepared by the developer and is submitted to the relevant Planning Authority as part of the process. The Planning Authority uses the information provided to assess the potential beneficial and/or adverse effects and proposed mitigation measures to determine if permission should be granted. The EIA Directive (2014/52/EU) and EPA Guidelines on the information to be contained in EIAR (published May 2022) describes information which should be included as part of an EIAR:

"1. Where an environmental impact assessment is required, the developer shall prepare and submit an environmental impact assessment report. The information to be provided by the developer shall include at least:

(a) a description of the project comprising information on the site, design, size and other relevant features of the project;
(b) a description of the likely significant effects of the project on the environment;
(c) a description of the features of the project and/or measures envisaged in order to avoid, prevent or reduce and, if possible, offset likely significant adverse effects on the environment;
(d) a description of the reasonable alternatives studied by the developer, which are relevant to the project and its specific characteristics, and an indication of the

main reasons for the option chosen, taking into account the effects of the project on the environment;

(e) a non-technical summary of the information referred to in points (a) to (d); and

(f) any additional information specified in Annex IV relevant to the specific characteristics of a particular project or type of project and to the environmental features likely to be affected.

Where an opinion is issued pursuant to paragraph 2, the environmental impact assessment report shall be based on that opinion and include the information that may reasonably be required for reaching a reasoned conclusion on the significant effects of the project on the environment, taking into account current knowledge and methods of assessment. The developer shall, with a view to avoiding duplication of assessments, take into account the available results of other relevant assessments under Union or national legislation, in preparing the environmental impact assessment report.

2. Where requested by the developer, the competent authority, taking into account the information provided by the developer in particular on the specific characteristics of the project, including its location and technical capacity, and its likely impact on the environment, shall issue an opinion on the scope and level of detail of the information to be included by the developer in the environmental impact assessment report in accordance with paragraph 1 of this Article. The competent authority shall consult the authorities referred to in Article 6(1) before it gives its opinion.
Member States may also require the competent authorities to give an opinion as referred to in the first subparagraph, irrespective of whether the developer so requests.

3. In order to ensure the completeness and quality of the environmental impact assessment report:

(a) the developer shall ensure that the environmental impact assessment report is prepared by competent experts;

(b) the competent authority shall ensure that it has, or has access as necessary to, sufficient expertise to examine the environmental impact assessment report; and

(c) where necessary, the competent authority shall seek from the developer supplementary information, in accordance with Annex IV, which is directly relevant to reaching the reasoned conclusion on the significant effects of the project on the environment."

Article 3 of the EIA Directive (2014/52/EU) states that the following environmental factors/topics should be described and assessed:

> *"1. The environmental impact assessment shall identify, describe and assess in an appropriate manner, in the light of each individual case, the direct and indirect significant effects of a project on the following factors:*
> *(a) population and human health;*
> *(b) biodiversity, with particular attention to species and habitats protected under Directive 92/43/EEC and Directive 2009/147/EC;*
> *(c) land, soil, water, air and climate;*
> *(d) material assets, cultural heritage and the landscape;*
> *(e) the interaction between the factors referred to in points (a) to (d).*
> *2. The effects referred to in paragraph 1 on the factors set out therein shall include the expected effects deriving from the vulnerability of the project to risks of major accidents and/or disasters that are relevant to the project concerned."*

1.7 EIAR Format

The EIAR is presented in the 'Grouped Format Structure' which gives an introduction and overall project description, then examines each topic within individual chapters. The coverage of each topic includes descriptions of the relevant characteristics of the proposed project, the existing environment, predicted impacts, mitigation measures and residual impacts. The EIAR is structured under the following subject headings:

1.0 – Introduction
2.0 – Screening, Policy Context & Alternatives
3.0 – Project Description
4.0 – Population and Human Health
5.0 – Biodiversity
6.0 – Land, Soils & Geology
7.0 – Water
8.0 – Climate
9.0 – Air
10.0 – Noise and Vibration
11.0 – Traffic
12.0 – Landscape & Visual
13.0 – Material Assets
14.0 – Cultural Heritage
15.0 – Interactions
16.0 – Impact and Mitigation Summary

- **Chapter 1** provides an introduction to the development and gives details in relation to the project team and their relevant expertise and competencies, including external consultants retained to assess various environmental factors/topics.

- **Chapter 2** provides details in relation to screening, scoping and consideration of alternative designs and processes.

- **Chapter 3** provides details relating to the existing and proposed work methods within the development including day to day processes that are/will be undertaken at the existing and proposed development.

- **Chapter 4 - 14** details information on all aspects of the existing environment including any impacts or potential impacts identified. Mitigation measures are reviewed and proposed where required to offset potential impacts identified.

- **Chapter 15** addresses the cumulative impacts, indirect impacts and main interactions between different aspects of the environment likely to be significantly affected by the proposed activities at the application site. Only topics that could be logically linked to the development have been examined in detail. Accordingly, when a topic is not mentioned, it is concluded that no potential for conflict exists.

- **Chapter 16** provides a summary of the mitigation measured proposed in order to offset the potential impact.

1.7.1 Chapter Layout

In accordance with the EPA (2022) guidance document, Chapters 4 to 14 of the EIAR follow the same general layout, as follows:

1. **Introduction** – Describes the purpose and the rationale for inclusion of the particular environmental topic within the EIAR.
2. **Methodology** – Details the sources of baseline information, the data and the methods employed to gather the data.
3. **Existing Environment** – A description of baseline information/data relating to the aspects relevant to each particular environmental topic. The description of aspects of the environment provides sufficient data to facilitate the identification and evaluation of the likely significant effects of the topic. Systematic, accurate and comprehensive

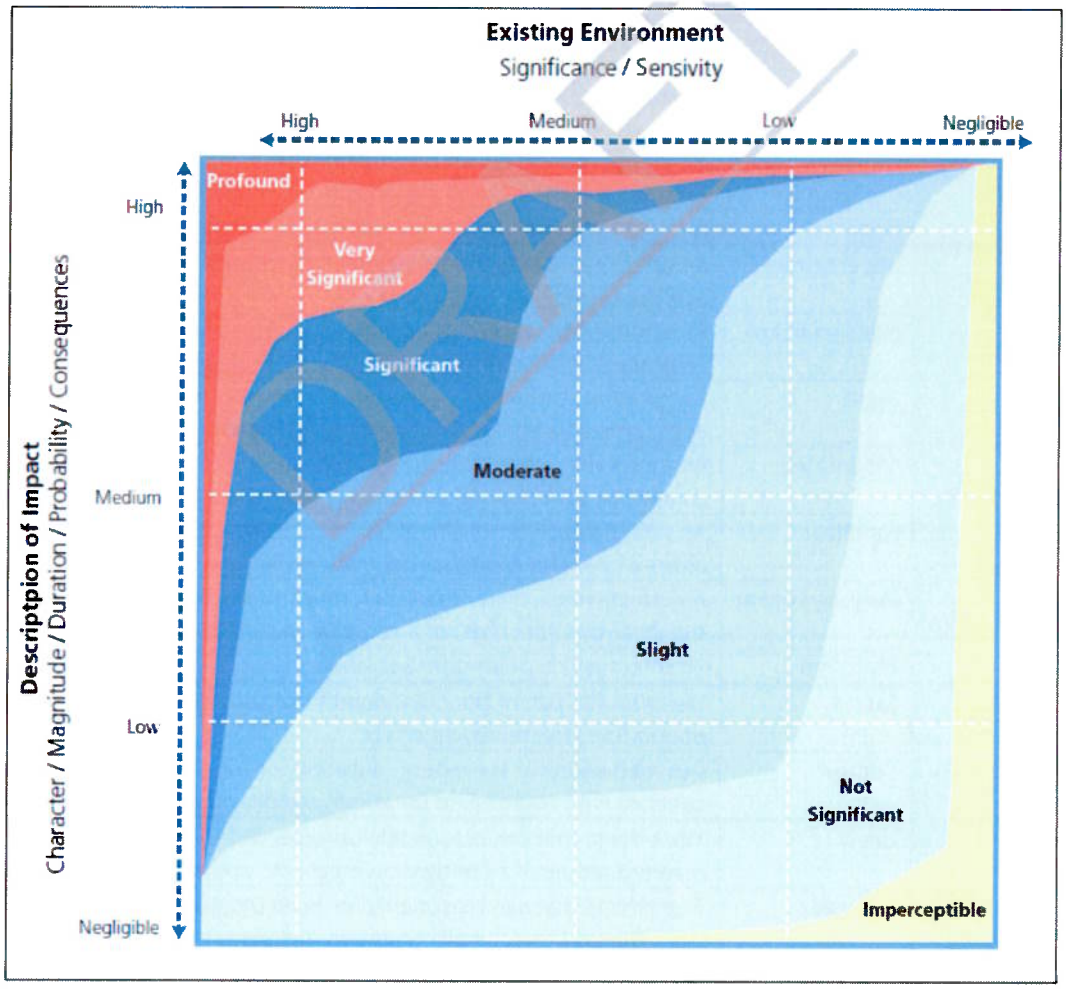
descriptions of the environment are presented under the following headings within each chapter:

- **Context** – Description of the location, magnitude, spatial extent and trends of the environmental factor;
- **Character** – An indication of the distinguishing aspects of the environment under consideration e.g. the types of habitats present or the current status of onsite water quality;
- **Significance** – The quality, value and/or designation assigned to the aspect of the existing environment under consideration, and;
- **Sensitivity** – An evaluation of the sensitivity of the aspect of the environment to change e.g. would any increase in nutrients cause eutrophication of local waterbodies or would disturbance cause nesting birds to disperse?

4. **Impact Assessment** - The assessment of effects has been undertaken in accordance with best practice, legislation and guidance notes. The evaluation of significance considers the magnitude of the change and the sensitivity of the resource or receptor. Unless otherwise stated, this approach has been adopted throughout the EIAR. The criteria for determining the significance of impacts and the effects are set out in Plate 1-3 below, taken from EPA Guidance, Guidelines on the Information to be contained in an EIAR.

   Definitions of impact as outlined by the EPA are included below. These definitions are used throughout the EIAR. Certain chapters may use additional or alternative terms due to the specific methodology or guidance required within those chapters.

Plate 1-3: Description of the Environmental Impacts (EPA 2022)



A clear and concise description of the *likely significant effects* of the proposed development on the environmental topic in terms of the following (Table 1.1):

- **Quality of effects** - whether an effect is positive, negative or neutral;
- **Significance of effects** - imperceptible, not significant, slight, moderate, significant, very significant, profound;
- **Extent and context of effects** – size of the area/number of sites/proportion of population effected and whether this will conform or contrast with established baseline conditions;
- **Probability of effects** – likely or unlikely;
- **Duration and frequency of effects** – momentary, brief, temporary, short-term, medium-term, long-term, permanent, reversible, frequency.

Table 1.1: Definition of Effects (EPA, 2022)

Characteristic	Level	Description
Quality	Positive	A change which improves the quality of the environment.
	Neutral	No effects/effects which are imperceptible, within normal bounds of variation or within the margin of forecasting error.
	Negative	A change which reduces the quality of the environment.
Significance	Imperceptible	An effect capable of measurement but without significant consequences.
	Not significant	An effect which causes noticeable changes in the character of the environment but without significant consequences.
	Slight	An effect which causes noticeable changes in the character of the environment without affecting its sensitivities.
	Moderate	An effect that alters the character of the environment in a manner consistent with existing and emerging baseline trends.
	Significant	An effect, which by its character, magnitude, duration or intensity alters a sensitive aspect of the environment.
	Very significant	An effect which, by its character, magnitude, duration or intensity significantly alters most of a sensitive aspect of the environment.
	Profound	An effect which obliterates sensitive characteristics.
Magnitude	Extent	Describe the size of the area, number of sites and the proportion of a population affected by an effect.
	Context	Describe whether the extent, duration, or frequency will conform or contrast with established (baseline) conditions.
Probability	Likely	The effects that can reasonably be expected to occur because of the planned project if all mitigation measures are properly implemented.
	Unlikely	The effects that can reasonably be expected not to occur because of the planned project if all mitigation measures are properly implemented.
Duration and Frequency	Momentary	Effects lasting from seconds to minutes.
	Brief	Effects lasting less than a day.
	Temporary	Effects lasting less than a year.
	Short-term	Effects lasting one to seven years.
	Medium-term	Effects lasting seven to fifteen years.
	Long-term	Effects lasting fifteen to sixty years.
	Permanent	Effects lasting over sixty years.
	Reversible	Effects that can be undone, for example through remediation or restoration.
	Frequency	Describe how often the effect will occur (once, rarely, occasionally, frequently, constantly – or hourly, daily, weekly, monthly, annually).
	Indirect (Secondary)	Impacts on the environment, which are not a direct result of the project, often produced away from the project site or because of a complex pathway.
	Cumulative	The addition of many minor or significant effects, including effects of other projects, to create larger, more significant effects.

Characteristic	Level	Description
Types of Effects	'Do Nothing'	The environment as it would be in the future should the subject project not be carried out.
	'Worst Case'	The effects arising from a project in the case where mitigation measures substantially fail.
	Indeterminable	When the full consequences of a change in the environment cannot be described Irreversible When the character, distinctiveness, diversity, or reproductive capacity of an environment is permanently lost.
	Residual	Degree of environmental change that will occur after the proposed mitigation measures have taken effect
	Synergistic	Where the resultant effect is of greater significance than the sum of its constituents.

5. **Mitigation Measures** – a description of the measures designed to avoid, prevent, reduce, remedy or offset any identified significant adverse effects on the environment, as follows:

   - **Avoidance** – when no effect is caused (often through consideration of alternatives);
   - **Prevention** – when a potential effect is prevented by a measure thus avoiding the possibility of the effect occurring;
   - **Reduction** – when an effect is lessened;
   - **Remedy** – when an effect is resolved by remedial action;
   - **Offset** – when an adverse effect is balanced by a positive effect.

   The description also explains the extent to which significant adverse effects on the environment are avoided, prevented, reduced or remedied/offset. The proposals of any monitoring arrangements are also outlined in this chapter.

6. **Residual Impacts** – a description of the final or intended effects which remain after the proposed mitigation measures have been implemented. These are the remaining environmental "costs" of a project that could not be reasonably avoided and will be a key consideration in deciding whether the project will be permitted or not. For this reason, residual effects are clearly described in accordance with the system of effects description as set out above i.e., quality, significance, extent, etc.

1.8 EIAR Team

Article 5(3) (a) of the amended Directive requires that :

> *"the developer shall ensure that the environmental impact assessment report is prepared by competent experts..."*

and Recital (33) of the Directive 2014/52/EU requires that:

> *"sufficient expertise, in the relevant field of the project concerned, is required for the purpose of its examination by the competent authorities in order to ensure that the information provided by the developer is complete and of a high level of quality."*

Table 1.2 presents details of all competent experts involved in the preparation of this EIAR.

Table 1.2: EIAR Study Team

Chapter	Company	Competent Expert	Area and Level of Expertise
1.0 Introduction	Earth Science Partnership	• Patrick O'Donnell C Eng. BSc. Eng. Dip Eng. MIEI • Sean O'Donnell BSc. Eng.	• Principle Engineer • Project Engineer
2.0 Screening, Policy Context & Alternatives			
3.0 Project Description			
4.0 Population & Human Health			
5.0 Biodiversity	Applied Ecology Ireland	• Sarah Jorgensen, BSc, MSc ACIEEM	• Senior Ecologist
6.0 Land, Soils & Geology	Earth Science Partnership	• Patrick O'Donnell C Eng. BSc. Eng. Dip Eng. MIEI	• Principle Engineer
7.0 Water	Aqua Geoservices Ltd.	• Bruno Telliard MSc. BSc. P Geo. EurGeo.	• Hydrogeologist
8.0 Climate	Earth Science Partnership	• Patrick O'Donnell C Eng. BSc. Eng. Dip Eng. MIEI	• Principle Engineer
9.0 Air	AWN Consulting	• Ciara Nolan BSc (Hons), MSc	• Air Quality Consultant
10.0 Noise & Vibration	Noise & Vibration Ltd.	• Brendan O'Reilly MPhil(Noise and Vibration) ISEE SFA EAA	• Noise and Vibration Consultant
11.0 Traffic	Tobin Consulting Engineers	• Maria Rooney BEng, MEng MIEI	• Design Engineer
12.0 Landscape	Earth Science Partnership	• Patrick O'Donnell C Eng. BSc. Eng. Dip Eng. MIEI	• Principle Engineer
13.0 Material Assets			
14.0 Cultural Heritage	Charles Mount Archaeology	• Charles Mount M.A., Ph.D., M.B.A., Dip. EIA & SEA Mgmt., M.I.A.I.	• Consultant Archaeologist
15.0 Interactions	Earth Science Partnership	• Patrick O'Donnell C Eng. BSc. Eng. Dip Eng. MIEI	• Principle Engineer
16.0 Mitigation & Monitoring Summary			

Biopics for personnel who contributed to the EIAR are detailed below.

Earth Science Partnership (ESP)

Patrick O'Donnell

Patrick is a senior chartered engineer with over 40 years' experience of site and consultancy based experienced on large infrastructural projects including road projects, main drainage projects, wastewater and water treatment facilities. Since founding Earth Science Partnership in 2003 he has provided a planning and environmental consultant experience to over one hundred quarry clients in relation to planning, environmental and engineering projects. This included compiling planning applications and contributing to the various sections of EIARs (previously EIS) for quarry planning applications which have included Section 34 applications to Local Authorities and Substitute Consent and Section 37L applications to An Bord Pleanála.

Sean O'Donnell

Sean is a project engineer with over 10 years of consultancy-based experience. This has included undertaking topographical surveys using total station and GPS surveying equipment, compiling planning application documents and drawings, waste facility permit applications and land transfers.

Applied Ecology Ireland

Sarah Jorgensen

Ms Sarah Jorgensen worked as an Ecologist and Project Manager with various environmental consultancies throughout Ireland from early 2014 until the present date. Ms Jorgensen is primarily a bird expert with robust professional experience in surveying and studying bird ecology both within and outside Special Protection Areas throughout Ireland.

Most notably Ms Jorgensen has a great deal of applied knowledge and experience of conducting protected species breeding surveys of hen harrier, merlin, golden plover, red grouse and snipe, as well as wintering swans and geese. Survey techniques included vantage point surveys, breeding bird transects, prey density point counts, nest finding and habitat mapping. Ms Jorgensen also worked as a habitat specialist on numerous projects, most notably the National Irish Uplands Habitat Survey.

Since taking up her position as a full-time ecological consultant in 2014, Ms Jorgensen has project managed all elements of several large scale and complex wind farm ecology projects such as Knockacummer Wind Farm and Glentane Wind Farm Phases I and II in Co. Cork. She was responsible for overseeing implementing the Hen Harrier Species and Habitat

Management Plan for these three wind farm projects from the pre-construction to operational phase.

She has written over 100 Appropriate Assessment Screening Reports, Natura Impact Statements and Ecological Impact Assessments for various infrastructural developments throughout Ireland and managed a team of up to 5 ecologists to assist in this work.

She has also taken the role of on-site Ecological Clerk of Works at numerous wind farms under construction, such as Slieve Callan Wind Farm, Co. Clare and Ballyhoura Wind Farm, Co. Cork.

Ms Jorgensen is an Associate Member of the Chartered Institute of Ecology and Environmental Management (ACIEEM).

Aqua Geoservices Ltd.

Bruno Telliard

Bruno Teillard, is a qualified Hydrogeologist (French M.Sc. Hydrogeology) with over 25 years of experience in Ireland and abroad and is certified as a:

- Professional Geologist (PGeo) by the Institute of Geologists of Ireland (IGI) since 2004 and,
- European Geologist (EurGeol) by the European Federation of Geologists (EFG) since 2005.

He is also a member of the International Association of Hydrogeologists (IAH), a professional member of the Irish Association of Economic Geology (IAEG) and an associate member of the Geological Society, NI Regional Group and Geological Society of London. Bruno is also on the Institute of Geologists of Ireland's "Register for professional hydrogeologists in respect of environmental risk assessment for unregulated waste disposal" and on the panel of independent hydrogeologist to work on Irish Water contracts nationwide.

Noise & Vibration Ltd.

Brendan O'Reilly

Mr. Brendan O'Reilly of Noise and Vibration Consultants Ltd. Mr. O'Reilly has a Master's degree in noise and vibration from Liverpool University and has over 35 years' experience in noise and vibration control (and many years' experience in preparation of noise impact statements) and is a member of a number of professional organisations. Mr. O'Reilly was a co-author and project partner (as a senior noise consultant) in 'Environmental Quality Objectives Noise in Quiet Areas' administered by the Environmental Protection Agency on behalf of the Department of the Environment, Heritage and Local Government (as a first step towards implementation of the EC Directive relating to the Assessment and Management of Environmental Noise (EU, 2002). Noise & Vibration Consultants have considerable

experience in the assessment of noise impact and have compiled EIA studies ranging from quarries, mines, retail development, wastewater treatment plants, housing developments and wind farms.

AWN Consulting

Ciara Nolan

Ciara Nolan is an environmental consultant in the air quality section of AWN Consulting Ltd. She holds an MSc. (First Class) in Environmental Science from University College Dublin and has also completed a BSc. in Energy Systems Engineering. She is an Associate Member of both the Institute of Air Quality Management (AMIAQM) and the Institution of Environmental Science (AMIEnvSc). She has been active in the field of air quality for over 4 years, with a primary focus on consultancy.

Tobin Consulting Engineers

Maria Rooney

Maria is a Senior Engineer in the Roads and Transportation division of the Building and Infrastructure division of Tobin Consulting Engineers. Maria is a TII (NRA) approved Road Safety Auditor Team Member with in depth experience in Traffic and Transportation projects. She has worked on a variety of projects assisting Tobins Environmental Department in preparing Environmental Impact Assessments Reports (EIAR). EIARs include projects such as solar farms, waste management facilities and quarries. Maria has also carried out numerous traffic and transportation assessments for a wide variety of projects including commercial, residential, educational and healthcare facilities. Maria has also gained experience in planning, detailed design, traffic management plans and tender preparation.

Dr. Charles Mount Heritage Services

Dr Charles Mount

Charles Mount is an PhD level qualified archaeologist and EIAR consultant with more than 25 years' experience of Irish archaeology and cultural heritage. He has worked in both the State and industrial sectors and has extensive experience of the commissioning and management of all types of archaeological services from desk-based reports to test and full excavations and geophysical surveys and is capable of assessing impacts on archaeology and cultural heritage at all stages of land use planning and development from site selection, through EIAR to planning condition compliance. He provides services to a diverse range of clients from multinational to Semi-States and SMEs throughout Ireland.

1.9 Technical Difficulties

Data limitations and technical difficulties associated with the compilation of the EIAR are detailed in relevant sections of the EIAR.

1.10 References

European Communities (Environmental Impact Assessment) Regulations, 1989 to 1999 (S.I. No. 349 of 1989)

Local Government (Planning & Development) Regulations, 2001 (S.I. No. 600 of 2001)

European Communities (Environmental Impact Assessment) Regulations, 1989 to 1999, Second Schedule, (S.I. No. 93 of 1999)

European Communities (Environmental Impact Assessment) Regulations, 1989 to 1999, Third Schedule, (S.I. No. 93 of 1999)

Guidelines on the Information to be Contained in Environmental Impact Statements, Environmental Protection Agency (EPA 2002)

Advice notes on current practice in the preparation of Environmental Impact Statements (EPA 2003)

Environmental Management Guidelines – Environmental Management in the Extractive Industry (Non – Scheduled Minerals) prepared by the Environmental Protection Agency (2006)

Draft Revised Guidelines on the Information to be contained In Environmental Impact Statements (EPA September 2015)

Draft Advice Notes for Preparing Environmental Impact Statements (EPA September 2015).

Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (EPA, May 2022).

Longford County Development Plan 2021 - 2027

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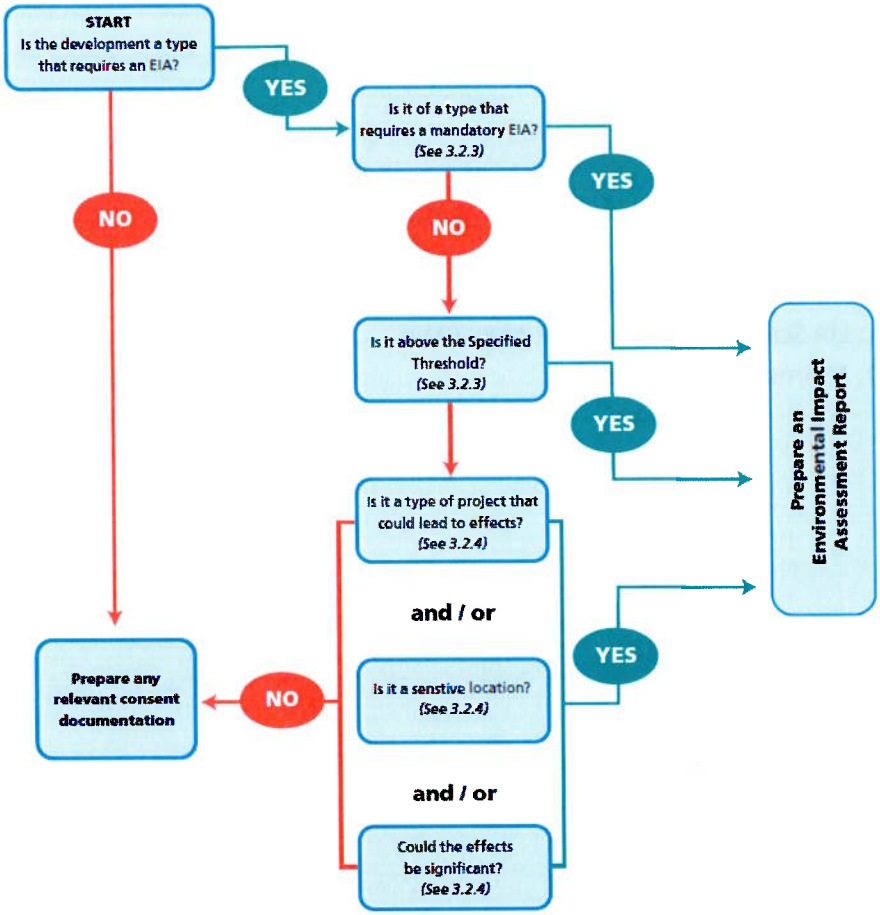
2.0 SCREENING & CONSIDERATION OF ALTERNATIVES

This section of the EIAR details the screening and scoping exercise carried out in relation to the proposal and sets out the context for the Site through planning guidelines, policy frameworks and reports issued by the county, state, and semi-state bodies. It also includes the alternative locations, layouts and designs considered as part of the process and the reasons or need for the Development, described in Chapter 3.0.

2.1 EIA Screening

The first step of the EIA process is screening which establishes whether an EIA is required or not. The project needs to be considered in its entirety for screening purposes. This means that off-site and secondary projects as well as indirect, secondary and cumulative impacts need to be identified and assessed at an appropriate level of detail. Plate 2.1 details the steps to be followed as part of the screening exercise.

Plate 2.1: EIA Screening Process (EPA May 2022)



The EIA Directive, "Council Directive 85/337/EEC of 27 June 1985 on the assessment of the effects of certain public and private projects on the environment" as amended by Council Directives 97/11/EC, 2003/35/EC, 2009/31/EC, 2011/92/EU and 2014/52/EU is designed to ensure that projects likely to have significant effects on the environment are subject to a comprehensive assessment of environmental effects prior to development consent being given.

Screening involves an initial determination to establish whether the proposal is a project which is listed in one of the Annexes to the Directive 2011/92/EU (as amended by Directive 2014/52/EU). The EIA Directive lists projects for which EIA is mandatory (Annex I) and those projects for which EIA may be required (Annex II). With regard to Annex II projects, Member States can choose to apply thresholds or use case by case examination or a combination of both, to assess whether these projects require EIA. These Annexes have been transposed into Irish law and the prescribed classes of development which require EIA are outlined in Schedule 5 of the Planning and Development Regulations 2001 (S.I. 600 of 2001) as amended. The relevant thresholds for quarrying and extractive developments are details in Section 2.1.1.

2.1.1 Screening Criteria

The sections of the schedule 5 which are applicable to the proposed development are detailed below and referenced A, B and C.

(A) Part 1, Class 19

Quarries and open-cast mining where the surface of the site exceeds 25 hectares.

(B) Part 2, Class 2(b)

Extraction of stone, gravel, sand or clay, where the area of extraction would be greater than 5 hectares.

(C) Part 2, Class 13(a)

Changes, extensions, development and testing

(a) Any change or extension of development which would:-

(i) result in the development being of a class listed in Part 1 or paragraphs 1 to 12 of Part 2 of this Schedule, and

(ii) result in an increase in size greater than-

- *25 per cent, or*
- *an amount equal to 50 per cent of the appropriate threshold, whichever is the greater.*

Where a project is of a specified type but does not meet, or exceed, the applicable threshold then the likelihood of the project having significant effects on the environment needs to be considered. Both the adverse and beneficial effects are considered. This is done by referencing the criteria specified in Annex III of the amended Directive.

1. Characteristics of projects

The characteristics of projects must be considered, with particular regard to:

(a) the size and design of the whole project;

(b) cumulation with other existing and/or approved projects;

(c) the use of natural resources, in particular land, soil, water and biodiversity;

(d) the production of waste;

(e) pollution and nuisances;

(f) the risk of major accidents and/or disasters which are relevant to the project concerned, including those caused by climate change, in accordance with scientific knowledge;

(g) the risks to human health (for example due to water contamination or air pollution).

2. Location of projects

The environmental sensitivity of geographical areas likely to be affected by projects must be considered, with particular regard to:

(a) the existing and approved land use;

(b) the relative abundance, availability, quality and regenerative capacity of natural resources (including soil, land, water and biodiversity) in the area and its underground;

(c) the absorption capacity of the natural environment, paying particular attention to the following areas:

(i) wetlands, riparian areas, river mouths;

(ii) coastal zones and the marine environment;

(iii) mountain and forest areas;

(iv) nature reserves and parks;

(v) areas classified or protected under national legislation; Natura 2000 areas designated by Member States pursuant to Directive 92/43/EEC and Directive 2009/147/EC;

(vi) areas in which there has already been a failure to meet the environmental quality standards, laid down in Union legislation and relevant to the project, or in which it is considered that there is such a failure;

(vii) densely populated areas;

(viii) landscapes and sites of historical, cultural or archaeological significance.

3. Type and characteristics of the potential impact

The likely significant effects of projects on the environment must be considered in relation to criteria set out in points 1 and 2 of this Annex, with regard to the impact of the project on the factors specified in Article 3(1), taking into account:

(a) the magnitude and spatial extent of the impact (for example geographical area and size of the population likely to be affected);
(b) the nature of the impact;
(c) the transboundary nature of the impact;
(d) the intensity and complexity of the impact;
(e) the probability of the impact;
(f) the expected onset, duration, frequency and reversibility of the impact;
(g) the cumulation of the impact with the impact of other existing and/or approved projects;
(h) the possibility of effectively reducing the impact.

2.1.2 Determination

A. The proposed development less than the 25 hectare threshold listed under Part 1, Class 19 as the application area is 18.6 hectares.

and

B. The proposed development is greater than the 5 hectare threshold listed under Part 2, Class 2(b) as the application area is 18.6 hectares.

Therefore, EIA is a mandatory requirement.

2.2 Appropriate Assessment Screening

Appropriate Assessment is required to be carried out under the Habitats Directive and specifically Article 6(3) thereof for plans or project likely to have significant effects on Natura 2000 sites. It is most recently implemented under the European Communities (Birds and Natural Habitats) Regulations 2011. An Appropriate Assessment is required to be carried out for development on or adjacent to sites classified by the Minister pursuant to the regulations as special areas of conservations (SACs) or special protection areas (SPAs). These are sites designated by European law and are also known as Natura 2000 Sites.

Specifically Article 42(1) of the 2011 Regulations requires public authorities to screen for Appropriate Assessment in relation to a plan or project, which is not directly connected with or necessary to the management of the site as a European Site, in view of best scientific knowledge and the conservation objectives of the site and to assess the plan or project not

only individually but also in combination with other plans or projects likely to have a significant effect on the Natura site.

The following Natura 2000 sites were identified during the desk study as being located within 15km (from closest to furthest distance). The sites and distances from the application site are as follows:

Table 2.1 – Name and Distance of Natura sites from proposed development

Site Code	Name of Site	Distance from Proposed Development
001818	Lough Forbes Complex SAC	8.9km to the southwest
004101	Ballykenny-Fisherstown Bog SPA	8.9km to the southwest
002346	Brown Bog SAC	9.8km to the southwest
002202	Mount Jessop Bog SAC	10.8km to southwest
002348	Jessop SAC	11.6km to the southwest
002341	Ardgullion Bog SAC	12.2km to the southeast
004045	Glen Lough SPA	14.7 Km to the southeast

An Appropriate Assessment (AA) Screening Statement has been compiled by Ms. Sarah Jorgensen MSc BSc (Hons) ACIEEM. Ms Jorgensen is a qualified ecologist with a BSc. (Hons) in Zoology and an MSc. in Biodiversity and Conservation from Trinity College Dublin (2009). Following consideration of

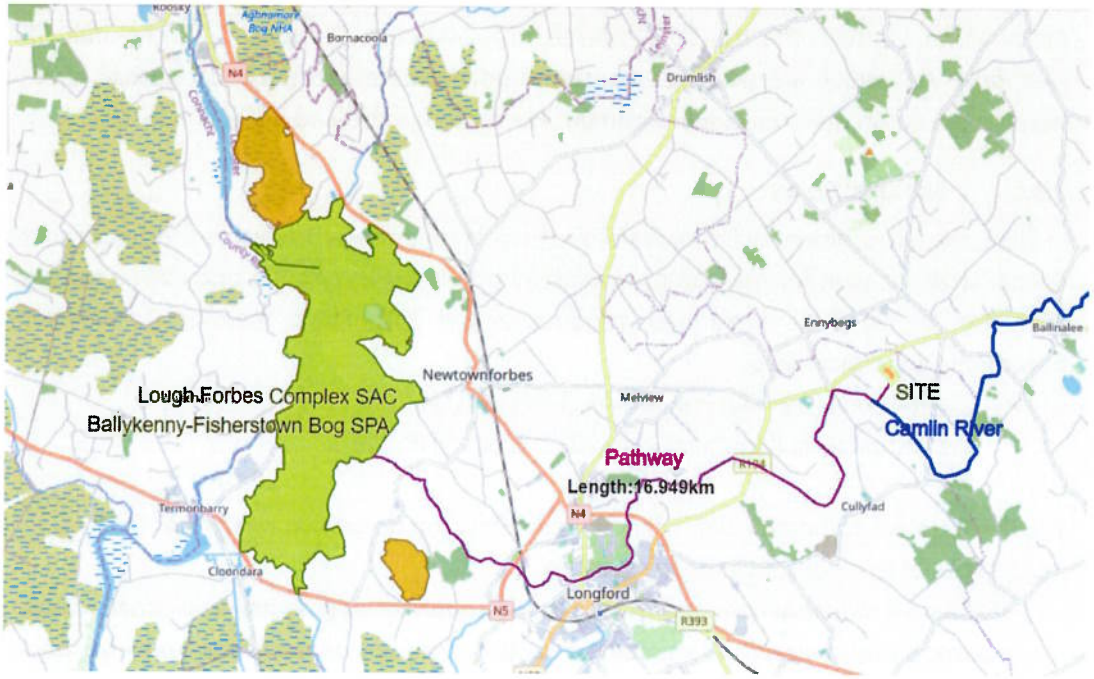
- the nature and scale of the project
- the hydrological/ecological connectivity between the proposed project location and the designated sites
- the site specifics of the proposed application area and its location
- the particular qualifying interests/special conservation interests of the Natura 2000 sites

Only the following 2 no. designated sites were identified with potential Source » Pathway » Receptor links to the proposed works and therefore warranted further assessment.

- 001818 Lough Forbes Complex SAC - 8.9km to the southwest
- 004101 Ballykenny - Fisherstown Bog SPA - 8.9km to the southwest.

The proposed application area is hydrologically connected with the Lough Forbes Complex SAC. The pathway was identified as a drainage ditch and the Camlin River. The Ballykenny - Fisherstown Bog SPA overlaps the SAC, as such the same distances and hydrological connections apply.

Plate 2.2 Showing the pathway distance from the site to the SAC/SPA



The AA Screening process concluded that in accordance with Article 6(3) of the Habitats Directive, it has been determined that, where mitigation measures are not applied, potentially significant indirect effects on the habitats and species listed remain as a result of a reduction in water quality due to the potential release of sediment and hydrocarbons into the local watercourse as a result of the proposed project. This could indirectly affect aquatic species and their habitats within the two overlapping EU sites.

As a result of the screening process recommended to proceed to Stage 2 Appropriate Assessment regarding the potential for significant indirect effects on Lough Forbes Complex SAC and Ballykenny - Fisherstown Bog SPA.

Therefore, a Natura Impact Statement (NIS) was prepared for the proposed development, and a copy of the NIS is attached as a stand-alone document to the Planning application documentation.

The NIS found that the potentially significant effects were evaluated and with the implementation of the proposed mitigation measures, the proposed project will not result in any effects that will adversely affect Lough Forbes Complex SAC and Ballykenny - Fisherstown Bog SPA.

2.3 Policy Context

When addressing the proposed development in relation to national regional and county level policy and objectives, this can be subdivided into National (Section 2.3.1), Regional policy (Section 2.3.2) which are overseen by central government and the Local Authority policy which is set out in the County Development Plan and is addressed in Section 2.3.3.

2.3.1 National Policy

In 2018, the Government of Ireland released Project Ireland 2040, which is the government's overall strategic plan for managing a projected population growth of one million people (a 20% rise) by 2040 in a planned, productive and sustainable manner. Two headline documents were produced:

- The National Planning Framework (NPF) [15]; and
- The National Development Plan 2021-2030 (NDP) [16].

The NPF sets out National Policy Objectives (NPOs). The document recognises the importance of the extractive sector, stating:

> *"Extractive industries are important for the supply of aggregates and construction materials and minerals to a variety of sectors, for both domestic requirements and for export. The planning process will play a key role in realising the potential of the extractive industries sector by identifying and protecting important reserves of aggregates and minerals from development that might prejudice their utilisation. Aggregates and minerals extraction will continue to be enabled where this is compatible with the protection of the environment in terms of air and water quality, natural and cultural heritage, the quality of life of residents in the vicinity, and provides for appropriate site rehabilitation."*

Within NPF2040 there are ten National Strategic Outcomes (NSOs), of which NSO9 (Sustainable Management of Water, Waste and other environmental resources) states that:

> *"The abundant natural and environmental resources such as our water sources are critical to our environmental and economic well-being into the future. Conserving and enhancing the quality of these resources will become more important in a crowded and competitive world as well as our capacity to create beneficial uses from products previously considered as waste, creating circular economic benefits".*

National Policy Objective (NPO) 23: –

> *"to facilitate the development of the rural economy through supporting a sustainable and economically efficient agricultural and food sector, together with forestry, fishing and aquaculture, energy and extractive industries, the bioeconomy and diversification into alternative on-farm and off-farm activities, while at the same time*

noting the importance of maintaining and protecting the natural landscape and built heritage which are vital to rural tourism."

In addition to the above, the NPF2040 recognises that aggregate supply is essential for the fulfilment of the housing goals within the 2040 Plan:

"In the longer term to 2040, there will be a need for provision of at least 275,000 new homes in the cities, with half of these located in already built-up areas."

The NDP estimates that the public investments in infrastructure etc. laid out in the NDP will sustain approximately 80,000 direct and indirect construction jobs per annum over the lifetime of the plan. It outlines the intent to deliver approximately 6,000 affordable homes per year and to improve regional accessibility through enhanced public infrastructure. Multiple National Road projects are also outlined in the NDP to improve connectivity and accessibility.

After the launch of Project Ireland 2040, the Irish Concrete Federation (ICF) produced its own report - Essential Aggregates: Providing For Ireland's Needs to 2040. The report highlights the importance of aggregates as identified in the NPF2040 and states:

"It is essential that the importance of aggregates and aggregate-based products to Ireland's future is recognised by the Government and that Ireland's strategic reserves of aggregates are identified and protected and their use enabled in a sustainable manner. It is equally important that the quarrying industry plays its part in ensuring that operations are carried out in a sustainable manner and that the state's planning enforcement and procurement functions ensure that only authorised operators are entitled to supply the marketplace."

The document estimates that in order to fulfil the housing aims of NPF2040, the industry will need to supply approximately 1.5 billion tonnes of aggregate, and stresses that:

'Scarcities of some particular aggregate products are already emerging in the eastern and midland regions. Therefore, the future supply of aggregates needs to be planned, monitored and managed in a sustainable manner.'

The ICF report also states that:

"To provide for the country's future development, Ireland's strategic reserves of aggregates need to be identified, quantified and protected."

2.3.2 Regional Policy

The Eastern and Midland Regional Assembly (EMRA) covers 9 no. counties including Longford. They have taken the national policy and distilled it down to a regional level through the preparation of Regional Spatial and Economic Strategies (RSESs). The RSES also sets out Regional Policy Objectives (RPOs) to provide a competitive and resilient economic base. The RSES has been incorporated in the Longford County Development Plan. The most direct reference to the extractive industry is RPO 6.7;

> *"Support local authorities to develop sustainable and economic efficient rural economies through initiatives to enhance sectors such as agricultural and food, forestry, fishing and aquaculture, energy and extractive industries, the bioeconomy, tourism, and diversification into alternative on-farm and off-farm activities, while at the same time noting the importance of maintaining and protecting the natural landscape and built heritage."*

2.3.3 Longford County Development Plan

Longford Development Plan (2021 – 2027) sets out an overall strategy for the proper planning and sustainable development of Longford County and consists of a written statement, supporting maps and appendices, indicating the development objectives for the County.

The Council acknowledges the need for extractive industries in terms of supply of aggregate materials for the construction sector, transport infrastructure projects, and for the export market. However, the potential for conflict in the operation of these industries with wider environmental issues needs careful consideration.

In the assessment of planning applications related to the extractive industry, including related buildings and restoration/rehabilitation of existing pits, the Council will have regard to the policy objectives for the specific landscape character of the area.

The suitability of any extraction enterprise shall be assessed on the basis of the sensitivity of the local environment to such impacts, the scale of the development proposed and the capacity of the road network in the area to accommodate associated traffic.

The County Development Plan clearly sets out its policy for the Extractive Industry in section 9.3.7, Volume 1, where it states:-

> *It is the County Policy Objective to:-*
> *CPO 9.39 - Recognise the role and facilitate the exploitation of County Longford's natural aggregate resources in a manner which does not unduly impinge on the*

environmental quality and the visual and residential amenity of an area, while continuing to regulate the extraction of aggregates and to seek the delivery of environmental benefits in the form of sustainable habitat creation in conjunction with the restoration phases of development.

CPO 9.40 - Facilitate the sourcing of aggregates for and the operation of the extractive industry in suitable locations, subject to the protection of landscape, environment, road network, heritage, visual quality and amenity of the area.

CPO 9.41 - Ensure that development for aggregate extraction, processing and associated concrete production does not significantly impact the following:

- *Existing and Candidate European Sites {Special Areas oi Conservation {SACs} and/or Special Protection Areas {SPAs}}*
- *Existing and proposed Natural Heritage Areas {pNHAs}*
- *Other areas of importance for the conservation of flora and fauna and biodiversity value*
- *Zones of archaeological potential*
- *Important aquifers and sensitive groundwater resources*
- *The vicinity of a recorded monument*
- *Sensitive landscape areas*
- *Established rights of way and walking routes*

CPO 9.42 - Consult with the Geological Survey of Ireland {GSI}, with regard to any developments likely to have an impact on Sites of Geological Importance listed in the County Development Plan {Chapter 12: Natural Heritage and Environment and Appendix 7: Natural Heritage and Environment}.

CPO 9.43 - Ensure that extraction activities address key environmental, amenity, traffic and social impacts and details of rehabilitation. In the assessment of planning applications for new development, intensification of use or diversification of activity, the Council will have regard to the nature of the proposal, the scale of activity proposed, the impact on the adjoining road network, the effect on the environment including important groundwater and aquifer sources, natural drainage patterns and surface water systems and the likely effects that any proposed extractive industry may have on the existing landscape and amenities of the county, including public rights of way and walking routes.

CPO 9.44 - Ensure that all extractions shall be subjected to landscaping requirements and that worked out quarries should be rehabilitated to a use agreed with the Planning Authority which could include recreational, biodiversity, amenity or other end-of-life uses. The use of these rehabilitated sites shall be limited to inert waste and sites shall be authorised under the appropriate waste regulations.

2.4 Consultation

A scoping exercise was conducted as part of the planning application process to establish the range and aspects of the environment to be considered as part of the planning application as well as all topics specified in the Environmental Impact Assessment Regulations and guidance documents.

This exercise was conducted following consultation with the applicant and members of the design team. Consultation with planning authority was also undertaken to provide an opportunity to:

- Identify concerns and measures about the project and use these to inform the preparation of the EIAR.
- Incorporate mitigating measures where required.
- Take into consideration the specific concerns of the planning authority.

2.5 Consideration of Alternatives

Firstly, it must be made clear that in the case of quarry developments, the location of the proposed development can only occur in the location where the aggregate resources are available. Therefore, the proposed location of a quarry development is solely dependent on the appropriate rock in both quality and quantity are present.

EIA guidance and legislation requires that consideration should be given to alternatives which should include, where relevant; sites, routes, alignments/layouts, processes, and strategies.

The alternatives considered have been described in line with the Guidelines on the Information to be Contained in Environmental Impact Assessment Reports which states that: *"It is generally sufficient to provide a broad description of each main alternative and the key issues associated with each, showing how environmental considerations were taken into account in deciding on the selected option. A detailed assessment (or 'mini-EIA') of each alternative is not required."*

"The objective is for the developer to present a representative range of the practicable alternatives considered. The alternatives should be described with 'an indication of the main reasons for selecting the chosen option'. It is generally sufficient to provide a broad description of each main alternative and the key issues associated with each, showing how environmental considerations were taken into account in deciding on the selected option. A detailed assessment (or 'mini-EIA') of each alternative is not required."

A number of alternatives were considered as part of the project. In consideration of alternatives for the proposed development, a practical and logical approach has been taken by the applicant and the project team. A number of areas were considered as part of the assessment process and these options were refined down to four options, which included areas in the existing quarry land holding and off-site locations.

These options were assessed and took into consideration economic, social and environmental factors and these are marked Option A to Option D below.

Plate 2.2: Alternative Locations

Option A

This proposal considered the continued use of the existing quarry by deepening the excavations below the existing quarry floor by a further depth of 20m. The maximum area available due to the width of the existing excavation is 3.8 Ha.

The material would be processed and stockpiled within the existing quarry area, at designated locations. It is estimated that Option A would provide a total of 1.9 million tonnes of material. At the maximum rate of extraction, which is in the region of 400,000 tonnes per annum, this option would provide a minimum of approximately 5 years of material and a maximum of 9 years at the current average extraction rate.

Option A - Advantages

Economic:

- The area is within the existing quarry land holding therefore no further land would be required for quarrying purposes and therefore no additional capital outlay would be required for additional lands.
- As the plant and quarry infrastructure is already in place there is an economic benefit in maintaining the existing plant.

Social:

- Mitigation measures associated with existing quarrying activity have already been implemented to offset potential impacts on the surrounding area and its habitats.
- Existing infrastructure is already in place.
- There would be no increase in traffic associated with the proposed development and therefore there would be no additional impact on the local road network.
- Employment would be secured.

Environmental:

- The quarry is an established land use in the area therefore the baseline environment has reflected this use for an extended period of time.
- The existing emissions such as noise, vibration and dust will not be altered significantly.
- Existing landscaping works have been undertaken at the quarry to date to screen the site from the surrounding landscape will continue to be effective.

Option A - Disadvantages

Economic:

- The capital outlay for a planning application which will require an Environment Impact Assessment Report, and the development contributions charges for such a small volume of rock would be uneconomical.
- The proposal would only secure a short to medium reserve of material.
- As the quarry will be deepened the existing quarry footprint would become narrow due to the benching required for stable quarry faces. This reduces the area for

processing and storage of material and increase cost of quarry operations such as blasting etc.

Social:

- Employment would be secured on a short to medium term basis.
- There may be increased impacts on the local community due to increase frequency of blasting and magnitude of vibrations.

Environmental:

- Blasting at depth and in confined areas may impact on the frequency of blasting as well as increase the magnitude of blast vibrations on surrounding houses.
- Restoration works at the existing quarry could not be completed until available material was extracted.
- The deepening of the existing quarry floor would require the management of groundwater in a small footprint which would have to be discharged off site to work on the quarry floor. There would be a limited area to store water during storm events.

Option B

Option B is to expand the ground area of the existing quarry and excavate rock on lands adjacent down to the existing floor of to the quarry. As the existing quarry is restricted by public roads along the northwest and southwest and restricted to the northeast by an existing stream, the only direction in which the quarry can expand is in an easterly direction.

Option B considered increasing the area of the existing quarry by extending over an area of 7.6 Ha, to the east of the quarry. Please refer to Plate 2.2 above which shows Option B in relation to the existing quarry. From the profile of the ground which was exposed by the extraction area at the existing quarry it shows that the rock formation dips in a northwest/south-easterly direction, with a significant overburden thickness of clay increasing eastwards.

Therefore, the proposed quarry extension area would require a significant amount of overburden to be removed and disposed of to extract the underlying bedrock. In addition, the contours indicate that the ground fall off in this direction also, by approximately 10 meters.

From preliminary assessments it is estimated that the entire extension area would have an average clay overburden of approximately 7 meters, plus a fall in ground level of approximately 10 meters. Therefore, the top of the rock would be on average 17 meters below the rock which is exposed in the present quarry face.

The average level of the top of rock in the extension area is 53.0 meters above Ordnance Datum (mOD) and the floor level of the existing quarry is 40 mOD. This gives an average depth of rock in the proposed extension of 13 metres. Given that the net extraction area of the proposed development, taking side slopes and buffer zone around the perimeter, would be 6.0 Hectares. This gives a net volume of rock available for excavation of 780,000 m^3. At a conversion of 2.4 tonnes per cubic metre, this gives a total volume of 1,872,000 tonnes.

At maximum output of 400,000 tonnes per annum this equates to a minimum reserve of just 5 years and at a minimum output of 250,000 tonnes per annum this would give a maximum reserve of just 8 years.

Option B - Advantages

Economic:

- The area is adjacent to the existing quarry land holding and additional land would be required for quarrying purposes; however, the area is relatively small and the capital outlay for purchases of land would be acceptable.
- As the plant and quarry infrastructure is already in place there is an economic benefit in maintaining the existing plant.

Social:

- Mitigation measures associated with existing quarrying activity have already been implemented to offset potential impacts on the surrounding area and its habitants.
- There would be no increase in traffic associated with the proposed development and therefore, there would be no additional impact on the local road network.
- Employment would be secured.

Environmental:

- The quarry is an established land use in the area therefore the baseline environment has reflected this use for an extended period of time.
- The existing emissions such as noise, vibration and dust will not be altered significantly.

Option B – Disadvantages

Economic:

- A planning application which will require an Environment Impact Assessment Report, and the development contribution charges for such a small volume of rock would be uneconomical.
- The proposal would only secure a short to medium reserve of material.

- As the quarry will be deepened the existing quarry footprint would become narrow due to the benching required for stable quarry faces. This reduces the area for processing and storage of material and increase cost of quarry operations such as blasting etc.
- As the average depth of the extension is just 13 metres of rock the height of the bench will necessitate a larger area to be blasted to provide the required yield. This in turn will increase the size and cost of each blast.
- As the area is expanded this may result in considerable increase in groundwater ingress due to the enlarged area which could, in turn, result in an increase in pumping costs to maintain the quarry free from water.

Social:

- Employment would be secured on a short to medium term basis only.
- There may be increased impacts on the local community due to increase frequency and size of blasting due to the limited area.
- Expansion of the quarry in this direction will result in an increase in the area of the quarry exposed to visual impact from the surrounding area

Environmental:

- The deepening of the existing quarry floor would require the management of groundwater in a small footprint which would have to be discharged off site to work on the quarry floor. There would be a limited area to store water during storm events.
- Blasting the reduced depth of rock may impact on the frequency of blasting as well as an increase in the magnitude of blast vibrations on surrounding houses

Option C

This option consisted of a greenfield area of 18.6 Ha. located 400m to the south of the existing quarry. The site would consist of an extraction area of approximately 14.2 Ha. which would be extracted down a level of 20mOD with the remaining area consisting of the manufacturing area, haul roads and landscaping areas. The manufacturing area which would be connected to the L5097 local road via a haul road. This is the same local road which services the existing quarry, so the exit onto the R194 regional road will not alter.

The plant and infrastructure located at the existing quarry would be relocated to a designated manufacturing area at the site. The location of the manufacturing area was located within the proposed development so that it is furthest away from the public road and local residents.

The total reserve of material at the quarry is estimated to be 9.1 million tonnes of material. At maximum output of 400,000 tonnes per annum this equates to a minimum reserve of just 23 years.

Option C - Advantages

Economic:

- The proposed site has a volume of 9.1 millon tonnes and a minimum reserve for over 20 years. This justifies a capital investment, taking into account the costs of a planning application and planning contributions to Longford County Council.
- The volume of material available on the site would give certainty to the future of the development of the company.
- The area is adjacent to the existing quarry operations which would mean plant would not have to move a long distance to an alternative site.
- The land required for the development has been secured in principle.
- The proposed location is located within the area of the existing customer base and close to Longford town and the N4 Longford to Mullingar Road.

Social:

- Quarrying is an existing activity in the area and the transition to the new site on the same country road would not cause additional concerns to the local residents.
- The exit from the proposed development onto the public road is closer to the R194 regional road and therefore have less impact on residences in terms of traffic.
- There would be no increase in traffic associated with the proposed development and therefore there would be no additional impact on the local road network.
- Employment would be secured on a long term basis.

Environmental:

- The quarry is an established land use in the area therefore the baseline environment has reflected this use for an extended period of time.
- Mitigation measures associated with existing quarrying activity will be implemented in the new site to offset potential impacts on the surrounding area and its habitants.
- As the proposed development will be designed so that all of the water collected in the proposed development will be reused for concrete manufacturing and ancillary use, there will be little or no discharge off the site.

Option C – Disadvantages

Economic: -

- The capital outlay for lands together with planning application which will require an Environment Impact Assessment Report, and the development contributions charges for such will require a minimum for 25 years to make the investment viable.
- The proposal would require the removal of in the region of 5m of overburden to extract the underlying bedrock.
- Due to the overburden on the site there will be a substantial investment in the initial years of the development.
- The initial costs of developing the proposed site will be challenging and it is estimated that it will take up to 8 years before the proposed development will become profitable.

Social:

- Quarrying will persist in the local area for additional 25 year period.
- The introduction of the quarry at this new location may result in a limited visual impact from the surrounding area.

Environmental:

- The proposal will result in the loss of a greenfield site and associated ecological habitats to quarrying activity.
- The proposed new quarry would require a detailed water management plan and monitoring to ensure that any discharged off site is minimised.
- Any discharge off site will require a water discharge licence.

Option D

Option D considered the option of closing all quarry activity in this area once the material from the existing quarry is exhausted, and in the future supplying material from available resources in another existing quarry in Drumlish. The applicant would then solely rely on the Drumlish Quarry to supply aggregate directly to the area while importing aggregates to supply the concrete production facility which will remain in the existing quarry. It should be noted that the existing quarry and the proposed development are in areas which consist of limestone aggregate.

The Drumlish quarry is located approximately 13 Kilometres along the local road network. The reserve of material at the Drumlish Quarry consists of a different type of rock which produces High "Polish Stone Value" (PSV) aggregates for the road construction and maintenance sector. This makes this quarry a regionally important source of specialised quarry product. High PSV aggregate is a valuable commodity which is used extensively in

road construction and maintenance. All major roads must have a high PSV chipping in the road surface to improve skid resistance and reduce the risk of accidents. High PSV aggregates are only produced at a limited number of sites in Ireland and the UK

Option D - Advantages

Economic:

- A significant reserve of material is available for extraction at the Drumlish Quarry with a planning duration to extract the available resource expiring in 2050.
- The quarry is operational with administrative facilities on-site and an active quarry face therefore would not require enabling works such as the removal of overburden and construction of haul roads.
- Although the Drumlish quarry is located away from the existing quarry in Killoe, it is still within the applicants existing customer area.

Social:

- The existing quarry void, vegetation and berms in place at the Drumlish quarry serve to reduce the potential noise and air impacts.
- Quarrying is an existing land use in the area.
- The increase in production may result in people indirectly employed by the development availing of existing services and potentially the establishment of additional services.

Environmental:

- The quarry is an established land use in the area therefore the baseline environment has reflected this use for an extended period of time.
- The existing emissions such as noise, vibration and dust will not be altered significantly.
- Mitigation measures to offset potential impacts of quarry activity such as berm construction and planting as been undertaken in locations of the quarry.
- No additional greenfield area would be lost to quarrying.

Option D – Disadvantages

Economic:

- The reserve of material at the Drumlish Quarry consists of High "Polish Stone Value" (PSV) aggregates for the road construction and maintenance sector which makes this quarry a regionally important source of specialised quarry product. High PSV aggregate is a valuable commodity which is used extensively in road construction and maintenance. All major roads must have a high PSV chipping in the road surface to improve skid resistance and reduce the risk of accidents. High PSV aggregates are

only produced at a limited number of sites in Ireland and the UK. Therefore, using this material for production of general aggregates would constitute an unsuitable use of a valuable resource.

- The cost of producing concrete using the material from Drumlish as opposed to using limestone aggregates is more expensive as the High PSV material is generally more flakey and will require more sand and cement to achieve the same strength.
- Many costumers specify limestone-based materials and will not accept the Drumlish material.
- The developer cannot maintain economic competitiveness in contracts while transitioning to this new material to be supplied from Drumlish
- The proposal would result in the loss of some of the employment at the Killoe Quarry on closure of the site. However, some may be accommodated at the Drumlish Quarry.

Social:

- Although all operations at the Drumlish Quarry are authorised, the movement of all operations to Drumlish may result in a potential impact on the local community due to an increase frequency of blasting over a short time period.
- The closure of the Killoe Quarry and the movement of operations to Drumlish would result in the reduction of people availing of social infrastructure in the area in Killoe.

Environmental:

- Trucks serving existing customers particularly in the Longford Town and environs would have to travel longer distances to collect material from the Drumlish Quarry which would result in an increase in emissions.
- The sudden increase in production as opposed to a gradual increase in production at the Drumlish Quarry to meet the demand from the closure of Killoe may displace birds and mammals which have established in the area surrounding the quarry and which are accustomed to the existing emissions from the quarry.

2.5.1 Preferred Option

Option C was the preferred option as it had several advantages over the alternative options which are listed which include the site being located in an area which was previously subject to quarrying. A proven quality resource is located in the general area. The proposed development will utilise the existing road infrastructure used by the existing quarry.

It is proposed to locate the manufacturing area in the southern corner of the application site which is at the greatest distance from dwellings houses along the northern boundary. Also,

the manufacturing area is located on the western side of a north south ridge which will provide visual and aural screening.

2.5.2 Alternative Processes

The proposed application area will be subject to extraction and processing of rock into various grades of aggregate. The method of extraction will be blasting which is deployed at the existing working quarry. The only other alternative to blasting is rock breaking using a hydraulic impact breaker attached to an excavator which can result in increased noise levels over a prolonged basis.

Material processing is undertaken at quarries using either fixed or mobile plant and in some cases both are used. The applicant proposes to erect a fixed crushing, screening and washing plant at the site. Mobile plant will continue to be used as required once the fixed plant is operational with the majority of processing undertaken at the fixed crushing and screening plant.

2.5.3 'Do-Nothing Alternative

If the proposed development was not to proceed, the site would remain as a greenfield site with existing land uses remaining which include livestock grazing, planted mixed woodland and historical peat extraction. The existing working quarry would continue to operate with extraction and processing of material and manufacturing of quarry products. If the quarry were to close due to the lack of material, this would result in a significant loss of jobs and employment and supply of quarry products to the local and regional market as the quarry would be forced to close.

2.6 Rationale for the Application

Rhyne Rock currently operates another quarry located at Drumlish which is approximately 7km north of the application site. As stated previously, the reserve of material at the Drumlish Quarry consists of High "Polish Stone Value" (PSV) aggregates for the road construction which is only produced at a limited number of sites in Ireland and the UK.

The resource at the existing quarry and proposed development site at Killoe consists of a Dark limestone & shale (`calp) of the Lucan Formation which existing customers prefer as a source of aggregate as opposed to the resource at the Drumlish Quarry. The reserve of material at the existing quarry is nearly exhausted therefore the applicant is applying for planning permission to authorise a long term resource to supply customer requirements

All plant and infrastructure would be relocated from the existing quarry at Killoe to the proposed location and the existing quarry would be restored once quarrying activity at the subject development commences.

2.7 References

European Communities (Environmental Impact Assessment) Regulations, 1989 to 1999 (S.I. No. 349 of 1989)

Local Government (Planning & Development) Regulations, 2001 (S.I. No. 600 of 2001)

European Communities (Environmental Impact Assessment) Regulations, 1989 to 1999, Second Schedule, (S.I. No. 93 of 1999)

European Communities (Environmental Impact Assessment) Regulations, 1989 to 1999, Third Schedule, (S.I. No. 93 of 1999)

Guidelines on the information to be contained in Environmental Impact Statements, Environmental Protection Agency (EPA, 2002)

Advice notes on current practice in the preparation of Environmental Impact Statements (EPA, 2003)

Environmental Management Guidelines – Environmental Management in the Extractive Industry (Non – Scheduled Minerals) (EPA, 2006)

Guidance for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment (DECLG, 2013)

Directive 2014/52/EU European Parliament and of the Council EIA Directive (April, 2014)

Draft Revised Guidelines on the Information to be contained In Environmental Impact Statements (EPA, September 2015)

Draft Advice Notes for Preparing Environmental Impact Statements (EPA, September 2015)

Guidelines on the information to be contained in Environmental Impact Assessment Reports (EIAR) (EPA, May 2022)

Longford County Development Plan 2021 - 2027

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3.0 PROJECT DESCRIPTION

3.1 Introduction

This section of the EIAR provides supporting information in relation to the activities that will be undertaken at the application site during the operational, construction and decommissioning phases of the development.

3.2 The Existing Environment

The application site is mainly farmland which consists of greenfield paddocks separated by hedgerows, an area of peatland to the northwest which was historically subject to peat extraction and an area of planted mixed woodland. An operational quarry is located to the east of the application site which is operated by Rhyne Rock. There are a number of residences in the immediate vicinity of the development comprising of isolated farm dwellings and ribbon development.

Land-use in the vicinity of the application site consists of livestock farming, historical peat extraction and commercial forestry. There are number residences in the immediate vicinity of the development comprising of isolated farm dwellings and ribbon development. An existing operational quarry is located to the northeast of the application site which is operated by Rhyne Rock.

The majority of the application site is located on the western side of a ridge running in a north-south direction which has a peak level of 71mOD. The extraction/manufacturing area of application site varies from a level of 55mOD along the western boundary to 70mOD along the eastern boundary.

The main surface water course in the area is the river Camlin which rises near Abbylaragh and flows in a south westerly direction joining the River Shannon approximately 15 kilometers from the site in the village of Cloondara. The river Camlin is located 360m to the southwest of the application site at its closest point. A number of tributaries flow into the river Camlin along its course including the Rhine Stream which flows in an easterly direction along the northern boundary of the existing quarry. The Rhine Stream is located approximately 50m to the east of the point where the haul road joins the L5097 Local Road.

The existing and proposed layouts and sections through the application site and quarry are illustrated on Figures 3.1 – 3.5 located at the end of this section.

3.3 Proposed Development

The proposed development of 18.6 Ha. consists of an extraction area (14.2 Ha.) where rock will be extracted by blasting means and a manufacturing area (2.1 Ha.) where material will be processed into saleable aggregate and sold to market or used to manufacture concrete products. The remaining areas consists of the haul road (0.7 Ha.) and landscaping areas (1.6 Ha.).

The proposed development will include the following:

- A construction phase associated with the construction of a haul road from the entrance to the manufacturing area and the erection of plant and infrastructure at the manufacturing area.
- The operational phase will include the day-to-day operations undertaken at the proposed development which will include vegetation and overburden removal, extraction and processing of rock and the manufacturing of concrete products.
- Berm construction will be undertaken in tandem with vegetation and overburden removal which will be undertaken during the operational phase therefore assessed under the operational phase of the proposed development.
- Once the available resource has been extracted final restoration works and decommissioning of the plant and infrastructure will be undertaken as per the landscape, restoration, and decommissioning plan.

The construction, operational and restoration/decommissioning phases are described under the respective headings. Details of the various phases of the proposed development are given in the drawings attached to the planning application

3.3.1 Construction Phase

The construction phase of the proposed development will consist of the levelling of the manufacturing area where the concrete batching plant, processing plant, block yard area and settlement lagoon will be located, erection of the concrete batching plant and processing plant, construction of a concrete block yard area and settlement lagoon. Details of the yard are given in Figure 3.4. The construction works associated with the proposed development will take approximately 6 to 12 months to complete and will consist of the following:

- Construction of Haul Road
- Levelling of Manufacturing Area
- Erection of Concrete Batching Plant
- Construction of Block Yard
- Construction of Settlement Lagoon

- Erection of Fixed Processing Plant

3.3.1.1 Construction of Haul Road

It is proposed to construct a haul road along the northern and eastern boundary of the application site from the entrance off the public road to the manufacturing area. Overburden will be removed, and the road will be constructed with aggregate sourced from the existing quarry. The overburden will be used to construct a berm around the boundary of the site. An excavator and dump trucks will be used to undertake this activity.

3.3.1.2 Construction of Manufacturing Area

The manufacturing area will be located in the southern area of the development site and will consist of a concrete batching plant, processing plant, block yard, storage sheds, workshop, office buildings, weighbridge, wheelwash, settlement lagoon and all other associated ancillary facilities. Overburden will be removed and used to construct a berm around the external boundary of the manufacturing area. The yard will then be constructed using aggregate sourced from the quarry. An excavator and dump trucks will be used to undertake this activity.

3.3.1.3 Erection of Concrete Batching Plant and Buildings

Once the ground has been levelled, works will commence on the construction of the concrete batching plant. This will involve pouring concrete bases which the plant will be erected on. Areas around the plant which will be heavily trafficked will also be concreted. The plant will be erected using mechanical lifting equipment such as a truck mounted crane. The plant will then be connected to mains power supply which will be diverted from the existing quarry. Once erected, the plant will undergo a series of checks as part of the commissioning process.

The proposed storage shed & workshop will be constructed with a steel frame and concrete walls with metal roof and wall cladding. All works will be undertaken by competent personnel either employed by Rhyne Rock directly or by subcontractors. The other plant and infrastructure will require similar construction methods.

3.3.1.4 Construction of Block Yard

The block yard will consist of a concrete slab where moulded blocks will be laid out to cure. The block yard will be located adjacent to the concrete batching plant to provide ease of access for the block making machine.

3.3.1.5 Construction of Settlement Lagoon

It is proposed to construct a settlement lagoon which will remove any suspended solids that may be present in the excess water before it is passed through a hydrocarbon interceptor before reused or discharging off-site. Water from the lagoon will be recycled and used for production.

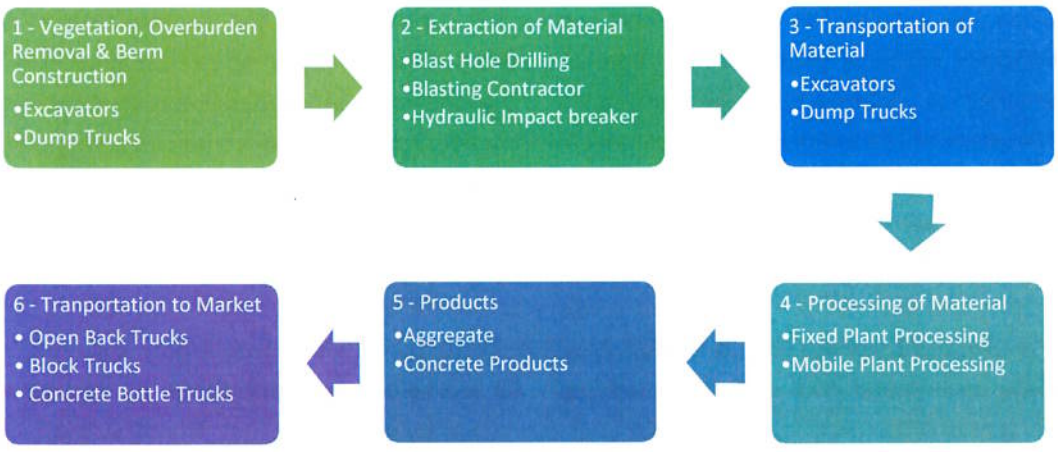
3.3.1.6 Erection of Fixed Processing Plant

It is proposed to construct a fixed processing plant in the manufacturing area which will consist of a crushing, screening and washing plant. This will involve pouring a concrete base and walls which the plant will be erected on. The plant will be transported to the quarry and erected by competent fitters using mechanical lifting equipment.

3.3.2 Operational Phase

The operational phase will consist of the day-to-day activities which will be undertaken associated with the provision of quarry products to market. Plate 3.1 below gives a summary of the activities that will be undertaken as part of the operational phase of the proposed development.

Plate 3.1: Flowchart Describing the Operational Phase of the Proposed Development



Activities that will be undertaken at the application site as part of the quarrying process are detailed below:

1. Vegetation, Overburden Removal & Berm Construction
2. Extraction of Material
3. Transportation of Material
4. Processing of Material

5. Products
6. Transportation to Market

3.3.2.1 Vegetation, Overburden Removal & Berm Construction

Vegetation and overburden will be removed in phases in advance of extraction of the underlying rock. Vegetation removal will be undertaken on an intermittent basis outside the bird breeding season. The wood has no commercial value and will be used for firewood with smaller branches chipped on site.

Overburden removed will be stored in berms around the application site boundary which is designated for landscaping or stored in stockpiles for restoring quarry faces once extraction has ceased. Trees will be planted on the proposed berms in order to offset the impact associated with the removal of vegetation.

Soil and stone material removed during the processing of extracted material will also be used for berm construction. The construction of berms is dealt with under the operational phase as this activity will be ongoing during the operational phase of the development.

Material will be transported to the site of the proposed berm, unloaded and shaped using an excavator. A suitable growth medium such as topsoil will be placed on the berm which will allow vegetation to establish. Berms will be planted with native trees and shrubs and allowed to naturally vegetate to provide screening.

3.3.2.2 Extraction of Material

Blasting will be the method used to fragment the material to a manageable size. Occasionally it may be necessary to fragment rocks using a hydraulic impact breaker attached to an excavator. A licenced blasting contractor will be employed to design and carry out the blasting of in-situ bedrock.

The process will begin with a detailed survey of the quarry face. This will allow the explosives engineer to design the blast and to plot where the shot holes should be drilled. After the face profiling survey, the drilling contractor will drill the holes to the required depths and angles.

After the shot holes are drilled, they will be surveyed to check that they correspond to the blast design. The placement of explosives will be professionally planned to ensure that the required fragmentation of the rock is achieved with the minimum environmental impact. Blasts will take place at predetermined times in advance of any blast occurring. On the day of the blast, the explosives will be delivered to the site of the blast. A detonator will be placed

in each hole and the holes will be loaded with high explosives to within a few metres of the top. The remaining depth will be 'stemmed' with quarry dust or fine aggregate.

Prior to the blast, the site will be cleared and a siren sounded to make sure that everyone nearby is warned. When the final all clear is given, the shot firer will set off the explosives. Vibration and air overpressure levels associated with this part of the operation will be monitored using monitors set up at predetermined sensitive locations.

After the blast, the face and shot pile will be inspected to check that all the shot holes are fired correctly. Blasting will be undertaken on an as required basis and will be designed so as to not exceed recommended guidelines in relation to blasting.

3.3.2.3 Transportation of Material

An excavator will be used to fill dump trucks which will transport the material via haul roads to the fixed processing plant. The material will be unloaded directly into the fixed crusher for processing. Material will be processed on the quarry floor occasionally to remove unwanted silt material prior to transporting the material to the fixed processing plant or to market.

3.3.2.4 Processing of Material

The fixed processing plant will process the material into various aggregate sizes with washing undertaken where required. The processed material will be directed via conveyors to a series of stockpiles. Mobile processing plant may also be deployed close to the point of extraction to process material to a certain grade before transporting to the fixed processing plant for further processing.

Soil material present in the blasted rock is separated from the material as it is passed through the crushing and screening plant and stockpiled. This material will be used to construct berms around the boundary of the quarry and for landscaping and restoration.

3.3.2.5 Products

Aggregate

The majority of the processed aggregate will be sold as graded aggregate to the client's requirements. Aggregate will be loaded onto open back trucks using wheel loaders and transported to the market destination. According to the Geological Survey of Ireland (GSI) mapping the bedrock of the application site is classified as dark limestone & shale (`calp) of the lucan formation. Each load will be weighted prior to exiting the site and a weighbridge docket printed out to accompany the load to the destination.

Ready-mix Concrete

Aggregate will also be used to produce ready-mix concrete to the required strengths depending on the order. Sand and cement which are a requirement of the mix will be imported from reputable suppliers on an as required basis. Sand will be stockpiled on-site and fed into storage bins close to the batching plant as required while cement will be stored in silos.

The aggregate required for the production of concrete will be released from the storage bins on a volumetric belt which will direct the aggregate to the mixing chamber of the batching plant. The mixed batch is then fed through a shoot at the base of the mixing tower into bottle trucks which transports the load to market.

Concrete Blocks

Concrete blocks will also be produced at the quarry. Concrete required for the manufacturing of concrete blocks will be batched in a similar way to ready-mix concrete. Water will be added and mixed to the batch prior to discharging into the concrete block manufacturing machine.

Blocks will be moulded in batches and laid out on the concrete block yard to cure for a few days. Once cured the blocks will be baled and stored at designated areas until they are transported to construction sites or builder suppliers.

3.3.2.6 Description of Plant On-Site

Due to the various processes undertaken, the following plant and equipment is typical of that which will operate at the proposed development during the various phases. Most of the plant and equipment detailed below operate at the existing quarry operated by the applicant:

Mobile Crushing & Screening Plant	Fixed Crushing, Screening & Washing Plant
Wheel loaders	Concrete Batching Plant
Excavators	Mobile Concrete Block Making Machine
Dump Trucks	Forklift / Concrete Block Handler
Drilling Rig	Road Trucks
Hydraulic Impact Breaker	Concrete Bottle Trucks
Tractor & Bowser	Block Carrier Trucks
Mobile Crane	

Aggregate trucks, concrete bottle trucks and concrete block trucks fitted with a grab will be used to transport products from the application site to the required destination.

3.3.2.7 Fuel & Chemical Storage

Fuel will be delivered to the quarry by competent fuel companies and dispensed into plant and machinery. A small volume of fuel will be stored in a bunded fuel storage tank which will be located in the storage shed/workshop. In general lubricating oil and hydraulic oil for servicing plant and equipment are brought to the site by the fitter employed with the waste oil removed from plant brought away by the fitter. Should there be a requirement to store these at the site they will be stored in covered bunded storage areas.

3.3.2.8 Surface & Groundwater Management

Surface water from the quarry floor, quarry faces, and elevated areas will be collected in a sump on the quarry floor. Water will be retained in the sump for a period of time to allow suspended solids to settle out of suspension and will be pumped to a settlement lagoon located in the manufacturing area of the quarry.

Water will be stored in the settlement lagoon and used for the day-to-day operations at the quarry such as manufacturing concrete products, aggregate washing, dust suppression etc. Excess water will be discharged off site to the local surface water network which will be the subject of a discharge licence application to Longford County Council. During extreme storm conditions the quarry floor will be allowed to flood, and water will be pumped out at a normal rate when the storm subsides.

Procedures will be put in place to prevent spillages associated with dispensing fuels, servicing of equipment, servicing plant & machinery and dealing with accidental spillages to ensure that no contaminants enter the ground or surface water environments. Detailed description of water management on the site is given in Chapter 7 of this EIAR

3.3.2.9 Working Hours & Employment

Operating hours for the development will be between 0700 hours and 1900 hours, Monday to Friday and between 0700 hours and 1600 hours on Saturdays. There may be a requirement to operate outside these hours for certain projects such as works required to be undertaken at night-time. Should there be a requirement to operate outside normal operating hours, prior agreement will be obtained from Longford Co. Co.

The quarry development will provide employment for approximately 30 people directly with a further 10 people employed indirectly. Sub-contractors for blasting, hauling products and maintenance contractors will also be a source of indirect employment at the quarry.

3.3.2.10 Utilities and Services

Connections to the relevant utilities such as ESB, telecommunications and water supply will be sought from the relevant providers. The electricity connection to the existing quarry is a 200KVa – 240v – 3 Phase over-head line which will be diverted to the proposed quarry manufacturing area via the proposed access road. An overhead telecommunications line services the existing quarry and dwellings houses to the east of the application site along the L5097 road. A connection will be obtained from this line to serve the administrative infrastructure located at the application site. A water connection will be obtained from an existing Irish Water main that runs along the L5097 road. This connection will provide a potable water supply to the office and canteen. Wastewater facilities will be constructed at the manufacturing area.

3.3.2.11 Energy Usage

Plant and machinery operating at the quarry will be mainly diesel powered with fuel supplied by a local authorised distributor. The proposed crushing, screening and washing plant and concrete batching plant will be powered by electricity.

3.3.2.12 Transport & Access

The development will generate a number of traffic movements associated with the delivery of raw materials, employee related traffic and the transport of material to market which is anticipated to be in the region of 73 truckloads per day. All the quarry traffic will exit onto the L5097 for approximately 50 meters before meeting the R194 which will be the main transport route for products from the quarry. There will be no net increase on traffic on the L5097and R194 from the proposed development as quarry related traffic will be transferred from the existing quarry to the proposed development.

3.3.2.13 Offices & Facilities

All traffic and personnel entering the quarry will report to the site office prior to proceeding further to the extraction area. A weighbridge facility will be located adjacent to the site office. A wheel wash facility will be located along the haul road to the manufacturing area. Canteen and toilet facilities will be located at the manufacturing area.

3.3.2.14 Waste Management

Overburden & Waste Soil

All overburden material arising from the development site will be used for screening around the boundary of the application site and other areas of the quarry. Soil and silt from crushing & screening will also be used for this purpose. Overburden material will be retained onsite for restoration of the quarry.

Waste Metal

Waste metal which originates from parts replaced on plant & vehicles and end of life vehicles is collected by licensed contractors on an as required basis and recycled at appropriately licensed plants or facilities.

General/ Canteen Waste

General/Canteen waste created by staff is held in wheelie bins supplied by the waste contractor and collected on a regular basis and transported to a licensed facility for recovery, recycling or disposal.

3.3.2.15 Safety & Security

The boundaries of the quarry will be enclosed by a combination of berms with planted hedgerows which will be designed to blend into the surrounding landscape. Stock proof post and wire fencing and security fencing will be put in place around the site. Warning signs will be erected at locations around quarry where required.

3.3.2.16 Ecological Sensitive Areas

Natural Heritage Areas (NHAs) are sites that are designated for the protection of flora, fauna, habitats and geological sites of national importance. These are the base designation for Nature Conservation in Ireland. It was from these NHAs that the most important sites were selected for international designation as Special Areas of Conservation (SACs) and Special Protection Areas (SPAs).

SACs are designated for the conservation of flora, fauna and habitats of European importance and SPAs for the conservation of bird species and habitats of European importance. These sites form part of 'Natura 2000' which is a network of protected areas throughout the European Union.

Areas of conservation interest located within 15km of the development site are outlined in Table 3.1. There are five SACs, two SPA, six NHAs and eleven pNHAs located within a 15km radius of the application site. These are discussed in more detail in Chapter 5.0 Biodiversity.

3.3.2.17 Dust Generation & Control

The extraction and processing of material and transporting of quarry product can have the potential to generate wind-blown dust if not managed effectively. Haul roads will be dampened down during dry windy conditions which are ideal conditions for dust blow. The quarry void created as a result of extraction will also prevent dust from escaping due to the depth below ground level. Stockpiles will be kept to a minimum and will be sprayed with

water to reduce dust blow where required. Dust generation and control is dealt with under Section 9.0 of the EIAR.

3.3.2.18 Noise Generation & Control

Sources of noise as a result of day to day activities being undertaken at the application site will be associated with blasting, extraction, processing, production and transporting of products around and off-site. All necessary precautions will be put in place to ensure that the operations at the quarry will not impact significantly on the local environment. Noise and vibration is dealt with under Section 10.0 of the EIAR.

3.3.2.19 Extraction Duration & Phases of Extraction

The total application area is 18.6 hectares of which 14.2 hectares will be subject to extraction of the available resource. The total reserve of material at the quarry is estimated to be 9.1 million tonnes of material which will be extracted over 12 Phases. The rate of extraction from the quarry is anticipated to be a maximum of 400,000 tonnes/annum. The applicant is requesting a 25-year permission in order to allow for adequate time to commence works post grant of permission and to restore the quarry on completion of extraction of the available resource. The proposed phases of extraction are detailed in Figures 3.3.

3.3.2.20 Environmental Management System

The purpose of an EMS is to describe the overall environmental management for the site to enable the company to conduct its activities while ensuring the associated environmental impacts are managed. A site-specific Environmental Management System (EMS) will be implemented for the quarry on granting of planning permission and will be a working document reviewed on an as required basis.

Environmental monitoring to include noise, dust, surface water and groundwater monitoring will be undertaken on a regular basis. Monitoring is dealt with in relevant sections of the EIAR.

3.3.3 Landscaping, Restoration, Decommissioning & Aftercare

When the appropriate planning period has expired at the application site and no further planning permission has been obtained, the applicant will be required to implement a restoration and decommissioning plan. A Landscape & Restoration Plan for the site has been drafted and is attached as Appendix 12.1. The final decommissioning/restoration will consist of the following:

Phase I – Permanent restoration of side slopes during rock extraction.

Quarry faces adjacent to the boundary of the quarry works or adjoining lands will be restored to a permanent restoration where possible. This activity will be undertaken during extraction activities and will include following works:

1. Benches will be side blasted to form 70° angle side slopes to the quarry face where possible.
2. The maximum height of a bench in the quarry will be 20 metres and the proposed width of each bench will be 5 metres wide.

Phase II – Final Restoration of Areas

The final restoration will commence prior to the expiration of the authorised duration of the permission. This will consist of the following:

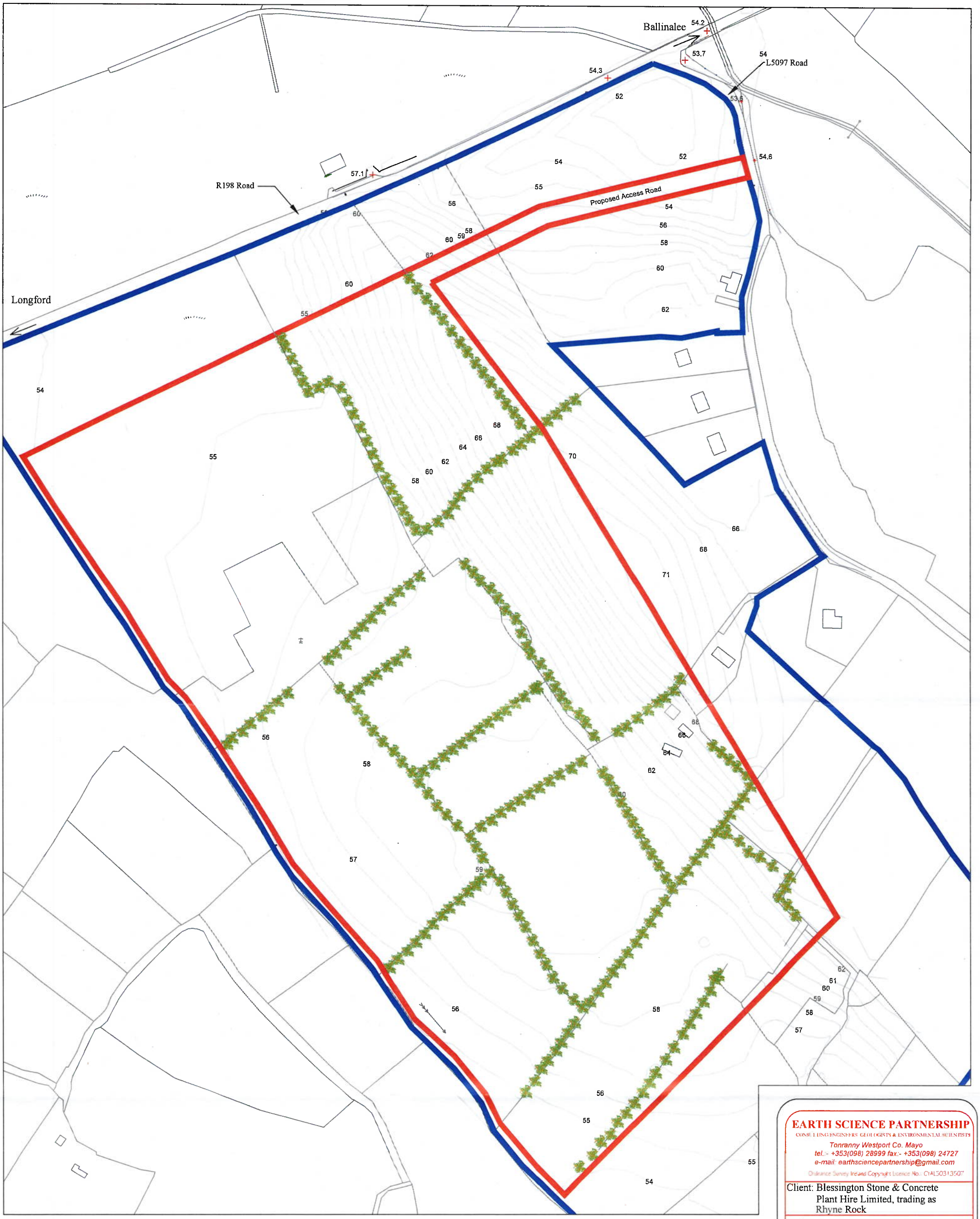
1. All plant and machinery will be removed from the application area.
2. Some areas of the quarry above the quarry lake that will be formed will be covered with subsoil, topsoil and allowed to regenerate.
3. Additional planting of trees and shrubs may be necessary in some areas.
4. The existing berms and planting will be retained as shown on the attached drawings.
5. No pesticides will be used on the topsoil which will allow the seed bank within the soil to quickly regenerate to re-establish native grasses and plants.

The main feature of the worked out area will be a new quarry lake and all preparations for the formation of that lake are designed to make it support plant and animal life. Creating of benches in rock, varying rock faces and fine materials which often gets trapped in rock crevices aid rooting of plants and provide varied habitats.

Phase III - Decommissioning

When quarrying activity has ceased at the site, all plant and machinery will be removed from the application area. The majority of plant and equipment on site does not pose any environmental concern in the event of decommissioning. In the event of decommissioning, all machinery removed from the quarry will be reused at a different location or if not required at another location, plant will be dismantled and the metal sold. After stockpiles, plant equipment and unused structures are removed from the site an inspection will be undertaken to ensure that all plant and equipment has been decommissioned and removed.

Figures



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Legend

Ownership/Consent Boundary

Application Area

Area = 18.6 Ha

Hedge/Vegetation

N

OS Sheet Ref. No. LD 009

ITM Coordinates E 619157, N 779736

All Levels Relative to Ordnance Datum

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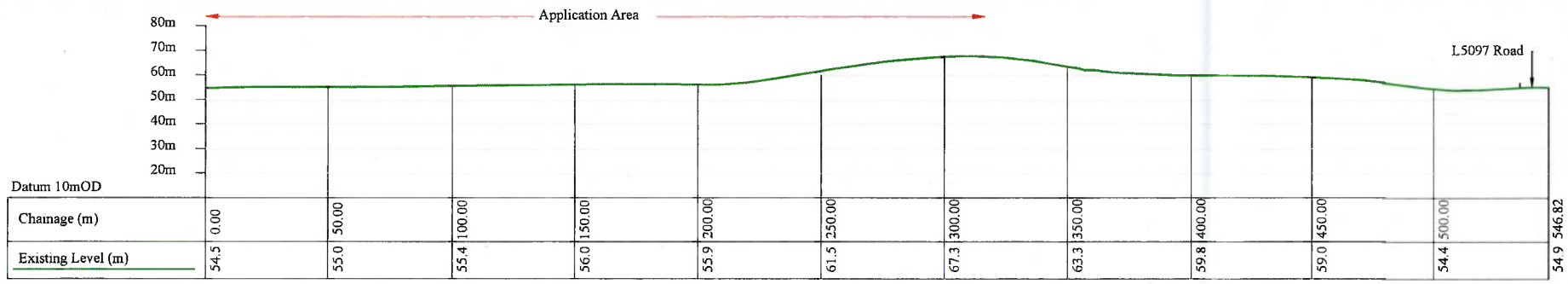
Project: Planning Application for a Quarry Located at Rhine, Killoe, Co. Longford.

Title: Existing Site Layout Map

Drawn By: P. O' Donnell

Scale: 1:2,500 @ A3	Date: May 2024
Job No: EI 161	Rev: 0

Figure 3.1



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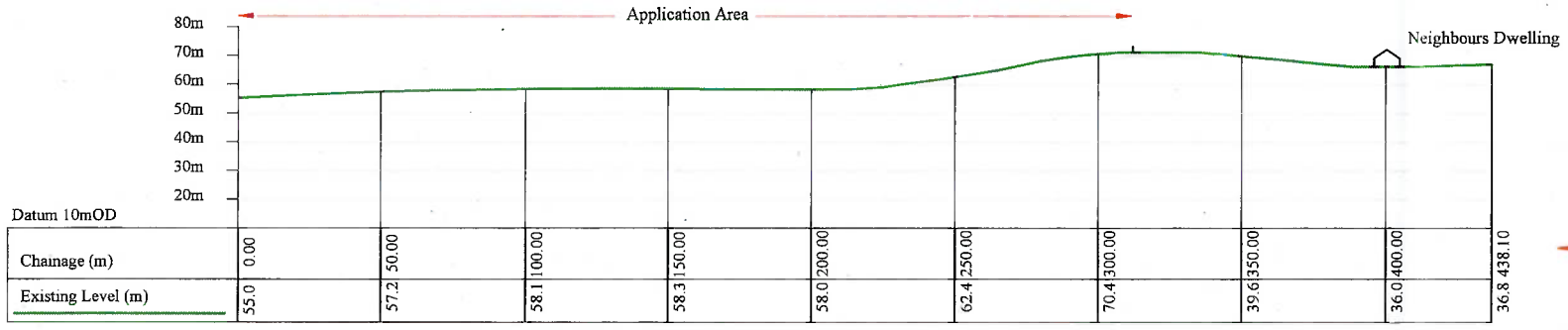
Existing Level (m)	54.5	55.0	55.4	56.0	55.9	61.5	67.3	63.3	59.8	59.0	54.4	54.9

Section A - A



Chainage (m)	0.00	50.00	100.00	150.00	200.00	250.00	300.00	350.00	400.00	438.10
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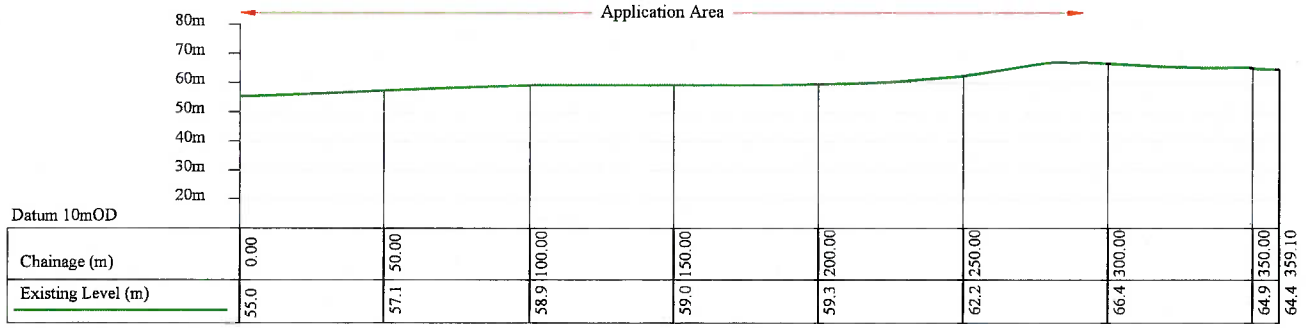
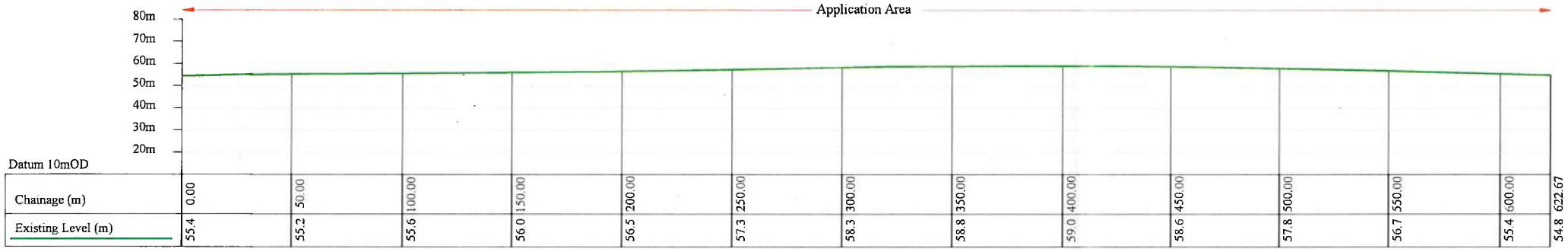
Section B - B



Chainage (m)	0.00	50.00	100.00	150.00	200.00	250.00	300.00	350.00
Existing Level (m)	55.0	57.1	58.9	59.0	59.3	62.2	66.4	64.9

359.10
64.4

Section C - C



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Existing Level (m)	55.4	55.2	55.6	56.0	56.5	57.3	58.3	58.8	59.0	58.6	57.8	56.7	55.4	54.8

Section D - D

Chainage (m)	0.00	50.00	100.00	150.00	200.00	250.00	300.00	350.00	400.00	450.00	500.00	550.00	583.47
Existing Level (m)	60.0	61.5	62.1	62.5	62.1	61.5	60.9	61.1	60.8	59.9	59.0	58.2	57.8

Section E - E

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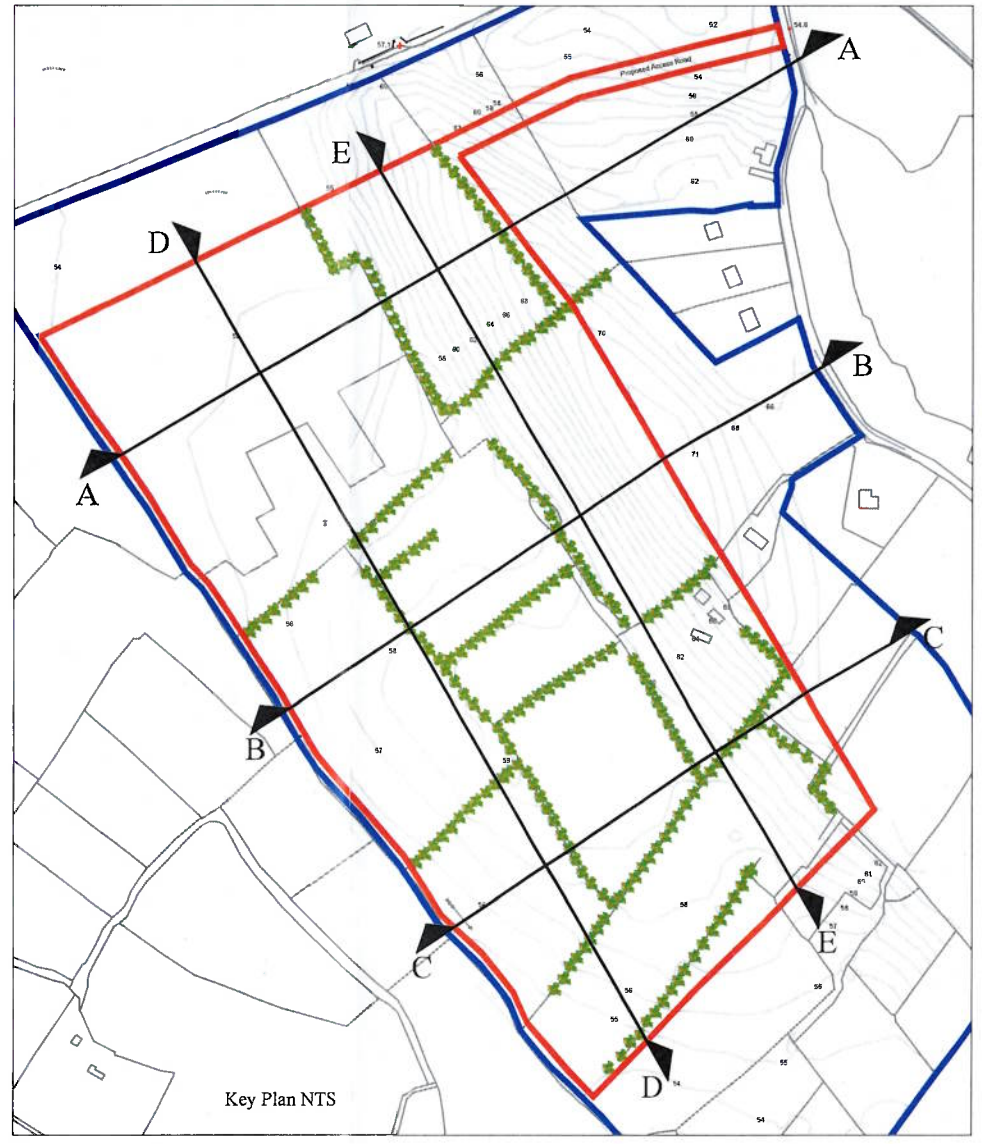

Legend

Ownership/Consent Boundary

Application Area

Area = 18.6 Ha

Existing Level

Hedge/Vegetation

OS Sheet Ref. No. LD 009

ITM Coordinates E 619157, N 779736

All Levels Relative to Ordnance Datum

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Client: Blessington Stone & Concrete Plant Hire Limited, trading as Rhyne Rock

Project: Planning Application for a Quarry Located at Rhine, Killoe, Co. Longford.

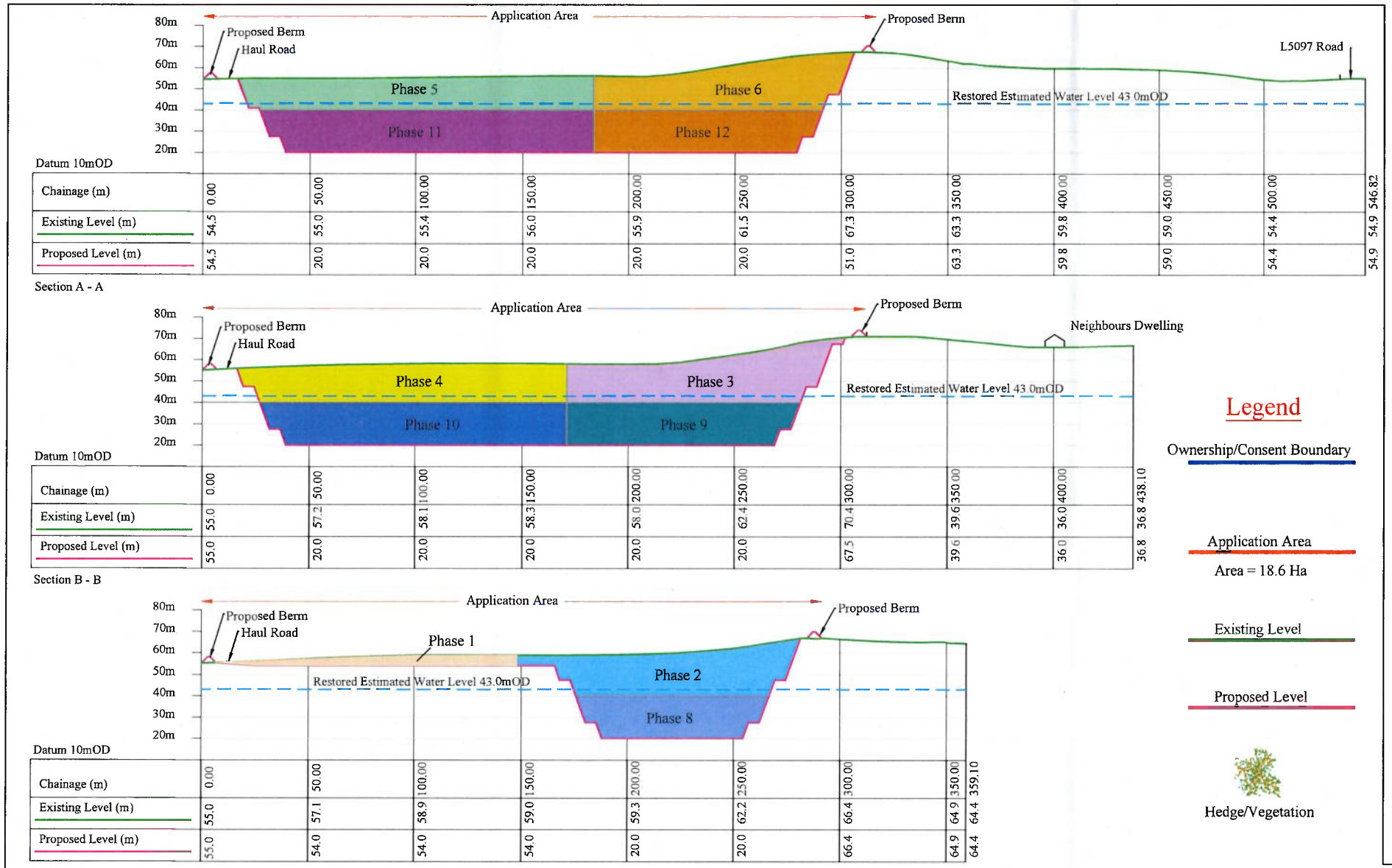
Title: Existing Site Sections (A-E)

Drawn By: P. O' Donnell

Scale: 1:2,500 @ A3 | Date: May 2024

Job No: EI 161 | Rev: 0

Figure 3.2



Chainage (m)	0.00	50.00	100.00	150.00	200.00	250.00	300.00	350.00	400.00	450.00	500.00	546.82
Existing Level (m)	54.5	55.0	55.4	56.0	55.9	61.5	67.3	63.3	59.8	59.0	54.4	54.9
Proposed Level (m)	54.5	20.0	20.0	20.0	20.0	20.0	51.0	63.3	59.8	59.0	54.4	54.9

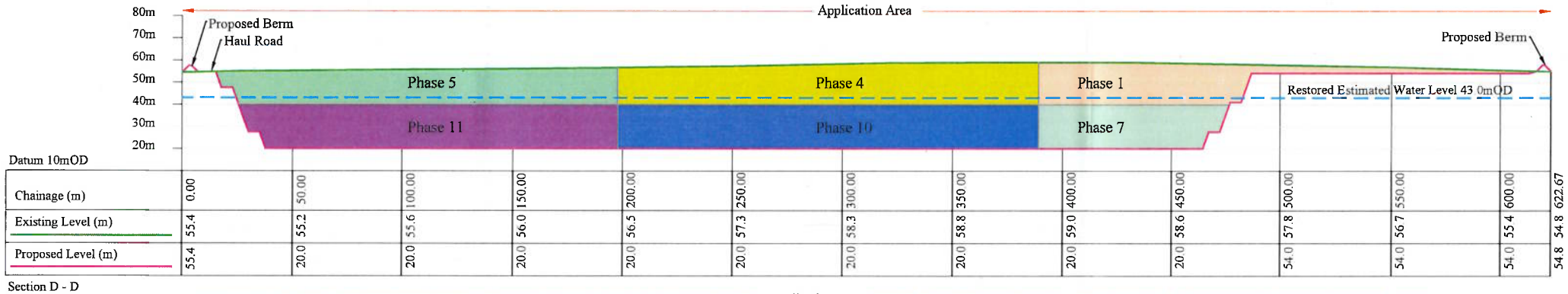
Section A - A

Chainage (m)	0.00	50.00	100.00	150.00	200.00	250.00	300.00	350.00	400.00	438.10
Existing Level (m)	55.0	57.2	58.1	58.3	56.0	62.4	70.4	39.6	36.0	36.8
Proposed Level (m)	55.0	20.0	20.0	20.0	20.0	20.0	67.5	39.6	36.0	36.8

Section B - B

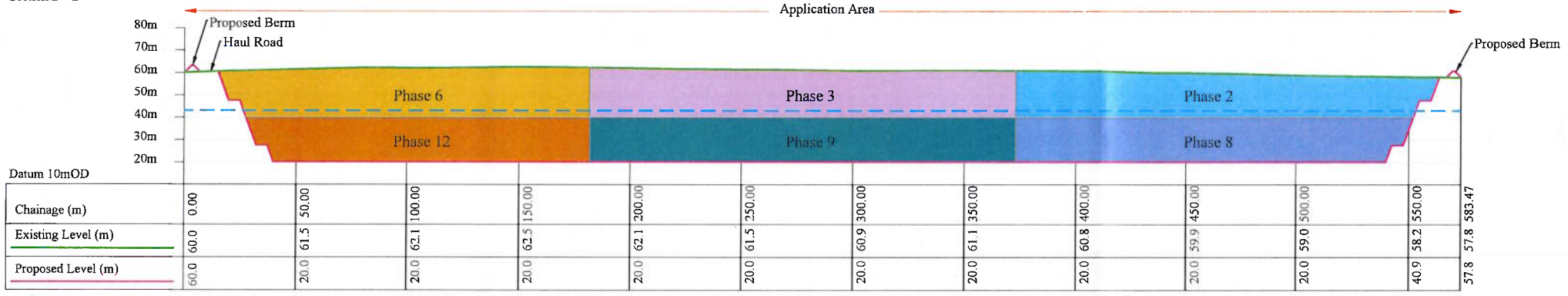
Chainage (m)	0.00	50.00	100.00	150.00	200.00	250.00	300.00	350.00
Existing Level (m)	55.0	57.1	58.9	59.0	59.3	62.2	66.4	64.9
Proposed Level (m)	55.0	54.0	54.0	54.0	20.0	20.0	66.4	64.9

Section C - C



Chainage (m)	0.00	50.00	100.00	150.00	200.00	250.00	300.00	350.00	400.00	450.00	500.00	550.00	600.00	622.67
Existing Level (m)	55.4	55.2	55.6	56.0	56.5	57.3	58.3	58.8	59.0	58.6	57.8	56.7	55.4	54.8
Proposed Level (m)	55.4	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	54.0	54.0	54.0	54.8

Section D - D



Chainage (m)	0.00	50.00	100.00	150.00	200.00	250.00	300.00	350.00	400.00	450.00	500.00	550.00	583.47
Existing Level (m)	60.0	61.5	62.1	62.5	62.1	61.5	60.9	61.1	60.8	59.9	59.0	58.2	57.8
Proposed Level (m)	60.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	40.9	57.8

Section E - E

Legend

Ownership/Consent Boundary

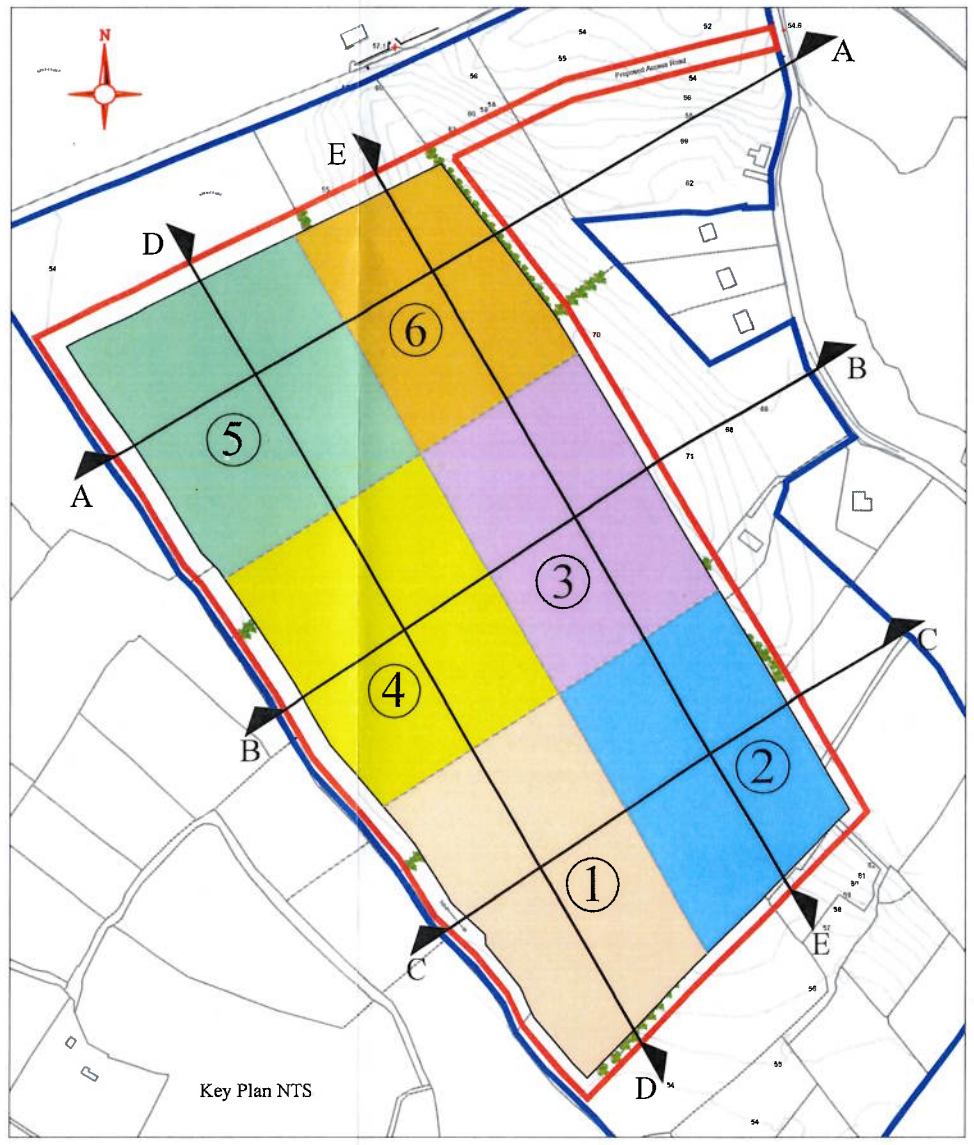
Application Area

Area = 18.6 Ha

Existing Level

Proposed Level

Hedge/Vegetation



Extraction Phases	
Phase	Color
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	

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ITM Coordinates E 619157, N 779736

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Project: Planning Application for a Quarry Located at Rhine, Killoe, Co. Longford.

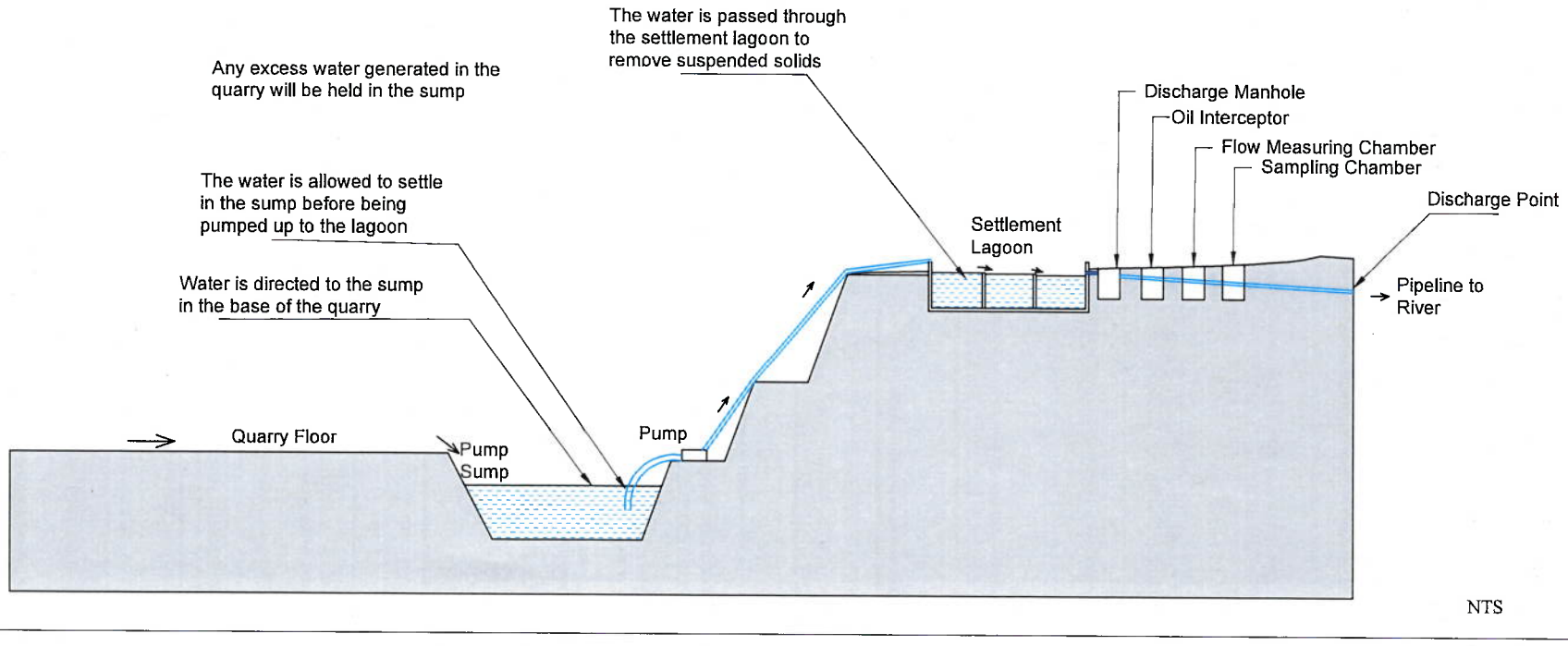
Title: Extraction Phase Sections (A-E)

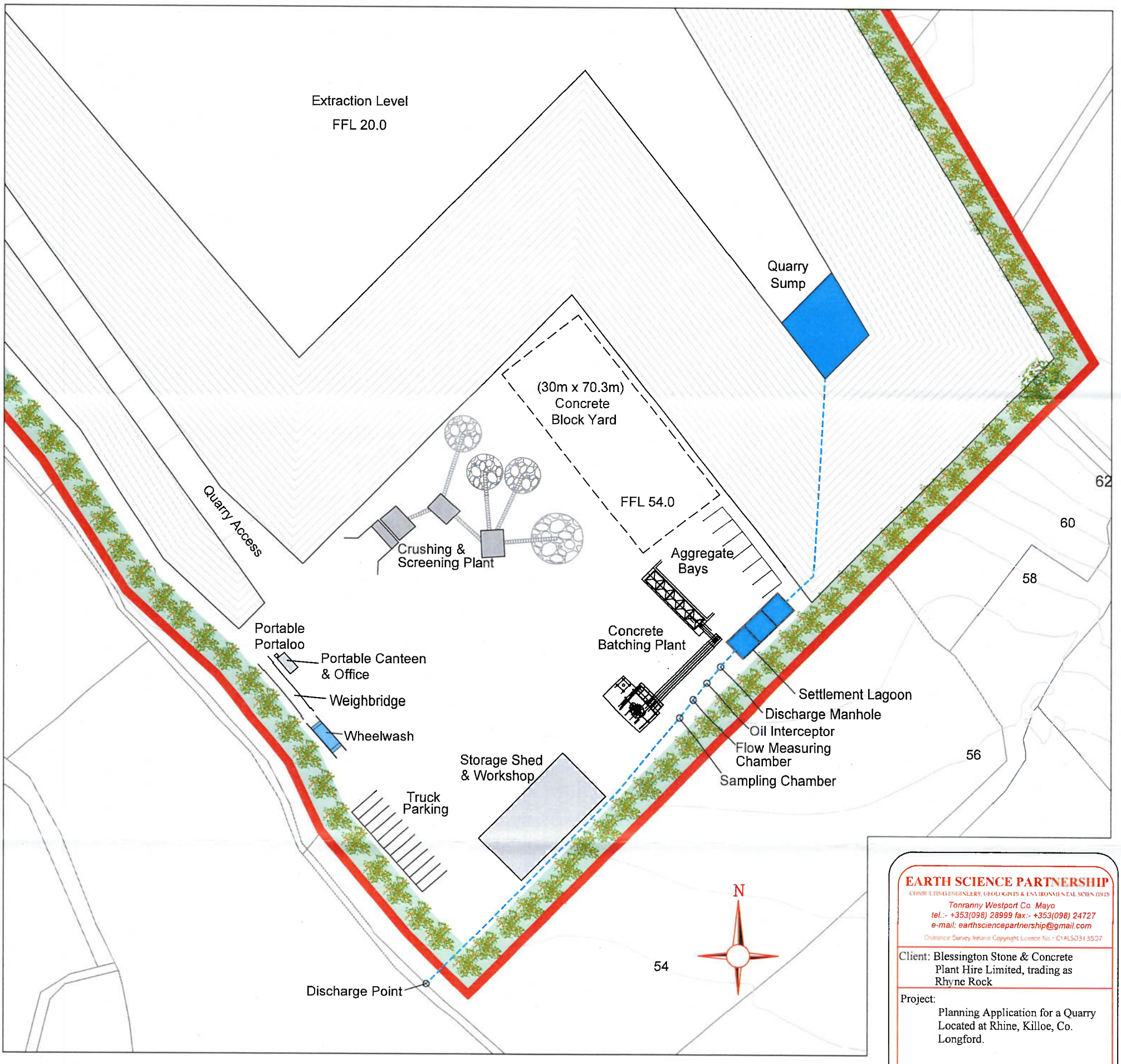
Drawn By: P. O' Donnell

Scale: 1:2,500 @ A3 | Date: May 2024

Job No: EI 161 | Rev: 0

Figure 3.3





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Legend

Planted Berms (Vegetation)

Application Area

Area = 18.6 Ha

ITM Coordinates E 619157, N 779736

All Levels Relative to Ordnance Datum

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Client: Blessington Stone & Concrete Plant Hire Limited, trading as Rhyne Rock

Project: Planning Application for a Quarry Located at Rhine, Killoe, Co. Longford.

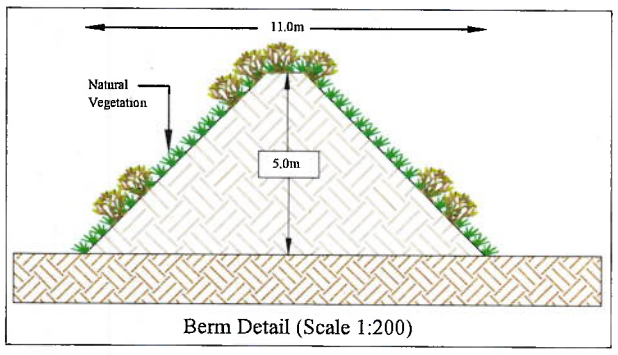
Title: Proposed Layout of Manufacturing Yard

Drawn By: P. O' Donnell

Scale: 1:1,250 @ A3 | Date: May 2024

Job No: EI 161 | Rev: 0

Figure 3.4



Berm Detail (Scale 1:200)

Ballinalee

L5097 Road

R198 Road

Access Road

Longford

Haul Road

Haul Road

Planted Berm Surround

Extraction Level FFL 20.0m OD

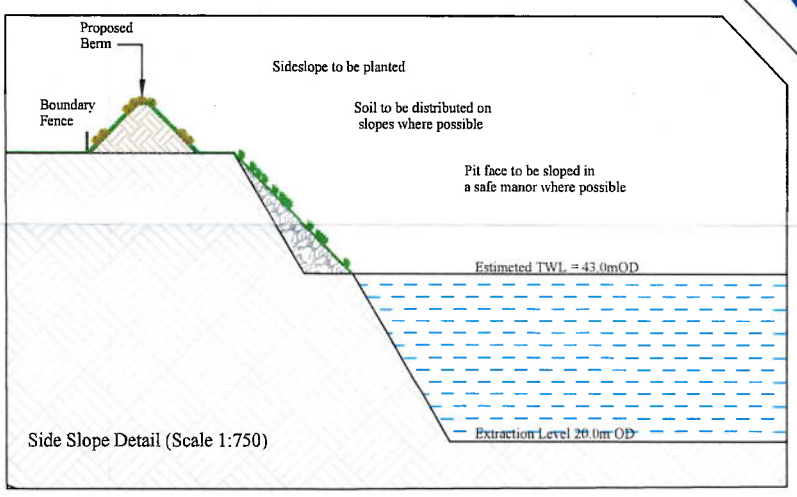
Estimated TWL 43.0m OD

Ramp

Manufacturing Area

FFL 54.0

Restored to Hardstand Area



Side Slope Detail (Scale 1:750)

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Legend

Ownership/Consent Boundary

Application Area

Area = 18.6Ha

Vegetated Side Slopes

Water

Haul Road / Manufacturing Area

Planted Berms

N

OS Sheet Ref. No. LD 009

ITM Coordinates E 619157, N 779736

All Levels Relative to Ordnance Datum

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Client: Blessington Stone & Concrete Plant Hire Limited, trading as Rhyne Rock

Project: Planning Application for a Quarry Located at Rhine, Killoe, Co. Longford.

Title: Proposed/ Restored Site Layout Map

Drawn By: P. O' Donnell

Scale: 1:2,500 @ A3 | Date: May 2024

Job No: EI 161 | Rev: 0

Figure 3.5

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4.0 POPULATION & HUMAN HEALTH

4.1 Introduction

This chapter assesses the potential effects on population and human health arising from the proposed development of the quarry at Rhine, Killoe, Co. Longford. While references are made to other environmental topics in this section (such as traffic, noise, vibration, air etc.) they are examined in detail in the respective chapters of the EIAR. Mitigation measures are proposed where required to mitigate any potential effects arising from the proposed development.

4.2 Methodology

This assessment was undertaken with reference to the *'EPA Guidelines on the information to be contained in environmental EIAR (2022)'*. The guidance document suggests the following:

- *The EIA legislation does not generally require assessment of land-use planning, demographic issues or detailed socio-economic analysis in the EIAR, unless issues such as economic or settlement patterns give rise directly to specific new developments and associated effects.*
- *The notion of human health should be considered in the context of the other issues to include the likely significant effects on the environment, including on issues such as biodiversity, population, human health, fauna, flora, soil, water, air, climatic factors, material assets, cultural heritage including architectural and archaeological heritage, landscape and the interrelationship between the factors.*
- *The evaluation of effects on these pathways is carried out by reference to accepted standards (usually international) of safety in dose, exposure or risk. These standards are in turn based upon medical and scientific investigation of the direct effects on health of the individual substance, effect or risk. This practice of reliance upon limits, doses and thresholds for environmental pathways, such as air, water or soil, provides robust and reliable health protectors [protection criteria] for analysis relating to the environment.*

Section 4.3 focuses on Population including potential effects of the development with regard to principal socio-economic indicators, including population, land use, employment, tourism and residential amenity. Section 4.4 assesses the potential effects on Human Health.

4.3 Population

4.3.1 Methodology

The assessment of impacts on human beings entails the identification of key populations that are most likely to be impacted on by day to day activities undertaken at the application site. Key populations that have the potential to be impacted on by the development have been identified as persons residing and engaging in activities near the development, persons with a stake in the general economy of the local and regional area and persons enjoying the recreational and cultural amenities of the area. The principal sources of information are sourced from the Central Statistics Office (CSO). A number of other sources of information and guidance documents were referred to as part of the compilation of this section which are listed in Section 4.5 References.

4.3.2 The Existing Environment

4.3.2.1 General

The closest urban centres to the application site are the villages of Aghaboy and Ballinalee located 1.4km to the north west and 3.5km to the east respectively. Longford town is located 7km to the south west.

The application site consists of greenfield paddocks separated by hedgerows, an area of peatland to the northwest which was historically subject to peat extraction and an area of planted mixed woodland located on the eastern boundary.

4.3.2.2 Land use

Land-use in the vicinity of the application site include agriculture consisting of livestock farming. Historical peat extraction and commercial forestry is also evident from aerial photography. There are number residences in the immediate vicinity of the development comprising of isolated farm dwellings and ribbon development. An operational quarry is located to the north east of the application site which is operated by Rhyne Rock.

The closest licenced waste facility is Mulleady's Limited (Drumlish) which is located 6km to the northwest of the application site. The closest IPPC licenced facility is Mr Padraig Kiernan (Ballinalee Pig Farm) located 2.3km south east of the application site.

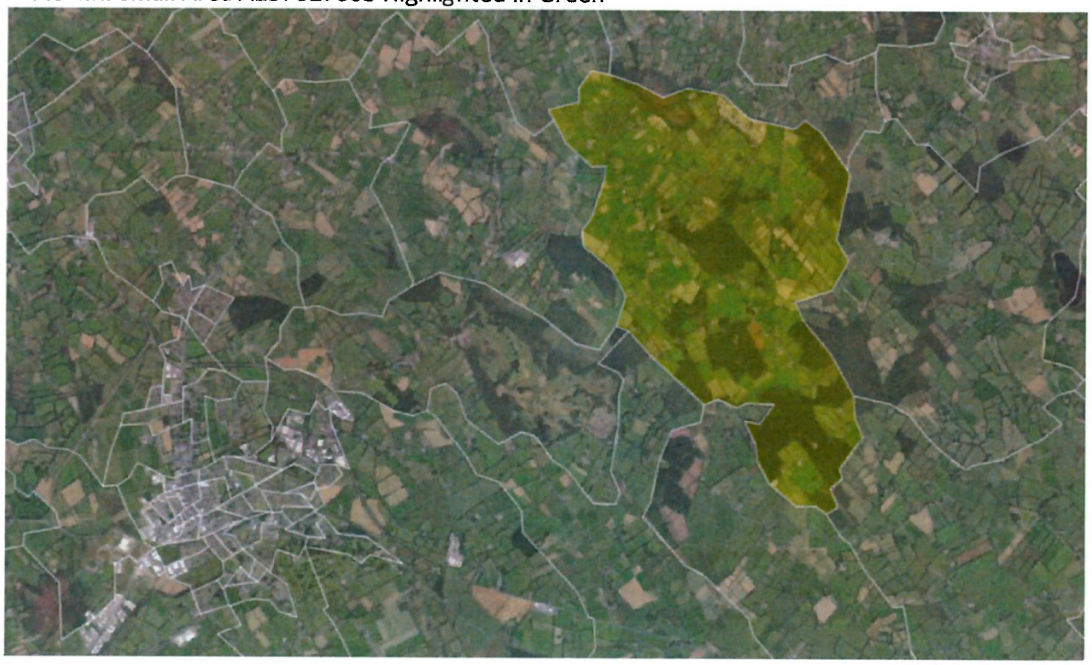
4.3.2.3 Socio-Economic Factors

The following socio-economic analysis concentrates mainly on the immediate hinterland in terms of population and employment as this is the area where most impacts will arise. The existing quarry is located in the townland of Rhine which is situated in the Cloonee District

Electoral Division (DED) and the Small Area A137017003. Small Areas (SAs) were first published for Census 2011 following work undertaken by the National Institute of Regional and Spatial Analysis (NIRSA) on behalf of Ordnance Survey Ireland (now Tailte Éireann) and in consultation with the CSO. They were designed as the lowest level of geography for the compilation of statistics in line with data protection guidelines and typically contain between 50 and 200 dwellings.

In describing the receiving environment in relation to human beings, this section provides an overview of the local area, including settlement patterns, age structure, population change, social indicators including employment, education, and social class, and economic activity.

Plate 4.1: Small Area A137017003 Highlighted in Green



4.3.2.4 Population Change

In terms of the County, Region and State, population change is strongly influenced by migration and emigration rates, rather than birth and death rates. Table 4.1 below shows the changes in population for the SA, Longford County and the State for the years 2016 and 2022. The SA experienced an increase in population between 2016 and 2022 of 19 people which constituted a 5.9% increase which is less than Co. Longford (14.4%) and the State (8.1%).

Table 4.1: Population Growth of DED, County & State

	2016	2012	2016 – 2022 % change
SA	323	342	5.9%
Co. Longford	40,873	46,751	14.4%
Ireland	4,761,865	5,149,139	8.1%

4.3.2.5 Age Profile

Table 4.2 shows the age profile of the population of the SA, County and State. The most notable difference is the higher proportion of 0-14 and 65+ age profile compared to the County & State.

Table 4.2: Age Profile of Population

	0-14	15-24	25-44	45-64	65+
SA	24.0%	13.2%	26.9%	24.6%	11.4%
Co. Longford	20.8%	12.3%	26.1%	25.1%	15.7%
Ireland	19.7%	12.5%	27.6%	25.1%	15.1%

4.3.2.6 Labour Force Participation

Table 4.3 tabulates the economic status of the population. The SA had a labour participation rate of 60.4% which is higher than the County (53.2%) and State (56.1%). It also had a lower percentage of retired (4.6%) and Unable to Work (11.5%) than the County and State.

Table 4.3: Labour Force by Principal Economic Status

	At work	Looking for first regular job	Unemployed	Student	Looking after home/family	Retired	Unable to work	Other
SA	60.4%	0.8%	1.9%	3.1%	13.5%	4.6%	11.5%	4.2%
Co. Longford	53.2%	1.2%	2.0%	3.2%	10.4%	7.2%	16.1%	5.8%
Ireland	56.1%	0.8%	1.7%	2.6%	11.1%	6.6%	15.9%	4.6%

4.3.2.7 Socio- Economic Groups

The CSO establishes several principal socio-economic groups within the population. These are classified as follows:

A Employers and managers
B Higher Professional
C Lower Professional
D Non-Manual
E Manual Skilled
F Semi-Skilled
G Unskilled

H Own Account Worker
I Farmers
J Agricultural Workers
Z All Others Gainfully Employed

Table 4.4 indicates that socio-economic groups for the SA, County and State. The highest percentage of people for the SA consists of Non-Manual (28.6%) which is similar to the County (28.7%) but lower than the State (34.4%). Another notable difference is the higher proportion of Unskilled for the SA (7.3%) compared to the County (3.4%) and State (3.1%).

Table 4.4: Percentage Distribution of Socio-Economic Groups

Area	A	B	C	D	E	F	G	H	I	J	Z
SA	13.4%	0.0%	7.9%	28.6%	11.4%	6.4%	7.3%	3.8%	9.6%	11.1%	13.4%
Co. Longford	10.7%	1.1%	3.9%	28.7%	10.8%	9.7%	3.4%	4.2%	5.2%	20.8%	10.7%
Ireland	14.3%	1.6%	6.8%	34.4%	9.1%	7.9%	3.1%	4.2%	3.1%	14.3%	14.3%

4.3.2.8 Housing Demand

An analysis of the increase in both the population and number of households in the area as tabulated in Tables 4.5 indicates the number of households and the number of persons in households which allows the average household size to be calculated.

Table 4.5: Private Households by Type of Accommodation and Average Household Size

	No. of Households	No. of Persons in Households	Avg. Household Size
SA	121	343	2.83
Co. Longford	16,229	43,920	2.71
Ireland	1,841,152	5,046,681	2.74

Table 4.6 tabulates the private households in the SA and the period of time they were built. A significant number of homes (48) were built between the years 2001-2010 with a significant drop in the number of homes built in the years after to date with a total of 10 built between the census periods of 2011 and 2022.

Table 4.6: Permanent Private Households by Year Built

Year Built	Permanent private households (No.)	Number of persons in permanent private households (No.)
Pre 1919	9	22
1919 - 1945	8	13
1946 - 1960	6	18
1961 - 1970	5	11
1971 - 1980	9	15
1981 - 1990	8	13
1991 - 2000	18	58
2001 - 2010	48	158
2011 - 2015	4	13
2016 or later	6	22
Not stated	0	0
Total	121	343

As illustrated on Plate 4.2, there are 34 dwelling houses located within a 500m radius of the application site boundary with a further 68 located between 500m and 1km of the site.

Plate 4.2: Dwelling Location Ma p

4.3.2.9 Travel Patterns

Census data for the study area provides information on the travel patterns of residents to work, school or college which is tabulated in Table 4.7. 44.1% travelled under 15 mins which is higher than the county (40.9%) and State (32.3%). A total of 28.3% travelled between 15 and 30 minutes and 9.9% travelled between 30 and 45 minutes.

A. Under 15 mins
B. 1/4 hour - under 1/2 hour
C. 1/2 hour - under 3/4 hour
D. 3/4 hour - under 1 hour
E. 1 hour - under 1 1/2 hours
F. 1 1/2 hours and over
G. Not stated

Table 4.7: Population aged 5 years & over by Journey Time to Work School or College

	A	B	C	D	E	F	G
SA	27.5%	36.9%	12.9%	6.0%	4.7%	4.7%	7.3%
Co. Longford	34.0%	23.1%	12.5%	3.5%	3.8%	4.5%	18.7%
Ireland	29.4%	28.1%	17.3%	5.9%	6.1%	2.5%	10.7%

4.3.2.10 Tourism & Recreation

Tourism is one of Ireland's most important industries, contributing to the economic and social fabric of the island. It is a leading creator of jobs and revenue, and one of the few sectors that has the potential to significantly benefit remote rural areas. The following is a summary of the *"Key Tourism Facts 2022"* published by Bord Faillte in October 2023.

- Domestic Tourism delivers €2,930mn in exchequer revenue.
- 13.3mn Domestic Trips.
- In 2022 holidays accounted for 50% of all domestic trips with a per diem spend of €100.
- €53 per capita spend on day trips.
- In relation to the Mid East/Midlands, the following statistics were noted:
  - No. of Trips (000s) - 1,957
  - No. of Nights (000s) - 4,681
  - Average Length of
  - Stay (Nights) - 2.4
  - Estimated Expenditure €m - 395

Some of the tourist attractions located in the Killoe area are listed below:

Carrigglas Estate

Carrigglas Manor and estate is approximately 4 kilometres southwest of the proposed development along the R194 regional towards Longford town. The house was designed for The Lord Chief Justice of Ireland, Thomas Langlois Lefroy, in 1837. Daniel Robertson of Scotland designed Carrigglas in the Tudor-Gothic Revival style, replacing a decrepit seventeenth-Century house. It was finished in 1840 and has remained substantially unaltered since that. James Gandon had previously designed the stables, farmyard and triumphal arch entrance between 1792 and 1804. The house is no longer open to the public to visit as it is in private ownership now. This rambling Tudor Revival or Elizabethan house, with its dramatic roofline of Tudoresque chimneystacks, turrets and gabled projections, is one of the finest houses of its type and date in the country. In 2005 the Lefroys sold Carrigglas to a property company, Thomas Kearns Developments, ran into financial trouble in 2008, when the Bank of Ireland, which had advanced €35 million, called in accountants to assess the project's viability. Thomas Kearns Developments went into liquidation and in the intervening years, Carrigglas has been allowed to suffer neglect.

Cultural Heritage

There are several Ringforts in the Parish. During excavation of one of these located on the Ballinalee Road, bones and artifacts were recovered and the Fort itself was covered again. One of the many old graveyards in Killoe parish is Killoe old graveyard at Killoe and Glebe, in the grounds of St. Catherines Church of Ireland church. This graveyard has been renovated by the Killoe Development Group and the graves indexed. A booklet which is available at local outlets has been published to allow people to more easily find the graves of their relatives and ancestors.

Oghill Bog

Oghill Bog is 60 acres of cut-bog. It has never been cut by machine and has not been seriously touched for nearly 70 years. It has been left as it was and the process of regeneration has made a slow start. There is an abundance of new tree growth and there are large old heather plants. From certain angles, the old dome shape of the bog can be seen. Corn Hill overlooks this quiet area, abundant with wildlife and insect life. A comfortable 8 kilometre round walk over quiet country roads will give you a lovely relaxing few hours to discover this lovely bog.

Newtownbond Graveyard

There is an old graveyard located on the grounds of the old Newtownbond Estate just a few miles from Cullyfad village. The graveyard contains thirty-five gravestones mainly dating from the early 19th and 20th centuries. There is a walking route, which takes you from the village,

along tree-lined county roads to the estate where the old graveyard is located. Still visible are the ruins of an old church and the old graveyard.

Killoe Old Graveyard

Old Killoe Cemetery is located adjacent to St. Catherine Church, Killoe Glebe, County Longford. The church was erected in 1824 by the Church of Ireland, an autonomous affiliate of the Anglican Communion. There are two burial grounds on the site: a Protestant one to the south of the church, and a Roman Catholic one to the north which has recently undergone improvements.

Corn Hill

Corn Hill stands on the northern side of the village of Killoe. There are several written accounts of cairns, dolmens and passage graves on the hill, but the exact positions are not known. These structures date back to 2500BC. It is the highest point in County Longford. The hill is 300 metres above sea level, and has a transmitter situated on the top which rises 100 metres above the peak of the hill.

The Camlin which flows through the area is a great source of recreation and fishing. The river Camlin (Irish An Chamlinn - Crooked Pool), which meanders it way through mid Longford, is a tributary of the River Shannon. Rising near Granard, it flows through Clonbroney, Ballinalee, Killoe and Longford Town before its two branch distributaries enter the Shannon. The Camlin is navigable for part of its course. Its source is around the village of Abbeylara. Fishing in the Camlin can be good, and it includes good stocks of pike perch and roach. It is known to produce some nice brown trout from Lough Ree and Eel and Rudd also live in the river.

4.3.2.11 Amenity

The following five SACs and two SPAs are located within a 15km radius of the proposed application area.

1818 - Lough Forbes Complex SAC
2202 - Mount Jessop Bog SAC
2341 - Ardagullion Bog SAC
2346 - Brown Bog SAC
2348 - Clooneen Bog SAC
4045 - Glen Lough SPA
4101 - Ballykenny-Fisherstown Bog SPA

The AA Screening Assessment undertaken considered the proposed project and a review of the National Parks and Wildlife Service database identified the following European Sites with potential Source » Pathway » Receptor links to the proposed works:

001818 Lough Forbes Complex SAC;
004101 Ballykenny - Fisherstown Bog SPA.

An AA Screening assessment was carried out which evaluated the objective information presented in the Project Description, taking consideration of the proposed works elements. The information was considered in accordance with Article 6(3) of the Habitats Directive and found that the proposed quarry development at Rhine, Killoe, Co. Longford should proceed to Stage 2 Appropriate Assessment process. A Natura Impact Statement accompanies the application as a separate document.

4.3.2.12 Social Infrastructure

The application site is located at Rhine, Killoe, Co. Longford as detailed in Plate 1.1. The closest urban centres are the villages of Aghaboy and Ballinalee located 1.4km to the northwest and 3.5km to the east respectively. Longford town is located 7km to the southwest. Aghaboy consists of a church and public house and community centre. Scoil Náisiúnta Naomh Treasa primary school is located 1km northeast of Aghaboy. Ballinalee is a small village with infrastructure consisting of shops, service station, church, Scoil Samhthann national school, public houses and hardware.

Longford (Irish: An Longfort) is the county town of County Longford. It has a population of 10,008 according to the 2016 census. It is the biggest town in the county and about one third of the county's population lives there. Longford town has a number of primary schools and three secondary schools. Longford's main industries are food production, sawmills, steel working, generator retailing, cable making and the production of medical diagnostics. It is the major services centre for the county as well as the location of the Department of Social Welfare and the Irish Prison Service. The town is also a local commercial centre, with a number of retail outlets including multiples such as Tesco, and German discount retailers, Aldi and Lidl and Irish retail outlets such as Dunnes Stores and Penneys. A retail park, the N4 Axis Centre, opened in Longford in January 2006.

4.4 Human Health

4.4.1 Introduction

A human health risk assessment is the process to estimate the nature and probability of adverse health effects in humans as a result of a development. The assessment has had regard to the findings of other chapters of this EIA Report, in particular to:

- Section 4.3 Population & Human Health
- Section 7.0 Water
- Section 9.0 Air
- Section 10.0 Noise and Vibration
- Section 11.0 Traffic
- Section 12.0 Landscape & Restoration

This assessment is focused on potential human health effects associated with potential emissions related to day-to-day activities undertaken at the quarry.

4.4.2 Health Based Standards

Health based standards by their nature are set to protect against human health effects. The Irish EPA Guidance favours the Health Based Standards approach. In its publication: EPA Guidelines on the Information to be contained in Environmental Impact Assessment Reports (May 2022) it states:-

> *'The evaluation of effects on these pathways is carried out by reference to accepted standards (usually international) of safety in dose, exposure or risk. These standards are in turn based upon medical and scientific investigation of the direct effects on health of the individual substance, effect or risk. This practice of reliance upon limits, doses and thresholds for environmental pathways, such as air, water or soil, provides robust and reliable health protectors [protection criteria] for analysis relating to the environment.'*

Baseline information gathered to date and predictions of future emissions in relation to air, noise, vibration, water etc. associated with the day-to-day operations of the existing and proposed development have been used as part of the assessment. These can be compared to various thresholds relevant to each element. No detrimental health effects are expected below these thresholds.

A question on general health was first introduced in Census 2011 and asked respondents to select one of five categories ranging from very good to very bad. Self-perceived health

provides a well validated and widely used measure of actual health. Table 4.8 tabulates the general health of the SA, County and State. Approximately 60% of the SA reported as having Very Good health which is higher than the County (47%) and State (53.2%). This category had the most notable differences in the percentages reported for each category for the SA, County and State.

Table 4.8: Population by General Health Census 2022

General Health	SA	Longford	Ireland
Very Good	59.6%	47.0%	53.2%
Good	27.2%	29.2%	29.7%
Fair	7.3%	9.7%	8.6%
Bad	1.8%	1.7%	1.4%
Very Bad	0.0%	0.4%	0.3%
Not Stated	4.1%	12.1%	6.7%

4.4.3 Emission Thresholds

Emissions to air including dust, noise and vibration emissions, emissions to water and traffic associated with the development are identified as the main areas which could impact on human health. The concept of dose response suggests that the greater the dose to which an individual is exposed the greater either the likelihood of a health response and/or the greater the severity of that response. Inbuilt to this concept is the principle of a threshold. The threshold is the level of an agent below which one would expect no adverse response. This is a concept on which many health-based standards are founded.

The Environmental Protection Agency (EPA) issued Environmental Management Guidelines in relation to the extractive industry Environmental Management in the Extractive Industry (Non-Scheduled Minerals). In this document, thresholds are set in relation to emissions to various elements of the environment such as emissions to air, dust deposition, noise associated with day-to-day operations, vibration emissions from blasting and discharge of water to surface water or ground water. These are set by way of standards and recommended guideline values which are attached as conditions to a grant of a planning permission or by way of an air emissions licence, or discharge licence, in order to ensure compliance routine monitoring of the emissions is undertaken.

Emission levels which are below the threshold are taken to have no significant health effects. If, however the levels increase above the threshold it is anticipated that an increasing number of people will be affected and the severity of that effect increases with increase in level.

The Environmental Protection Agency (EPA) has produced a Guidance Note for Noise in Relation to Scheduled Activities (EPA, 1996). It deals in general terms with the approach to be taken in the measurement and control of noise, and provides advice in relation to the setting of noise ELVs and compliance monitoring:

In relation to quarry developments and ancillary activities, it is recommended that noise from the activities on site shall not exceed the following noise ELVs at the nearest noise sensitive receptor:

Daytime: 08:00–20:00 hrs LAeq (1 h) = 55 dBA
Night-time: 20:00–08:00 hrs LAeq (1 h) = 45 dBA

There are currently no Irish statutory standards or EPA guidelines relating specifically to dust deposition thresholds for inert mineral dust. There are a number of methods to measure dust deposition but only the German TA Luft Air Quality Standards (TA Luft, 1986) specify a method of measuring dust deposition – The Bergerhoff Method (German Standard VDI 2119, 1972) – with dust nuisance. It is the only enforceable method available. Where this method is deemed unsuitable for use, and only in these circumstances, an alternative method may be agreed with the local authority. On this basis, it is recommended that the following TA Luft dust deposition limit value be adopted at site boundaries associated with quarry developments – total dust deposition (soluble and insoluble): 350 mg/m^2/day (when averaged over a 30-day period).

4.4.4 Site Safety

There may be some concerns in relation to safety of people and agricultural stock as a result of quarry faces. There is also a potential danger to members of the public who may gain access to the site. Security fencing and stock proof post and wire fencing will be erected around the perimeter of the application site to prevent unauthorised access. The quarry will be subject to The Safety, Health and Welfare at Work (Quarries) Regulations, 2008, which clearly sets out the standards for Health and Safety in quarries.

4.4.5 Traffic

The existing working quarry development generates a number of traffic movements associated with the transport of material from the quarry to market. As the existing quarry will be closed before the application site is fully operational there will be no net increase in traffic on the public roads as the quarry related traffic will transfer from the existing quarry to the application site.

4.4.6 Risk of Major Accidents and Disasters

The EIA Directive states that an EIAR must include the expected effects arising from the vulnerability of the project to risks of major accidents and/or disasters that are relevant to the project. In this respect, taking cognisance of the other chapters contained within this EIAR document, which should be reviewed for further details, it is not considered that the proposed development site presents risks of major accidents or disasters, either caused by the scheme itself or from external man-made or natural disasters.

4.5 Development Description

The development consists of a total area of 18.6 hectares and comprises of the following:

- Extraction of rock by blasting means down to a level of 20mOD from an area of approximately 14.2 Hectares.
- Erection of a concrete batching plant, processing plant, block yard, storage sheds, workshop, office buildings, weighbridge, wheelwash, settlement lagoon and all other associated ancillary facilities at the proposed manufacturing area of approximately 2.1 Hectares.
- Landscaping consisting of Planted Berms Surround (1.6 Hectares).
- Entrance and access road from the public road to the manufacturing area (0.7 Hectares).
- Landscaping and restoration of the site on completion of extraction.
- The planning permission is for a 25-year period.

Overburden will be removed in phases prior to extraction of underlying material and will be used in the construction of berms around the perimeter of the site. Overburden may also be used in restoration of the quarry once work has ceased.

Material will be extracted down to a level of 20.0mOD. Extraction of material will mainly be carried out by blasting means. Occasionally, rock breaking may be required on site. It is proposed that material will be extracted at a maximum rate of 400,000 tonnes/annum. Once extracted, material will be loaded onto dump trucks using an excavator. Material will be transported along internal haul roads to the proposed manufacturing area where it will be processed into various grades of aggregate using crushing and screening plant. Material may also be used in the manufacturing of ready-mix concrete at the proposed concrete batching plant.

Products will be transported off site to market via a proposed road which will connect the site to the L5097 and onto the R194 regional road. It is proposed that the development will generate an Annual Average Daily Traffic (AADT) of 73 loads/day.

Water management on site will be as follows: a sump will be constructed on the quarry floor which will collect all excess surface water. Water will be retained for a period of time to allow suspended solids to settle. Water will then be pumped to the proposed settlement lagoon which will be constructed at the proposed manufacturing area. Water at the settlement lagoon will be used in the day-to-day operations of the quarry such as manufacturing of ready-mix concrete, aggregate washing or dust suppression. Water which is not required will be discharged off site. An application for a water discharge licence will be made to Longford Co. Co. if planning permission for the subject development is secured.

For security reasons, very little fuel will be stored at the quarry. A small volume of fuel will be stored in a bunded fuel storage tank which will be located close to the site office. Fuel will be delivered to the quarry by competent oil companies and dispensed into plant and machinery, at a designated refuelling location.

It is proposed that the operating hours at the development will be 07:00-19:00 Monday to Friday and 07:00-16:00 on Saturdays. The development will not operate on Sundays or Public Holiday. The proposed development will provide employment for approximately 30 people directly with further people employed indirectly (e.g., sub-contractors for blasting).

4.6 Potential Impacts of the Proposed Development

The significance criteria used in the assessment as adapted from the Irish EPA Guidelines, are set out in Table 4.9.

Table 4.9: Criteria Used in the Assessment of Human Health Effects

Effect Level	Significance Criteria
Imperceptible	No significant human health impacts are apparent. An example is no measurable effect attributable to the proposed development.
Slight	A small impact on individual reported symptoms but no change in health status can be attributed to the proposed development. An example is a temporary increase in symptoms in an individual but no change in the severity of the underlying condition or treatment required.
Moderate	A small impact on health status of individuals but no change in morbidity or mortality can be attributed to the proposed development. An example is an individual increasing their use of a treatment attributable to the development but no change in underlying condition.
Significant	A proposed development has the potential to impact on individual health status. An example is an individual's condition becoming measurably more severe as a result of the proposed development.
Very Significant	A proposed development has the potential to impact on the health status of groups. An example is a group of individuals' conditions becoming measurably more severe as a result of the proposed development.
Profound	A proposed development has the potential to impact on the health status of communities. An example is a measurable increase in the incidence or severity of a condition in a community.

4.6.1 Potential Construction Phase Impacts

The construction phase of the proposed development will consist of the overburden removal along the haul road and manufacturing area and levelling with aggregate to construct the haul road for the placement of infrastructure, erection of the concrete batching plant and processing plant, construction of a concrete block yard area and settlement lagoon. The construction works associated with the proposed development will take approximately 6 to 12 months to complete.

As detailed in the noise assessment (Chapter 10.0), the adopted noise criteria will not be exceeded by the equipment carrying out works as part of this phase of the proposed development at any of the noise sensitive locations (NSLs) as such there will be no significant impacts on human health. Similarly, it is envisaged that dust deposition, PM_{10} and $PM_{2.5}$ levels will be compliant with all National and EU ambient air quality limit values levels.

Therefore, due to the nature and duration of the proposed construction works, all impacts are likely to be localised, short-term and of temporary nature. Furthermore, appropriate mitigation measures have been detailed in the Noise & Vibration and Air Quality Chapters.

4.6.2 Operational Phase

4.6.3 Population

The application site and the existing quarry are less than 400 metres from each other and are located in an area which is populated with one-off houses situated along local roads in the vicinity of the quarry. This is not unique to this area and is typical of rural and semi-rural areas. Activities undertaken at quarry sites including extraction, processing, manufacturing of concrete products and traffic movements can deter people from living within proximity to such developments.

However, as the proposed development is in close proximity to the existing quarry and on the same minor road the substitution of the new quarry for the old quarry will not have any additional impacts on the surrounding environment. Therefore, it is not anticipated that the application site will have a bearing on the population numbers of the area. Noise, vibration air and water monitoring will be undertaken during the operational phase to ensure emission levels are within EPA recommended guideline values. Air, dust, noise and vibration emissions are discussed in more detail in Chapters 9.0 and 10.0.

4.6.4 Economic Activity

The existing quarry development provides employment for approximately 30 people directly with further people employed indirectly (e.g., sub-contractors for blasting, supply of machinery parts and services, local shops for employees etc). This employment will be transferred to the application and will sustain the employment on a long-term basis.

Indirectly the proposed development will contribute to and sustain socio-economic activity in the area as the raw materials extracted from the site will be used in the local construction sector. The provision of employment and the generation of economic activity are therefore both positive direct and indirect socio-economic impacts arising from the development.

The significance of these impacts are considered having regard to the profile of economic activity in the area. Should operations on the site cease, permanently or temporarily, these jobs will be lost and the longer-term viability of the operations on the site seriously undermined and likely to cease. The Proposed Development will have an imperceptible, positive and long-term socio-economic effect.

4.6.5 Land-Use & Housing

The application site is currently subject to agricultural use the land in this area is considered as marginal land with extensive areas of peat. At present the land is in use with livestock farming being practiced. The proposed development will result in a change in land use from

agricultural to quarrying. Quarrying is a long-established use in the area with the existing quarry operational for over 30 years. As the new quarry is brought into operation the existing quarry, which is exhausted, will be decommissioned and restored in line with a landscape and restoration plan for that development.

The impact on housing demand and associated infrastructure, arising from the proposed development is likely to be dispersed over a limited area. Therefore, it is not likely that the proposed development will create any adverse housing impacts. The proposed quarry will operate in line with conditions in relation to noise, vibration, dust etc. which will ensure that the quarry will not have a negative impact on land use and housing in the vicinity. The proposed development will serve the demand for aggregate and products associated with the construction of one off housing and small developments. The proposed development will have a slight, negative and permanent effect on land-use.

4.6.6 Tourism, Recreation & Amenity

Tourism is regarded as one of the greatest sources of potential employment nationally and also has potential to benefit the community in an environmentally sustainable way. There are no tourist or amenity areas in the immediate vicinity which could be impacted on by the proposed development. Traffic associated with the development could potentially impact on recreational walkers who use the adjoining road network. However, the proposed development will not result in an increase in traffic as the traffic associated with the existing quarry will be transferred to the proposed development once operational. The Proposed Development will have a neutral, imperceptible, long-term effect on Tourism, Recreation & Amenity.

4.6.7 Social Infrastructure

There is no significant social infrastructure in the area which could be impacted on by quarrying activity and may have a positive impact as materials extracted from the quarry will be used to develop infrastructure in the area.

4.6.8 Unplanned Events

Should an unplanned event occur, emergency response plans and procedures in place will be implemented.

4.6.9 Human Health

The key elements of the proposed development which have the potential to impact on Human Health are detailed below. Each element has been assessed in relation to thresholds specified for emissions related to each element such as dust deposition, noise, vibration etc.

The various elements have been assessed under other sections of the EIAR, for example air has been assessed under Chapter 9.0 (Air) and Noise assessed under Chapter 10.0. It can be assumed that provided the predicted changes do not result in exceedances of the threshold for each element that there will be no significant impact on human health.

4.6.9.1 Assessment of Impacts Associated with Emissions to Water

The potential impacts of the proposed development on the water environment have been assessed in Chapter 7.0 and mitigation measures are proposed in order to safeguard the water environment. Consideration of groundwater hydrogeology and surface water hydrology of the proposed development and the receiving environment indicates that there is potential for local impacts during the operational phase of the proposed quarry extension.

Assessment of Effect

The proposed quarry will result in a very minor loss of approximately 0.15% of the catchment area of the Camlin River. As most of the water draining within the proposed quarry, will however discharge back to the Camlin River via an existing drainage ditch. The overall water budget of the receiving water from the Camlin River will therefore not be affected.

The bulk of the cone of drawdown induced by the quarry is likely to occur within 250m from the quarry boundaries. Beyond this distance, the drawdown would likely remain within the order of the natural fluctuation of the water table. Two water supply wells have been identified c. 330m downgradient from the proposed quarry boundary, which is beyond the 250m distance. As a result, these wells will not be adversely impacted by the proposed quarry activities.

Pollution control monitoring of groundwater and other preventative measures have been incorporated into the project design to minimise any adverse impacts to water quality. Mitigation drainage designs, which will be subject to a water discharge licence will be implemented so that no residual significant impacts will occur on the water environment or on sensitive downstream aquatic receptors (salmonid fish).

4.6.9.2 Assessment of Impacts Associated with Noise & Vibration

As detailed in Section 10.0 of the EIAR the noise levels associated with the proposed development at the nearest receptors surrounding the site will be below recommended guideline values during operation of the development. The construction phase of the proposed screening berm will result in a temporary increase in noise; however, it will be below recommended guidelines for construction related activities.

Assessment of Effect

It is not anticipated that there will be an adverse impact on noise or vibration quality in the vicinity of the application site provided that mitigation measures and best practice is applied. Noise and vibration emissions from the proposed development will result in a negative, not significant, likely, long term effect.

4.6.9.3 Assessment of Impacts Associated with Emissions to Air

The main potential sources of emissions to air in relation to the development will be associated with plant and machinery undertaking day to day activities such as extraction and transportation of material and dust blow generated during dry windy conditions.

Assessment of Effect

Air dispersion modelling of operational activities at the site was undertaken to assess the impact of the development with reference to EU ambient air quality standards which are based on the protection of human health. As demonstrated by the modelling results in Chapter 9.0 Air, emissions of PM10 and PM2.5 as a result of the development are compliant with all National and EU ambient air quality limit values and, therefore, will not result in a significant impact on human health.

4.6.9.4 Assessment of Impacts Associated with Traffic

The Impact of traffic resulting from the proposed development if fully assessed in Chapter 11 of this EIAR. The proposed development replace the existing quarry which is near exhausted. This will result in an overall reduction in the traffic levels associated with the manufacturing facility as material will be sourced, where possible, from within the proposed quarry facility. Material is currently sourced from locations at a greater distance from the site.

Assessment of effects

Operational traffic associated with the quarry was assessed at the site accesses onto the L5097 and onto the R194. Traffic arriving and departing for the quarry will have a high content of HGV movement. The assessments indicate that the site accesses are expected to operate well within capacity in all the assessment years including the continuation of the quarry traffic and therefore will have an imperceptible effect on the existing site access and a not significant impact on the road network. The mitigation measures outlined in Chapter 11.0 will minimise any residual impacts.

The Decommissioning Phase traffic will be temporary in nature, with traffic volumes lower than the current operations at the Quarry. The preparation of the Traffic Management Plan will minimise traffic impacts during this phase.

4.6.10 Unplanned Events

Should an unplanned event occur, emergency response plans and procedures in place will be implemented. Unplanned events are discussed further in various sections of the EIAR.

4.1.1.1 'Do Nothing' Scenario

If the applicant considered not applying for planning permission the application site would remain as greenfield site and the applicant would continue to source material from third party quarries and pits. There would be no significant change in the existing baseline environment and the future baseline environment.

4.7 Avoidance, Remedial & Mitigation Measures

4.7.1 Construction & Decommissioning Phase

During the Construction Phase, a number of mitigation measures will be implemented to protect human health.

- Activity is expected to take place between 07:00 and 19:00, Monday to Friday.
- There will be no unnecessary revving of vehicles during arrival or departures to and from the site to ensure that construction related traffic does not give rise to unnecessary noise nuisances.
- All vehicles will be switched off when not in use on-site. There will be no unnecessary idling of vehicles or machinery on-site. This will reduce or eliminate any potential noise impacts.
- A speed limit of 15km per will be put in place on-site for the Construction Phase of the Proposed Development. This will ensure that traffic will not give rise to dust in periods of prolonged dry weather.
- In periods of prolonged dry weather, the entrance roadway and areas where material is being exavated will be dampened down with water to prevent dust if considered necessary.

No other specific mitigation measures are required during the Construction and Decommissioning Phases of the Proposed Development in relation to population and human health, given the lack of direct effects resulting from the Proposed Development. However, where required, mitigation measures in relation to air emissions (dust), noise, traffic, waste etc. are identified in their respective Chapters in this EIA Report.

4.7.2 Operational Phase

Mitigation measures are included in various sections of the EIAR to protect human health. The proposed development will be developed in a manner such that the effect on human beings is minimised. Mitigation measures for Air, Noise & Vibration, Water, Landscape &

Restoration and Material Assets included in the representative sections of the EIAR will ensure that the proposed development's effect on the receiving environment is minimised. The proposed development will ensure that a reserve of material will be available for future extraction which will secure employment and supply of building materials for the construction industry.

4.7.3 "Worst Case" Scenario

In the worst-case scenario where mitigation measures fail for the proposed development, it is considered that localised nuisances such as noise, dust or water contamination may arise on site and local receptors. This is considered highly unlikely and indeterminable.

4.8 Residual Effects

The findings of the assessment is that once mitigation measures, appropriate design standards and operational infrastructure management plans are adhered to, it is considered that the proposed development will give rise to a slight, long term direct / indirect, long-term effect on population and human Health.

4.9 Monitoring

Environmental monitoring will be carried out during the construction and operational phases in accordance with Section 16 of this EIAR and the requirements of the conditions attached to the grant of planning permission.

4.10 Technical Difficulties

No technical difficulties were encountered.

4.11 References

Longford County Development Plan 2021 -2027

Central Statistics Office – Results of the 2016 and 2022 Census - www.cso.ie

Discover Ireland - http://www.discoverireland.ie/Activities-Adventure/cong-touristoffice/48280

Fáilte Ireland - http://www.failteireland.ie/Research-Insights/Current-Tourism Performance.aspx

https://www.longfordcoco.ie/

https://www.longford.ie/en/live/towns-villages/killoe/

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5.0 Biodiversity

5.1 Introduction

Applied Ecology Ireland Ltd was commissioned by Earth Science Partnership Ireland (ESPI) on behalf of Blessington Stone & Concrete Plant Hire Ltd. trading as Rhyne Rock. to produce an EIAR Biodiversity Chapter in respect of a planning application to develop an area of 18.6ha. at a quarry in Rhine, Killoe, Co. Longford.

This Biodiversity Chapter appraises the likely significant effects of the proposed development on the ecology of the receiving environment. Where likely significant effects are identified, appropriate mitigation measures to reduce / avoid these effects are outlined.

A Natura Impact Statement (NIS) has also been produced for this application which evaluates the potential for significant effects on the Natura 2000 sites within 15 km of the proposed development and this document included as part of the planning application.

5.1.1 Statement of Authority

Ms Sarah Jorgensen MSc BSc (Hons) ACIEEM

Qualified ecologist Ms Sarah Jorgensen (nee Ingham) graduated in from Anglia Ruskin University, Cambridge with a BSc. (Hons) in Zoology. Following her undergraduate degree, she attained her MSc. in Biodiversity and Conservation from Trinity College Dublin, graduating in 2009.

In 2021, after gaining 12 years' experience working with a number of leading environmental consultancies, Sarah established her own company, Applied Ecology Ireland Ltd, offering her expertise in ecological consultancy.

A large part of Sarah's work also involves the output of expertise and recommendations regarding Appropriate Assessments and Environmental Impact Assessments of large-scale developments throughout Ireland. Her day-to-day work regularly includes designing detailed mitigation measures based on constraints regarding various types of developments, as well as undertaking desk-top research into other matters relating to ecological conservation in Ireland. Sarah also has experience as an Ecological Clerks of Works (ECoW) working with developers on wind farm construction sites, overseeing the implementation and adherence to both wildlife and environmental regulations and providing advice on compliance with the environmental planning conditions.

Sarah carried out the ecological field work for this project, with the exception of bat surveys and analysis, and is the author of this report.

Dr Tina Aughney PhD MCIEEM

Dr Aughney has worked as a Bat Specialist since 2000 and has undertaken extensive survey work for all Irish bat species including large scale development projects, road schemes, residential developments, wind farm developments and smaller projects in relation to building renovation or habitat enhancement. She is a monitoring co-ordinator and trainer for Bat Conservation Ireland. She is a co- author of the 2014 publication Irish Bats in the 21st Century. This book received the 2015 CIEEM award for Information Sharing. Dr Aughney is a contributing author for the Atlas of Mammals in Ireland 2010-2015.

All bat analysis and reporting was completed by Dr Tina Aughney. Bat data collected and surveying was completed with the assistance of trained field assistant, Mr. Shaun Boyle (Field Assistant) NPWS licence DER/BAT 2022-37 (Survey licence, expires 24th March 2025).

5.1.2 Description of the Proposed Development

Rhyne Rock currently operates a quarry at Killoe in Co. Longford. The proposed quarry is located in the townland of Rhine, Killoe in Co. Longford, about 7km to the north-east of Longford Town. It is positioned at Irish Transverse Mercator (ITM) Reference 619188 E 779742 N.

The site is bordered by a regional road R194 to the north-west and by a third-class road to the north-east (Figure 5.1.1).

The reserves of the existing quarry are almost depleted as the quarry is now excavating the third bench. Blessington Stone and Concrete are seeking planning permission to develop a new quarry opposite the road approximately 400 metres to the southwest of the existing quarry.

The development is required to secure a continued supply of high quality aggregates for nationwide road making companies and local authorities and for the production of readymix concrete.

The excavation will be phased as described in Section 3.0 – Project Description of this EIAR.

The proposed development consists of a total area of 18.6 hectares and comprises of the following:

- Extraction of rock by blasting means down to a level of 20mOD from an area of approximately 14.2 Hectares.
- Erection of a concrete batching plant, processing plant, block yard, storage sheds, workshop, office buildings, weighbridge, wheelwash, settlement lagoon and all other associated ancillary facilities at the proposed manufacturing area of approximately 2.1 Hectares.
- Landscaping consisting of Planted Berms Surround (1.6 Hectares).
- Entrance and access road from the public road to the manufacturing area (0.7 Hectares). Landscaping and restoration of the site on completion of extraction.
- The Planning permission is for a 25-year period.

Overburden will be removed in phases prior to extraction of underlying material and will be used in the construction of berms around the perimeter of the site. Overburden may also be used in restoration of the quarry once work has ceased.

Material will be extracted down to a level of 20mOD. Extraction of material will mainly be carried out by blasting means. Occasionally, rock breaking may be required on site. It is proposed that material will be extracted at a maximum rate of 400,000 tonnes/annum. Once extracted, material will be loaded onto dump trucks using an excavator. Material will be transported along internal haul roads to the proposed manufacturing area where it will be processed into various grades of aggregate using crushing and screening plant. Material may also be used in the manufacturing of ready-mix concrete at the proposed concrete batching plant.

Products will be transported off site to market via a proposed road which will connect the site to the L5097 and onto the R194 regional road. It is proposed that the development will generate an Annual Average Daily Traffic (AADT) of 73 loads/day.

Water management on site will be as follows:

- A sump will be constructed on the quarry floor which will collect all excess surface water.
- Water will be retained for a period of time to allow suspended solids to settle.
- Water will then be pumped to the proposed settlement lagoon which will be constructed at the proposed manufacturing area.
- Water at the settlement lagoon will be used in the day-to-day operations of the quarry such as manufacturing of ready-mix concrete, aggregate washing or dust suppression.
- Water which is not required will be discharged off site.

- An application for a water discharge licence will be made to Longford Co. Co. if planning permission for the subject development is secured.

For security reasons, very little fuel will be stored at the quarry. A small volume of fuel will be stored in a bunded fuel storage tank which will be located close to the site office. Fuel will be delivered to the quarry by competent oil companies and dispensed into plant and machinery using drip trays or at a designated refuelling location.

It is proposed that the operating hours at the development will be 07:00-19:00 Monday to Friday and 07:00-16:00 on Saturdays. The development will not operate on Sundays or Public Holiday. The proposed development will provide employment for approximately 30 people directly with further people employed indirectly (e.g., sub-contractors for blasting).

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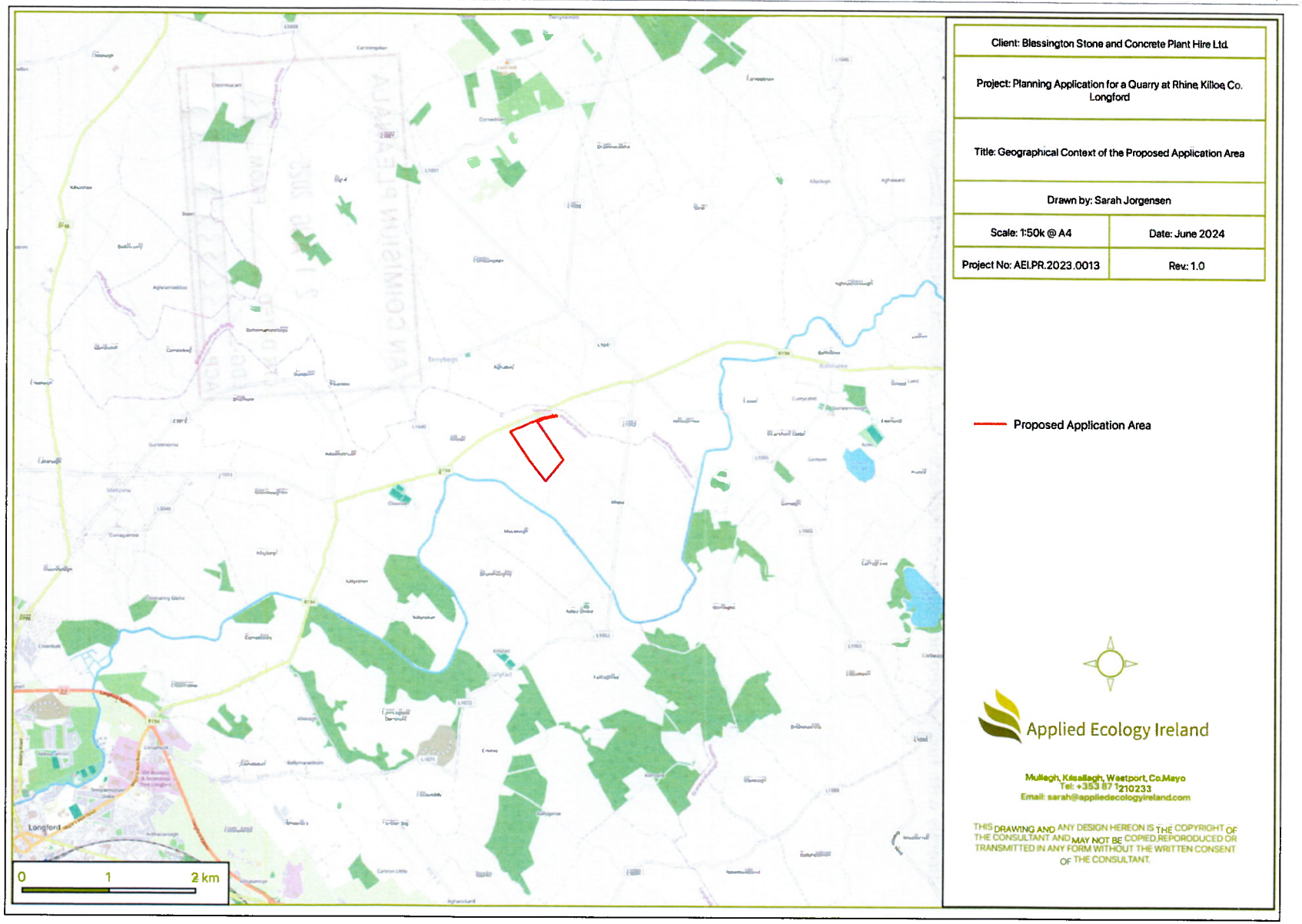

Figure 5.1.1: Geographical context of the proposed application area at Rhine, Killoe, Co. Longford.

5.2 Methods

5.2.1 Study Area Extents

In order to evaluate likely significant effects on ecological receptors in the receiving environment, a number of survey area extents were required. These comprised of the application area (Figure 5.2.1) plus a wider survey area extent as recommended by specific published best practice guidance for each ecological receptor. Where specific published Best Practice recommendations were not available, professional judgement and a review of peer reviewed literature were the primary drivers in calculating survey area extents. Ecological receptors and justification for their respective survey area extents are presented in Table 5.2.1.

Table 5.2.1: Study area extents in relation to individual ecological receptors and justification for same.

Ecological Receptor	Geographical Boundary of the Study Area	Justification for the Study Area Extents
Designated Sites including European Sites, NHAs, pNHAs.	Appraised in the Appropriate Assessment reporting document.	A distance of 15km is currently recommended in the case of projects (DoEHLG, 2009). A zone of 15km is considered sufficient in this instance given the magnitude of works and distance downstream to other European sites.
Habitats	The application area (delineated in red in Figure 5.2.1).	Professional judgement and as per Best Practice (CIEEM, 2018).
Birds	The application area (delineated in red in Figure 5.2.1).	Professional judgement and as per Best Practice (CIEEM, 2018).
Non-volant Mammals	The application area (delineated in red in Figure 5.2.1).	Badgers, as per Best Practice guidelines published by the NRA (2005). Other mammal species, professional judgement and as per Best Practice (CIEEM, 2018)
Bats	The application area (delineated in red in Figure 5.2.1).	Professional judgement and as per: "*Bat Surveys for Professional Ecologists: Good Practice Guidelines,* Collins, (2016)" and "*The Conservation of Bats in Bridges Project – A report on the survey and conservation of bat roosts in bridges in Cumbria,* Billington and Norman (1997).

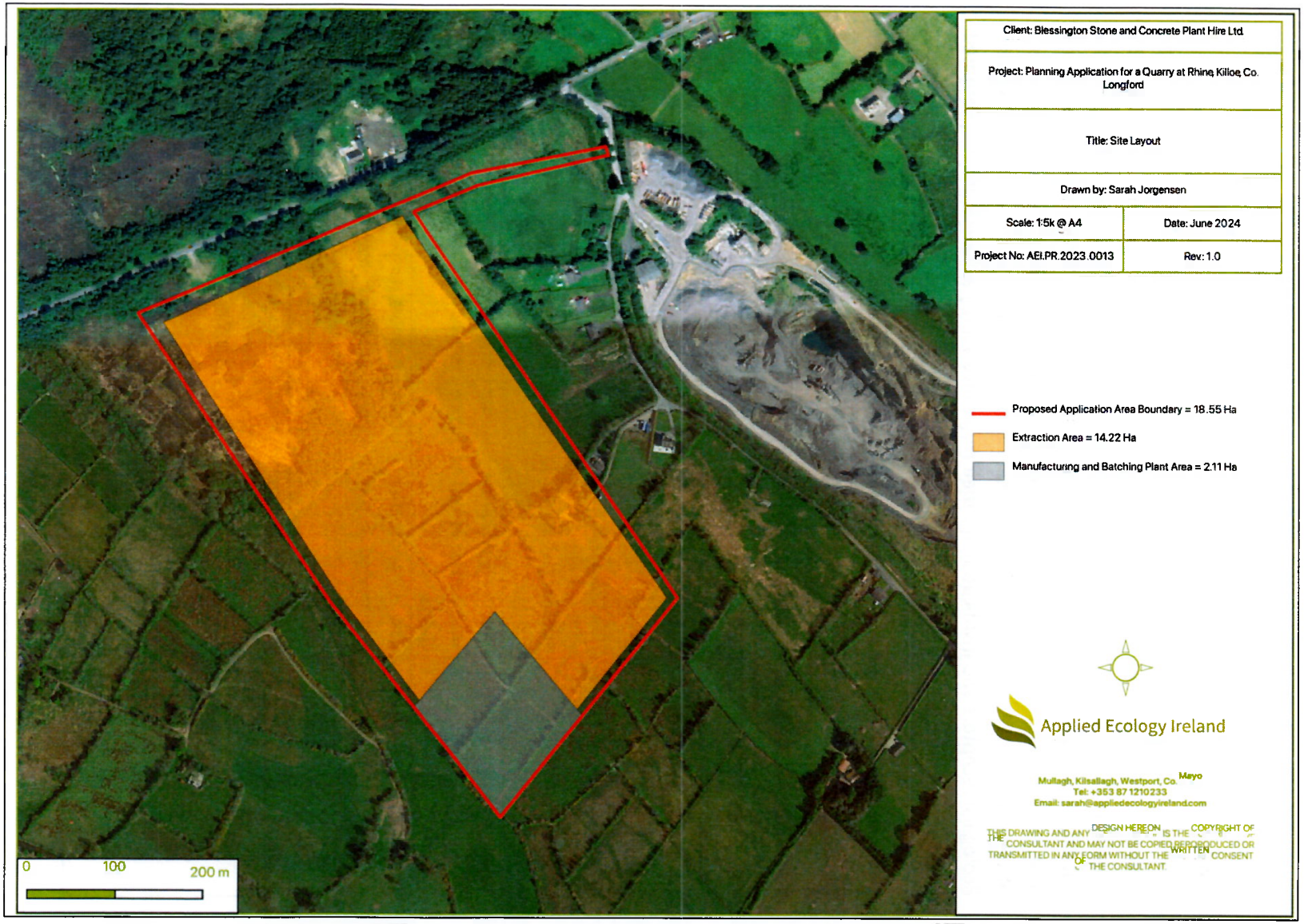

Figure 5.2.1: Redline boundary and site layout of proposed application area at Rhine, Killoe, Co. Longford.

5.2.2 Desktop Review

A desktop review was carried out to identify features of ecological importance within the receiving environment of the proposed vertical extension of the existing quarry site.

A review of the extent of sites designated for nature conservation was carried out by consulting the National Parks and Wildlife Service web mapping service (http://webgis.npws.ie/npwsviewer/. These included European sites i.e. Special Areas of Conservation and Special Protection Areas, as well as nationally designated Natural Heritage Areas (NHAs) and proposed Natural Heritage Areas (pNHAs) within a 15km radius of the existing quarry site.

A review of the published literature was undertaken in order to collate data on the receiving environment, including species and habitats of conservation importance in the study area. Publicly available documents from the following agencies and bodies were accessed as part of the desktop review:

- Environmental Protection Agency (EPA);
- Longford County Council (LCC);
- Inland Fisheries Ireland (IFI);
- Inland Waterways Association of Ireland (IWAI);
- National Parks and Wildlife Service (NPWS);
- National Biodiversity Data Centre (NBDC);
- BirdWatch Ireland (BWI);
- Bat Conservation Ireland (BCI).

5.2.3 Site Survey

The proposed quarry development site was first visited by Principal Ecologist, Ms Sarah Jorgensen MSc. ACIEEM of Applied Ecology Ireland on 19th August 2021. The ecological walkover survey was carried out to establish the baseline ecology of the proposed application area and its environs.

CIEEM EcIA guidance (CIEEM, 2018) states that *"...in the majority of cases, ecological data are likely to have been collected within one or two years prior to an EcIA being written and development activities may take place one or two years after. In these cases, the survey data may represent a reliable indication of the baseline conditions."* As such, an updated field survey for the majority of ecological receptors was not deemed necessary. However, given the amount of hedgerow and treelines within the site, a full suite of bat surveys was carried out by bat specialist, Dr Tina Aughney of Bat Eco Services, in August 2023.

5.2.4 Habitat Survey and Evaluation

A Phase I habitat survey was undertaken to inform an ecological evaluation of the habitats present within the proposed development site in accordance with methods outlined in the Heritage Council publication, *"Guidance for Habitat Survey and Mapping"* (Smith *et al.*, 2011). Habitats were recorded using the habitat classification scheme published by the Heritage Council in *A Guide to Habitats in Ireland* (Fossitt, 2000) and evaluated using the geographical frame of reference scheme as per *"Guidelines for Assessment of Ecological Impacts of National Road Schemes"* (NRA, 2009; please see Table 5.2.2 below for an outline of this evaluation scheme).

5.2.5 Fauna Survey and Evaluation

5.2.5.1 Bats

A comprehensive suite of bat surveys was carried out on the proposed application site in August 2023 by bat ecologist, Dr Tina Aughney of Bat Eco Services, and her field assistant, Mr Shaun Boyle. The Bat Assessment Report (Bat Eco Services, 2023) is available in Appendix 5.1. A list of bat surveys carried out and their associated methods are outlined below.

The following bat surveys were undertaken within the proposed application site during August 2023:

- Daytime Building Inspection
- Tree Potential Bat Roost (PBR) Survey
- Endoscope Inspection
- Static Detector Survey
- Dusk Bat Survey
- Walking Transect

Building and Structure Inspections

There are agricultural buildings within the proposed development site. These buildings were inspected during daylight hours on 9th August 2023. Evidence of bat usage is in the form of actual bats (visible or audible), bat droppings, urine staining, grease marks (oily secretions from glands present) and claw marks. In addition, the presence of bat fly pupae (bat parasite) also indicated that bat usage of a crevice, for example, has occurred in the past. Inspections were undertaken visually with the aid of a strong torch beam (LED Lenser P14.2) and endoscope (General DC5660A Wet / Dry Scope).

Buildings were assessed to determine their suitability as a bat and described using the parameters Negligible, Low, Medium or High suitability in view of Table 5.2.2.

Table 5.2.2: Building Bat Roost Classification System and Survey Effort (Adapted from Collins, 2016 and Marnell *et al.*, 2022).

Suitability Category	Description (examples of criteria)	Survey Effort (Timings)
Negligible	Buildings have no potential as a roost site. Urban setting, heavily disturbed, building material unsuitable, building in poor condition etc.	No surveys required.
Low	Building has a low potential as a roost site. No evidence of bat usage (e.g. droppings).	One dusk or dawn survey.
Medium	Building with some suitable voids / crevices for roosting bats. Some evidence of bat usage. Suitable foraging and commuting habitat present.	At least one survey in May to August, minimum of two surveys (one dusk and one dawn).
High	Building with many features deemed suitable for roosting bats. Evidence of bat usage. Largely undisturbed setting, rural, suitable foraging and commuting habitat, suitable roof void and building material.	At least two surveys in May to August, with a minimum of three surveys (at least one dusk survey and one dawn survey).

Tree Potential Bat Roost (PBRs) Inspection

Trees that may provide a roosting space for bats were classified using the Bat Tree Habitat Key (BTHK, 2018) and the classification system adapted from Collins (2016) (Table 5.2.3). The Potential Roost Features (PRFs) listed in BTHK (2018) were used to determine the PBR value of trees.

Trees identified as PBRs were inspected during the daytime, where possible, on 9th August 2023, for evidence of bat usage. Evidence of bat usage is in the form of actual bats (visible or audible), bat droppings, urine staining, grease marks (oily secretions from glands present) and claw marks. In addition, the presence of bat fly pupae (bat parasite) also indicated that bat usage of a crevice, for example, has occurred in the past.

A Phase 1 inspection was undertaken to make a list of trees within the proposed development site that may be suitable as roosting sites for bats. Inspections were undertaken visually with the aid of a strong torch beam (LED Lenser P14.2) during the

daytime searching for PRFs, if visible. To aid this Phase 1 inspection, tree reports, where available, were consulted to supplement the data collected.

Table 5.2.3: Tree Bat Roost Category Classification System (adapted from Collins, 2016).

Tree Category	Description
1 High	Trees with multiple, highly suitable features (Potential Roosting Features = PRFs) capable of supporting larger roosts
2 Moderate	Trees with definite bat potential but supporting features (PRFs) suitable for use by individual bats;
3 Low	Trees have no obvious potential although the tree is of a size and age that elevated surveys may result in cracks or crevices being found or the tree supports some features (PRFs) which may have limited potential to support bats;
4 Negligible	Trees have no potential.

Bat Habitat and Commuting Routes Mapping

The survey site was assessed during daytime walkabout surveys on 9th August 2023, in relation to potential bat foraging habitat and potential bat commuting routes. Such habitats were classified according to Fossitt (2000) while hedgerows were classified according to BATLAS 2020 classification (Bat Conservation Ireland, 2015). Bat habitats and commuting routes identified were considered in relation to the wider landscape to determine landscape connectivity for local bat populations through the examination of aerial photographs.

Dusk Bat Survey and Walking Transects

A dusk survey was completed on 9th August 2023 from 15 minutes before sunset to 110 minutes post sunset and the surveyor was located within the proposed development site adjacent to agricultural buildings and dwelling located on the boundary of the proposed development site. Post dusk survey, a walking transect was undertaken on 9th August 2023 within accessible sections of the study area.

On 16th August 2023, a dusk survey of the two mature trees was completed and this was followed by a walking transect of accessible areas of the study area and the local road network.

The following equipment was used:

- BatLogger M2 Full Spectrum Bat Detector and Petersson D200 Heterodyne Bat Detector.

Passive Static Bat Detector Survey

Passive Static Bat Surveys were completed over 7 nights from 9th to 16th August 2023. Five units were deployed to record potential nightly bat activity during this time period (See Figure 5.2.2 for location of static units and Table 5.2.4 for the types of units used in each location).
A Passive Static Bat Surveys involves leaving a static bat detector unit (with ultrasonic microphone) in a specific location and set to record for a specified period of time (i.e. a bat detector is left in the field, there is no observer present and bats which pass near enough to the monitoring unit are recorded and their calls are stored for analysis post surveying). The bat detector is effectively used as a bat activity data logger and the habitat type of where the bat detector is location is noted to allow interpretation of the results (e.g. Open verses Edge verses Closed habitat types). Static surveillance results in a far greater sampling effort over a shorter period of time. Bat detectors with ultrasonic microphones are used as the ultrasonic calls produced by bats cannot be heard by human hearing.

The microphone of the unit was positioned horizontally to reduce potential damage from rain. Wildlife Acoustics Song Meter Mini Bat FS Platform Units use Real Time recording as a technique to record bat echolocation calls and using specific software, the recorded calls are identified. It is these sonograms (2-d sound pictures) that are digitally stored on the SD card (or micro SD cards depending on the model) and downloaded for analysis.

The recordings are analysed using Wildlife Acoustics Kaleidoscope Pro. The Auto-Id function is used for all sound files, but manual verification is used to ensure the auto-id function is accurate. This is particularly important for less common bat species and cryptic bat species such as Myotis species. In addition, "Noise" and "Unidentified" sound files are also checked. Each sequence of bat pulses is noted as a bat pass to indicate level of bat activity for each species recorded. This was either expressed as number of bat passes per survey night for bat species recorded with additional analysis in relation to Lesser horseshoe bat activity.

Audio files are a maximum of 15 seconds long and each audio file is taken as a bat pass for each bat species recorded within the audio file. Each bat pass does not equate to the number of individuals of bats flying in vicinity of the recording device but is representative of bat activity levels. Some species such as the pipistrelles will continuously fly around a habitat and therefore it is likely that a series of bat passes within a similar time frame (i.e.

separate audio files within a small time frame) is one individual bat. On the other hand, Leisler's bats tend to travel through an area quickly and therefore an individual sequence of echolocation calls, or bat pass is more likely to be indicative of individual bats.

Table 5.2.4: Static Bat Detectors deployed during Static Bat Detector Surveys.

Static Unit Code	Bat Detector Type	Recording Function	Microphone
SM4 Unit 5, 6, 8	Wildlife Acoustics SongMeter 4 Bat FS	Passive Full Spectrum	SMM-U2, 4m lead
Mini Bat 1, 2	Wildlife Acoustics SongMeter Mini Bat FS	Passive Full Spectrum	SMM-U2

Figure 5.2.2: Location of static units deployed within the site.

5.2.5.2 Non-Volant Mammals

A badger survey was undertaken along all field boundaries to check for the presence of active or disused setts.

As there are no watercourses within the immediate vicinity of the proposed application area, an otter survey was not required.

Any records of tracks or signs of other mammals such as red fox (*Vulpes vulpes*), pine marten (*Martes martes*), Irish hare (*Lepus timidus*), European rabbit (*Oryctolagus cuniculus*), red squirrel (*Sciurus vulgaris*), bank vole (*Clethrionomys glareolus*) and wood mouse (*Apodemus sylvaticus*) encountered were noted.

5.2.5.3 Birds

All avifauna, both seen and heard within the study area, were recorded.

5.2.5.4 Amphibians and Reptiles

Any sightings and suitable habitat of amphibians and reptiles were noted during the site ecology walkover survey.

5.2.5.5 Invertebrates

A survey of suitable habitat of invertebrate species was undertaken during ecology walkover surveys. Particular attention was paid to any instances of Devil's Bit Scabious (*Succisa pratensis*), the larval food plant of the Annex I Lepidoptera species, Marsh Fritillary (*Euphydryas aurinia*).

5.2.6 Aquatic Ecology and Evaluation

A water chapter was prepared by hydrogeologist, Mr Bruno Teillard, of Aqua Geoservices Ltd. (AGS), a company specialising in Hydrogeology and Hydrology.

The assessment of potential effects on water quality and the aquatic ecology within the local environment were extracted from the water chapter. Water is discussed in Section 7.0 of the EIAR.

5.2.7 Criteria for Evaluating Likely Significant Effects

The significance of a likely effect is a combined function of the value of the affected feature (its ecological importance), the type of effect and the magnitude of the effect. It is necessary to identify the value of ecological features within the study area in order to evaluate the significance and magnitude of possible effects.

The proposed quarry extraction area has been appraised in terms of habitat types present and mapped accordingly. Each habitat type within the study area is evaluated and given an overall significance rating on the basis of the criteria outlined in the National Roads Authority (2009) *Guidelines for the Ecological Assessment of Road Schemes*. This system,

presented in Table 5.2.2 below, outlines criteria for evaluating the significance of effects on at various geographical scales.

5.2.7.1 Geographical Context for Determining Ecological Value

Ecological features are evaluated on the following geographical frame of reference when determining value:

- International importance
- National importance
- County importance (or vice-county in the case of plant or insect species)
- Local importance (higher value)
- Local importance (lower value)

The local scale is approximately equivalent to one 10km square but can be operationally defined to reflect the character of the area of interest. This system is presented in Table 5.2.5 below and is taken from the NRA publication *"Guidelines for the Assessment of the Ecological Impacts of National Road Schemes"* (NRA, 2009).

Table 5.2.5: Criteria used to determine the value of the ecological resources (adapted from NRA, 2009)

Ecological Valuation	Criteria
International Importance	• 'European Site' including Special Area of Conservation (SAC), Site of Community Importance (SCI), Special Protection Area (SPA) or proposed Special Area of Conservation. • Proposed Special Protection Area (pSPA). • Site that fulfills the criteria for designation as a 'European Site' (see Annex III of the Habitats Directive, as amended). • Features essential to maintaining the coherence of the Natura 2000 Network. • Site containing 'best examples' of the habitat types listed in Annex I of the Habitats Directive. • Resident or regularly occurring populations (assessed to be important at the national level) of the following: o Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive; and/or o Species of animal and plants listed in Annex II and/or IV of the Habitats Directive.

Ecological Valuation	Criteria
	• Ramsar Site (Convention on Wetlands of International Importance Especially Waterfowl Habitat 1971). • World Heritage Site (Convention for the Protection of World Cultural & Natural Heritage, 1972). • Biosphere Reserve (UNESCO Man and the Biosphere Programme). • Site hosting significant species populations under the Bonn Convention (Convention on the Conservation of Migratory Species of Wild Animals, 1979). • Site hosting significant populations under the Berne Convention (Convention on the Conservation of European Wildlife and Natural Habitats, 1979). • Biogenetic Reserve under the Council of Europe. • European Diploma Site under the Council of Europe. Salmonid water designated pursuant to the European Communities (Quality of Salmonid Waters) Regulations, 1988, (S.I. No. 293 of 1988).
National Importance	• Site designated or proposed as a Natural Heritage Area (NHA). • Statutory Nature Reserve. • Refuge for Fauna and Flora protected under the Wildlife Acts. • National Park. • Undesignated site fulfilling the criteria for designation as a Natural Heritage Area (NHA); Statutory Nature Reserve; Refuge for Fauna and Flora protected under the Wildlife Act; and/or a National Park. • Resident or regularly occurring populations (assessed to be important at the national level) of the following: o Species protected under the Wildlife Acts; and/or o Species listed on the relevant Red Data list. Site containing 'viable areas' of the habitat types listed in Annex I of the Habitats Directive.
County Importance	• Area of Special Amenity. • Area subject to a Tree Preservation Order.

Ecological Valuation	Criteria
	• Area of High Amenity, or equivalent, designated under the County Development Plan. • Resident or regularly occurring populations (assessed to be important at the County level) of the following: o Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive; o Species of animal and plants listed in Annex II and/or IV of the Habitats Directive; o Species protected under the Wildlife Acts; and/or o Species listed on the relevant Red Data list. • Site containing area or areas of the habitat types listed in Annex I of the Habitats Directive that do not fulfil the criteria for valuation as of International or National importance. • County important populations of species, or viable areas of semi-natural habitats or natural heritage features identified in the National or Local BAP, if this has been prepared. • Sites containing semi-natural habitat types with high biodiversity in a county context and a high degree of naturalness, or populations of species that are uncommon within the county. • Sites containing habitats and species that are rare or are undergoing a decline in quality or extent at a national level.
Local Importance (Higher Value)	• Locally important populations of priority species or habitats or natural heritage features identified in the Local BAP, if this has been prepared; • Resident or regularly occurring populations (assessed to be important at the Local level) of the following: o Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive; o Species of animal and plants listed in Annex II and/or IV of the Habitats Directive; o Species protected under the Wildlife Acts; and/or o Species listed on the relevant Red Data list. • Sites containing semi-natural habitat types with high biodiversity in a local context and a high degree of

Ecological Valuation	Criteria
	naturalness, or populations of species that are uncommon in the locality; • Sites or features containing common or lower value habitats, including naturalised species that are nevertheless essential.
Local Importance (Lower Value)	• Sites containing small areas of semi-natural habitat that are of some local importance for wildlife; • Sites or features containing non-native species that are of some importance in maintaining habitat links.

5.2.7.2 Definitions of Effects

The description of effects needs to be precise and concise. Each effect usually needs to be qualified to provide a comprehensive description of the predicted effect on receptors. Definitions of the quality, significance, duration, probability and magnitude of effects as outlined in the EPA (2022) "*Guidelines on the Information to be contained in Environmental Impact Assessment Reports*" are presented in Tables 5.2.6 – 5.2.10 below.

Table 5.2.6: Quality of Effects (adapted from EPA, 2022)

Quality of Effect	Description
Positive Effect	A change which improves the quality of the environment (for example, by increasing species diversity; or the improving reproductive capacity of an ecosystem or removing nuisances or improving amenities).
Neutral Effect	A change which does not affect the quality of the environment.
Negative/Adverse Effect	A change which reduces the quality of the environment (for example, lessening species diversity or diminishing the reproductive capacity of an ecosystem; or damaging health or property or by causing nuisance).

Table 5.2.7: Significance of Effects (adapted from EPA, 2022)

Significance of Effect	Description
Imperceptible	An effect capable of measurement but without notice changes in the character of the environment.
Not Significant	An effect which causes noticeable changes in the character of the environment but without noticeable consequences.
Slight	An effect which causes noticeable changes in the character of the environment without affecting its sensitivities.

Significance of Effect	Description
Moderate	An effect that alters the character of the environment in a manner that is consistent with existing and emerging trends.
Significant	An effect which, by its character, magnitude, duration or intensity alters a sensitive aspect of the environment.
Very Significant	An effect which, by its character, magnitude, duration or intensity significantly alters the majority of a sensitive aspect of the environment.
Profound	An effect which obliterates sensitive characteristics.

Table 5.2.8: Duration and Fre quen cyof Effects (adapted from EPA, 2022)

Duration of Effect	Description
Momentary Effects	Effects lasting from seconds to minutes.
Brief Effects	Effects lasting less than a day.
Temporary Effects	Effects lasting less than a year.
Short-term Effects	Effects lasting one to seven years.
Medium-term Effects	Effects lasting seven to fifteen years.
Long-term Effects	Effects lasting fifteen to sixty years.
Permanent Effects	Effects lasting over sixty years.

Table 5.2.9: Probabi lityof Effects (ada pted from EPA, 2022)

Probability of Effect	Description
Likely Effects	The effects that can reasonably be expected to occur as a result of the planned project if all mitigation measures are properly implemented.
Indeterminable Effects	When the full consequences of a change in the environment cannot be described.
`Worst case' Effects	The effects arising from a project in the case where mitigation measures substantially fail.

Table 5.2.10: Magnitude of Effects (ad apted from EPA,202 2)

Magnitude of Effect	Description
Extent	The size of the area, the number of sites, and the proportion of a population affected by an effect.
Duration	The period of time over which the effect will occur (see further detail above in Table 6.2.5).
Frequency	How often the effect will occur (once, rarely, occasionally, frequently, constantly – or hourly, daily, weekly, monthly, annually)?
Context	Will the extent, duration, or frequency conform or contrast with established (baseline) conditions (is it the biggest, longest effect ever?)?

5.3 Receiving Environment

5.3.1 Designated Sites

5.3.1.1 Natura 2000 sites

There are seven EU designated sites (five SACs and two SPAs) located within a 15km radius of the proposed application area at Rhine, Killoe, Co. Longford (Table 5.3.1). Figure 5.3.1 shows the locations of these sites relative to the proposed application area.

Table 5.3.1: EU designated sites located within a 15km radius of the proposed application area at Rhine, Killoe, Co. Longford.

EU Designated Site and Site Code	Distance and direction from the proposed application area
Lough Forbes Complex SAC (001818)	8.9 km west
Ballykenny-Fisherstown Bog SPA (004101)	8.9 km west (overlaps above SAC)
Brown Bog SAC (002346)	9.7 km southwest
Mount Jessop Bog SAC (002202)	10.8 km southwest
Clooneen Bog SAC (002348)	11.6 km northwest
Ardagullion Bog SAC (002341)	12.3 km southeast
Glen Lough SPA (004045)	14. 9km southeast

The overlapping Lough Forbes Complex SAC and Ballykenny-Fisherstown Bog SPA are hydrologically connected, albeit at a considerable hydrological distance of approximately 16.9km along the pathway of the waterway, with the proposed application area via a drainage ditch which runs along the southwestern boundary of the site into the Camlin River.

A Natura Impact Statement (NIS), which evaluates the likely significant effects of the proposed quarry development on the two hydrologically connected European sites, is included in the planning application.

Evaluation: EU designated sites are of International Importance.

5.3.1.2 Nationally Designated sites

There are six Natural Heritage Areas (NHAs) located within a 15km radius of the proposed application area. (Table 5.3.2). Figure 5.3.1 also shows the locations of these sites relative to the proposed application area.

Table 5.3.2: Natural Heritage Areas (NHA) located within a 15km radius of the proposed application area at Rhine, Killoe, Co. Longford.

Proposed Natural Heritage Areas and Site Code	Distance and direction from the proposed application area
Cloonageeher Bog NHA (001423)	8.9 km northwest
Rinn River NHA (000691)	9.7 km northwest
Mount Jessop Bog NHA (001450)	10.8 km southwest
Aghnamona Bog NHA (000422)	12.8 km northwest
Cashel Bog (Leitrim) NHA (001405)	13.7 km northwest
Corracramph Bog NHA (001420)	14.2 km northwest

There are 11 proposed Natural Heritage Areas (pNHAs) located within a 15km radius of the proposed development (Table 5.3.3). Figure 5.3.1 also shows the locations of these sites relative to the proposed application area.

Table 5.3.3: Proposed Natural Heritage Areas (pNHA) located within a 15km radius of the proposed application area at Rhine ,Killoe ,Co. L ongford

Proposed Natural Heritage Areas and Site Code	Distance and direction from the proposed application area
Carrickglass Demesne pNHA (001822)	2.7 km southwest
Derrymore Bog pNHA (00447)	7.3 km southwest
Royal Canal pNHA (002103)	7.4 km southeast
Lough Forbes Complex pNHA (001818)	8.9 km west
Brown Bog pNHA (000442)	9.7 km southwest
Lough Gowna pNHA (000992)	10 km northeast
Clooneen Bog pNHA (000445)	11.6 km northwest
Ardagullion Bog pNHA (002069)	12.3 km southeast
Lough Rinn pNHA (001417)	13.3 km northwest
Clooncoe Wood And Lough pNHA (000424)	13.6 km northwest
Glen Lough pNHA (001687)	14.9 km southeast

Evaluation: NHAs and pNHAs are of National Importance.

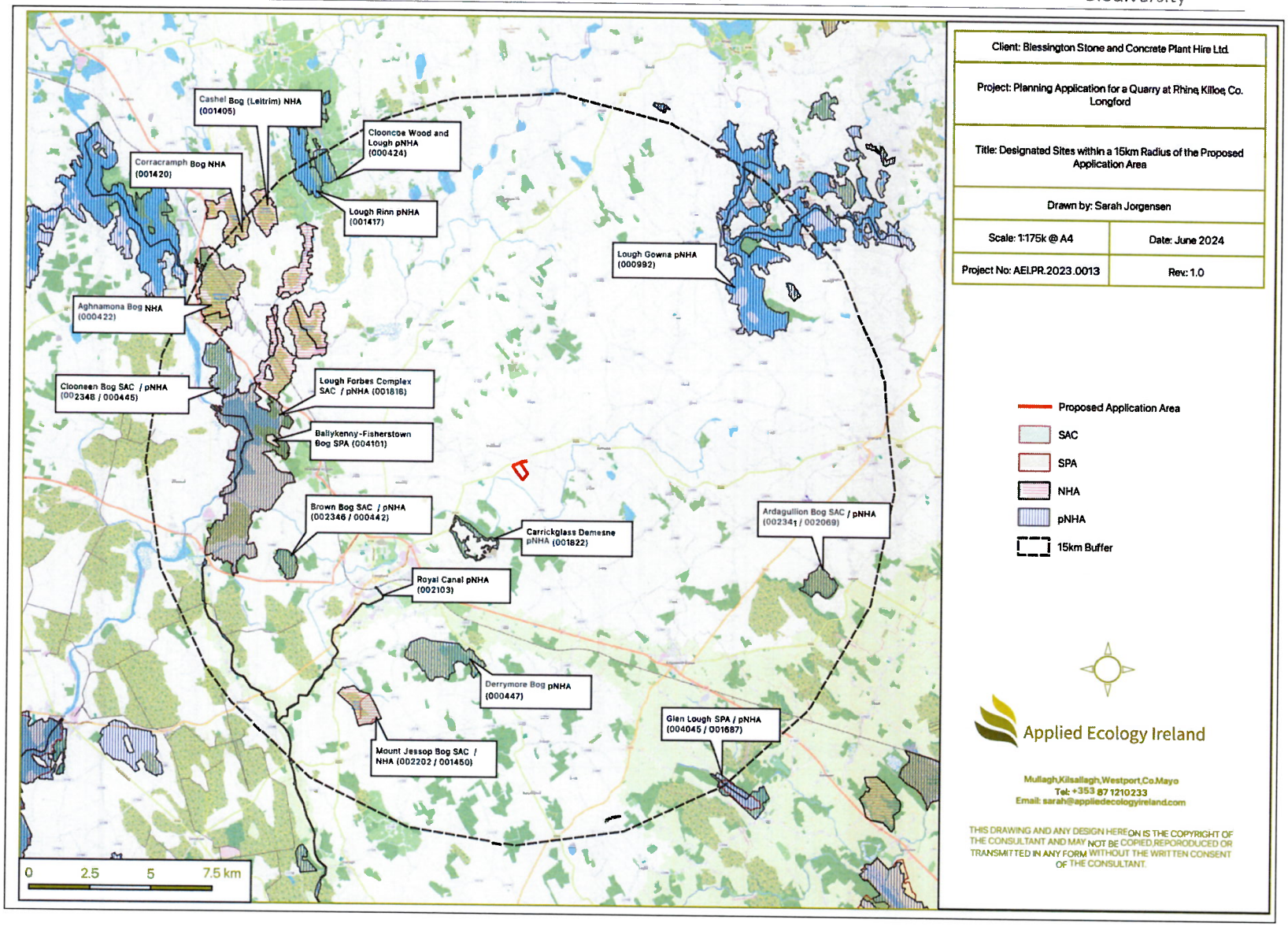

Figure 6.3.1: European designated (SACs and SPAs) and nationally designated (NHAs and pNHAs) sites within 15km of the proposed application area at Rhine, Killoe, Co. Longford.

5.3.2 Habitats

The habitats recorded within the proposed application area are presented and evaluated in Table 5.3.4 as per *"Guidelines for Assessment of Ecological Impacts of National Road Schemes"* (NRA, 2009; please see Table 5.2.2 for an outline of the geographic frame of reference valuation scheme). Habitats have been mapped as per Fossitt (2000) and are illustrated in Figure 5.3.2. Each habitat is then described individually in Sections 5.3.2.1 – 5.3.2.8.

Table 5.3.4: Summary of habitat recorded within and adjacent to the proposed application area classified as per Fossitt (2000), their respective evaluations as per NRA (2009) and their respective correspondence, if a ny,to EU Annex I Habitats.

Fossitt Code	Habitat Type	Habitat Evaluation	Correspondence to EU Annex I Habitats
BL3	Buildings and artificial surfaces	Local Importance (Lower Value)	N/A
FW4	Drainage ditch	Local Importance (Lower Value)	N/A
GA1	Improved agricultural grassland	Local Importance (Lower Value)	N/A
GS4	Wet grassland	Local Importance (H igher Valu e)	N/A
GS4/GA1	Wet/Improved agricultural grassland mosaic	Local Importance (Lower Value)	N/A
WD1/WS1	(Mixed) broadleaved woodland/Scrub	Local Importance (Higher Value)	Although scrub is classified as a higher value semi-natural habitat, given the absence of heath and calcareous grassland, there is no potential correspondence with the EU Annex I habitat Juniperus communis formations on heaths or calcareous grasslands [5130].
WL1	Hedgerows	Local Importance (Hi gher Value)	N/A
WL2	Treelines	Local Importance (H igher Value)	N/A
WL1/WL2	Hedgerow/Treeline mix	Local Importance (H igher Value)	N/A

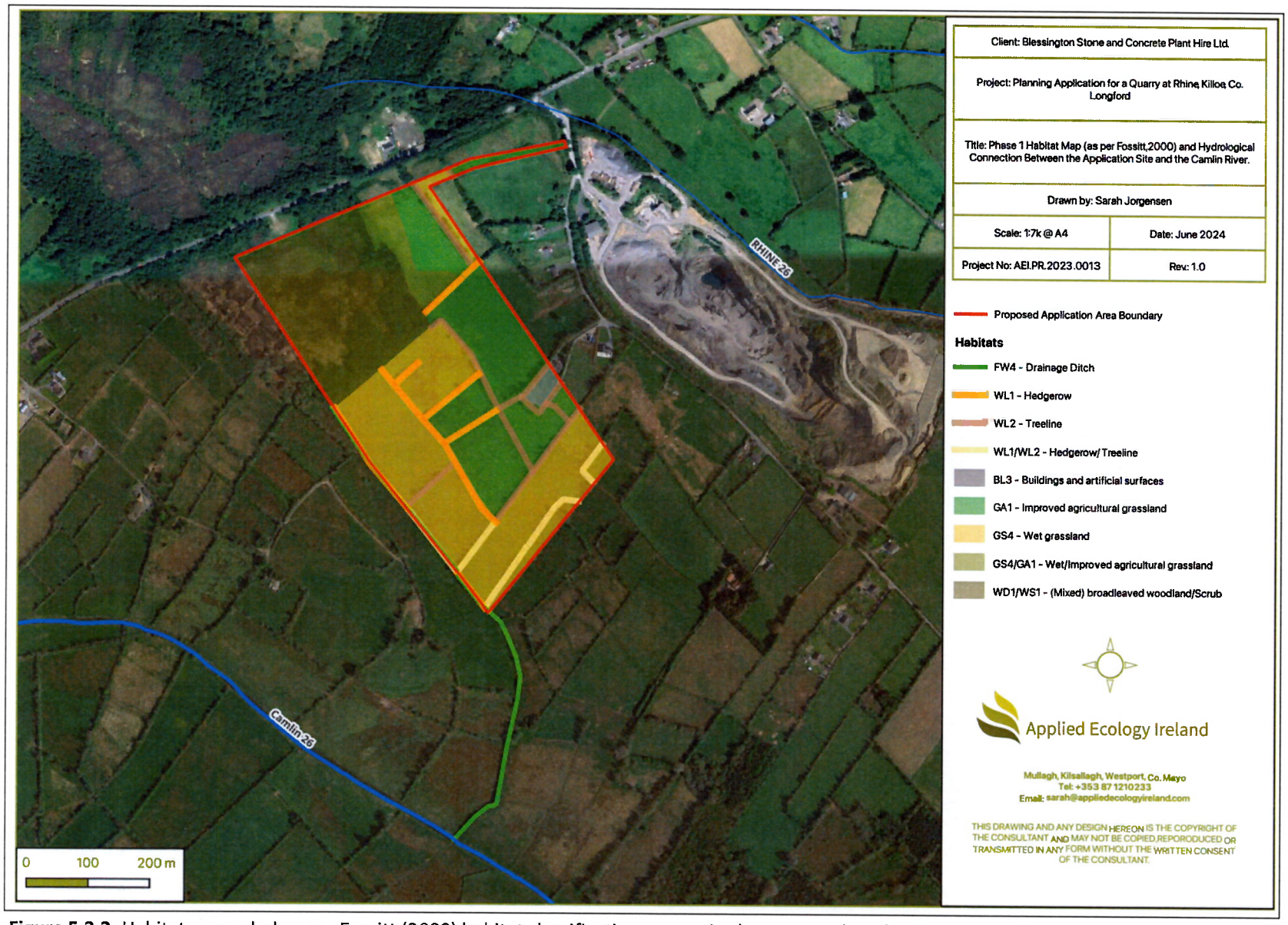

Figure 5.3.2: Habitats recorded as per Fossitt (2000) habitat classification system in the proposed application area at Rhine, Killoe, Co. Longford.

5.3.2.1 Wet Grassland (GS4)

This type of grassland can be found on flat or sloping ground in upland and lowland areas. It occurs on wet or waterlogged mineral or organic soils that are poorly drained or, in some cases, subjected to seasonal or periodic flooding. On sloping ground, wet grassland is mainly confined to clay-rich gleys and loams, or organic soils that are wet but not waterlogged (Fossitt, 2000).

This habitat predominantly occurs in the southwestern and southern sections of the application area, which are at a generally lower gradient than the rest of the site. These wet grassland fields are dominated by dense soft rush (*Juncus effusus*) and overall, are species poor from a botanical perspective (Plate 5.3.1). However, dense rush can provide good nesting habitat for Red and Amber listed bird species, such as meadow pipit (*Anthus pratensis*) and skylark (*Alauda arvensis*) respectively (Gilbert *et al*, 2021).

Evaluation: Given its potential to provide nesting habitat for protected bird species, the wet grassland fields within the proposed application area are considered to be of Local Importance (Higher Value).

Plate 5.3.1: Wet grassland (GS1) dominated by dense soft rush (*Juncus effusus*).

5.3.2.2 Improved Agricultural Grassland (GA1)

This category is used for intensively managed or highly modified agricultural grassland that has been reseeded and/or regularly fertilized and is now heavily grazed and/or used for silage production. Improved agricultural grassland is typically species-poor. Sward quality varies depending on soil type, fertility, drainage and management (Fossitt, 2000).

Much of the lands on the higher ground in the eastern section of the proposed application area are improved agricultural grassland (GA1). These lands are sloping to the south/southwest and currently grazed by sheep and cattle. The sward is uniform, and the grazing has created a short dense sward (Plate 5.3.2).

Species composition of the sward is relatively low and comprised of grasses typical of the classification. Perennial ryegrass (*Lolium perenne*) is abundant and dominant over much of the area. Other species such as Fescues (*Festuca spp.*) were abundant, Yorkshire-fog (*Holcus lanata*) was frequent and Cock's-foot (*Dactylis glomerata*) occasional. The closely grazed sward and survey period made identification of more diverse species such as Timothy (*Phleum pratense*), Crested dog's-tail (*Cynosurus cristatus*) and Sweet vernal-grass (*Anthoxanthum odoratum*) difficult but they were not evident in amounts which would render the sward calcareous grassland (GS1).

The main broadleaved herb layer evident comprised of Creeping buttercup (*Ranunculus repens*) and White clover (*Trifolium repens*). There were also dead heads of last year's thistles (*Cirsium spp.*) and docks (*Rumex spp.).*

Due to the low species diversity and grazing regime the area was determined to be of limited conservation value. Its main ecological value is based on the matrix of hedgerows that are associated with the grasslands and as field forage for mammals and wintering populations of corvid and thrush species.

Evaluation: Improved agricultural grassland fields within the proposed application area are considered to be of Local Importance (Lower Value).

5.3.2.3 Wet/Improved Agricultural Grassland Mosaic (GS4/GA1)

There is relatively small strip of wet/improved agricultural grassland mosaic in the northern section of the application site in the lower part of a field that has been agriculturally improved.

The species composition of this habitat is very similar to the improved agricultural grassland described above, however, with more soft rush present (Plate 5.3.3). This area is grazed by cattle.

Evaluation: Wet/Improved agricultural grassland habitat within the proposed application area is considered to be of Local Importance (Lower Value).

Plate 5.3.3: Wet/Improved agricultural grassland mosaic (GS4/GA1) within the northern section of the application area.

5.3.2.4 Hedgerows (WL1) and Treelines (WL2)

Hedgerows and treelines boarder the perimeters of the wet and agricultural grassland fields within the proposed application area (Plate 5.3.4 and 5.3.5).

The dominant species of the hedgerows are hawthorn (*Crataegus monogyna*), goat willow (*Salix caprea*) and bramble (*Rubus fruticosus*). Tree species which were locally frequent and occasional included Ash (*Fraxinus excelsior*) (many of which are showing signs of Ash Dieback Disease), Sycamore (*Acer pseudoplatanus*) and large-leaved lime (*Tilia platyphyllos*)

These habitats have the potential to support local populations of wintering and resident bird species and feeding and foraging for mammals including bats. There are no mature deciduous trees within these habitats which are considered to be suitable for roosting bats.

Evaluation: Mature hedgerows and treelines to the northeast of the proposed application area are considered to be of Local Importance (Higher Value).

5.3.2.5 (Mixed) Broadleaved Woodland/Scrub (WD1/WS1)

The mixed broadleaved woodland category includes woodland areas with 75-100% cover of broadleaved trees, and 0-25% cover of conifers. It is be used in situations where woodland stands cannot be classified as semi-natural. Trees may include native and non-native species. Plantations of broadleaved trees are included if the canopy height is greater than 5 m, or 4 m in the case of wetland areas. Scrub is a broad category includes areas that are dominated by at least 50% cover of shrubs, stunted trees or brambles. The canopy height is generally less than 5 m, or 4 m in the case of wetland areas (Fossitt, 2000).

Desktop assessment of satellite imagery shows that this habitat appears to have been planted on a wet area of raised bog or wet heath and is dominated by birch (*Betula pendula*) and alder (*Alnus glutinosa*) with an understorey of dense bramble scrub (WS1). The woodland does not contain any conifers.

This habitat provides good breeding/roosting potential for countryside bird species and feeding and foraging habitat for mammals including bats.

Although a higher value semi-natural habitat, given the absence of heath and calcareous grassland, there is no potential correspondence with the EU Annex I habitat *Juniperus communis* formations on heaths or calcareous grasslands [5130].

Evaluation: The (mixed) broadleaved woodland/scrub within the northwestern section of the proposed application area is considered to be of Local Importance (Higher Value).

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Plate 6.3.6: Mixed broadleaved woodland plantation (WD1) dominated by birch (*Betula pendula*) and alder (*Alnus glutinosa*) with an understorey of dense bramble scrub (WS1).

5.3.2.6 Drainage Ditch (FW4)

This category includes linear water bodies or wet channels that are entirely artificial in origin, and some sections of natural watercourses that have been excavated or modified to enhance drainage and control the flow of water. To be included here, drainage ditches will either contain water (flowing or stagnant) or be wet enough to support wetland vegetation (Fossitt, 2000).

A drainage ditch runs along the south-western boundary of the proposed application area and continues for a further 420m to the south-west the proposed area along field boundaries to its confluence with the Camlin River (Figure 5.3.2). This ditch is the main drainage for the site.

5.3.2.7 Invasive Plant Species

No invasive plant species were found onsite during the Phase I habitat survey.

Records of the high impact invasive species Japanese Knotweed (*Fallopia japonica*) (n=7; registered in 2019), Indian Balsam (*Impatiens glandulifera*) (n=2; registered in 2008), Rhododendron *(Rhododendron ponticum)* (n=3; registered in 2017) and Cherry laurel

(*Prunus laurocerasus*) (n=2; registered in 2004) are listed within the 10km grid square N17 (NBDC, 2023, accessed on 29/08/2023).

5.3.3 Fauna

5.3.3.1 Bats

Building and Structure Inspection

One area of buildings was inspected during the daytime which consists of a private dwelling (a bungalow – not within the proposed development, but on the boundary) and agricultural sheds (modern corrugated single storey barn structure) (Figure 5.3.3). All of the buildings were deemed to have a Low value in relation to potential bat roosting sites. No evidence of bat usage was recorded.

Tree Potential Bat Roost (PBRs) Inspection

The mature trees within the proposed development site were inspected on 9th August 2023 (Figure 5.3.3). Two mature ash trees with heavy ivy growth were considered to have a Category 2 PBR value.

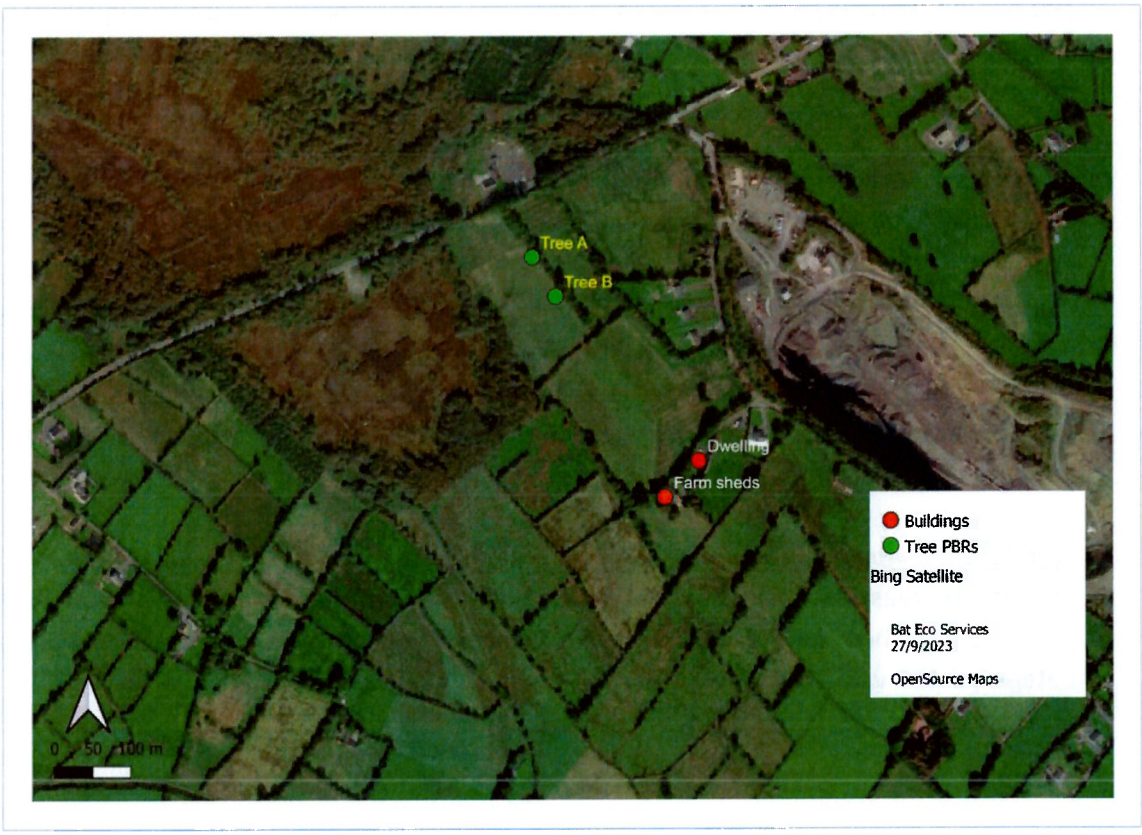


Figure 5.1.3: Locations of the PBR trees and buildings and structures which were inspected for roosting potential and evidence of bats.

Bat Habitat and Commuting Routes Mapping

The habitat types, with reference to Fossit (2000), were recorded both within the survey area and adjacent to the survey area. The principal bat habitats located within the proposed development are linear habitats comprised of hedgerows and treeline boundaries (Figure 5.3.2). As described in Section 5.3.2 above, there is a section of scrub and woodland in the north-western part of the of the proposed development site. Grassland is a mixture of wet grassland and improved agricultural grassland.

Dusk Bat Surveys

The dusk survey on 9th August 2023 (weather conditions: calm, dry, patchy cloud cover and 22°C) concentrated on determining if the dwelling and agricultural buildings were used by roosting bats. With sunset at 21:13, the first bat was not recorded until 21:43, and this was a Leisler's bat. As this species tends to emerge around sunset, this bat was commuting from a roost located a distance from the proposed development area.

The first common pipistrelle was recorded at 21:45 and commuted along the lane past the dwelling and farm buildings towards the linear habitat features of the agricultural land. This was followed by two additional individuals of this species at 21:47 and 21:48.

The first soprano pipistrelle was recorded at 21:48 and, similarly, commuted along the lane into the proposed development area. The buildings surveyed were deemed not to be bat roosts.

A walking transect was undertaken of the accessible fields within the survey area and three species of bat were recorded: common pipistrelle (*Pipistrellus pipistrellus*), soprano pipistrelle (*Pipistrellus pygmaeus*) and Leisler's bat (*Nyctalus leisleri*).

The dusk survey on 16th August 2023 (weather conditions: patchy cloud cover, dry, breezy and 16°C) concentrated on determining the direction of commuting bats and potential bat roosting in mature trees. No bats were recorded emerging from these trees during this second dusk survey.

Passive Static Bat Detector Survey

The following seven species of bat were recorded within the survey area during the static bat detector survey over 7 nights from 9th to 16th August:

- Soprano pipistrelle
- Common pipistrelle
- Leisler's bat
- Daubenton's bat (*Myotis daubentonii*)
- Natterer's bat (*Myotis nattereri*)
- Nathusius' pipistrelle (*Pipistrellus nathusii*) and
- Brown long-eared bat (*Plecotus auratus*)

A full breakdown of nightly activity is presented in the Bat Assessment Report (Bat Eco Services, 2023) in Appendix 5.1 of this Biodiversity Chapter.

The following graphs depict the level of bat activity recorded on the static units (please note that number of bat passes do not equate to number of individuals – it is a measure of activity levels only).

There are three bat species considered to be common in Ireland: common pipistrelle, soprano pipistrelle and Leisler's bats. Figure 5.3.4 depicts the total level of bat activity for these three bats species.

Common pipistrelle was the most frequently recorded bat species particularly on Static Units 4 and 5, both of which were located along treelines documented as commuting routes for local bat populations.

Soprano pipistrelle was the second most frequently encountered bat species. While a higher level of bat activity for this species was also recorded on Static Unit 4, there was also a similar level of activity recorded on Static Unit 1 which was located in the scrub/woodland/wet grassland habitat. Static Units 2 and 3 generally recorded a lower level of bat activity and this reflects the lower quality of linear habitat at these two points.

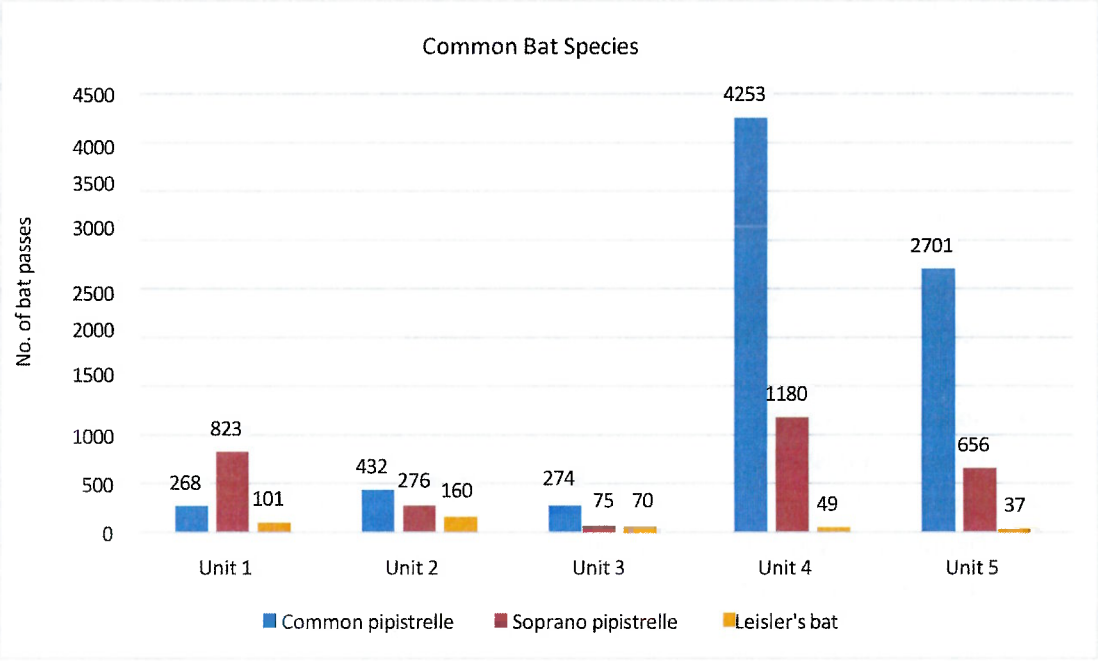


Figure 5.3.4: Total number of passes of common bat species recorded during static surveillance (7 nights).

A different pattern of bat activity on the 5 static units was recorded for less common bat species (Nathusius' pipistrelle, brown long-eared bat, Daubenton's bat and Natterer's bat; Figure 5.3.5).

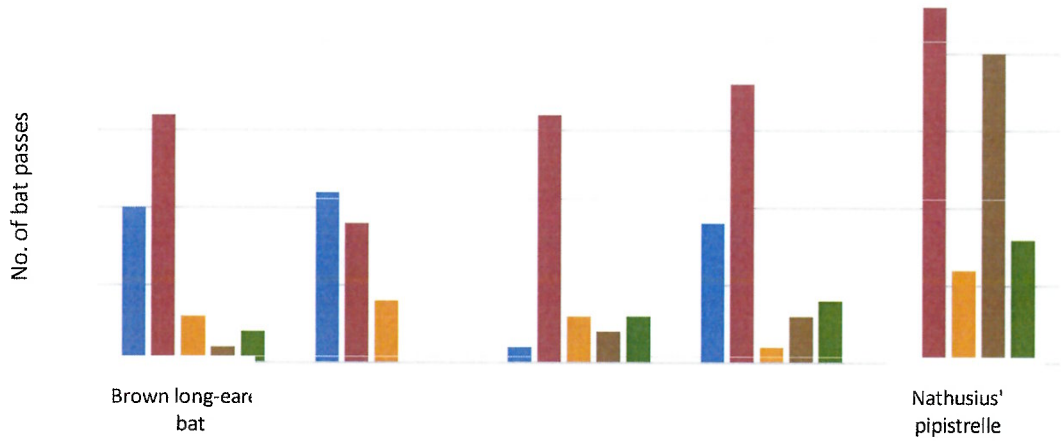
Brown long-eared bat activity was higher on Static Unit 1 and 2, which may indicate that individuals of this species of bat commuted along the linear habitat where Static Unit 2 was located in order to forage within the scrub/woodland area, the preferred habitat for this

species. The time stamp audio files for Static 2 on Night 1 (9th August 2023), the night with the highest level of bat activity for this species, activity was recorded between 22:57 and 23:07 and then between 03:35 and 04:10. These two time slots coincide with commuting periods for this bat species.

A similar pattern was recorded for Daubenton's bats within individuals of this species possibly commuting to the river located south of the proposed development area.

A higher level of bat activity for Natterer's bats were recorded on Static Unit 2. While this species has a similar habitat preference to brown long-eared bats, it tends to forage in extensive agricultural landscape habitats also, which is characteristic of the wider landscape around the proposed development site. The time stamp audio files for Static 2 on Night 1 (9th August 2023), the night with the highest level of bat activity for this species, activity was recorded throughout the night at a low level and therefore is indicative of foraging individuals.

Nathusius' pipistrelle is Ireland's newest bat species and first recorded in Northern Ireland in the mid- 1990s. This species tends to be associated with large waterbodies such as Lough Forbes located 10km further west. The time stamp audio files for Static 2 on Night 6 (14th August 2023), the night with the highest level of bat activity for this species, all of the activity was recorded between 01:16 and 03:49. This is indicative of commuting/foraging individuals passing through the landscape of the proposed development area.



In order to determine static locations considered to be important for bats, the total number of bats passes for each bat species was divided by the total number of static surveillance nights (7 nights) (Figures 5.3.6 and 5.3.7).

In summary, the linear habitats where Unit 2, 4 and 5 are located are important for local bat populations.

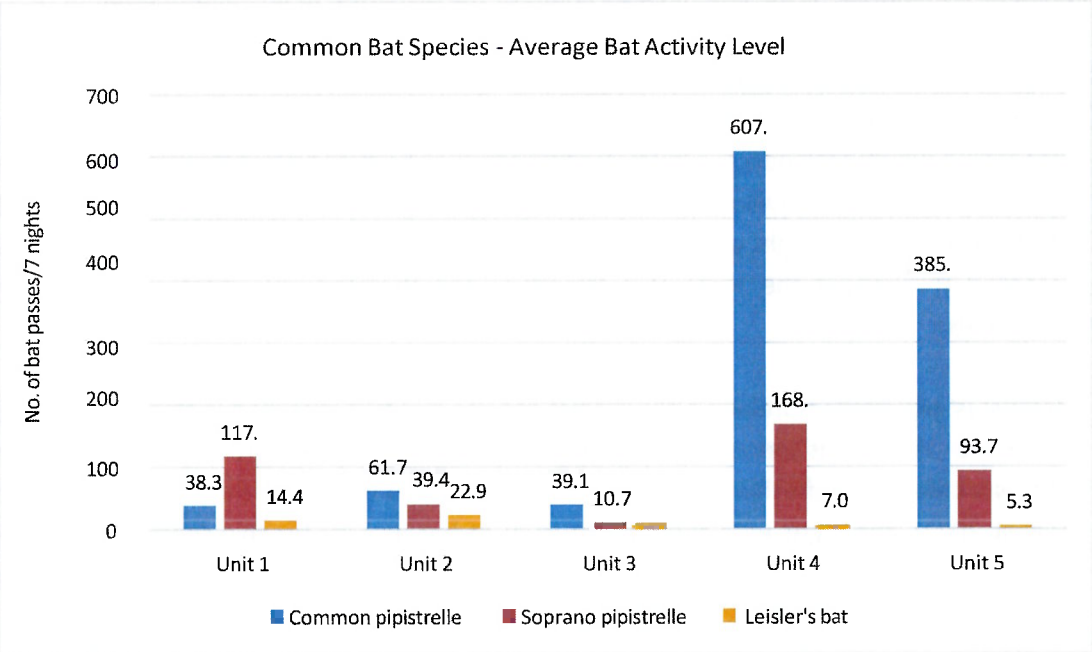


Figure 5.3.6: Average bat activity level of common bat species during static surveillance (Total number of bat passes divided by 7 nights of static surveillance).

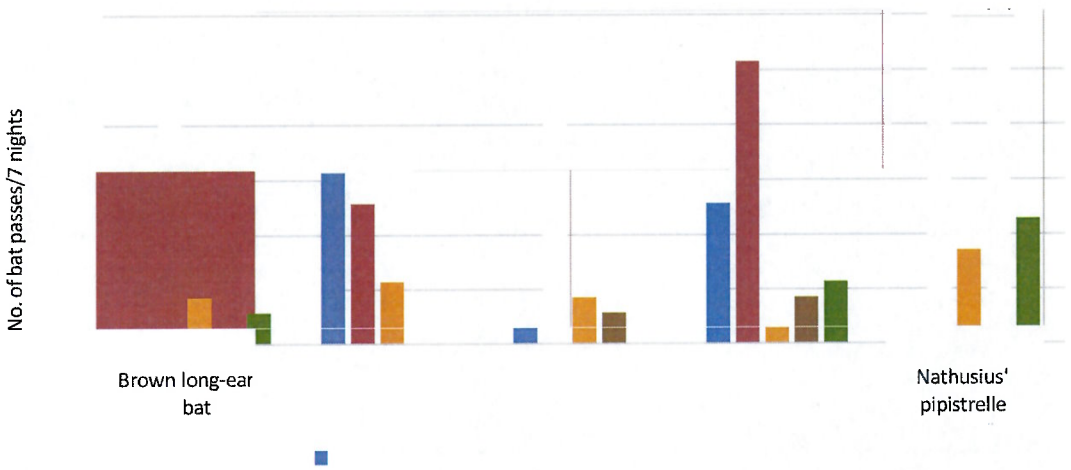


Figure 5.3.7: Average bat activity level of less common bat species during static surveillance (T number of bat passes divided by 7 nights of static surveillance).

Overall, a high level of bat activity was recorded for common pipistrelle, a medium level of bat activity was recorded for soprano pipistrelles and a low level of bat activity was recorded for all other bat species noted within the survey area.

Bat Encounter Locations

All of the bat survey data for each bat species were combined to produce maps depicting the location of geo-referenced bat encounter locations (Figures 5.3.8-5.3.14). This illustrates the dispersal of the different bat species throughout the survey area.

Bats were recorded throughout accessible survey area with common pipistrelle and soprano pipistrelle the two most common bats species.

Evaluation: Bat species within and surrounding the proposed application area are considered to be of Local Importance (Higher Value).

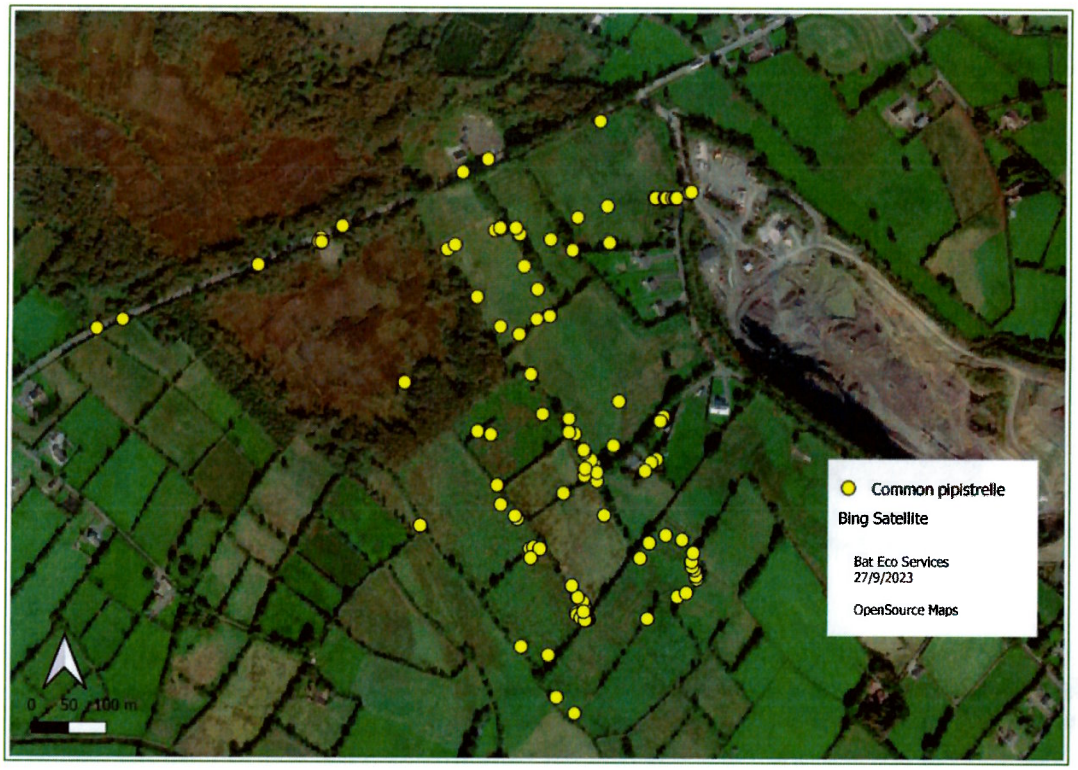


Figure 5.3.8: Common pipistrelle bat encounters within survey area.

Figure 5.3.9: Soprano pipistrelle bat encounters within survey area.

Figure 5.3.10: Leisler's bat encounters within survey area.

Figure 5.3.11: Narthusius pipistrelle bat encounters within survey area.

Figure 5.3.12: Brown long-eared bat encounters within survey area.

Figure 5.3.13: Natterer's bat encounters within survey area.

Figure 5.3.14: Daubenton's bat encounters within survey area.

5.3.3.2 Non-Volant Mammals

No protected mammals or signs were recorded on site during the site visit within the proposed application area. However, given the habitats present within the proposed application area, it is highly likely that the following species use this for foraging and breeding: badger (*Meles meles*), fox (*Vulpes vulpes*), Irish hare (*Lepus timidus hibernicus*), Irish stoat (*Mustela erminea hibernica*), pine marten *(Martes martes),* rabbit (*Oryctolagus cuniculus*), hedgehog *(Erinaceus europaeus)*, wood mouse (*Apodemus sylvaticus*).

Given the absence of watercourses within and surrounding the proposed application area, it is highly unlikely that otter (*Lutra lutra*) will utilize the area.

Evaluation: Non-volant mammals within and surrounding the proposed application area are considered to be of Local Importance (Higher Value).

5.3.3.3 Birds

The site survey recorded the presence of 17 bird species by sight and sound. All were common countryside species. The presence of hedgerows, treelines and the woodland/scrub area make for suitable nesting and roosting sites for a range of these species.

Bird species diversity and abundance recorded during the site visit are shown in Table 5.3.5.

Table 5.3.5: Bird species and the numbers of each recorded ecology walk-over survey within the proposed application area together with their conservation status.

Common and Scientific Name	Number of Birds Observed	Conservation Status	
		BoCCI	Annex I
Meadow Pipit (*Anthus pratensis*)	5	Red	No
Spotted Flycatcher (*Muscicapa striata*)	3	Amber	No
Sand Martin (*Riparia riparia*)	10	Amber	No
Swallow (*Hirundo rustica*)	13	Amber	No
Linnet (*Linaria cannabina*)	6	Amber	No
Goldcrest *(Regulus regulus)*	2	Amber	No
Common Buzzard (*Buteo buteo*)	1	Green	No
Blackbird *(Turdus merula)*	2	Green	No
Coal Tit *(Periparus ater)*	3	Green	No
Chaffinch *(Fringilla coelebs)*	5	Green	No
Great Tit *(Parus major)*	1	Green	No
Robin *(Erithacus rubecula)*	3	Green	No
Dunnock *(Prunella modularis)*	2	Green	No
Rook *(Corvus frugilegus)*	3	Green	No
Hooded Crow (*Corvus cornix*)	2	Green	No
Wood Pigeon (*Columba palumbus*)	3	Green	No
Wren *(Troglodytes troglodytes)*	3	Green	No

Meadow pipit was the only species cited as Red-listed under the Birds of Conservation Concern in Ireland (Gilbert *et al*, 2021) which was recorded during the walk-over survey. The Meadow Pipit is amongst the most abundant Red-listed bird species in the country. It is a very widespread breeding species in Ireland, with around 500,000 to 1,000,000 pairs. A total of five meadow pipits were observed flying within the wet grassland fields throughout the site. The survey took place in August, which is post breeding for this species. However, given the breeding habitats available, it is likely that meadow pipits bred successfully both onsite and in the surrounding area.

A total of five of the species recorded onsite are Amber-listed, whilst the remaining 12 are Green-listed. There were no Annex I bird species recorded.

Buzzard was the only raptor species recorded. It was observed circling and calling overhead to the west of the site.

Evaluation: Given the presence of the Red-listed meadow pipit and breeding habitat for same, the proposed application area is considered to be of National Importance (Medium Value) in relation to birds.

5.3.3.4 Amphibians and Reptiles

The Common Frog (*Rana temporaria*) and the Smooth Newt (*Lissotriton vulgaris*) are afforded protection under the Wildlife Act (1976) and Wildlife (Amendment) Act, 2000. Frog has been recorded in the 10km grid square, N17, (NBDC, 2023; accessed 29/08/2023), however there are no records of newt. Both frogs and smooth newts are likely to be present within the wet grassland habitat. Both species are generally common and widespread in the Irish countryside.

The Viviparous lizard (*Zootoca vivipara*) is also afforded protection under the Wildlife Act (1976) and Wildlife (Amendment) Act, 2000. No existing records of Viviparous lizard are known from within the study area (NBDC, 2022; accessed 29/08/2022). No Viviparous lizards were recorded on site during the habitat survey. Some habitats within the site such as tracks, spoil and bare ground, hedgerows and grassland could potentially be used by Viviparous lizard. Viviparous lizard is unlikely to use the adjacent improved agricultural grassland habitat.

Evaluation: Amphibian and reptile species within the proposed application area are considered to be of Local Importance (Lower Value).

5.3.3.5 Invertebrates

Given the season in which the field survey was undertaken, Lepidoptera or other invertebrate species were not recorded within the proposed application area. Devils Bit Scabious (*Succisa pratensis*), the larval food plant of the Marsh Fritillary (*Euphydryas aurinia*) was not recorded within the proposed application area.

Desktop records within 10km of the proposed application area obtained from the following sources were reviewed:

- All Ireland Non-Marine Mollusc Database (http://maps.biodiversityireland.ie/#/DataSet/1/General);
- Moths Ireland (http://www.mothsireland.com/);
- Bees Ireland (http://maps.biodiversityireland.ie/#/DataSet/5);
- Dragonfly Ireland (http://www.habitas.org.uk/dragonflyireland/);
- Ephemeroptera of Ireland (https://www.npws.ie/sites/default/files/publications/pdf/RL7%20-%20Mayflies_corrected%20BN%20Sept%202016.pdf).

The data review revealed that few of the recorded species are rated as 'vulnerable' and none have legal protection or were likely to be associated with the habitats within the study area.

Evaluation: Invertebrate species within the proposed application area are considered to be of Local Importance (Lower Value).

5.3.4 Hydrology and Aquatic Ecology

Regionally, the proposed site is located in the Lower Shannon surface water catchment within Hydrometric Area 26 (Upper Shannon) of the Shannon IRBD. The River Shannon flows c. 11km to the west of the proposed site boundary. The proposed quarry area lies entirely within the catchment area of the Camlin River Sub Basin (RSB). The Camlin River (EPA Code: IE_SH_26C010600) is a tributary of the Shannon River.

The proposed application area is situated on poorly drained soils. As mentioned previously, a ditch runs along the south-western boundary of the proposed site area, which effectively drains all the proposed area to the south-west. Based on the soil cover and the density of drainage ditches in the area within the site and its surrounding, it is anticipated that only a small portion of the effective rainfall infiltrate to ground.

During the wet season, the soils would be rapidly saturated. Given the poorly drained soil cover, it is anticipated that most of the effective rainfall would generate surface water runoff, which is then drained by the network of ditches in the area.

According to calculations presented in Chapter 7.0 - Water, it was calculated that both the proposed extraction area (14.2 Ha) and the manufacturing and batching plant area (2.1 Ha) already drain to the large ditch running along the south-western boundary of the quarry landholding. As the proposed extraction area is being quarried, it is essentially only surface

water runoff generated on site that will have to be dealt with. It is proposed that the water be discharged back to the aforementioned ditch.

The Camlin flows from its point of confluence with the drainage ditch in a west/south-westerly direction for a further approximately 21.5km into the overlapping Lough Forbes Complex SAC and Ballykenny-Fisherstown Bog SPA.

The River Waterbody WFD status of the Camlin_030 RSB (including all tributaries) for the period 2013-2018 (IE_SH_26C010600) is classified as "good status" (Source: EPA). The overall risk as part of the third cycle is classed as "Not at Risk" of not achieving good status with the overall objective to keep its good status by 2027.

The overall Biological Q rating of the Camlin River in the most recent monitoring (2021) remains consistent with a Q-Value of 4 – Good quality rating.

Evaluation: Given the surface water hydrological connection between the proposed application area and the Camlin River, which has a Q-Value of 4 - Good, aquatic ecology within the proposed application area is considered to be of Local Importance (Higher Value).

5.4 Likely Significant Effects

5.4.1 Source-Pathway-Receptor-Effect Conceptual Model

Using Source-Pathway-Receptor-Effect (consequences) modelling, all characteristics and activities associated with the proposed quarry development are evaluated for their likelihood to cause significant effects (in the absence of mitigation) on the sensitive ecological aspects of the receiving environment. The conceptual model is presented in Table 5.4.1 below.

The description, significance, magnitude, probability, duration and type of effects are then described in the subsequent subsections in accordance with the EPA (2022) "*Guidelines on information to be contained in EIAR*" (Please see Tables 5.2.3 – 5.2.7 in Section 5.2.3.2 for full list of definitions of effects).

Table 5.4.1: Source-Pathway-Receptor-Effect (consequence) conceptual model for all potential effects of individual elements (sources) of the proposed project on sensitive ecological receptors and their respective potential for significant effects.

Source of Effects on Biodiversity	Pathway	Receptor	Effect (Consequences)	Potential for Significant Effects (Y/N)
Operational quarry excavation activities	Surface water runoff	• Natura 2000 Designated Sites • NHAs and pNHAs	Indirect effects through surface water contamination by virtue of sediment runoff and possible hydrocarbon due to possible oil spillages on site	**Yes.** Significance of effect evaluated in Section 5.4.3
	Groundwater flow-paths		Indirect effects through groundwater contamination by virtue of percolation of hydrocarbons.	**Yes.** Significance of effect evaluated in Section 5.4.3
	Groundwater flow-paths	• Terrestrial Habitats	Indirect degradation of terrestrial habitats within application area through ground water contamination.	**No.** No measurable effects on terrestrial habitats due to groundwater flow-paths.
	Surface water runoff	• Water quality/Aquatic Ecology	Indirect effects through surface water contamination by virtue of runoff from sediment and/or hydrocarbons.	**Yes.** Significance of effect evaluated in Section 5.4.3
	Groundwater flow-paths		Indirect effects on aquatic ecology through groundwater contamination by virtue of percolation of hydrocarbons.	**No.** No measurable effects on aquatic ecology due to groundwater flow-paths.
	Landtake	• Terrestrial Habitats	Direct reduction in habitats for birds, mammals and bats within the proposed application area.	**Yes.** Significance of effect evaluated in Section 5.4.3
Noise, vibration and human activity	Visibility	• Birds (General species)	Indirect effects on breeding and foraging bird species which use the application area through disturbance/displacement.	**Yes.** Significance of effect evaluated in Section 5.4.3
		• Non-Volant Mammals	Indirect effects on breeding and foraging non-volant mammal species which use the application area through disturbance/displacement.	**Yes.** Significance of effect evaluated in Section 5.4.3
		• Bats	Indirect effects on breeding and foraging bat species which use the application area through disturbance/displacement.	**Yes.** Significance of effect evaluated in Section 5.4.3

5.4.2 Potential Effects on Designated Sites

5.4.2.1 Potential Effects on European Sites

There are seven EU designated sites (five SACs and two SPAs) located within a 15km radius of the proposed application area (see Table 5.3.1 for a list of these sites). Only two of these are hydrologically connected with the proposed application site, albeit tentatively, namely overlapping Lough Forbes Complex SAC and Ballykenny-Fisherstown Bog SPA.

A Natura Impact Statement (NIS) has been prepared, which evaluates the potential for significant effects on the integrity of the two identified EU sites within 15 km of the proposed application area which are hydrologically connected with the application site.

The NIS assessed the proposed development in light of the conservation objectives and rationale for designation of Lough Forbes Complex SAC and Ballykenny - Fisherstown Bog SPA, the potential for significant indirect effects exists as a result of the proposed quarry development. These potentially significant effects were evaluated and the NIS concluded that with the implementation of the proposed mitigation measures, the proposed project will not result in any effects that will adversely affect Lough Forbes Complex SAC and Ballykenny - Fisherstown Bog SPA, having regard to the sites' conservation objectives, in circumstances where "no reasonable scientific doubt" remains as to the absence of such adverse effects.

The NIS is a standalone document attached to the Planning Application together with the EIAR and other independent reports. We recommend that the NIS should be read in conjunction with relevant sections of this EIAR.

5.4.2.2 Potential Effects on Natural Heritage Areas (NHA) and proposed Natural Heritage Areas (pNHA)

There are six Natural Heritage Areas (NHAs) and 11 proposed Natural Heritage Areas (pNHA) located within 15km of the proposed application area (see Tables 5.3.2 and 5.3.3 for lists of sites). The features of interest for these NHAs and pNHAs and any ecological or hydrological connectivity to the proposed application area was examined to determine potential effects on nationally important sites designated for nature conservation.

The conceptual model presented in Table 5.4.1 reveals that there is no potential for indirect effects on the nationally important sites identified within a 15km radius of the proposed application area as a result of proposed quarry excavation activities.

Of the six identified NHAs, the closest to the proposed application area is Cloonageeher Bog NHA (001423), which is located 8.9km to the northwest, and is not hydrologically connected with the application area. A hydrological link does not exist between the application area and any of the remaining five NHAs.

Of the 11 identified pNHAs, the closest to the proposed application area is Carrickglass Demesne pNHA (001822), which is located 2.7km to the southwest, and is also not hydrologically connected with the application area.

Lough Forbes Complex pNHA (001818) is located 8.9km to the west of the application area and overlaps Lough Forbes Complex SAC. As mentioned above, there is a hydrological connection between the application site and this SAC/SPA/pNHA via the Camlin River. This was assessed and it was concluded that the proposed project will not result in any effects that will adversely affect Lough Forbes Complex SAC and Ballykenny - Fisherstown Bog SPA, and by extension the Lough Forbes Complex pNHA (001818)

There are no hydrological or ecological connections between the remaining pNHAs and the proposed application area as they are neither hydrologically nor ecologically connected with the proposed application area.

5.4.3 Potential Effects on the Existing Environment

5.4.3.1 Potential Effects on Existing Habitats

Commencing top-soil and rock extraction within the proposed application area will lead to land-take and the irreversible loss of habitats existing within that area. Wet grassland and improved agricultural grassland are the dominant habitats within the application area, which are evaluated as being of local importance (higher value) and local importance (lower value) respectively.

Although the wet grassland habitat is rush dominated and species poor, it is given a higher value due to its potential to provide nesting habitat for Red and Amber listed bird species

such as meadow pipit and skylark, respectively (Gilbert *et al*, 2021), which in turn are prey species for Annex I raptors such as hen harrier (*Circus cyaneus*) and peregrine falcon (*Falco peregrinus*). As such, the permanent loss of this habitat could result in indirect effects on this existing habitat for breeding birds. However, given the area of wet grassland habitat is approximately 6ha, the permanent loss of this habitat at a landscape level is not considered to be significant due to the availability of significant amounts of alternative wet grassland habitat of similar or better quality in the surrounding environment. As such, the loss of this area of wet grassland habitat is evaluated as **slight in the long-term.**

Similarly, the loss of c. 4ha of mixed broadleaved woodland/scrub habitat and c. 1,900m of hedgerow and treeline habitat will be permanent and irreversible. These habitats are also of use to breeding birds, in addition to foraging and commuting bats and non-volant mammals.

As such, mitigation measures are required.

5.4.3.2 Potential Effects on Bats

The principle impacts of the proposed quarry development are as follows:

- Removal of scrub/woodland habitat;
- Removal of a large number of linear habitats (treelines and hedgerows);
- Potential removal of two trees deemed to be PBRs;
- Introduction of lighting and noise as a result of human activity.

It is estimated that the following amount of linear habitat is proposed to be removed:

- Total length of hedgerow = 943.85m
- Total length of treeline = 1,055.9m
- Total length of linear habitat = 1,999.75m

This will potentially reduce foraging and commuting habitat for local bat populations. It is considered that the proposed development is likely to have **Moderate Negative effects** on local bat populations.
As such, mitigation measures to avoid likely effects on bats as a result of vegetation removal and noise and lighting are outlined in Section 5.5.

5.4.3.3 Potential Effects on Non-Volant Mammals

Similar to the effects on bat species as described above, the removal of hedgerows and treelines along the field boundaries and the area of woodland/scrub has the potential to result in **Slight to Moderate Negative effects** on non-volant mammals, particularly badger, through permanent loss of breeding, foraging and commuting habitat.

As such, mitigation measures to avoid likely effects on non-volant mammals as a result of vegetation removal are outlined in Section 5.5.

5.4.3.4 Potential Effects on Birds

In the absence of mitigation, there is potential for likely **Moderate to Significant effects** on breeding birds by virtue of disturbance/displacement and direct mortality of as a result of the removal of the woodland/scrub, hedgerow and treeline habitats.

Mitigation measures to avoid likely effects on birds as a result of vegetation removal are outlined in Section 5.5.

5.4.3.5 Potential Effects on Amphibians and Reptiles

Given that the proposed application area is evaluated as being of local importance (lower value), and the fact that species of neither taxa were recorded during the ecology walk-over survey the potential for direct or indirect effects on amphibian and reptilian species is considered **imperceptible in the long-term**.

As such, mitigation measures potential effect on amphibians and reptiles as a result of habitat loss are not required.

5.4.3.6 Potential Effects on Invertebrates

Given that the proposed application area is evaluated as being of local importance (lower value), the potential for direct or indirect effects on invertebrate species is considered **imperceptible in the long-term**.

As such, mitigation measures potential effect on invertebrates as a result of habitat loss are not required.

5.4.3.7 Potential Effects on Water Quality and Aquatic Ecology

The following impact assessment of proposed quarry activities on surface water has been extracted from Chapter 8 – Water as they relate to aquatic ecology.

Potential Effects on Surface Water Quality

Silt laden runoff waters and contaminants (e.g. fuel and hydraulic oils, by products of blasting activities) from spillages and leaks have the potential to contaminate the water in the excavation. When this water is discharged to the drainage ditch, it will give rise to a potential risk to surface water quality.

In wet winter weather, surface runoff within the quarry will inevitably contain an elevated suspended solids load. However, these periods tend to coincide with above average flow rates in the receiving Camlin River. In the absence of mitigation measures, the available dilution would already contribute to reduce the impact on surface water quality. The potential risk to surface water quality is greatest when heavy rainfall occurs during periods of low flow when the available dilution is low.

Stream water quality of the receiving Camlin River is generally good. Mitigation measures (collection and settlement ponds) will be put in place in the proposed quarry area with sufficient capacity to deal with the silt laden runoff generated within the quarry void.

It is anticipated that there will be no continuous discharge from the quarry to the Camlin River. However, an occasional discharge of treated water from the quarry to the Camlin River will be sought under the conditions of discharge licence.

Pathway / Mechanism: Site drainage network.
Receptor: Surface waters and associated dependant ecosystems.
Pre-mitigation Impact: Direct, negative, significant, medium term, medium probability impact.

Potential Effects on Downstream Salmonid Fish

The Camlin River has potential as a salmonid water and is a tributary of the Shannon River.

Salmonid fish are particularly sensitive to the presence of fine sediments. Earthworks such as those proposed at the quarry have the potential to impact on the salmonid fish from site runoff, if the appropriate stringent mitigation measures are not put in place.

Pathway / Mechanism: Site drainage network and downstream watercourses.
Receptor: Salmonid Fish
Pre-mitigation Impact: Indirect, negative, slight, temporary, medium probability impact.

Contamination from Accidental Spills

Accidental spillage during refuelling of machinery with petroleum hydrocarbons is a significant pollution risk to groundwater, surface water and associated ecosystems, and to terrestrial ecology. The accumulation of small spills of fuels and lubricants during routine plant use can also be a pollution risk.

Hydrocarbon has a high toxicity to humans and all flora and fauna, including fish, and is persistent in the environment. It is also a nutrient supply for adapted micro-organisms, which can rapidly deplete dissolved oxygen in waters, resulting in death of aquatic organisms. The potential effects on the surface water aquatic environment, in particular, are significant. The quarry will operate below the water table in a locally important aquifer within bedrock which is moderately productive only in local zones. The groundwater is being abstracted and discharged into the surface water system. For this reason, it is mainly with surface water that this potential risk is deemed as significant.

Pathway / Mechanism: Groundwater flow paths and site drainage network.
Receptor: Groundwater and surface water.
Pre-mitigation Impact: Indirect, negative, significant, temporary, medium probability impact to surface water quality and groundwater quality.

5.4.4 Potential In-combination Effects

The existing Rhyne Rock Quarry is located just upgradient to the north of the proposed quarry development and is under the same ownership as the proposed quarry. As the proposed quarry will effectively replace the existing quarry, which has reached its lifespan, no significant cumulative ecological effects are anticipated from the proposed new quarry.

The Longford County Development Plan 2021-2027 lists policies and objectives in relation to extractive development. Policy (ED16) is to facilitate the extraction of material but having regard to the landscape sensitivity and having no works which will materially injure the amenities of the area.
In the Development and Management Standard 37 for the extractive developments in the county, the proximity of other developments is a criterion for evaluation. In this instance, other than the aforementioned operational quarry to the north of the proposed development, there was no other significant development found in proximity to the proposed application area.

As there are no other plans or projects in the vicinity of the proposed application area, no potential in-combination effects as a result of the proposed works with regard to other proposed or existing plans or projects are expected. In conclusion, it is determined that the surrounding land management is very unlikely to result in a significant in-combination impact i.e. the risk of cumulative impact is deemed to be **not significant**.

5.5 Mitigation Measures

Mitigation is required where significant adverse effects are likely to occur as the result of proposed quarry development. In the absence of mitigation, significant adverse effects remain with regard to bats, breeding non-volant mammals, breeding birds, and surface water quality.

5.5.1 Mitigation Measures for the Protection of Bats

Mitigation measures have been devised and included herein in order minimise the potential effects on all identified ecological receptors at risk as a result of the proposed quarry development.

The bat mitigation measures described below take into consideration Marnell *et al.* (2022) as well as best practice guidelines from Collins (2016) and BCT (2018). The measures

described are those considered to be practical and effective based on past experience of the principal bat specialist, for the proposed development site.

Measures are also reflective to published scientific research, where available and applicable to Irish bat populations. As stated by Marnell *et al.* (2022), *"Any mitigation intended to ensure that there is no impact or minimal impact on the bats must be clearly described in detail, giving examples of how it worked in other places*". Please see the Bat Assessment Report in Appendix I for more information.

5.5.1.1 Scrub Removal

The following measures will be strictly adhered to in relation to scrub removal:

- It is recommended that, where possible, minimum scrub removal is undertaken within the proposed development site.
- To retain some foraging habitat along the western boundary of the proposed development site a berm shall be constructed along this boundary and planted as directed by the ecologist.
- It is recommended that replacement vegetation is planted using native shrub species. This is required to be planted within 2 years of clearance.

5.5.1.2 Tree Protection

The following measures will be strictly adhered to in relation to tree protection:

- The two trees identified as PBRs are located along one treeline within the proposed development site. As this treeline is proposed to be removed, both trees will require additional surveying to ensure that there are no bats present.
- Tree removal will only be undertaken in the months of September, October and November during mild weather conditions (8C air temperature during the daytime).
- Surveying will entail a dusk/dawn survey directly prior to tree removal.
- Felling will be undertaken under supervision and the tree will be left on the ground for 24 hrs (to allow any residing bats to leave unharmed from ivy growth).
- As part of planting, 6 trees of at least 15-20 year growth (native tree species e.g. oak) will be planted post clearance and within 2 years of clearance.
- Such new planting will be protected from operations of proposed development.

5.5.1.3 Outdoor Lighting

Bats are light sensitive bats species, hence their nocturnal activities. Luminaire design is extremely important to achieve an appropriate lighting regime. Luminaires come in a myriad of different styles, applications and specifications which a lighting professional can help to select. The following will be considered when choosing luminaires. This BCT (2018) guidelines provided a list of recommendations in relation to luminaire design, which was based on the extensive research completed at the time on the potential impact of lighting on bats, and therefore provides best practice mitigation measures. These recommendations have been updated with the new BCT (2023) guidelines.

The following measures will be strictly adhered to in relation to outdoor lighting:

- The presence of light sensitive bat species such as brown long-eared bats and Natterer's bat means that outdoor lighting will not be erected in vicinity of treeline boundaries.
- All luminaires will lack UV elements when manufactured. Metal halide, compact fluorescent sources will not be used.
- LED luminaires will be used where possible due to their sharp-cut-off, lower intensity, good colour rendition and dimming capability.
- A warm white light source (2700 Kelvin or lower) will be adopted to reduce blue light component.
- Light sources will feature peak wavelengths higher than 550nm to avoid the component of light most disturbing to bats. DEFINITION: Red Light refers to the light sources in the red spectrum and mainly consist of long wavelength light above 600nm with an RA value of 60 (for good colour recognition). This wavelength of light is considered to the have the least impact on bats.
- Column heights will be carefully considered to minimise light spill and glare visibility. This will be balanced with the potential for increased numbers of columns and upward light reflectance as with bollards.
- Only luminaires with a negligible or zero Upward Light Ration, and with good optical control, will be considered.
- Luminaires will always be mounted horizontally, with no light output above 90o and/or no upward tilt.
- Where appropriate, external security light will be set on motion sensors and set to as short a possible a timer as the risk assessment will allow (e.g. 1-2 minute timer).
- Use of a Central Management System (CMS) with additional web-enables devices to light on demand.

- Only if all other options have been explored, accessories such as baffles, hoods or louvres can be used to reduce light spill and direct it only to where it is needed.
- Security lighting will be minimal and used activation mode and will put on a setting of 2 minutes.
- Any external lighting for the proposed development will strictly follow the above guidelines and these will be strictly implemented during construction and operation phase of the proposed development.

5.5.1.4 Landscaping

The following measures will be strictly adhered to in relation to landscaping:

- It is recommended that planting of a new hedgerow and treeline is undertaken along the boundary of the proposed development site.
- As per EIAR Chapter 12.0 – Landscape and the proposed Restoration Plan, it is estimated that a total of 2,370.92m will be planted which will replace the estimated 1,999.75m proposed to be removed.
- This planting is required to be undertaken within 2 years of clearance.
- The planting mix will be of the following tree and shrub species (all native plant species – no non- native planting is permitted):

    - Hawthorn
    - Blackthorn
    - Holly
    - Mountain ash
    - Crab apple
    - Alder
    - Hazel
    - Birch

- As hawthorn and blackthorn are planted in 1-2 foot whips, it is recommended that the planting regime is as follows:

    - For each 1 meter of planting, the planting mix will be 5 hawthorn whips and 2 black thorn whips to create a double hedgerow with one holly plant within the mix.

- One small tree species will be planted within the hedge planting at every 2m of new hedgerow.
- This new hedgerow/treeline will be planted along the entire length of the boundary.
- No lighting is permitted along the hedgerow and treelines to ensure that they remain in darkness for bat usage.

5.5.1.5 Bat Box Scheme

The following measures will be strictly adhered to in relation to the implementation of a bat box scheme:

- Bat boxes scheme will be sited carefully by a bat specialist.
- Some general points in relation to selecting suitable trees for bat boxes that will be followed include:

    - Straight limb trees (or telegraph pole) with no crowding branches or other obstructions for at least 1 metre above and below position of bat box.
    - Diameter of tree will be wide and strong enough to hold the required number of boxes.
    - Locate bat boxes in areas where bats are known to forage or adjacent to suitable foraging areas. Locations will be sheltered from prevailing winds.
    - Bat boxes will be erected at a height of 4-5 metres to reduce the potential of vandalism and predation of roosting bats.
    - Locations for bat boxes will be selected to ensure that the lighting plan for the proposed site does not impact on the bat boxes. Therefore, the bat boxes are to be erected mature trees or in the barn away from outdoor lighting.

- It is recommended that 8 summer bat boxes (suitable for trees) are erected as part of a bat box scheme. This will entail the following bat box types: 1FF and 2Fl.
- These bat box designs are suitable for the bat species recorded.
- They will be located away from quarry works and in existing bat habitat.
- If mature trees are not available, then telegraph poles will be erected (1 per two bat boxes).

5.5.2 Mitigation Measures for the Protection of Non-Volant Mammals

The following mitigation measure will ensure that the proposed removal of vegetation to facilitate the development of the quarry will not result in significant adverse effects on breeding mammals, particularly badgers.

5.5.2.1 Pre-construction Surveys

- As mammal species can breed at various times of the year, prior to the removal of vegetation such as hedgerows, treelines or scrub, a breeding mammal survey will be undertaken by suitably qualified and experienced ecologist to determine the presence or absence of any active mammal breeding sites, such as badger setts and fox dens.
- In the case of badgers, a survey of setts within 50m of the application site is required no more than 10-12 months in advance of construction.
- This will ensure that there will be sufficient time to comply with all licensing requirements and that the necessary actions are undertaken to protect the badger populations prior to the commencement of construction.
- The survey will be supplemented by a further inspection of the development area immediately prior to site clearance to ensure that no new setts were established in the intervening period and that setts previously identified continue to be used by badgers.
- The additional survey information will allow specialists to modify, where appropriate, the extent and location of badger-resistant fencing.
- Badger surveys are significantly constrained by vegetational cover and season and are best conducted from November to April.
- All areas must be systematically searched for setts and both sides of hedgerows and boundaries checked.
- Badger territorial activity is high from mid-January to March and surveys at this time are most efficient in identification of badger paths, latrines and feeding signs.

5.5.2.2 Exclusion of Badgers from the Proposed Development Site

- Exclusion of badgers from any currently active sett will only be carried out during the period of July to November (inclusive) in order to avoid the badger breeding season.
- Closure of any active sett during this period (i.e. a potential breeding sett) would result in the exclusion of adult badgers, while, if present, dependent young are likely to remain below ground.

- Knowledge of alternative setts within the particular social group's territory is required to ensure that excluded badgers are able to relocate to a suitable alternative refuge.
- The objective is to allow the badgers to remain within their territory, even though a portion of their current territory may be lost as a result of a particular development.
- Exclusion of badgers from disused or currently inactive setts, may be entertained during any season.
- Confirming that a sett is inactive during the breeding season (i.e. as described above, with no possibility of cubs below ground) will usually require a brief period of sett monitoring (e.g. five or more days of checking activity either with sticks or with sand pads on the spoil heaps to identify footprints).
- In circumstances where there are difficulties in identifying alternative setts available to the affected badger group, specialist studies (e.g. bait-marking) may have to be undertaken to ascertain the group's territory and to locate alternative setts.
- Where no alternative setts are available within the territory of the animals, an artificial sett will need to be constructed within the affected group's territory. While individual situations may require different approaches, exclusion will generally follow the steps outlined in the next section.

5.5.2.3 Badger Evacuation Procedures

- Prior to any work commencing in the vicinity of a badger sett that will be affected by the proposed quarry development, it must be ensured that badgers are excluded and evacuated from the sett.
- Badgers will not necessarily make regular use of all of the setts in their territory; some setts may be used only intermittently. Nevertheless, all setts will be considered as resting places under the Wildlife (Amendment) Act, 2000.
- The methodology by which a licensed operative evacuates a sett depends largely on the number of sett entrances, the observed activity at the sett, terrain and topography, likelihood of interference by people and livestock, and other considerations. Therefore, it will be determined on a case-by-case basis.
- The activity status of a sett is adjudged by field signs at and around the sett e.g. evidence of paths, rooting, bedding etc. will suggest recent or intermittent use.
- The procedures below are usually sufficient to ensure that badgers are not present within a sett prior to its destruction.

5.5.2.4 Disused and Inactive Setts

- In the instance of disused setts or setts verified as inactive, and to prevent their reoccupation, the entrances may be lightly blocked with vegetation and a light application of soil (soft blocking).
- The purpose of soft-blocking is to confirm that an apparently inactive sett is not occupied by badgers.
- If all entrances remain undisturbed for approximately five days, the sett will be destroyed immediately using a mechanical digger, under the supervision of the licensee.
- Should there be any delay in sett destruction, the soft blocked entrances will be hard-blocked and the sett destroyed as soon as possible, again under the supervision of the licensee.
- Hard-blocking is best achieved using buried fencing materials and compacted soil with further fencing materials laid across and firmly fixed to blocked entrances and surrounds.

5.5.2.5 Active Setts

- Where field signs or monitoring reveal any suggestion of current or recent badger activity at any of the sett entrances, the sett requires thorough evacuation procedures.
- Inactive entrances may be soft and then hard-blocked, as described for inactive setts, but any active entrances will have one-way gates installed (plus proofing around sides of gates as illustrated) to allow badgers to exit but not to return.
- The gates will be tied open for three days prior to being set to exclude.
- Sticks will be placed at arm's length within the gated tunnels to establish if badgers remain within the sett.
- Gates will be left installed, with regular inspections, over a minimum period of 21 days (including period with gates tied open) before the sett is deemed inactive.
- Any activity at all will require the procedures to be repeated or additional measures taken.
- Gates might be interfered with by other mammals or members of the public - hence the importance of regular exclusion monitoring visits.

- Sett destruction will commence immediately following the 21-day exclusion period, provided that all badgers have been excluded.
- Badgers will often attempt to re-enter setts after a period, and if gates are left in place for any long period, they may attempt to dig around them or even create new entrances and tunnels into the sett system.
- Where an extensive sett is involved, an alternative method of evacuating badgers is to erect electric fencing around the sett (ensuring all entrances are included) with one-way badger-gates installed within the electric fence at points where the fence crosses badger paths leading to and from the sett.
- The exclusion will again take place over a minimum period of 21 days before sett destruction.
- This monitoring period would be contingent upon no badger activity being observed within the fenced area.
- Fencing may not be practical in many situations due to the topography or the terrain – and can be difficult to install effectively.
- If no activity is observed, then the sett may be destroyed, under supervision by the licensed wildlife expert.

5.5.2.6 Badger Sett Destruction

- The destruction of a successfully evacuated badger sett may only be conducted under the supervision of qualified and experienced personnel under licence from the NPWS.
- The possibility of badgers remaining within a sett must always be considered.
- Suitable equipment will be available on hand to deal with badgers within the sett or any badgers injured during sett destruction.
- Destruction is usually undertaken with a tracked 12-25 tonne digger, commencing at c. 25m from the outer sett entrances and working towards the centre of the sett, cutting c. 0.5m slices in a trench to a depth of 2m.
- Exposed tunnels may be checked for recent badger activity, with full attention paid to safety requirements in so doing.
- The sett will be destroyed from several directions, in the above manner, until only the central core of the sett remains.
- Once it is ensured that no badgers remain, the core may then also be destroyed and the entire area backfilled and made safe.

- Sett excavation will, preferably, be concluded within one working day, as badgers may re-enter exposed tunnels and entrances.
- A report detailing evacuation procedures, sett excavation and destruction, and any other relevant issues will be submitted to the NPWS, in fulfilment of usual wildlife licence conditions.

5.5.2.7 Artificial Setts

- Where survey indicates that suitable alternative natural setts are not present, a badger expert may recommend the construction of an artificial sett to replace a breeding sett that will be affected by the road scheme.
- Artificial setts will be constructed several months in advance of the closure of a breeding sett.
- In this interval, the affected badgers will be encouraged to utilise the artificial sett by means of attractive food baits (peanuts etc.) and materials from the breeding sett added (such as bedding and spoil).
- The construction of an effective artificial sett is an exercise best conducted by experienced personnel.
- The sett will be constructed as close as reasonably possible to the natural main sett, and within the group's territory, but, obviously, away from the proposed quarry site.
- The constructed tunnel and chamber system will be located in well-drained soils and be landscaped and planted to ensure cover and lack of disturbance.
- Correct location of an artificial sett is necessary to ensure its successful occupation by the affected badgers.
- Suitably designed and well-situated, artificial setts are usually successfully occupied by the badgers being re-located.
- Translocation of badgers from an affected site to a distant locality is rarely considered feasible or practical.

5.5.3 Mitigation Measures for the Protection of Birds

The following mitigation measure will ensure that the proposed removal of vegetation to facilitate the development of the quarry will not result in significant adverse effects on breeding birds:

- No removal of vegetation such as hedgerows, treelines or scrub will be undertaken within the application area during the bird breeding season 1st March to 31st August.

- A detailed bird survey will be undertaken each spring for the first five years of the proposed development to record and monitor bird activity and to inform the quarry of any mitigating measures, if required, to protect the bird population.

5.5.4 Mitigation Measures for the Protection of Water Quality

5.5.4.1 Protection Against the Release of Suspended Solids

The key mitigation measure during the construction phase is the avoidance of sensitive aquatic areas where possible. The following proposed mitigations measures will be strictly adhered to in relation to the release of suspended solids into surface watercourses:

- Avoid physical damage to watercourses, and associated release of sediment.
- Avoid the entry of suspended sediment from earthworks into watercourses.
- It is proposed to create a buffer zone around the drainage ditch so as to ensure that adequate space is maintained for the proposed drainage mitigation measures to be properly installed and operate effectively before this area be stripped off.
- Provision of interceptor drains, diversion drains and silt traps where necessary – these will be maintained for the duration of the excavation work on an ad hoc basis;
- Temporary sumps/attenuation lagoons, prior to discharge into the settlement ponds at the bottom of the excavation;
- Use of outfall controls such as buffered outfalls, vegetation filters, silt bags, sedimats etc.
- The land in the proposed quarry will only be stripped as required in order to limit the length of time the soil is exposed to erosion thereby restricting the generation of silt in surface runoff.
- Where possible the land will be stripped in dry weather to reduce nutrient loss, sustain soil condition and reduce the generation of silt-laden runoff.
- All bare/disturbed surfaces shall be reinstated, and soil mounds shall be revegetated as rapidly as possible in order to reduce erosion and restrict silt generation in water.
- The slope of the soil storage mounds shall be minimised, their general shape will be in a manner as to avoid any potential for water ponding.
- As the pit is being worked, land shall be restored in order to reduce any potential for surface runoff.
- Replacement of topsoil and restoration of the site will reduce the vulnerability of groundwater beneath the site on closure.

5.5.4.2 Protection Against the Release of Hydrocarbons

The following mitigation measures shall be strictly adhered to in relation to the storage and use of hydrocarbons during the proposed works:

- Storage of fuels, lubricants and hydraulic fluids shall occur only at the dedicated area within the proposed quarry yard, thereby ensuring that the area in which fuels, lubricants and hydraulic fluids are stored will be properly secured against unauthorised access or vandalism and protected against accidental spillage.
- In the unlikely event of a spillage of fuels, lubricants or hydraulic oils, it will be immediately contained, and the contaminated soil removed from the site and disposed of appropriately.
- All waste oils and hydraulic fluids will be collected in leak-proof containers and removed from the site for disposal or recycling.
- As a minimum, simple spill protection equipment that will be held locally and will include specialist absorbent mats / pillows and granules for containment / cleanup of oil. Adequate quantities will be held in stock and be available for immediate use.
- Appropriate spill control equipment, such as oil soakage pads, will be available on site to deal with any accidental spillage and emergency response procedures will be put in place.
- Designated contractors' personnel will be trained and certified in oil spill control and clean up procedures, and in the proper and safe disposal of any waste generated through such an event.

5.6 Residual Effects

The residual effect is defined as the degree of environmental change that will occur after the proposed mitigation measures have taken effect (EPA, 2022). Generally, a proposed development adequately considers the ecological issues into its design, so that its effects on the existing environment are minimised to an acceptable level of slight residual effects. Occasionally, where significant effects cannot be avoided or reduced, the consequences of significant residual effects in light of planning policies and legislation will be considered (CIEEM, 2016). Significant residual environmental effects may be offset by appropriate compensatory measures nearby/elsewhere (CIEEM, 2016).

Table 5.6.1 presents those elements of the environment with the potential for significant or moderate effects prior to any mitigation measures. A revised potential effect of the proposed application on these features post-mitigation is provided here also, in addition to the significance of any potential residual effects. In addition, please refer to the Natura Impact Statement (NIS) which accompanies this planning application, as a stand-alone document and gives conclusions in regard to effects on the integrity of European sites under consideration within same.

Best scientific professional judgment has been used in some cases, to appraise the potential effects post mitigation.

Table 5.6.1: Significance of residual effects of the proposed application.

Environmental Element	Ecological Receptor	Potential Significance of Effect - Pre-Mitigation	Potential Significance of Effect - Post Mitigation	Significance of Residual Effect
Bats	All 7 species recorded onsite	Moderately adverse	Imperceptible	Not significant
Non-volant mammals	All terrestrial, but particularly badger	Moderately adverse	Imperceptible	Not significant
Birds	General species (breeding)	Moderately adverse	Imperceptible	Not significant
Water quality	Surface water	Significantly adverse	Imperceptible	Not significant
Overall Significance of Residual Effects				**No Significant Residual Effects**

5.7 Conclusions and Recommendations

Following a detailed ecological impact assessment of the proposed application, it is concluded that the proposed development of a quarry at Killoe, Rhine, Co. Longford will not have any significant residual effects providing the mitigation measures outlined herein are strictly adhered to during the enabling and operational phases at the quarry.

It is recommended that the proposed vegetation clearance works are monitored closely, particularly in relation to bat and bird species by a qualified ecologist to ensure that the mitigation measures proposed are strictly implemented and that the conservation interests within the receiving environment are effectively protected. Ongoing monitoring of water quality will also be undertaken during the operation of the quarry.

Reports on the findings will be submitted to the competent authority (Longford County Council).

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Appendices

Appendix 5.1: Bat Eco Services (2023) Bat assessment of proposed quarry development at Rhine, Killoe, Co. Longford.

2023

Bat Assessment – Proposed Quarry Development, Rhine, Killoe, Co. Longford

Dr Tina Aughney
Bat Eco Services

Bat Eco Services, Ulex House, Drumheel, Lisduff, Virginia, Co. Cavan. A82 XW62.

Licensed Bat Specialist: Dr Tina Aughney (tina@batecoservices.com, 086 4049468)
NPWS licence C17/2023 (Licence to handle bats, expires 23rd January 2026);
NPWS licence 27/2023 (Licence to photograph/film bats, expires 31st December 2024);
NPWS licence DER/BAT 2022-36 (Survey licence, expires 24th March 2025).

Statement of Authority: Dr Aughney has worked as a Bat Specialist since 2000 and has undertaken extensive survey work for all Irish bat species including large scale development projects, road schemes, residential developments, wind farm developments and smaller projects in relation to building renovation or habitat enhancement. She is a monitoring co-ordinator and trainer for Bat Conservation Ireland. She is a co-author of the 2014 publication *Irish Bats in the 21st Century.* This book received the 2015 CIEEM award for Information Sharing. Dr Aughney is a contributing author for the Atlas of Mammals in Ireland 2010-2015.

All analysis and reporting is completed by Dr Tina Aughney. Data collected and surveying is completed with the assistance of a trained field assistant.

Mr. Shaun Boyle (Field Assistant) NPWS licence DER/BAT 2022-37 (Survey licence, expires 24th March 2025).

Client: Michael Blessington

Project Name & Location: Planning application for a quarry development at Rhine, Killoe, Co. Longford.

Report Revision History

Date of Issue	Draft Number	Issued To (process of issuing)
12th October 2023	Draft1	By email to Appl ed Ecology Ireland

Purpose

This document has been prepared as a Report for Applied Ecology Ireland on behalf of client. Only the most up to-date report should be consulted. All previous drafts/reports are deemed redundant in relation to the named site.

Bat Eco Service accepts no responsibility or liability for any use that is made of this document other than by the client for the purposes for which it was originally commissioned and prepared.

Carbon Footprint Policy

It is the policy of Bat Eco Services to provide documentation digitally in order to reduce carbon footprint. Printing of reports etc. is avoided, where possible.

Bat Record Submission Policy

It is the policy of Bat Eco Services to submit all bat records to Bat Conservation Ireland database one year post-surveying. This is to ensure that a high level bat database is available for future desktop reviews. This action will be automatically undertaken unless otherwise requested, where there is genuine justification.

Executive Summary

Project Name & Location: Planning application for a quarry development at Rhine, Killoe, Co. Longford.

Proposed work: Quarry development.

Bat Survey Results - Summary

Bat Species	Roosts	Foraging	Commuting
Common pipistrelle *Pipistrellus pipistrellus*		√	√
Soprano pipistrelle *Pipistrellus pygmaeus*		√	√
Nathusius' pipistrelle *Pipistrellus nathusii*		√	√
Leisler's bat *Nyctalus leisleri*		√	√
Brown long-eared bat *Plecotus auritus*		√	√
Daubenton's bat *Myotis daubentonii*		√	√
Natterer's bat *Myotis nattereri*		√	√
Whiskered bat *Myotis mystacinus*			
Lesser horseshoe bat *Rhinolophus hipposideros*			

Bat Survey Duties Completed (Indicated by red shading)

Tree PBR Survey	●	Daytime Building Inspection	●
Static Detector Survey	●	Daytime Bridge Inspection	○
Dusk Bat Survey	●	Dawn Bat Survey	○
Walking Transect	●	Driving Transect	○
Trapping / Mist Netting	○	IR Camcorder filming	○
Endoscope Inspection	●	Other	○
		Thermal Imagery filming	

Citation: Bat Eco Services (2023) Bat assessment of proposed quarry development at Rhine, Killoe, Co. Longford. Unpublished report prepared for Applied Ecology Ireland.

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1. Introduction

Bat Eco Services was commissioned by Applied Ecology Ireland on behalf of Michael Blessington to undertake a bat survey of proposed quarry development at Rhine, Killoe, Co. Longford.

1.1 Relevant Legislation & Bat Species Status in Ireland

1.1.1 Irish Statutory Provisions

A small number of animals and plants are protected under Irish legislation (Nelson, *et al.,* 2019). The principal statutory provisions for the protection of animal and plant species are under the Wildlife Act 1976 (as amended) and the European Communities (Birds and Natural Habitats) Regulations 2011, as amended. The Flora (Protection) Order 2015 (S.I. no. 356 of 2015) lists the plant species protected by Section 21 of the Wildlife Acts. See www.npws.ie/ legislation for further information.

The codes used for national legislation are as follows:

- WA = Wildlife Act, 1976, Wildlife (Amendment) Act, 2000 and other relevant amendments
- FPO = Flora (Protection) Order, 2015 (S.I. No. 356 of 2015)

1.1.2 EU Legislation

The Birds Directive (Directive 2009/147/EC) and Habitats Directive (Council Directive 92/43/EEC) are the legislative instruments which are transposed into Irish law, *inter alia,* by the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477 of 2011) ('the 2011' Regulations), as amended.

The codes used for the Habitats Directive (Council Directive 92/43/EEC) are:

- Annex II Animal and plant species listed in Annex II
- Annex IV Animal and plant species listed in Annex IV
- Annex V Animal and plant species listed in Annex V

The main aim of the Habitats Directive is the conservation of biodiversity by requiring Member States to take measures to maintain or restore natural habitats and wild species listed on the Annexes to the Directive at a favourable conservation status. These annexes list habitats (Annex I) and species (Annexes II, IV and V) which are considered threatened in the EU territory. The listed habitats and species represent a considerable proportion of biodiversity in Ireland and the Directive itself is one of the most important pieces of legislation governing the conservation of biodiversity in Europe.

Under Article 11 of the Directive, each member state is obliged to undertake surveillance of the conservation status of the natural habitats and species in the Annexes and under Article 17, to report to the European Commission every six years on their status and on the implementation of the measures taken under the Directive. In April 2019, Ireland submitted the third assessment of conservation status for 59 habitats and 60 species. There are three volumes with the third listing details of the species assessed.

Article 12 of the Habitats Directive requires Member States to take measures for the establishment of a strict protection regime for animal species listed in Annex IV(a) of the Habitats Directive within the whole territory of Member States. Article 16 provides for derogation from these provisions under defined conditions. These provisions are implemented under Regulations 51 and 54 of the 2011 Regulations.

1.1.3 IUCN Red Lists

The International Union for the Conservation of Nature (IUCN) coordinates the Red Listing process at the global level, defining the categories so that they are standardised across all taxa. Red Lists are also produced at regional, national and subnational levels using the same IUCN categories (IUCN 2012, 2019). Since 2009, Red Lists have been produced for the island of Ireland by the National Parks and Wildlife Service (NPWS) and the Northern Ireland Environment Agency (NIEA) using these IUCN categories. To date, 13 Red Lists have been completed. The Red Lists are an assessment of the risk of extinction of each species and not just an assessment of their rarity. Threatened species are those species categorised as Critically Endangered, Endangered or Vulnerable (IUCN, 2019) – also commonly referred to as 'Red Listed'.

1.1.4 Irish Red List - Mammals

Red Lists in Ireland refer to the whole island, i.e. including Northern Ireland, and so follow the guidelines for regional assessments (IUCN, 2012, 2019). The abbreviations used are as follows:.

- RE Regionally Extinct
- CR Critically Endangered
- EN Endangered
- VU Vulnerable
- NT Near Threatened
- DD Data Deficient
- LC Least Concern
- NA Not Assessed
- NE Not Evaluated

There are 27 terrestrial mammals species in Ireland, which includes the nine resident bat species listed. The terrestrial mammal, according to Marnell *et al.,* 2019, list for Ireland consists of all terrestrial species native to Ireland or naturalised in Ireland before 1500. The IUCN Red List categories and criteria are used to assess that status of wildlife. This was recently completed for the terrestrial mammals of Ireland. Apart from the two following two mammal species (grey wolf *Canis lupus* (regionally extinct) and black rat *Rattus rattus* (Vulnerable)), the remaining 25 species were assessed as least concern in the most recent IUCN Red List publication by NPWS (Marnell *et al.*, 2019).

1.1.5 Irish Bat Species

All Irish bat species are protected under the Wildlife Act (1976) and Wildlife Amendment Acts (2000 and 2010). Also, the EC Directive on The Conservation of Natural habitats and of Wild Fauna and Flora (Habitats Directive 1992), seeks to protect rare species, including bats, and their habitats and requires that appropriate monitoring of populations be undertaken. All Irish bats are listed in Annex IV of the Habitats Directive and the lesser horseshoe bat *Rhinolophus hipposideros* is further listed under Annex II. Across Europe, they are further protected under the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention 1982), which, in relation to bats, exists to conserve all species and their habitats. The Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention 1979, enacted 1983) was instigated to protect migrant species across all European boundaries. The Irish government has ratified both these conventions.

Also, under existing legislation, the destruction, alteration or evacuation of a known bat roost is an offence. The most recent guidance document is "Guidance document on the strict protection of animal species of Community interest un the Habitats Directive (Brussels, 12.10.2021 C(2021) 7391 final".

Regulation 51(2) of the 2011 Regulations provides –

("*(2) Notwithstanding any consent, statutory or otherwise, given to a person by a public authority or held by a person, except in accordance with a licence granted by the Minister under Regulation 54, a person who in respect of the species referred to in Part 1 of the First Schedule—*

(a) deliberately captures or kills any specimen of these species in the wild, (b) deliberately disturbs these species particularly during the period of breeding, rearing, hibernation and migration,

(c) deliberately takes or destroys eggs of those species from the wild,

(d) damages or destroys a breeding site or resting place of such an animal, or

(e) keeps, transports, sells, exchanges, offers for sale or offers for exchange any specimen of these species taken in the wild, other than those taken legally as referred to in Article 12(2) of the Habitats Directive,

shall be guilty of an offence."

The grant of planning permission does not permit the commission of any of the above acts or render the requirement for a derogation licence unnecessary in respect of any of those acts.

Any works interfering with bats and especially their roosts, may only be carried out under a derogation licence granted by National Parks and Wildlife Service (NPWS) pursuant to Regulation 54 of the European Communities (Birds and Natural Habitats) Regulations 2011 (which transposed the EU Habitats Directive into Irish law).

There are eleven recorded bat species in Ireland, nine of which are considered resident on the island. Eight resident bat species and one of the vagrant bat species are vesper bats and all vespertilionid bats have a tragus (cartilaginous structure inside the pinna of the ear). Vesper bats are distributed throughout the island. Nathusius' pipistrelle *Pipistrellus nathusii* is a recent addition while the Brandt's bat has only been recorded once to-date (Only record confirmed by DNA testing, all other records has not been genetically confirmed). The ninth resident species is the lesser horseshoe bat *Rhinolophus hipposideros*, which belongs to the Rhinolophidea and has a complex nose leaf structure on the face, distinguishing it from the vesper bats. This species' current distribution is confined to the western seaboard counties of Mayo, Galway, Clare, Limerick, Kerry and Cork. The eleventh bat species, the greater horseshoe bat, was only recorded for the first time in February 2013 in County Wexford and is therefore considered to be a vagrant species. A total of 41 SACs have been designated for the Annex II species lesser horseshoe bat (1303), of which nine have also been selected for the Annex I habitat 'Caves not open to the public' (8310).

Irish bat species list is presented in Table 1 along with their current status.

Table 1: Status of the Irish bat fauna (Marnell *et al.*, 2019).

Species: Common Name	Irish Status	European Status	Global Status
Resident Bat Species ^			
Daubenton's bat *Myotis daubentonii*	Least Concern	Least Concern	Least Concern
Whiskered bat *Myotis mystacinus*	Least Concern	Least Concern	Least Concern
Natterer's bat *Myotis nattereri*	Least Concern	Least Concern	Least Concern

Leisler's bat *Nyctalus leisleri*	Least Concern	Least Concern	Least Concern
Nathusius' pipistrelle *Pipistrellus nathusii*	Least Concern	Least Concern	Least Concern
Common pipistrelle *Pipistrellus pipistrellus*	Least Concern	Least Concern	Least Concern
Soprano pipistrelle *Pipistrellus pygmaeus*	Least Concern	Least Concern	Least Concern
Brown long-eared bat *Plecotus auritus*	Least Concern	Least Concern	Least Concern
Lesser horseshoe bat *Rhinolophus hipposideros*	Least Concern	Least Concern	Least Concern
Possible Vagrants ^			
Brandt's bat Myotis brandtii	Data deficient	Least Concern	Least Concern
Greater horseshoe bat *Rhinolophus ferrumequinum*	Data deficient	Near threatened	Near threatened

^ Roche *et al.*, 2014

1.2 Relevant Guidance Documents

This report will draw on guidelines already available in Europe and will use the following documents:

- National Roads Authority (2006) Best Practice Guidelines for the Conservation of Bats in the Planning of National Road Schemes
- Collins, J. (Editor) (2016) Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edition). Bat Conservation Trust, London
- McAney, K. (2006) A conservation plan for Irish vesper bats, Irish Wildlife Manual No. 20 National Parks and Wildlife Service, Department of Environment, Heritage and Local Government, Dublin, Ireland.
- Marnell, F., Kelleher, C. & Mullen, E. (2022) Bat mitigation guidelines for Ireland v2. Irish Wildlife Manuals, No. 134. National Parks and Wildlife Service, Department of Housing, Local Government and Heritage, Ireland (Version 1: Kelleher & Marnell, 2006).
- The status of EU protected habitats and species in Ireland: Conservation status in Ireland of habitats and species listed in the European Council Directive on the Conservation of Habitats, Flora and Fauna 92/43/EEC. National Parks and Wildlife Service, Department of Environment, Heritage and Local Government.
- Bat Conservation Trust (2023) Bats and artificial lighting at night. Guidance Note GN08/23. BCT, London & Institution of Lighting Professionals (ILP), Warwickshire.
- Guidance document on the strict protection of animal species of Community interest un the Habitats Directive (Brussels, 12.10.2021 C(2021) 7391 final.
- EPA (2017) Guidelines on the information to be contained in Environmental Impact Assessment Reports.

Collins (2016) is the principal document used to provide guidance in relation to bat survey effort required but the level of surveying is assessed on a case-by-case basis taking into consideration the historical bat records for the survey area, presence of built, structures and trees potentially suitable for roosting bats and the presence of suitable bat habitats for foraging and commuting. Additional reference is made to this document in relation to determining the value of buildings, trees etc. as bat roosts. The tables referred to from this document are described in the following section and in the section on methodology.

Marnell *et al.* (2022) is referred to for guidance in relation to survey guidance (timing and survey design), derogation licences and mitigation measures.

1.2.1 Bat Survey Requirements & Timing

With reference to Collins (2016) and Marnell *et al.* (2022), the information presented in this section is used to determine the bat survey requirements for the proposed development site. Collins (2016) provides a trigger list in relation to determining if a bat survey is required and this is presented Appendix 3 (Figure B) for reference. In addition, Chapter 2 of Collins (2016) discusses that a bat survey is required when proposed activities are likely to impact on bats and their habitats. The level of surveying is to be determined by the ecologist and these are influenced by the following criteria:

- Likelihood of bats being present;
- Type of proposed activities;
- Scale of proposed activities;
- Size, nature and complexity of the site;
- Species concerned;
- No. of individuals.

Collins (2016) also provides the following table detailing when different survey components should be undertaken.

Table 2.2 Recommended UK survey times for survey types described in these guidelines.

Survey type	Month											
	J	F	M	A	M	J	J	A	S	O	N	D
Preliminary ecological appraisal – fieldwork												
Preliminary roost assessment – structures[a]												
Emergence/re-entry survey for maternity or summer roosts[b]												
Emergence/re-entry survey for transitional roosts[b]												
Emergence survey for mating roosts[b]												
Hibernation survey – structures[a]												
Preliminary ground level roost assessment – trees[d]												
Potential roost feature (PRF) inspection survey – trees												
Ground level bat activity survey – transects and automated/static												
Pre-, during and post-hibernation – automated/static bat activity survey												
Swarming survey												
Back-tracking survey												
Trapping survey[e]												
Radio tagging and tracking survey[e]												

= optimal period

= sub-optimal period

= weather or location dependent (i.e. may not be suitable due to spring and autumn conditions in any one year or in more northerly latitudes). Note that October surveys are not acceptable in Scotland.

Figure 1a: Table 2.2 reproduced from Collins (2016).

1.2.1.1 Buildings

In Marnell *et al.* (2022), Table 3 (The applicability of survey methods) provides information on the type of surveys that can be undertaken according to the different seasons.

Marnell *et al.* (2022) states that it is more suitable to survey buildings in the summer months. The following is a summary of the principal points:

1. The presence of a significant bat roost (invariably a maternity roost) can normally be determined on a single visit at any time of year, provided that the entire structure is accessible and that any signs of bats have not been removed by others. However, a visit during the summer or autumn has the advantage that bats may be seen or heard.
2. Roosts used by a small number of bats, as opposed to maternity sites, can be particularly difficult to detect and may require extensive searching backed up (in summer) by bat detector surveys or emergence counts.
3. If the entire building is not accessible or signs of bats may have been removed by others, or by the weather, bat detector or exit count methodologies may be required to back up a limited search.

Table 3. The applicability of survey methods.

Season	Roost type	Inspection	Bat detectors and emergence counts
Spring (Mar – May)	Building	Suitable (signs, perhaps bats)	Limited, weather dependent
	Trees	Difficult (best for signs before leaves appear)	Rarely useful
	Underground	Suitable (signs only)	Static detectors may be useful
Summer (June-August)	Building	Suitable (signs and bats)	Suitable
	Trees	Difficult	Limited; use sunrise survey
	Underground	Suitable (signs only)	Rarely useful
Autumn (September –November)	Building	Suitable (signs and bats)	Limited, weather dependent
	Trees	Difficult	Rather limited weather dependent; use sunrise survey?
	Underground	Suitable (signs, perhaps bats)	Static detectors may be useful
Winter (December-February)	Building	Suitable (signs, perhaps bats))	Rarely useful
	Trees	Difficult (best for signs after leaves have gone)	Rarely useful
	Underground	Suitable (signs and bats)	Static detectors may be useful

Figure 1b: Table 3 reproduced from Marnell *et al.* (2022).

The following table is used to determine the level and timing of surveys for buildings/structures with reference to the surrounding habitat. Buildings are assessed to determine their suitability as a bat roost and are described using the parameters Negligible, Low, Medium or High suitability in view of Table 2 from Marnell *et al.* (2022). The level of suitability informs the level of surveying and timing of surveys required based on Table 7.3 of Collins, 2016 (Note: These two tables are presented in Appendix 1 but a summary is provided in the table below).

Table 2a: Building Bat Roost Classification System & Survey Effort (Adapted from Collins, 2016 and Marnell *et al.*, 2022).

Suitability Category	Description (examples of criteria)	Survey Effort (Timings)
Negligible	Building have no potential as a roost site Urban setting, heavily disturbed, building material unsuitable, building in poor condition etc.	No surveys required.
Low	Building has a low potential as a roost site. No evidence of bat usage (e.g. droppings)	One dusk or dawn survey.
Medium	Building with some suitable voids / crevices for roosting bats. Some evidence of bat usage Suitable foraging and commuting habitat present.	At least one survey in May to August, minimum of two surveys (one dusk and one dawn).
High	Building with many features deemed suitable for roosting bats. Evidence of bat usage. Largely undisturbed setting, rural, suitable foraging and commuting habitat, suitable roof void and building material.	At least two surveys in May to August, with a minimum of three surveys (at least one dusk survey and one dawn survey).

1.2.1.2 Trees

Marnell *et al.* (2022) recommends the following in relation to detecting roosts in trees:

- "The best time to carry out surveys for suitable cavities is between November and April, when the trunk and branches are not obscured by leaves. If inspection suggests that the tree has suitable cavities or roost sites, a bat detector survey at dusk or dawn during the summer may help to produce evidence of bats, though the nomadic nature of most tree-dwelling species means that the success rate is very low.
- It can also be difficult to pinpoint exactly which tree a bat emerged from. A dawn survey is more likely to be productive than a dusk one as swarming bats returning to the roost are much more visible than those leaving the roost. Because tree-dwelling bats move roosts frequently, a single bat-detector survey is unlikely to provide adequate evidence of the absence of bats in trees that contain a variety of suitable roosting places.
- Several dawn or dusk surveys spread over a period of several weeks from June to August will greatly increase the probability of detecting significant maternity roosts and is recommended where development proposals will involve the loss of multiple trees".

As a consequence, the BTHK (2018) Potential Roost Features (PRFs) list and the classification system adapted from Collins (2016) is recommended as part of the daytime inspection of trees to determine their PBR or Potential Bat Roost value. Details of the methodology followed is presented in Section 3.2.2.

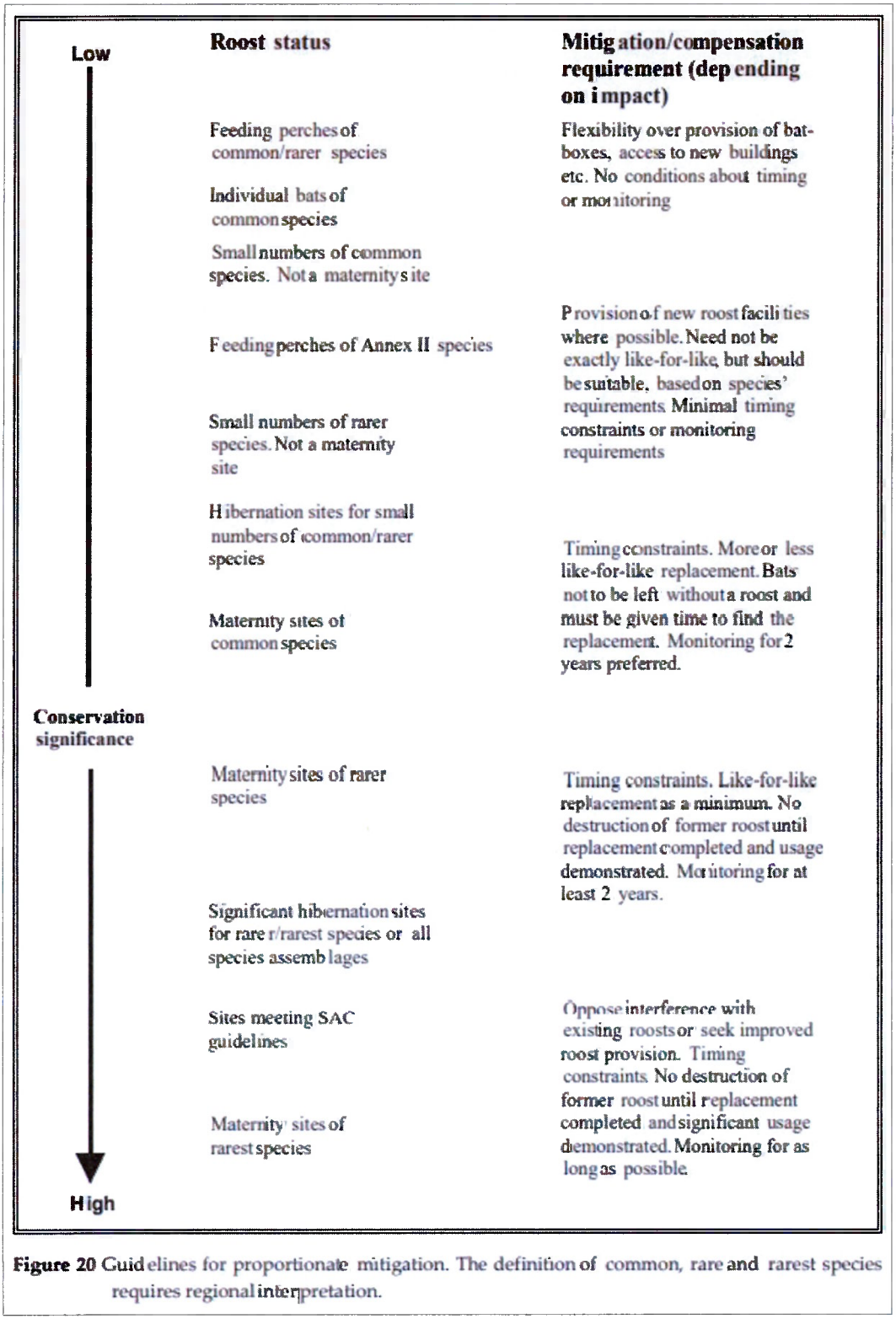

Figure 20 Guidelines for proportionate mitigation. The definition of common, rare and rarest species requires regional interpretation.

Figure 1c: Figure 20 (p 46) Reproduced from Marnell *et al.* (2022).

Table 4 The scale of main impacts at the site level on bat populations. [**NB** This is a general guide only and does not take into account species differences. Medium impacts, in particular, depend on the care with which any mitigation is designed and implemented and could range between high and low.]

Roost type	Development effect	Scale of impact		
		Low	Medium	High
Maternity	Destruction			✓
	Isolation caused by fragmentation			✓
	Partial destruction; modification		✓	
	Temporary disturbance outside breeding season	✓		
	Post-development interference			✓
Major hibernation	Destruction			✓
	Isolation caused by fragmentation			✓
	Partial destruction, modification		✓	
	Temporary disturbance outside hibernation season	✓		
	Post-development interference			✓
Minor hibernation	Destruction			✓
	Isolation caused by fragmentation			✓
	Partial destruction, modification		✓	
	Modified management		✓	
	Temporary disturbance outside hibernation season	✓		
	Post-development interference		✓	
	Temporary destruction, then reinstatement	✓		
Mating	Destruction		✓	
	Isolation caused by fragmentation		✓	
	Partial destruction	✓		
	Modified management	✓		
	Temporary disturbance	✓		
	Post-development interference	✓		
	Temporary destruction, then reinstatement	✓		
Night roost	Destruction	✓		
	Isolation caused by fragmentation	✓		
	Partial destruction	✓		
	Modified management	✓		
	Temporary disturbance	✓		
	Post-development interference	✓		
	Temporary destruction, then reinstatement	✓		

Figure 1d: Table 4 (p 44) Reproduced from Marnell *et al.* (2022).

Different parameters are considered for the overall assessment of the potential impact(s) of a proposed development on local bat populations.

The overall impacts of the proposed project on local bat populations is assessed using the following criteria:

- Impact Quality using the parameters Positive, Neutral or Negative Impact (based on EPA, 2017)

Table 2b: Criteria for assessing impact quality based on EPA, 2017,

Quality of Effect	Criteria
Positive	A change which improves the quality of the environment (for example, by increasing species diversity; or the improving reproductive capacity of an ecosystem, or by removing nuisances or improving amenities).
Neutral	No effects or effects that are imperceptible, within normal bounds of variation or within the margin of forecasting error.
Negative	A change which reduces the quality of the environment (for example, lessening species diversity or diminishing the reproductive capacity of an ecosystem; or damaging health or property or by causing nuisance).

- Impact Significance of potential impact parameters on specific bat species in relation to particular elements (e.g. roosting sites, foraging area and commuting routes) are assessed with reference to the following:
    - Table 4 of Marnell *et al.* (2022) (Figure 1a);
    - the known ecology and distribution of the bat species in Ireland;
    - bat survey results including type of roosts (if any recorded), pattern of bat usage of the survey area, level of bat activity recorded etc.
    - and bat specialist experience.

- Impact Significance of the proposed development on local bat populations maybe determine, where applicable, using the parameters listed in Table 2c (based on EPA, 2017).

Table 2c: Criteria for assessing significance of effects based on EPA, 2017,

Significance of Effects	Definition
Imperceptible	An effect capable of measurement but without significant consequences.
Not significant	An effect which causes noticeable changes in the character of the environment but without significant consequences.
Slight	An effect which causes noticeable changes in the character of the environment without affecting its sensitivities.
Moderate	An effect that alters the character of the environment in a manner that is consistent with existing and emerging baseline trends.
Significant	An effect which, by its character, magnitude, duration or intensity alters a sensitive aspect of the environment.
Very Significant	An effect which, by its character, magnitude, duration or intensity significantly alters most of a sensitive aspect of the environment.
Profound	An effect which obliterates sensitive characteristics

The following terms will be used, where possible and applicable, when quantifying the duration of the potential effects (selected from EPA, 2017):

- Temporary – effects lasting less than a year
- Short-term – effects lasting 1 to 7 years
- Medium term – effects lasting 7 to 15 years
- Long term – effects lasting 15 to 60 years

- Permanent – effects lasting over 60 years
- Reversible – effects that can be undone, for example through remediation or restoration.

1.2.2 Bat Mitigation Measures

1.2.2.1 Bats & Lighting

All European bat species, including Irish bat species, are nocturnal. Light levels as low as typical full moon levels, i.e. around 0.1 LUX, can alter the flight activity of bats (Voigt *et al.* 2018). Any level of artificial light above that of moonlight can mask the natural rhythms of lunar sky brightness and, thus, can disrupt patterns of foraging and mating and might, for instance, interfere with entrainment of the circadian system.

Artificial light pollution is an increasing global problem (Rich and Longcore, 2006) and Artificial light at night (ALAN) is considered a major threat to biodiversity, especially to nocturnal species. As urbanisation expands into the landscape, the degree of street lighting also expands. Its ecological impacts can have a profound affect the behaviour of nocturnal animals including impacts on reproductive behaviours, orientation, predator-prey interaction and competition among others, depending on the taxon and ecosystem in question (Longcore and Rich 2004). It is considered by Hölker *et al.* (2010) to be a key biodiversity threat to biodiversity conservation. In relation to bats, the potential impacts of artificial night lighting can result in habitat fragmentation (Hanski, 1998), delay in roost emergence (Downs *et al.,* 2003) and a reduction in prey items.

In the context of behavioural ecology, lights can work to attract or repel certain animals. Many groups of insects, including moths, lacewings, beetles, bugs, caddisflies, crane flies, midges, hoverflies and wasps, can be attracted to artificial light (Eisenbeis and Hassel 2000; Frank 1988; Kolligs 2000). Attraction depends on the spectrum of light. In the context of street lights, white (mercury vapour) lamps emit a white light that includes ultraviolet. High pressure sodium lights (yellow) emit some ultraviolet, while low pressure sodium lamps (orange) emit no ultraviolet light (e.g. Rydell 2006). As a result of the attractiveness of lights to aerial invertebrates, swarms of insects often occur in and around street lights and, particular bat species such as aerial insect predators, can exploit the swarming insects to their advantage. Such attraction can also take prey items away from dark zones where light sensitive species are foraging, thus reducing their likelihood of feeding effectively.

Rydell (2006) divides bats into four categories in terms of their characteristic behaviours at street lamps. The four categories are based on bat size, wing morphology and echolocation call characteristics which were highlighted by Norberg and Rayner (1987) to determine flight speed, manoeuvrability, and prey detection capabilities of bats. Rydell (2006) stated that the large, fast flying bats, which are confined to open airspace, fly high over lit areas and are rarely observed near ground level. None of these, typically large free-tailed bats (e.g. large species of the family Molossidae), are found in Ireland. The second category are the medium-sized fast flying species, including the *Nyctalus* species, which patrol the street well above the lights and can be seen occasionally as they dive for prey into the light cone. This group includes the Leisler's bat, which is found in Ireland. Rydell's third category describes the small but fast flying bats that are manoeuvrable enough to forage around light posts or under the lights, and includes the small *Pipistrellus* species of the old world, three of which are found in Ireland. The fourth category includes broad-winged slow flyers, most of which are seldom or never observed at lights. Slow flying bat species may be more vulnerable to predation by diurnal birds of prey and this may restrict their exploitation of insects around artificially illuminated areas (e.g. Speakman 1991). There are also the concerns that some bat species are more light sensitive and therefore actively avoid lit up areas. This is particularly

relevant for lesser horseshoe bats. Therefore from this, we can categorise the suite of Irish bats species as follows (please note that the sensitivity category is the author's description):

Table 3a: Potential light sensitivity of the Irish bat fauna using categories described by Rydell, 2006.

Species: Common Name	Rydell Category	Sensitivity
Daubenton's bat *Myotis daubentonii*	Category 4	Light sensitive
Whiskered bat *Myotis mystacinus*	Category 4	Light sensitive
Natterer's bat *Myotis nattereri*	Category 4	Light sensitive
Leisler's bat *Nyctalus leisleri*	Category 2	Light tolerant
Nathusius' pipistrelle *Pipistrellus nathusii*	Category 3	Semi-tolerant
Common pipistrelle *Pipistrellus pipistrellus*	Category 3	Semi-tolerant
Soprano pipistrelle *Pipistrellus pygmaeus*	Category 3	Semi-tolerant
Brown long-eared bat *Plecotus auritus*	Category 4	Light sensitive
Lesser horseshoe bat *Rhinolophus hipposideros*	Category 4	Light sensitive

The ability of different bat species to exploit insects gathered around street lights varies greatly. Gleaning species such as *Myotis* bats rarely forage around street lights (Rydell and Racey, 1995). The ecological effects of illuminating aquatic habitats are also poorly known. Moore *et al.* (2006) found that light levels in an urban lake, subject simply to sky glow and not direct illumination from lights, reached the same order of magnitude as full moonlight.

All European bat species, including Irish bat species, are nocturnal. As a consequence, the scientific literature provides evidence that artificial lighting does impacts on bats. The degree of impact depends on the light sensitivity of the bat species and the type of luminaire. Lesser horseshoe bats are light sensitive and therefore adversely effected by the presence of lighting in all aspects of their life strategies (e.g. foraging, commuting, drinking and roosting).

The potential impacts of street lighting can be summarised as follows:

- Attracting Prey Items

Lights can work to attract or repel certain animals. Many groups of insects can be attracted to artificial light and this attraction depends on the spectrum of light. As a result of the attractiveness of lights to aerial invertebrates, swarms of insects often occur in and around street lights. Such attraction can also take prey items away from dark zones where light sensitive species, such as lesser horseshoe bats, are foraging, thus reducing their likelihood of feeding effectively.

- Reducing Foraging Habitat

The research documents that there is less bat species diversity foraging in habitats lit up by artificial lighting. Only bat species considered to be light tolerant are generally able to exploit habitats with lighting present, but overall, all bat species activity tends to be less in lit up habitats compared to non-lit up habitats.

- Fragmenting The Landscape

Scientific evidence shows that lighting is a barrier to the movement of light sensitive bat species, such as lesser horseshoe bats. Light sensitive bat species will actively seek dark corridors to commute along and therefore the presence of lighting in commuting habitats will restrict their movement of such species in the landscape.

- Reducing Drinking Sites

There is increasing evidence that drinking sites for bats is an essential component for local bat population survival and that the presence of artificial lighting at waterbodies prevents bats from availing of this resource.

Lighting, including street lights come in an array of different types but for street lights they typically include High Pressure Sodium, Low Pressure Sodium, Mercury Vapour and the more modern Light Emitting Diodes (LED). An array of field-based research has been undertaken to document the potential impact of lighting on bat flight activity. LED lighting is predicted to constitute 70% of the outdoor and residential lighting markets by 2020. While the use of LEDs promotes energy and cost savings relative to traditional lighting technologies, little is known about the effects these broad-spectrum "white" lights will have on wildlife, human health, animal welfare, and disease transmission. As a consequence, a large array of research has been undertaken recently on the potential impact of LED on bats.

Stone *et al.* (2012) undertook research in relation to "Cool" LED street lights on an array of local bat species in England. Overall the presence of LED street lights had a significant negative impact on lesser horseshoe bats and *Myotis* spp. for all light treatments investigated while there was no sign impact of light treatment type on *Pipistrellus pygmaeus* (soprano pipistrelle – a common Irish bat species) or *Nyctalus* (Leisler's bats is part of this bat family and is a common Irish bat species)/*Eptesicus* species. This research paper also documented behavioural changes for the different bat species. Lesser horseshoe bats and *Myotis* spp. did not avoid lights by flying along the other side of the hedge but altered their commuting behaviour altogether. It was concluded that LEDs can fragment commuting routes causing bats to alter their behaviour with potentially negative conservation consequences. Lesser horseshoe bat activity was significantly lower during high intensity treatment than medium, but at all treatment levels (even as low as 3.6 LUX), activity was significantly lower than unlit control (LUX level measurements were taken at 1.7m at the hedge below the light).

Russo *et al.* (2017) investigated the impact of LED lighting on drinking areas for bats in Italy. Drinking sites are considered to be important components for the survival of local bat populations. Drinking sites were illuminated with a portable LED outdoor light emitting (48 high-power LEDs generated a light intensity of 6480 lm (4000–4500 K) at 25°C, two peaks of relative luminous flux at 450 and 590 nm). *Plecotus auritus* (brown long-eared bat – resident in Ireland), *Pipistrellus pygmaeus* (soprano pipistrelle – resident in Ireland) and *Rhinolophus hipposideros* (lesser horseshoe bat – resident in Ireland) did not drink when troughs were illuminated.

Rowse *et al.* (2018) researched the impacts of LED lights (portable lights, 97W 4250K LED on 10m high poles) in England on local bat populations. Treatments were either 100% light intensity; dimmed (using pulse width modulation) at 50% or 25% light intensity; and unlit. Sites were in suburban areas along busy roads but with vegetation and tree lines adjacent. High light levels (50% & 100% light treatments) increased activity of opportunistic *Pipistrellus pipistrellus* (common pipistrelle – resident in Ireland) but reduced activity of *Myotis* species group. Conversely 25% and unlit sites had no

difference from each other. The research paper conclude that dimming could be an effective strategy to mitigate ecological impacts of street lights.

Wakefield *et al.* (2017) stated that an important factor to be aware of in relation to LED is the direction of the light projected. Therefore it is recommended that highly focused/shielded LEDS designed to filter out short wavelengths of light may should be used as they attract relatively fewer insects. Less insects attracted to street lights means less insects leaving dark zones where light sensitive bat species primarily feed.

Martin *et al.* (2021) showed that LED street lights lead to a reduction in the total number of insects captured with light traps in a wide range of families. Coleoptera and Lepidoptera orders were the most sensitive groups to ecological light pollution in the study area. The paper suggested that LED was the least attractive light system for most of the affected groups both because of its very little emitted short-wavelength light and because of its lower light intensity. They also concluded that reduction in insect attraction to LED could be even larger with current LED technologies emitting warmer lights, since other research showed that LED emitting "warmer white" colour light (3000 K) involves significantly lower attraction for insects than "colder white" LED (6000 K).

Wilson *et al.* (2021) investigate the impact of LED on biting insects and concluded because LED is highly malleable with regard to spectral composition, they can be tailored to decrease or increase insect catches, depending on situation. Therefore this design control of LED could greatly assist in reducing impact of street lighting on local bat populations.

Stone *et al.* (2015) reviewed the impacts of ALAN on bat roosts and flight paths in order to provide recommendations in relation to street lighting. The principal recommendations were to avoid lighting places where bats are present and to ensure that there are interconnected light exclusion zones and variable light regimes with reduced intensity of light in specific areas (e.g. important foraging and commuting habitats) as responses to street lighting may vary between species. It recommends that there should be a 'light threshold'.

1.2.2.1.1 Lighting Guidelines – Effective Mitigation Measures

As a consequence of this extensive amount of research there are two principal guideline documents available for best practice for effective mitigation relating to outdoor lighting.

EUROBATS (Voigt *et al.*, 2018) guidelines recommends the following:

- ALAN should be strictly avoided, and artificial lighting should be installed only where and when necessary coupled with the following:
    - Dynamic lighting schemes, where possible.
    - Use a minimal number of lighting points and luminaires on low positions in relation to the ground for minimising light trespass to adjacent bat habitats or into the sky.
    - Use focused light, e.g. by using LED or shielded luminaires which limit the light flux only to the required areas and prevent light trespass into adjacent bat habitats.
    - Create screens, either by erecting walls or by planting hedgerows or trees, to prevent light trespass, e.g. from illuminated roads, to surrounding bat habitats.
    - Exits of bat roosts and a buffer zone around them should be protected from direct or indirect lighting to preserve the natural circadian rhythm of bats.

This BCT (2018) guidelines provided a list of recommendations in relation to luminaire design, which was based on the extensive research completed at the time on the potential impact of lighting on

bats, and therefore provides best practice mitigation measures. These recommendations have been updated with the new BCT (2023) guidelines:

- All luminaires should lack UV elements when manufactured. Metal halide, compact fluorescent sources should not be used.
- LED luminaires should be used where possible due to their sharp-cut-off, lower intensity, good colour rendition and dimming capability,
- A warm white light source (2700 Kelvin or lower) should be adopted to reduce blue light component.
- Light sources should feature peak wavelengths higher than 550nm to avoid the component of light most disturbing to bats.

DEFINITION: Red Light refers to the light sources in the red spectrum and mainly consist of long wavelength light above 600nm with an RA value of 60 (for good colour recognition). This wavelength of light is considered to the have the least impact on bats.

- Internal luminaires can be recessed (as opposed to using a pendant fitting) where installed in proximity to windows to reduce glare and light spill.
- Waymarking inground markers (low output with cowls or similar to minimised upward light spill) to delineate path edges.
- Column heights should be carefully considered to minimise light spill and glare visibility. This should be balanced with the potential for increased numbers of columns and upward light reflectance as with bollards.
- Only luminaires with a negligible or zero Upward Light Ration, and with good optical control, should be considered.
- Luminaires should always be mounted horizontally, with no light output above 90° and/or no upward tilt.
- Where appropriate, external security light should be set on motion sensors and set to as short a possible a timer as the risk assessment will allow (e.g. 1-2 minute timer).
- Use of a Central Management System (CMS) with additional web-enables devices to light on demand.
- Use of motion sensors for the local authority street lighting may not be feasible unless the authority has the potential for smart metering through a CMS.
- The use of bollard or low-level downward-directional luminaires is strongly discouraged.
- Only if all other options have been explored, accessories such as baffles, hoods or louvres can be used to reduce light spill and direct it only to where it is needed.

Due to the large array of research undertaken on the potential impact of ALAN on bats, the new guidelines from the BCT (2023) has provided an updated table on the potential impact of ALAN on UK bat species. Extracting data from this table, the following is a summary of the effect of LAN on Irish Bat species. Please note that this information is drawn from European studies and as does not have information for all Irish bat species for each of the various topics listed, it is indicative only.

Table 3b: Potential light sensitivity of the Irish bat fauna using categories described by Rydell, 2006.

YELLOW: Positive effect **GREY:** No effect **BLUE:** Negative effect **NA:** No data available

Species	Roost	Flight Corridor	Foraging Area	Drinking Site	Migration	Landscape Level	Habitat Type
Lesser horseshoe bat			NA	NA	NA		Clutter
Brown long-eared bat					NA		Clutter
Natterer's bat		NA	NA		NA	NA	Clutter
Daubenton's bat	NA			NA	NA		Edge
Whiskered bat	NA	NA	NA	NA	NA	NA	Edge
Common pipistrelle	NA				NA		Edge
Soprano pipistrelle				NA			Edge
Nathusius' pipistrelle	NA	NA	NA	NA			Edge
Leisler's bat	NA	NA	NA		NA		Open

BCT (2023) also state key messages in this document, some of which are presented below:

Key Message 1.18

"It is important to minimised ALAN close to vegetation, particularly for slower-flying species, and the need to increase dense vegetation in urban landscape to provide, not just roosting opportunities, but also protection against ALAN for open-space foraging bats in city landscapes".

Key Message 1.20

"When considering how bats move through the landscape, ALAN has been shown to be particularly harmful along river corridors, near woodland edges and hedgerows".

Key Message 1.39

"This research highlights the importance of integrating avoidance measures (as per the first step of the mitigation hierarchy see Figure 2) into the development design, by retaining ecologically functional 'dark corridors' within scheme where feasible, and in preference to seeking lighting mitigation strategies".

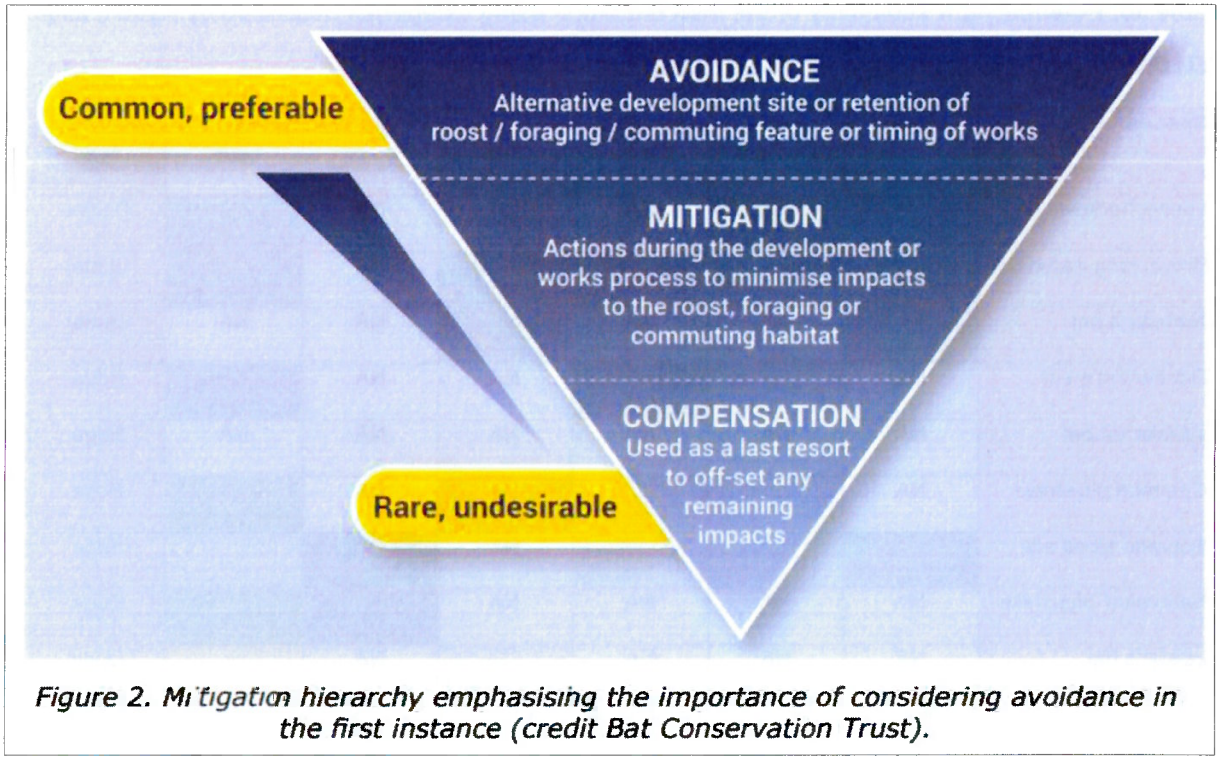

Figure 2. Mitigation hierarchy emphasising the importance of considering avoidance in the first instance (credit Bat Conservation Trust).

Figure 1e: Taken from BCT (2023) – Mitigation Hierarchy.

Key Message 3.13

"There are no lux level thresholds available for individual species to negate the need for site specific advice. Every site is different ... The key in the first instance is to maintain or reduce existing light levels, and reduce blue content to protect the bat species present ... Ideally light levels should always be designed to minimise potential environmental impacts and to maximise the potential of habitat and species enhancement work ..."

1.2.2.2 Landscaping For Bats

Bats depend on the landscape for foraging, roosting and commuting. Different bat species will travel different distances, to and from their principal roosting sites, depending on their morphology, life stage and preferred foraging areas. Bats in Ireland are insect eating mammals and feed on an array of insects, whose populations are ultimately supported by vegetation. Areas of rich vegetation habitat tend to support higher abundances of insect populations and therefore a higher abundance of bats. In addition, many bat species rely on continuous linear habitats (e.g. treelines and hedgerows) to commute along. As a consequence landscaping as part of a proposed development project is an important element to the goal of retaining local bat populations.

The Bat Conservation Trust publication "Landscape and Urban Design for bats and biodiversity" (Gunnell *et al.,* 2012) is a resource for planning landscape design in our urban areas. This resource encourages measures to enhance existing bat foraging habitat, create water features such as ponds (drinking sites for bats and as a source of emerging insects), manage species rich grassland and planting of tall vegetation to ensure that exiting treelines and hedgerows are linked. It also recommends that use of landscaping as a means to creating dark zones or dark corridors for this mammal group to fly along in our lit urban areas. This is also support by the BCT Lighting Guidelines (BCT, 2018) where landscape design can be utilised to buffer potential light spillage from developments.

2. Proposed Development Description

2.1 Site Location

The proposed quarry development is located west of Ballinalee in the townland of Rhine.

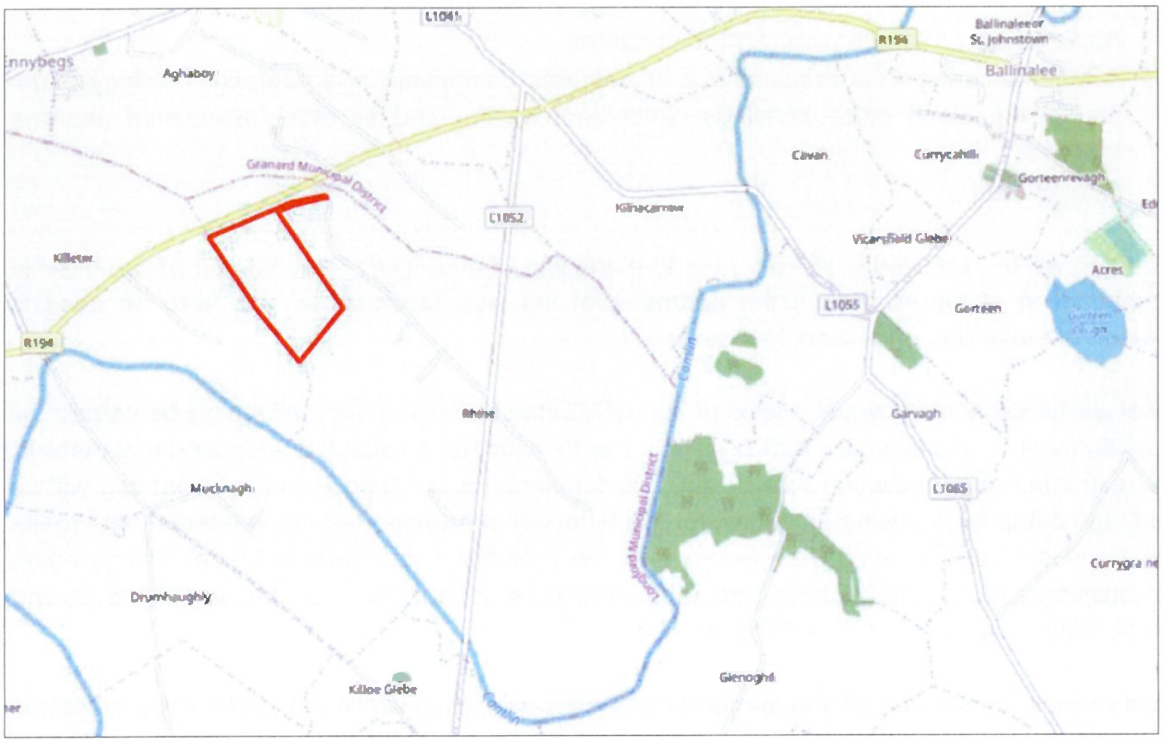

Figure 2a: Location of proposed development site (Red outline).

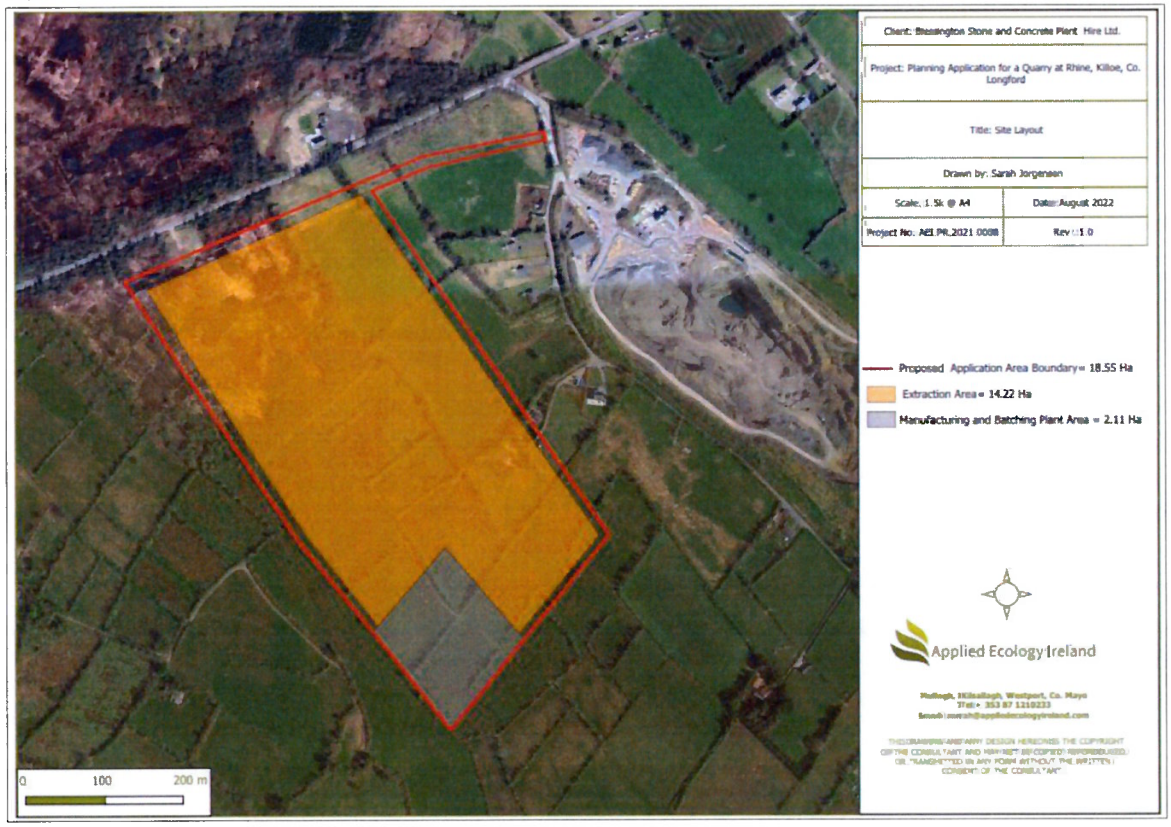

Figure 2b: Aerial photograph of proposed development site (Red outline).

2.2 Proposed Project

Development Description

The proposed development measures a total area of 18.55hecatres which will consist of the following:

- An Extraction Area measuring 14.22 hectares.
- A Manufacturing Area measuring 2.11 hectares comprising of a concrete batching plant, processing plant, office buildings, settlement lagoon and all other associated ancillary facilities.
- Access road.

Overburden will be removed in phases prior to extraction of underlying material and will be used in the construction of berms around the perimeter of the site. Overburden may also be used in restoration of the quarry once work has ceased.

Material will be extracted down to a level of 70mOD. Extraction of material will mainly be carried out by blasting means. Occasionally, rock breaking may be required on site. It is proposed that material will be extracted at a maximum rate of 400,000 tonnes/annum. Once extracted, material will be loaded onto dump trucks using an excavator. Material will be transported along internal haul roads to the proposed manufacturing area where it will be processed into various grades of aggregate using crushing and screening plant. Material may also be used in the manufacturing of ready-mix concrete at the proposed concrete batching plant.

Products will be transported off site to market via a proposed road which will connect the site to the L5097 and onto the R194 regional road. It is proposed that the development will generate an Annual Average Daily Traffic (AADT) of 73 loads/day.

Water management on site will be as follows: a sump will be constructed on the quarry floor which will collect all excess surface water. Water will be retained for a period of time to allow suspended solids to settle. Water will then be pumped to the proposed settlement lagoon which will be constructed at the proposed manufacturing area. Water at the settlement lagoon will be used in the day-to-day operations of the quarry such as manufacturing of ready-mix concrete, aggregate washing or dust suppression. Water which is not required will be discharged off site. An application for a water discharge licence will be made to Longford Co. Co. if planning permission for the subject development is secured.

For security reasons, very little fuel will be stored at the quarry. A small volume of fuel will be stored in a bunded fuel storage tank which will be located close to the site office. Fuel will be delivered to the quarry by competent oil companies and dispensed into plant and machinery, at a designated refuelling location.

It is proposed that the operating hours at the development will be 07:00-19:00 Monday to Friday and 07:00-16:00 on Saturdays. The development will not operate on Sundays or Public Holiday. The proposed development will provide employment for approximately 30 people directly with further people employed indirectly (e.g., sub-contractors for blasting).

Figure 2c: Site Layout Plan for proposed quarry development.

3. Bat Survey Methodology

3.1 Daytime Inspections

One purpose of daytime inspections is to determine the potential of bat roosts within the survey area. Due to the transient nature of bats and their seasonal life cycle, there are a number of different type of bat roosts. Where possible, one of the objectives of the surveys is to be able to identify the types of roosts present, if any. However, the determination of the type of roost present depends on the timing of the survey and the number of bat surveys completed. Consequently, the definition of roost types, in this report, is based on the following:

Table 4: Bat Roost Types (adapted from Collins 2016).

Roost Type	Definition	Time of Survey
Day Roost	A place where individual bats or small groups of males, rest or shelter in the daytime but are rarely found by night in the summer.	Anytime of the year
Night Roost	A place where bats rest or shelter in the night but are rarely found in the day. May be used by a single bat on occasion or it could be used regularly by the whole colony.	Anytime of the year
Feeding Roost	A place where individual bats or a few bats rest or feed during the night but are rarely present by day.	Anytime of the year
Transitional Roost	A place used by a few individuals or occasionally small groups for generally short periods of time on waking from hibernation or in the period prior to hibernation.	Outside the main maternity and hibernation periods.
Swarming Site	Where large numbers of males and females gather. Appear to be important mating sites.	Late summer and autumn
Mating Site	Where mating takes place.	Late summer and autumn
Maternity Site	Where female bats give birth and raise their young to independence.	Summer months
Hibernation Site	Where bats are found, either individually or in groups in the winter months. They have a constant cool temperature and humidity.	Winter months in cold weather conditions
Satellite Roost	An alternative roost found in close proximity to the main nursery colony and is used by a few individuals throughout the breeding season.	Summer months

3.1.1 Building & Structure Inspection

There are agricultural buildings within the proposed development site. These buildings were inspected during the daytime on 9th August 2023. Evidence of bat usage is in the form of actual bats (visible or audible), bat droppings, urine staining, grease marks (oily secretions from glands present) and claw marks. In addition, the presence of bat fly pupae (bat parasite) also indicated that bat usage of a crevice, for example, has occurred in the past. Inspections were undertaken visually with the aid of a strong torch beam (LED Lenser P14.2) and endoscope (General DC5660A Wet / Dry Scope).

Buildings were assessed to determine their suitability as a bat and described using the parameters Negligible, Low, Medium or High suitability in view of Table 2a presented in the previous section.

Survey Date: 9th August 2023

3.1.2 Tree Potential Bat Roost (PBRs) Inspection

Trees that may provide a roosting space for bats were classified using the Bat Tree Habitat Key (BTHK, 2018) and the classification system adapted from Collins (2016). The Potential Roost Features (PRFs) listed in BTHK (2018) were used to determine the PBR value of trees.

Trees identified as PBRs were inspected during the daytime, where possible, for evidence of bat usage. Evidence of bat usage is in the form of actual bats (visible or audible), bat droppings, urine staining, grease marks (oily secretions from glands present) and claw marks. In addition, the presence of bat fly pupae (bat parasite) also indicated that bat usage of a crevice, for example, has occurred in the past.

A Phase 1 inspection was undertaken to make a list of trees within the proposed development site that may be suitable as roosting sites for bats. Inspections were undertaken visually with the aid of a strong torch beam (LED Lenser P14.2) during the daytime searching for PRFs, if visible. To aid this Phase 1 inspection, tree reports, where available, were consulted to supplement the data collected.

Survey Date: 9th August 2023

Table 5: Tree Bat Roost Category Classification System (adapted from Collins, 2016).

Tree Category	Description
1 High	Trees with multiple, highly suitable features (Potential Roosting Features = PRFs) capable of supporting larger roosts
2 Moderate	Trees with definite bat potential but supporting features (PRFs) suitable for use by individual bats;
3 Low	Trees have no obvious potential although the tree is of a size and age that elevated surveys may result in cracks or crevices being found or the tree supports some features (PRFs) which may have limited potential to support bats;
4 Negligible	Trees have no potential.

3.1.3 Bat Habitat & Commuting Routes Mapping

The survey site was assessed during daytime walkabout surveys, in relation to potential bat foraging habitat and potential bat commuting routes. Such habitats were classified according to Fossit, 2000 (Appendix 1, Table 1.B) while hedgerows were classified according to BATLAS 2020 classification (Bat Conservation Ireland, 2015) (Appendix 1, Table 1.A). Bat habitats and commuting routes identified were considered in relation to the wider landscape to determine landscape connectivity for local bat populations through the examination of aerial photographs.

Survey Date: 9th August 2023

3.2 Night-time Bat Detector Surveys

3.2.1 Dusk Bat Survey & Walking Transects

A Dusk Survey was completed on the 9th August 2023 from 15 minutes before sunset to 110 minutes post sunset and the surveyor was located within the proposed development site adjacent to agricultural buildings and dwelling located on the boundary of the proposed development site. Post dusk survey, a walking transect was undertaken on the 9th August 2023 within accessible sections of the study area. On the 16th August 2023, a dusk survey of the two mature trees (noted as PBRs – See Section 4.1.2) was completed and this was followed by a walking transect of accessible areas of the study area and the local road network.

Survey Date: 9th & 16th August 2023

The following equipment was used:

Surveyor 1: BatLogger M2 Full Spectrum Bat Detector and Petersson D200 Heterodyne Bat Detector.

3.2.2 Passive Static Bat Detector Survey

Passive Static Bat Surveys were completed on 9th to 16th August 2023. Five units were deployed to record potential nightly bat activity during this time period (See Figure 3 for location of static units).

A Passive Static Bat Surveys involves leaving a static bat detector unit (with ultrasonic microphone) in a specific location and set to record for a specified period of time (i.e. a bat detector is left in the field, there is no observer present and bats which pass near enough to the monitoring unit are recorded and their calls are stored for analysis post surveying). The bat detector is effectively used as a bat activity data logger and the habitat type of where the bat detector is location is noted to allow interpretation of the results (e.g. Open verses Edge verses Closed habitat types – see table below). Static surveillance results in a far greater sampling effort over a shorter period of time. Bat detectors with ultrasonic microphones are used as the ultrasonic calls produced by bats cannot be heard by human hearing.

The microphone of the unit was positioned horizontally to reduce potential damage from rain. Wildlife Acoustics Song Meter Mini Bat FS Platform Units use Real Time recording as a technique to record bat echolocation calls and using specific software, the recorded calls are identified. It is these sonograms (2-d sound pictures) that are digitally stored on the SD card (or micro SD cards depending on the model) and downloaded for analysis.

The recordings are analysed using Wildlife Acoustics Kaleidoscope Pro. The Auto-Id function is used for all sound files but manual verification is used to ensure the auto-id function is accurate. This is particularly important for less common bat species and cryptic bat species such as *Myotis* species. In addition, "Noise" and "Unidentified" sound files are also checked. Each sequence of bat pulses are noted as a bat pass to indicate level of bat activity for each species recorded. This was either expressed as number of bat passes per survey night for bat species recorded with additional analysis in relation to Lesser horseshoe bat activity.

Audio files are a maximum of 15 seconds long and each audio file is taken as a bat pass for each bat species recorded within the audio file. Each bat pass does not equate to the number of individuals of bats flying in vicinity of the recording device but is representative of bat activity levels. Some species such as the pipistrelles will continuously fly around a habitat and therefore it is likely that a series of bat passes within a similar time frame (i.e. separate audio files within a small time frame)

is one individual bat. On the other hand, Leisler's bats tend to travel through an area quickly and therefore an individual sequence of echolocation calls or bat pass is more likely to be indicative of individual bats.

The following static units were deployed during this static bat detector survey:

Table 6: Static Bat Detectors deployed during Static Bat Detector Surveys.

Static Unit Code	Bat Detector Type	Recording Function	Microphone
SM4 Unit 5, 6, 8	Wildlife Acoustics SongMeter 4 Bat FS	Passive Full Spectrum	SMM-U2, 4m lead
Mini Bat 1, 2	Wildlife Acoustics SongMeter Mini Bat FS	Passive Full Spectrum	SMM-U2

Surveillance Dates: 9th to 16th August 2023 (7 nights)

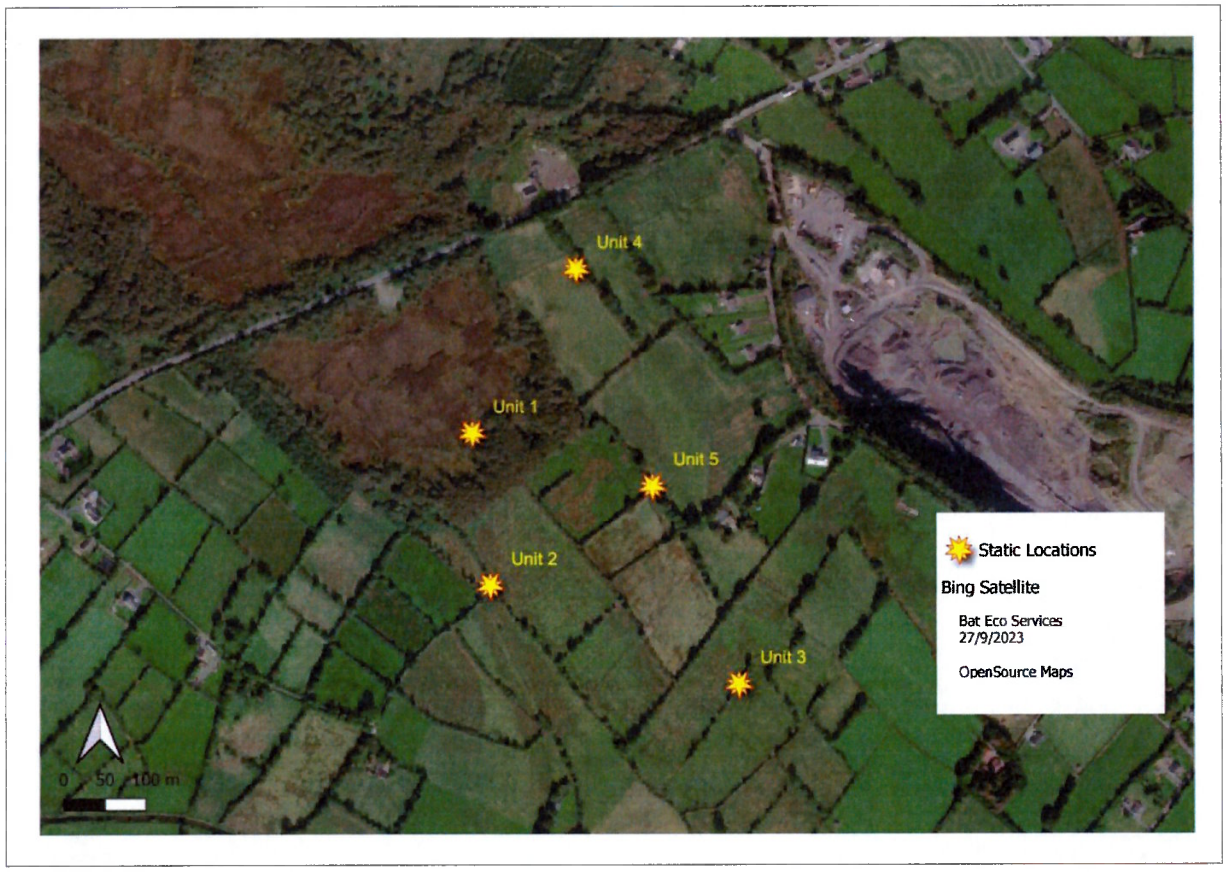

Figure 3: Aerial photograph of the location of static units.

4. Bat Survey Results

A bat survey is comprised of a number of different elements. The results of these different types of surveys are presented below in a step-wise fashion and summarised at the end of the section. It is important that the whole section is read in order to gain a full impression of the potential bat value of the survey area.

4.1 Daytime Inspections

4.1.1 Building & Structure Inspection

One area of buildings were inspected during the daytime: private dwelling (bungalow – not within the proposed development are but on the boundary) and agricultural sheds (modern corrugated barn an corrugated single storey structure). All of the buildings were deemed to have a Low value in relation to potential bat roosting sites. No evidence of bat usage was recorded.

4.1.2 Tree Potential Bat Roost (PBRs) Inspection

The mature trees within the proposed development site were inspected on the 9th August 2023. Two mature ash trees with heavy ivy growth were considered to have a Category 2 PBR value.

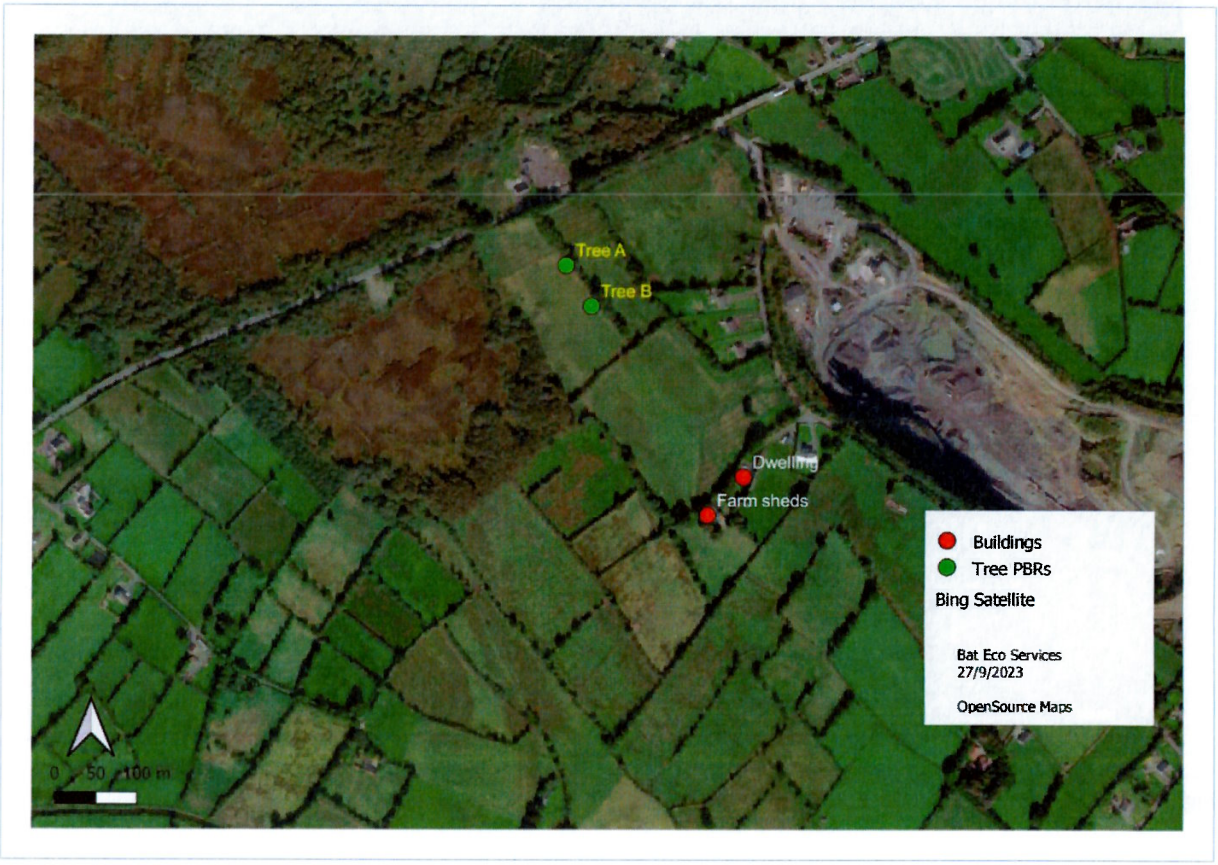

Figure 4a: Aerial photograph of proposed development site depicting the location of PBR trees.

4.1.3 Bat Habitat & Commuting Routes Mapping

The habitat types, with reference to Fossit (2000) were recorded both within the survey area and adjacent to the survey area. The principal "Bat Habitats" located within the proposed development are linear habitats comprised of hedgerows and treeline boundaries (Figure 4b). There is a section

of scrub and woodland in the north-western part of the of the proposed development site. Grassland is a mixture of wet grassland and improved agricultural grassland.

Table 7a: Habitat types present within survey area.

Habitat	Yes	Habitat	Yes	Habitat	Yes	Habitat	Yes
Cultivated land		Salt marshes		Exposed rock		Fens/flushes	
Built land	√	Brackish waters		Caves		Grasslands	√
Coastal structures		Springs		Freshwater marsh		Scrub	√
Shingle/gravel		Swamps		Lakes/ponds		Hedges/treelines	√
Sea cliffs/islets		Disturbed ground		Heath		Conifer plantation	
Sand dunes		Watercourse		Bog		Woodland	√

Table 7b: Habitat types present adjacent to survey area.

Habitat	Yes	Habitat	Yes	Habitat	Yes	Habitat	Yes
Cultivated land		Salt marshes		Exposed rock	√	Fens/flushes	
Built land	√	Brackish waters		Caves		Grasslands	√
Coastal structures		Springs		Freshwater marsh		Scrub	√
Shingle/gravel		Swamps		Lakes/ponds	√	Hedges/treelines	√
Sea cliffs/islets		Disturbed ground	√	Heath		Conifer plantation	√
Sand dunes		Watercourse	√	Bog		Woodland	√

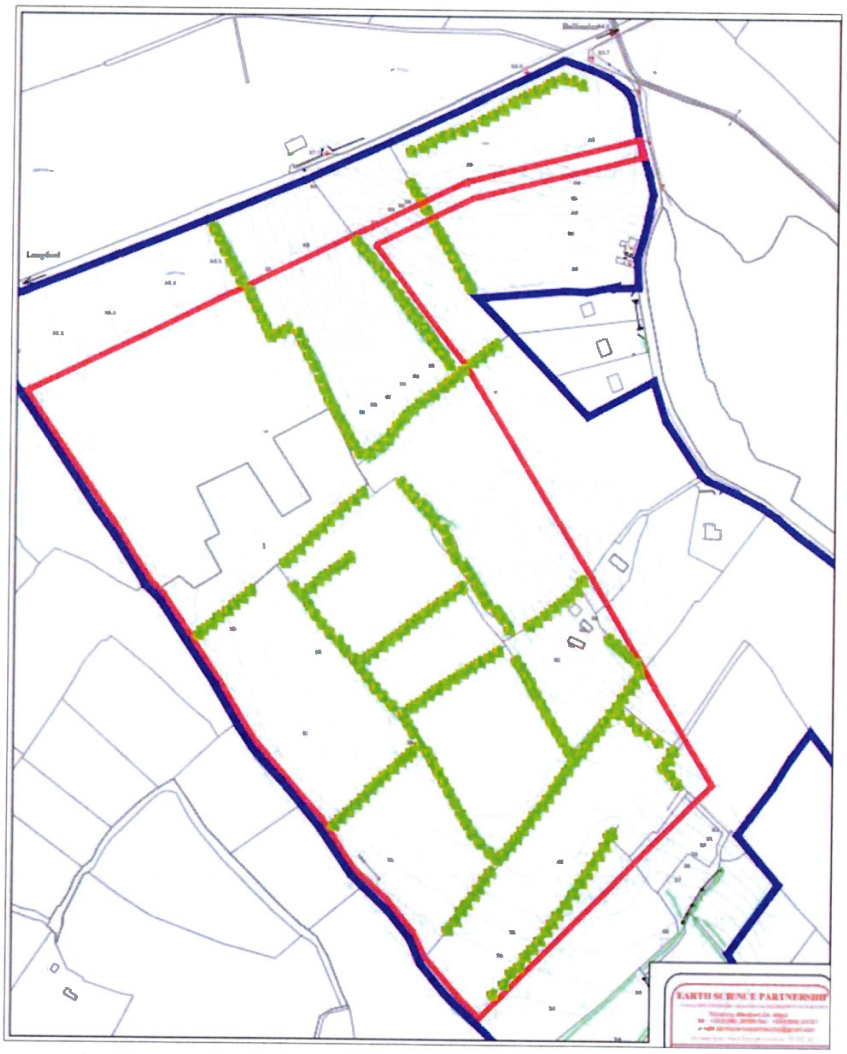

Figure 4b: Linear habitats of proposed development area (Supplied by Applied Ecology Ireland).

4.2 Night-time Bat Detector Surveys

4.2.1 Dusk Bat Surveys

The dusk survey (9/8/2023, weather conditions: calm, dry, patchy cloud cover and 22°C) concentrated on determining if the dwelling and agricultural buildings were used by roosting bats. Sunset was at 21:13 hrs and the first bat was not recorded till 21:43 hrs and this was a Leisler's bat. As this specie tends to emerge around sunset, this bat was commuting from a roost located a distance from the proposed development area. The first common pipistrelle was recorded at 21:45 hrs and commuted along the lane past the dwelling and farm buildings towards the linear habitat features of the agricultural land. This was followed by two additional individuals of this species at 21:47 hrs and 21:48 hrs. The first soprano pipistrelle was recorded at 21:48 hrs and, similarly, commuted along the lane into the proposed development area. The buildings surveyed were deemed not to be bat roosts.

A walking transect was undertaken of the accessible fields within the survey area and three species of bat were recorded: common pipistrelle, soprano pipistrelle and Leisler's bat. The results of this (i.e. geo-referenced bat encounters) are presented in 4.2.3.

The dusk survey on 16th August 2023 (weather conditions: patchy cloud cover, dry, breezy and 16oC) concentrated on determining the direction of commuting bats and potential bat roosting in mature trees. No bats were recorded emerging from these trees during the 2nd dusk survey (16th August 2023).

4.2.2 Passive Static Bat Detector Survey

The following table summarises the results recorded on the static units deployed (Please see Figure 3b). A total of seven species of bat was recorded in the survey area: soprano pipistrelle, common pipistrelle, Leisler's bat, Daubenton's bat, Natterer's bat, brown long-eared bat and Nathusius' pipistrelle. A full breakdown of nightly activity is presented in the Appendices.

Table 8: Results of Static Bat Detectors deployed during Static Bat Detector Surveys.

Static Code	Location Description / Bat Habitat Type	Survey Period	Bat Species
Unit 1	On tree within scrub area	9th to 16th August (7 nights)	Soprano pipistrelle, common pipistrelle, Leisler's bat, Daubenton's bat, Natterer's bat, Nathusius' pipistrelle and brown long-eared bat.
Unit 2	On tree along hedgerow	9th to 16th August (7 nights)	Soprano pipistrelle, common pipistrelle, Leisler's bat, Daubenton's bat, Natterer's bat, Nathusius' pipistrelle and brown long-eared bat.
Unit 3	On tree along hedgerow	9th to 16th August (7 nights)	Soprano pipistrelle, common pipistrelle, Leisler'sbat, Daubenton's bat, Natterer's bat, Nathusius' pipistrelle and brown long-eared bat.
Unit 4	On tree along hedgerow	9th to 16th August (7 nights)	Soprano pipistrelle, common pipistrelle, Leisler's bat, Natterer's

			bat, Nathusius' pipistrelle and brown long-eared bat.
Unit 5	On tree along hedgerow	9th to 16th August (7 nights)	Soprano pipistrelle, common pipistrelle, Leisler's bat, Natterer's bat, Nathusius' pipistrelle and brown long-eared bat

NOTE: The behaviour of bats during commuting and foraging greatly influences the level of bat passes recorded on static units. The number of bat passes do not equate to the number of bats flying past the static unit. Pipistrellus species tend to forage as they commute and therefore are regularly observed flying up and down a treeline or hedgerow before moving on in the landscape. This can result in multiple passes being recorded for an individual bat. Leisler's bats fly high in the sky and therefore can be observed flying fast through the landscape, occasionally foraging over treetops as they commute. As a consequence, Pipistrellus species bat activity tends to result in a higher number of bat passes recorded on static units compared to Leisler's bats. In relation to other bat species recorded, as they tend to be less common in the landscape compared to common pipistrelles, soprano pipistrelles and Leisler's bats, their recorded presence is notable.

The following graphs depict the level of bat activity recorded on the static units (please note that number of bat passes do not equate to number of individuals – it is a measure of activity levels only).

There are three bat species considered to be common in Ireland: common pipistrelle, soprano pipistrelle and Leisler's bats. The following graph depicts the total level of bat activity for these three bats species. Common pipistrelle was the most frequently recorded bat species particularly on Static Units 4 and 5, both of which were located along treelines documented as commuting routes for local bat populations. Soprano pipistrelle was the 2nd most frequently encountered bat species. While a higher level of bat activity for this species was also recorded on Static Unit 4, there was also a similar level of activity recorded on Static Unit 1 which was located in the scrub/woodland/wet grassland habitat. Static Units 2 and 3 generally recorded a lower level of bat activity and this reflects the lower quality of linear habitat at these two points.

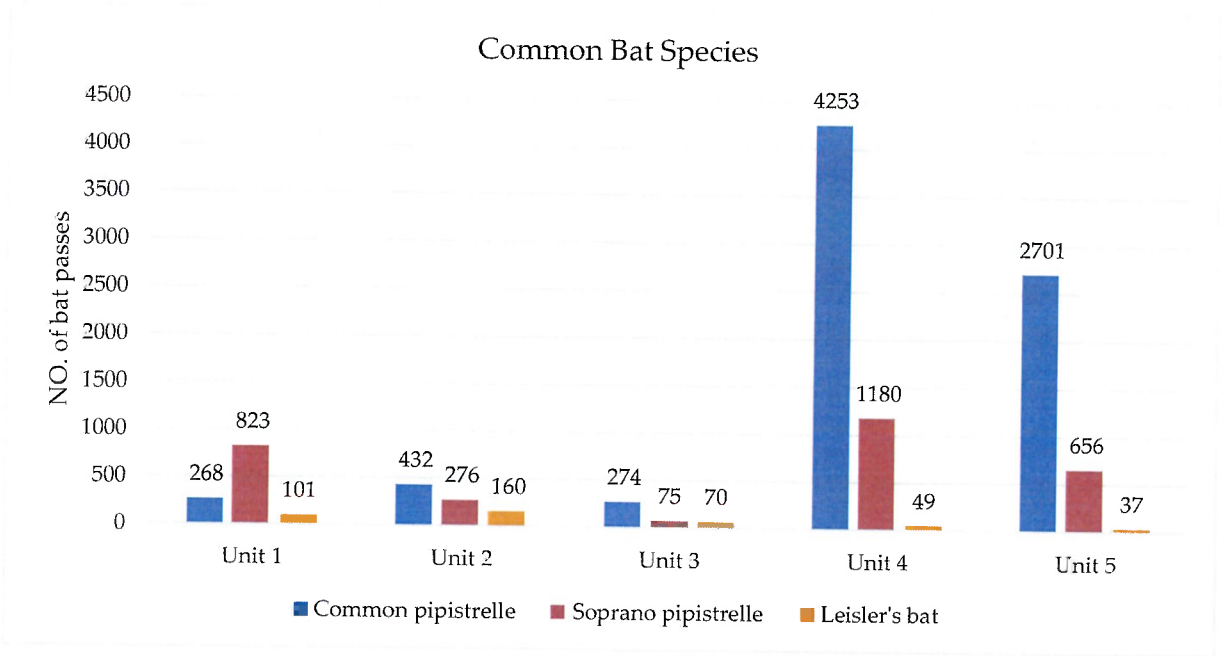

Figure 5a: Total no. of bat passes recorded for Common Bat Species during static surveillance (7 nights).

A different pattern of bat activity on the 5 static units was recorded for "Less" common bat species (Nathusius' pipistrelle, brown long-eared bat, Daubenton's bat and Natterer's bat).

Brown long-eared bat activity was higher on Static Unit 1 and 2 which may indicate that individuals of this species of bat commuted along the linear habitat where Static Unit 2 was located in order to forage within the scrub/woodland area, the preferred habitat for this species. Looking at the time stamp audio files for Static 2 on Night 1 (9th August 2023), the night with the highest level of bat activity for this species, activity was recorded between 22:57 hrs to 23:07 hrs and then between 03:35 hrs to 04:10 hrs and these two time slots coincide with commuting periods for this bat species.

A similar pattern was recorded for Daubenton's bats within individuals of this species possibly commuting to the river located south of the proposed development area.

A higher level of bat activity for Natterer's bats were recorded on Static Unit 2. While this species has a similar habitat preference to brown long-eared bats, it tends to forage in extensive agricultural landscape habitats too which is characteristic of the wider landscape around the proposed development site. Looking at the time stamp audio files for Static 2 on Night 1 (9th August 2023), the night with the highest level of bat activity for this species, activity was recorded throughout the night in a low level and therefore is indicative of foraging individuals.

Nathusius' pipistrelle is Ireland's newest bat species and first recorded in Northern Ireland in the mid-1990s. This species tends to be associated with large waterbodies such as Lough Forbes located 10km further west. Looking at the time stamp audio files for Static 2 on Night 6 (14th August 2023), the night with the highest level of bat activity for this species, all of the activity was recorded between 01:16 hrs to 03:49 hrs. This is indicative of commuting/foraging individuals passing through the landscape of the proposed development area.

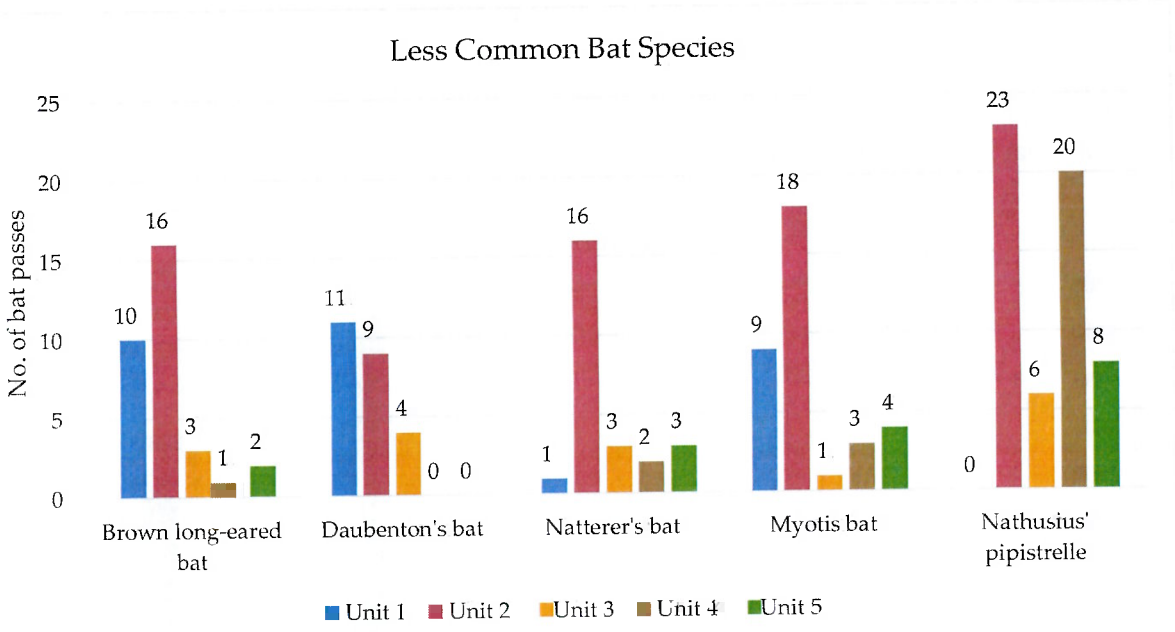

Figure 5b: Total no. of bat passes recorded for Less Common Bat Species during static surveillance (7 nights).

In order to determine static locations considered to be important for bats, the total number of bats passes for each bat species was divided by the total number of static surveillance nights (7 nights). These graphs are presented below. In summary, the linear habitats where Unit 2, 4 and 5 are located are important for local bat populations.

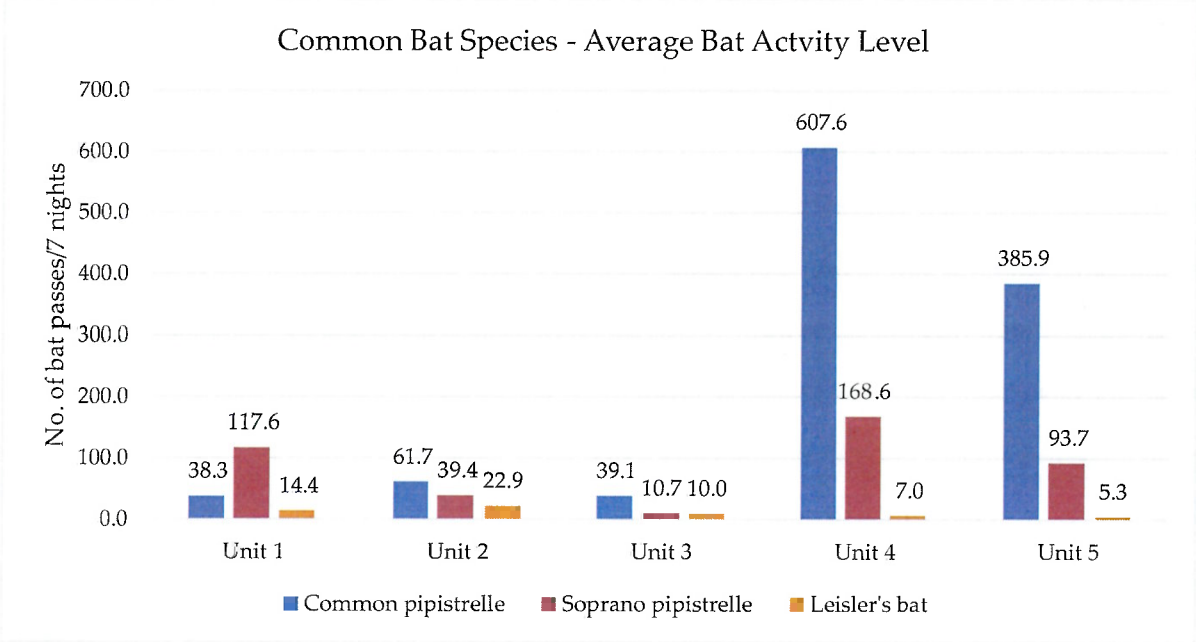

Figure 5c: Average Bat Activity level for Common Bat Species during static surveillance (Total number of bat passes divided by 7 nights of static surveillance).

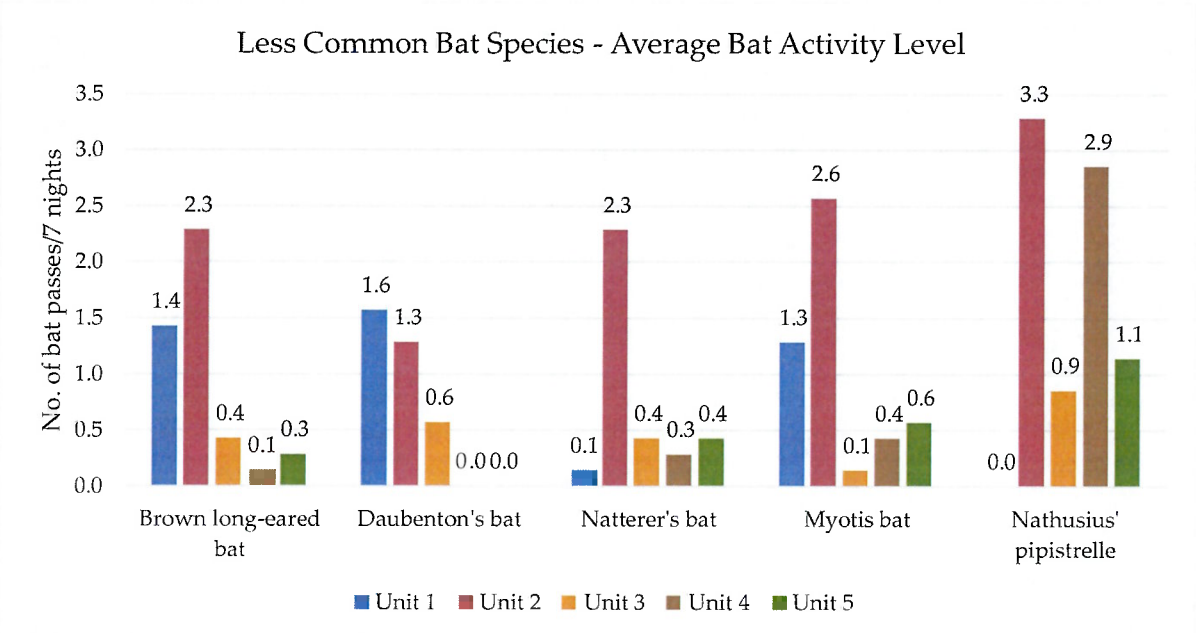

Figure 5c: Average Bat Activity level for Common Bat Species during static surveillance (Total number of bat passes divided by 7 nights of static surveillance).

Overall, a high level of bat activity was recorded for common pipistrelle, a medium level of bat activity was recorded for soprano pipistrelles and a low level of bat activity was recorded for all other bat species noted within the survey area.

4.2.3 Bat Encounter Locations

All of the bat survey data for each bats species were combined to produce maps depicting the location of geo-referenced bat encounter locations. This illustrated the dispersal of the different bat species throughout the survey area.

Common pipistrelle: 156 geo-referenced points

Soprano pipistrelle: 89 geo-referenced points

Leisler's bat:21 geo-referenced points

Nathusius' pipistrelle: 7 geo-referenced points

Brown long-eared bat: 5 geo-referenced points

Natterer's bat: 7 geo-referenced points

Daubenton's bat: 3 geo-referenced points

Bats were recorded throughout accessible survey area with common pipistrelle and soprano pipistrelle the two most common bats species.

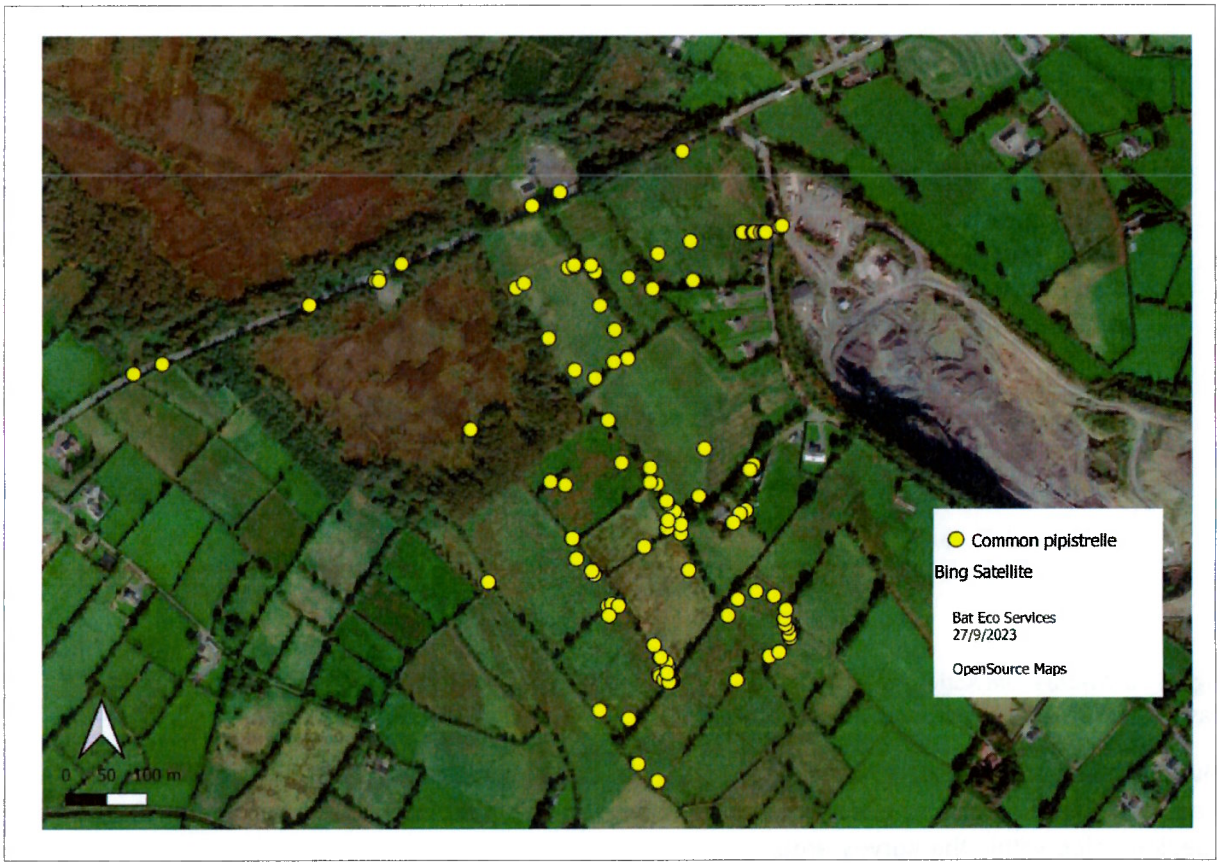

Figure 6a: Common pipistrelle bat encounters within survey area.

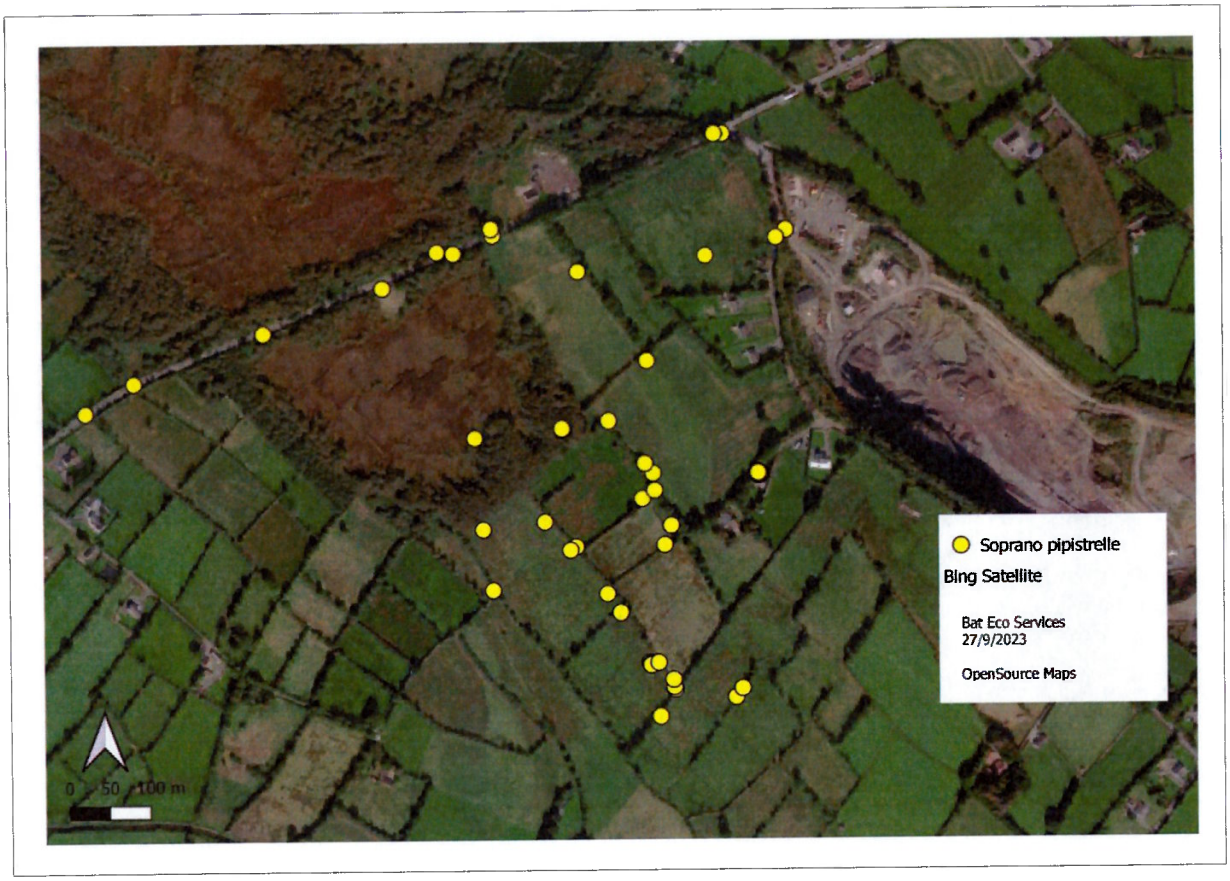

Figure 6b: Soprano pipistrelle bat encounters within survey area.

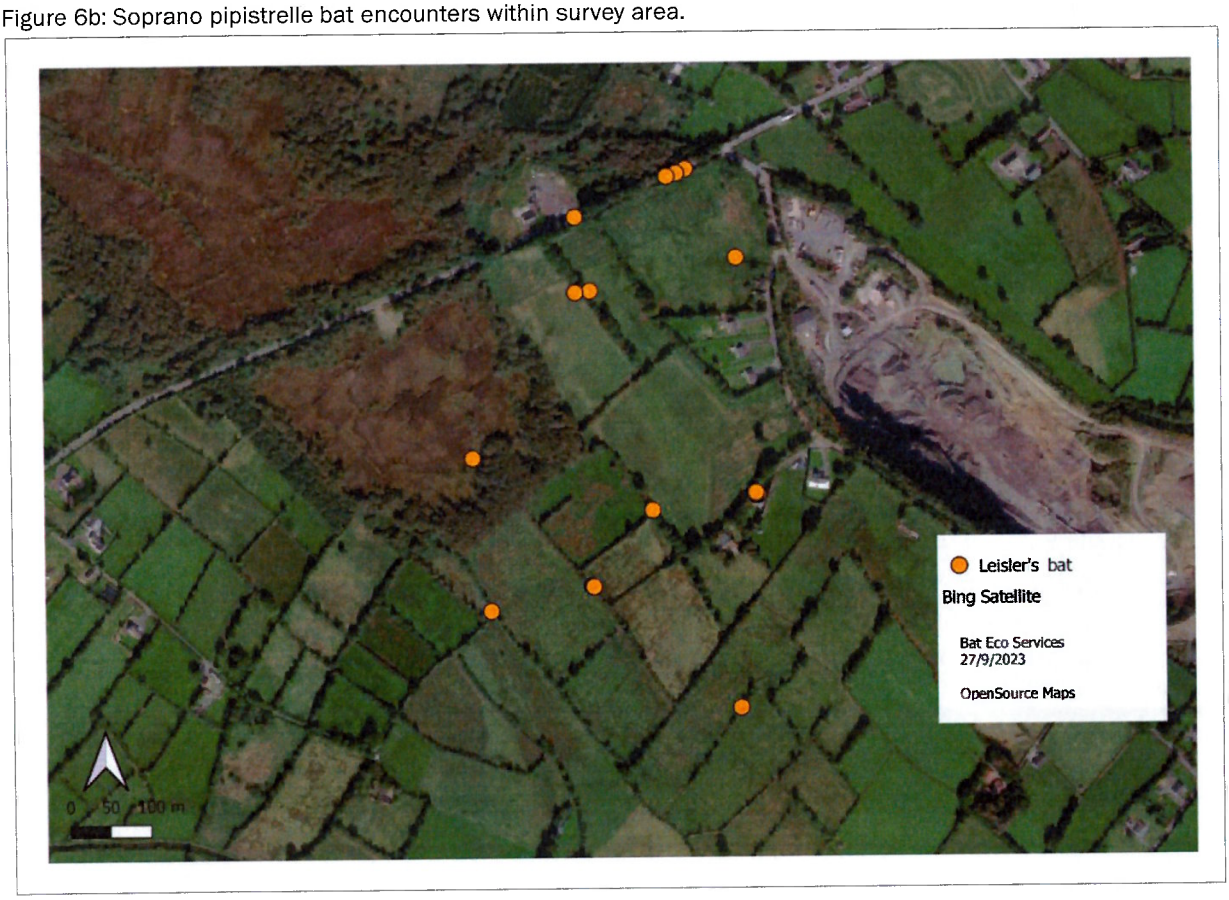

Figure 6c: Leisler's bat encounters within survey area.

Figure 6d: Nathusius' pipistrelle bat encounters within survey area.

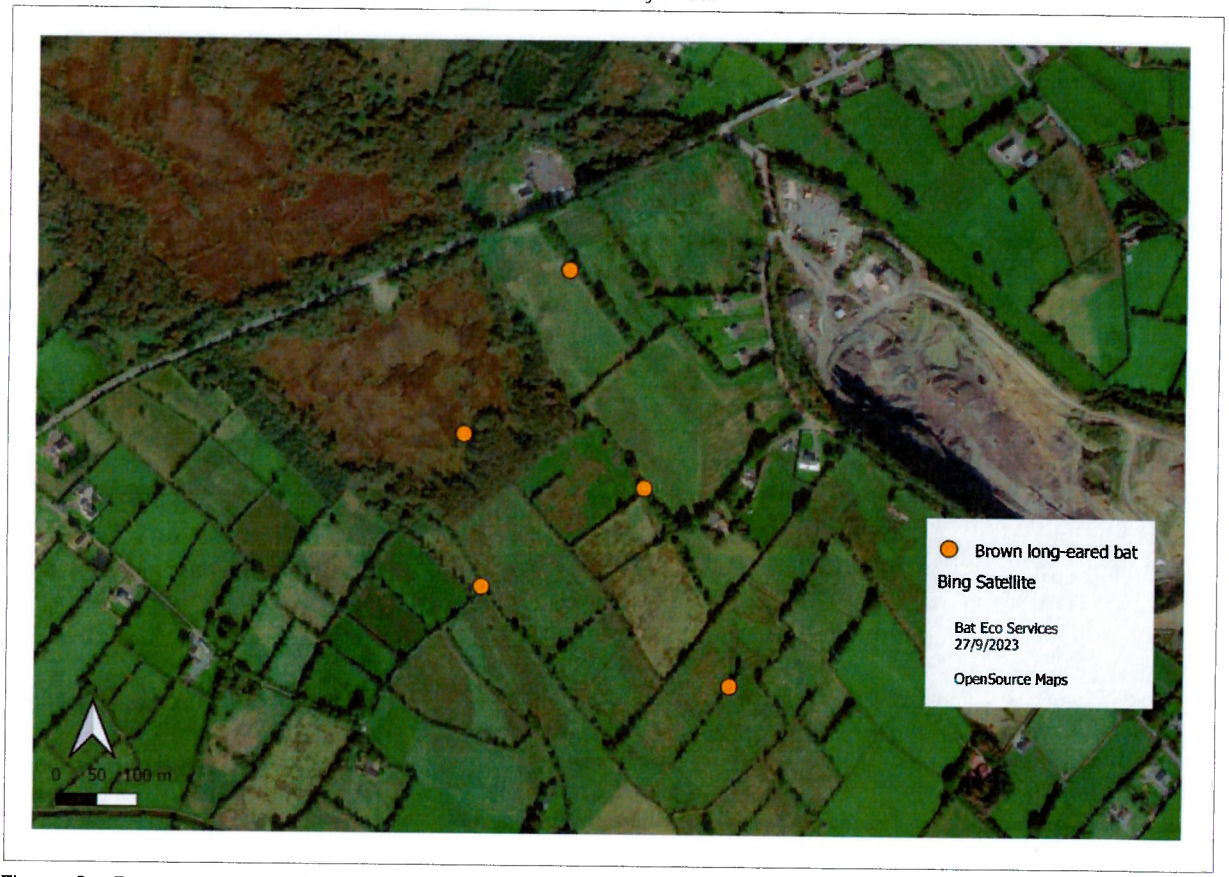

Figure 6e: Brown long-eared bat encounters within survey area.

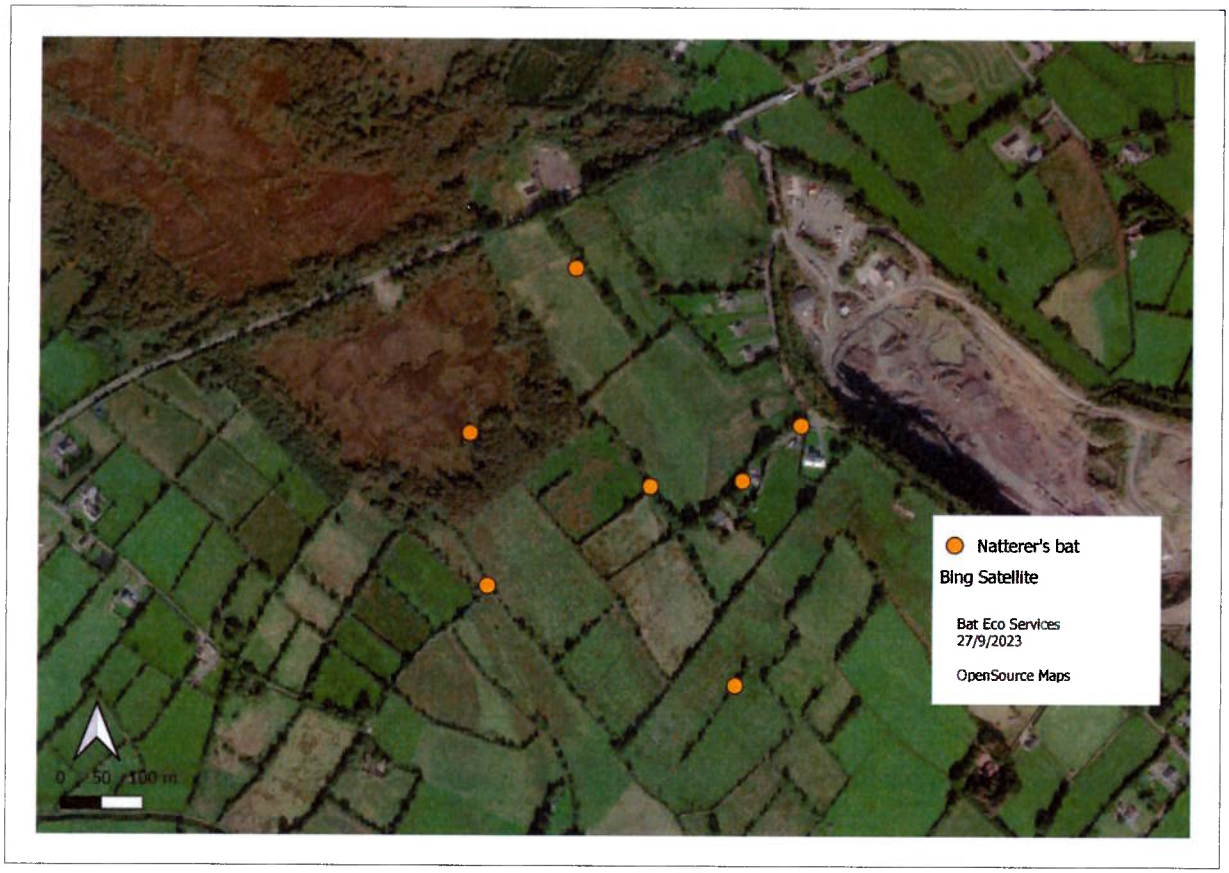

Figure 6f: Natterer's bat encounters within survey area.

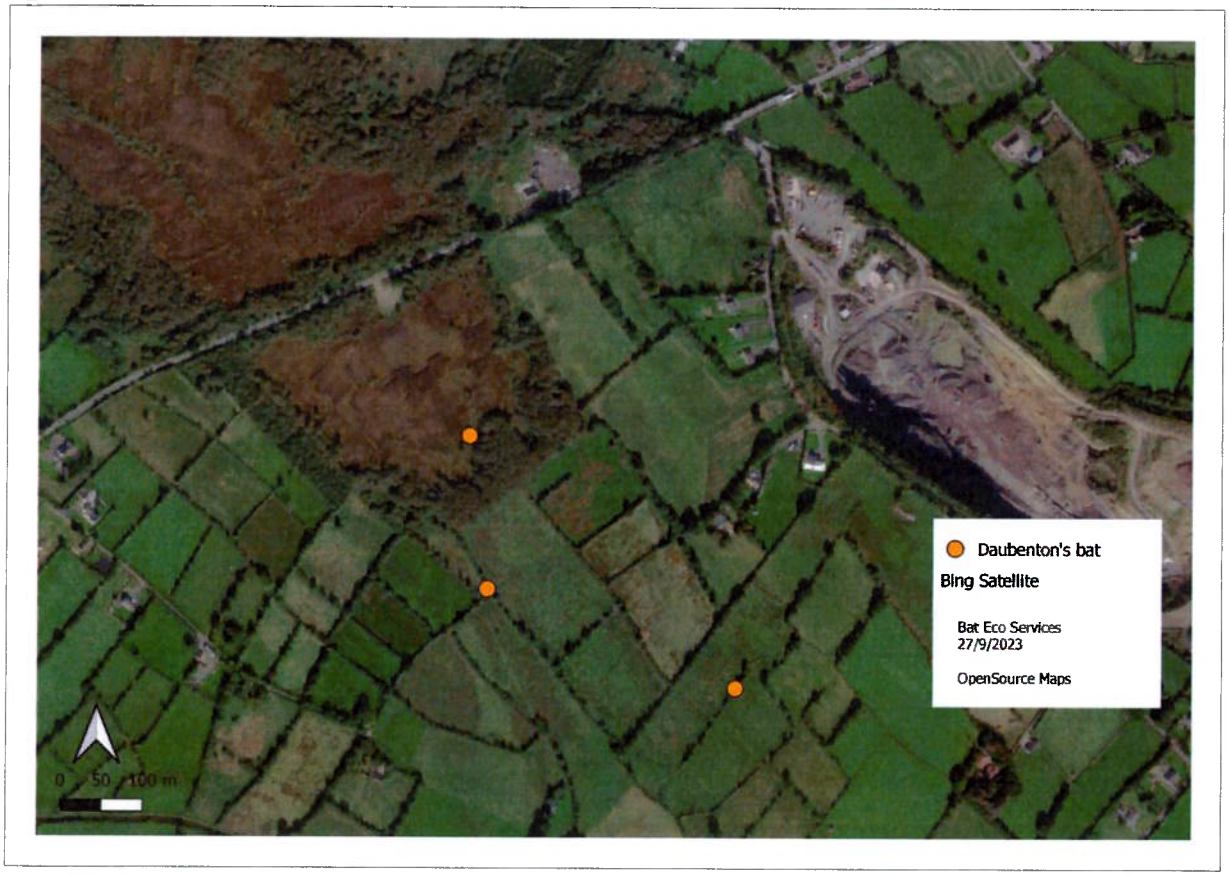

Figure 6g: Daubenton's bat encounters within survey area.

4.3 Survey Effort, Constraints & Survey Assessment

The following table details any Survey Constraints encountered and a summary of Scientific Assessment completed.

Table 9: Survey Effort, Constraints & Survey Assessment Results.

Category	Discussion
Timing of surveys	The dusk survey and static surveillance was undertaken in the preferred survey period of May to August and therefore meets the survey guidelines. The information gathered provided information on the commuting and foraging bat activity of the proposed development site.
Survey Type	Bat Survey Duties Completed (Indicated by red shading) Tree PBR Survey ■ Daytime Building Inspection ■ Static Detector Survey ■ Daytime Bridge Inspection ○ Dusk Bat Survey ■ Dawn Bat Survey ○ Walking Transect ■ Driving Transect ○ Trapping/Mist Netting ○ IR Camcorder filming ○ Endoscope Inspection ■ Other ○
Weather conditions	Favourable weather conditions during dusk survey and for the majority of the static surveillance period.
Survey Constraints	The dense scrub and wet grassland habitat located in one area of the proposed development site was not safe to walk during the hours of darkness. Therefore walking transects were confined to the local road network and agricultural fields.
Survey effort	Daytime inspection (4 hours), dusk survey & walking transects (8 hours) and static surveillance (280 hours) = TOTAL 292 hrs
Extent of survey area	Proposed development site only
Equipment	All equipment in good working order

The extent of the surveys undertaken has achieved to determine:

- Presence / absence of bat within the survey area;
- A bat species list for the survey area;
- Extent and pattern of usage by bats within the survey area.

Surveying was completed according Collins (2016) and, while, the timing meets guidelines the survey level meets and exceeds this guidance document.

It is therefore deemed that the Scientific Assessment completed is Appropriate in order to completed the aims of the bat survey.

5. Bat Ecological Evaluation

5.1 Bat Species Recorded & Sensitivity

The survey area is a small proposed development site located along a local road in an agricultural setting. At least seven species of bat was detected during the static surveillance: brown long-eared bat, common pipistrelle, Leisler's bat, Natterer's bat, Daubenton's bat, Nathusius' pipistrelle and soprano pipistrelle. Additional *Myotis* species recorded were recorded but not identified to species level. No Annex II bat species (i.e. lesser horseshoe bat) was recorded during the array of bat surveys.

This is a high level of bat biodiversity for this survey site. The level of bat activity varied for each of the bat species recorded. Overall, a high level of bat activity was recorded for common pipistrelle, a medium level of bat activity was recorded for soprano pipistrelles and a low level of bat activity was recorded for all other bat species noted within the survey area.

Agricultural buildings are located within the proposed development zone but not bats were recorded roosting within them.

Two mature trees along one treeline boundary of the proposed development site were recorded as PBRs but no bats were recorded roosting in them during the dusk survey.

The bat activity recorded was primarily commuting individuals along the treeline boundaries and foraging individuals within scrub/woodland habitat and along the linear habitats.

Table 10: Bat Ecological Evaluation Results for survey area according to referenced criteria.

Bat Species	Survey Results	Evaluation Value	Roost Evaluation
Brown long-eared bat	Foraging habitat Commuting routes	Local importance	Not applicable
Natterer's bat	Foraging habitat Commuting routes	Local importance	Not applicable
Leisler's bat	Foraging habitat Commuting routes	Local importance	Not applicable
Soprano pipistrelle	Foraging habitat Commuting routes	Local importance	Not applicable
Common pipistrelle	Foraging habitat Commuting routes	Local importance	Not applicable
Daubenton's bat	Foraging habitat Commuting routes	Local importance	Not applicable
Nathusius' pipistrelle	Foraging habitat Commuting routes	Local importance	Not applicable

Leisler's bat

- Leisler's bat is an Annex IV bat species under the EU Habitats Directive. The status of this bat species is listed as Least Concern. The national Leisler's bat population is considered to be significantly increasing (Aughney *et al.*, 2021).
- The modelled Core Area for Leisler's bats is a relatively large area that covers much of the island of Ireland (52,820km^2). The Bat Conservation Ireland Irish Landscape Model indicated that the Leisler's bat habitat preference has been difficult to define in Ireland. Habitat modelling for Ireland shows an association with riparian habitats and woodlands (Roche *et al.*, 2014). The landscape model emphasised that this is a species that cannot be defined by habitats preference at a local scale compared to other Irish bat species but that it is a landscape species and has a habitat preference at a scale of 20.5km.

Common pipistrelle

- Common pipistrelle is an Annex IV bat species under the EU Habitats Directive. The status of this bat species is listed as Least Concern. The national common pipistrelle population is considered to be significantly increasing (Aughney *et al.*, 2021).
- The modelled Core Area for common pipistrelle is a relatively large area that covers much of the island of Ireland (56,485km^2). The Bat Conservation Ireland Irish Landscape Model indicated that the common pipistrelle selects areas with broadleaf woodland, riparian habitats and low density urbanization (<30%) (Roche *et al.*, 2014).

Soprano pipistrelle

- Soprano pipistrelle is an Annex IV bat species under the EU Habitats Directive. The status of this bat species is listed as Least Concern. The national soprano pipistrelle population is considered to be significantly increasing (Aughney *et al.*, 2021).
- The modelled Core Area for soprano pipistrelle is a relatively large area that covers much of the island of Ireland (62,020km^2). The Bat Conservation Ireland Irish Landscape Model indicated that the soprano pipistrelle selects areas with broadleaf woodland, riparian habitats and low density urbanisation (Roche *et al.*, 2014).

Brown long-eared bat

- Brown long-eared bat is an Annex IV bat species under the EU Habitats Directive. The status of this bat species is listed as Least Concern. The national brown long-eared bat population is considered to be stable (Aughney *et al.*, 2021).
- The modelled Core Area for brown long-eared bat is a relatively large area that covers much of the island of Ireland (49,929 km^2). The Bat Conservation Ireland Irish Landscape Model indicated that the brown long-eared bat habitat preference is for areas with broadleaf woodland and riparian habitats on a small scale of 0.5km emphasising the importance of local landscape features for this species (Roche *et al.*, 2014).

Natterer's bat

- Natterer's bat is an Annex IV bat species under the EU Habitats Directive. The status of this bat species is listed as Least Concern.
- The modelled Core Area for Natterer's bat is a relatively large area that covers much of the island of Ireland (52,864km^2). The Bat Conservation Ireland Irish Landscape

Model indicated that the Natterer's bat selects areas with broadleaf woodland, riparian habitats and areas with larger scale provision of mixed forest (Roche *et al.*, 2014).

Daubenton's Bat

- Daubenton's bat is an Annex IV bat species under the EU Habitats Directive. The status of this bat species is listed as Least Concern. The national Daubenton's bat population is considered to be stable (Aughney *et al.*, 2021).
- The modelled Core Area for Daubenton's bat is (41,285 km^2) reflecting the distribution of sizeable river catchments. The Irish Landscape Model indicated that the Daubenton's bat habitat preference is for areas with broadleaf woodland, riparian habitats and low density urbanisation (Roche *et al.*, 2014).

6. Assessment of Potential Impact

The principal impact of the proposed quarry development is:

- Removal of scrub/woodland habitat;
- Removal of a large number of linear habitats (treelines and hedgerows);
- Potential removal of two trees deemed to be PBRs;
- Introduction of lighting and noise as a result of human activity.

It is estimated that the following amount of linear habitat is proposed to be removed:

- Total length of hedgerow = 943.85m
- Total length of treeline = 1,055.9m
- **Total length of linear habitat = 1,999.75m**

This will potentially reduce foraging and commuting habitat for local bat populations. It is considered that the proposed development is likely to have a **Slight to Moderate Negative Impact** on local bat populations. Therefore bat mitigation measures are required.

6.1 Bat Mitigation Measures

The bat mitigation measures described below take into consideration Marnell *et al.* (2022) as well as best practice guidelines from Collins (2016) and BCT (2018). The measures described are those considered to be practical and effective based on past experience of the principal bat specialist, for the proposed development site. Measures are also reflective to published scientific research, where available and applicable to Irish bat populations. As stated by Marnell *et. Al.* (2022) "Any mitigation intended to ensure that there is no impact or minimal impact on the bats must be clearly described in detail, giving examples of how it worked in other places". Please see Section 1.2.3 for more information.

6.1.1 Scrub Removal

It is recommended that minimum scrub removal is undertaken within the proposed development site to retain some foraging habitat along the western boundary of the proposed development site. It is recommended that replacement vegetation is planted using native shrub species. This is required to be planted within 2 years of clearance.

6.1.2 Tree Protection

The two trees identified as PBRs are located along one treeline within the proposed development site. As this treeline is proposed to be removed, both of threes will required additional surveying to ensure that there are no bats present. Tree removal should only be undertaken in the months of September, October and November during mild weather conditions (8°C air temperature during the daytime). Surveying should entail a dusk/dawn survey directly prior to tree removal. Felling will be undertaken under supervision and the tree will be left on the ground for 24 hrs (to allow any residing bats to leave unharmed from ivy growth).

As part of planting, 6 trees of at least 15-20 year growth (native tree species e.g. oak) should be planted post clearance and within 2 years of clearance. Such new planting should be protected from operations of proposed development.

6.1.3 Outdoor Lighting

The presence of light sensitive bat species such as brown long-eared bats and Natterer's bat means that outdoor lighting should not be erected in vicinity of treeline boundaries. It is also recommended that the following guidelines are followed to reduce the negative impact of outdoor lighting on nocturnal animals.

Bats are light sensitive bats species, hence their nocturnal activities. Luminaire design is extremely important to achieve an appropriate lighting regime. Luminaires come in a myriad of different styles, applications and specifications which a lighting professional can help to select. The following should be considered when choosing luminaires. This BCT (2018) guidelines provided a list of recommendations in relation to luminaire design, which was based on the extensive research completed at the time on the potential impact of lighting on bats, and therefore provides best practice mitigation measures. These recommendations have been updated with the new BCT (2023) guidelines:

- All luminaires should lack UV elements when manufactured. Metal halide, compact fluorescent sources should not be used.
- LED luminaires should be used where possible due to their sharp-cut-off, lower intensity, good colour rendition and dimming capability,
- A warm white light source (2700 Kelvin or lower) should be adopted to reduce blue light component.
- Light sources should feature peak wavelengths higher than 550nm to avoid the component of light most disturbing to bats.

DEFINITION: Red Light refers to the light sources in the red spectrum and mainly consist of long wavelength light above 600nm with an RA value of 60 (for good colour recognition). This wavelength of light is considered to the have the least impact on bats.

- Column heights should be carefully considered to minimise light spill and glare visibility. This should be balanced with the potential for increased numbers of columns and upward light reflectance as with bollards.
- Only luminaires with a negligible or zero Upward Light Ration, and with good optical control, should be considered.
- Luminaires should always be mounted horizontally, with no light output above 90° and/or no upward tilt.
- Where appropriate, external security light should be set on motion sensors and set to as short a possible a timer as the risk assessment will allow (e.g. 1-2 minute timer).
- Use of a Central Management System (CMS) with additional web-enables devices to light on demand.
- Only if all other options have been explored, accessories such as baffles, hoods or louvres can be used to reduce light spill and direct it only to where it is needed.
- Security lighting should be minimal and used activation mode and should put on a setting of 2 minutes.

Any external lighting for the proposed development should strictly follow the above guidelines and these should be strictly implemented during construction and operation phase of the proposed development.

6.1.4 Landscaping

It is recommended that there is planting of a new hedgerow and treeline is undertaken along the of the proposed development site. It is estimated that a total of 2,370.92m will be planted which will replace the estimated 1,999.75m proposed to be removed. This planting is required to be undertaken within 2 years of clearance.

The planting mix will be of the following tree and shrub species (all native plant species – no non-native planting is permitted).

- Hawthorn
- Blackthorn
- Holly
- Mountain ash
- Crab apple
- Alder
- Hazel
- Birch

As hawthorn and blackthorn are planted in 1-2 foot whips, it is recommended that the planting regime is as follows:

- For each 1 meter of planting, the planting mix should be 5 hawthorn whips and 2 black thorn whips to create a double hedgerow with one holly plant within the mix.
- One small tree species should be planted within the hedge planting at every 2m of new hedgerow.
- This new hedgerow/treeline should be planted along the entire length of the boundary.
- No lighting is permitted along the hedgerow and treelines to ensure that they remain in darkness for bat usage.

6.1.5 Bat Box Scheme

Bat boxes scheme (woodcrete bat boxes – please see appendices) be sited carefully and this will be undertaken by a bat specialist. Some general points in relation to selecting suitable trees for bat boxes that will be follow include:

- Straight limb trees (or telegraph pole) with no crowding branches or other obstructions for at least 1 metre above and below position of bat box.
- Diameter of tree should be wide and strong enough to hold the required number of boxes.
- Locate bat boxes in areas where bats are known to forage or adjacent to suitable foraging areas. Locations should be sheltered from prevailing winds.
- Bat boxes should be erected at a height of 4-5 metres to reduce the potential of vandalism and predation of roosting bats.
- Locations for bat boxes should be selected to ensure that the lighting plan for the proposed site does not impact on the bat boxes. Therefore the bat boxes are to be erected mature trees or in the barn away from outdoor lighting.

It is recommended that 8 summer bat boxes (suitable for trees) are erected as part of a bat box scheme. This should entail the following bat box types: 1FF and 2FI). These bat box designs are suitable for the bat species recorded. There should be located away from quarry works and in existing bat habitat. If mature trees are not available, then telegraph poles should be erected (1 per two bat boxes).

7. Survey Conclusions

The survey area is a small proposed development site located along a local road in an agricultural setting. At least seven species of bat was detected during the static surveillance: brown long-eared bat, common pipistrelle, Leisler's bat, Natterer's bat, Daubenton's bat, Nathusius' pipistrelle and soprano pipistrelle. Additional *Myotis* species recorded were recorded but not identified to species level. No Annex II bat species (i.e. lesser horseshoe bat) was recorded during the array of bat surveys.

This is a high level of bat biodiversity for this survey site. The level of bat activity varied for each of the bat species recorded. Overall, a high level of bat activity was recorded for common pipistrelle, a medium level of bat activity was recorded for soprano pipistrelles and a low level of bat activity was recorded for all other bat species noted within the survey area.

Agricultural buildings are located within the proposed development zone but not bats were recorded roosting within them.

Two mature trees along one treeline boundary of the proposed development site were recorded as PBRs but no bats were recorded roosting in them during the dusk survey.

The bat activity recorded was primarily commuting individuals along the treeline boundaries and foraging individuals within scrub/woodland habitat and along the linear habitats.

It is considered that the proposed development is likely to have a **Slight to Moderate Negative Impact** on local bat populations. Therefore bat mitigation measures are required.

The full implementation of bat mitigation measures will reduce the impact of the proposed development to **Not Significant Negative** Impact.

AN COIMISIÚN PLEANÁLA
21 AUG 2025
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9. Appendices

9.1 Appendix 1 Bat Habitat & Commuting Route Classifications

Table 1.A: Hedgerow Category (Bat Conservation Ireland, 2015)

Type of Hedgerow / Treeline	Code	Description / Bat Potential
Small Hedgerow	**SH**	Hedgerow is less than approximately 1.5 m high, there are no, or very few, protruding bushes or trees. This type of hedgerow would provide little shelter to bats.
Medium Hedgerow	**MH**	Hedgerow is approximately 1.5 to 3 m high. This type of hedgerow will provide foraging and commuting potential for bats.
Sparse Treeline Hedgerow	**ST**	Hedgerow, low or medium in height, with individuals trees (where tree canopies, for the most part, do not touch).

Dense Treeline Hedgerow	**DT**	Large uncut hedgerows or treelines, dominated by mainly large tree or very tall scrub species (e.g. tall hawthorn, blackthorn or hazel), where the canopies are mostly touching.

Table 1.B: Habitat Classification (Bat Conservation Ireland, 2015, based on Fossit, 2000)

Cultivated land		Salt marshes		Exposed rock		Fens/flushes	
Built land		Brackish waters		Caves		Grasslands	
Coastal structures		Springs		Freshwater marsh		Scrub	
Shingle/gravel		Swamps		Lakes/ponds		Hedges/treelines	
Sea cliffs/islets		Disturbed ground		Heath		Conifer plantation	
Sand dunes		Watercourse		Bog		Woodland	

9.2 Appendix 2 Bat Assessment Tables

Table 4.1 Guidelines for assessing the potential suitability of proposed development sites for bats, based on the presence of habitat features within the landscape, to be applied using professional judgement.

Suitability	Description Roosting habitats	Commuting and foraging habitats
Negligible	Negligible habitat features on site likely to be used by roosting bats.	Negligible habitat features on site likely to be used by commuting or foraging bats.
Low	A structure with one or more potential roost sites that could be used by individual bats opportunistically. However, these potential roost sites do not provide enough space, shelter, protection, appropriate conditions[a] and/or suitable surrounding habitat to be used on a regular basis or by larger numbers of bats (i.e. unlikely to be suitable for maternity or hibernation[b]). A tree of sufficient size and age to contain PRFs but with none seen from the ground or features seen with only very limited roosting potential.[c]	Habitat that could be used by small numbers of commuting bats such as a gappy hedgerow or unvegetated stream, but isolated, i.e. not very well connected to the surrounding landscape by other habitat. Suitable, but isolated habitat that could be used by small numbers of foraging bats such as a lone tree (not in a parkland situation) or a patch of scrub.
Moderate	A structure or tree with one or more potential roost sites that could be used by bats due to their size, shelter, protection, conditions[a] and surrounding habitat but unlikely to support a roost of high conservation status (with respect to roost type only – the assessments in this table are made irrespective of species conservation status, which is established after presence is confirmed).	Continuous habitat connected to the wider landscape that could be used by bats for commuting such as lines of trees and scrub or linked back gardens. Habitat that is connected to the wider landscape that could be used by bats for foraging such as trees, scrub, grassland or water.
High	A structure or tree with one or more potential roost sites that are obviously suitable for use by larger numbers of bats on a more regular basis and potentially for longer periods of time due to their size, shelter, protection, conditions[a] and surrounding habitat.	Continuous, high-quality habitat that is well connected to the wider landscape that is likely to be used regularly by commuting bats such as river valleys, streams, hedgerows, lines of trees and woodland edge. High-quality habitat that is well connected to the wider landscape that is likely to be used regularly by foraging bats such as broadleaved woodland, tree-lined watercourses and grazed parkland. Site is close to and connected to known roosts.

[a] For example, in terms of temperature, humidity, height above ground level, light levels or levels of disturbance.
[b] Evidence from the Netherlands shows mass swarming events of common pipistrelle bats in the autumn followed by mass hibernation in a diverse range of building types in urban environments (Korsten *et al.*, 2015). This phenomenon requires some research in the UK but ecologists should be aware of the potential for larger numbers of this species to be present during the autumn and winter in large buildings in highly urbanised environments.
[c] This system of categorisation aligns with BS 8596:2015 Surveying for bats in trees and woodland (BSI, 2015).

Figure A: Table 4.1 (p 35) Reproduced from Collins (2016).

(1) Conversion, modification, demolition or removal of buildings (including hotels, schools, hospitals, churches, commercial premises and derelict buildings) which are:

- agricultural buildings (e.g. farmhouses, barns and outbuildings) of traditional brick or stone construction and/or with exposed wooden beams;
- buildings with weather boarding and/or hanging tiles that are within 200m of woodland and/or water;
- pre-1960 detached buildings and structures within 200m of woodland and/or water;
- pre-1914 buildings within 400m of woodland and/or water;
- pre-1914 buildings with gable ends or slate roofs, regardless of location;
- located within, or immediately adjacent to woodland and/or immediately adjacent to water;
- Dutch barns or livestock buildings with a single skin roof and board-and-gap or Yorkshire boarding if, following a preliminary roost assessment, the site appears to be particularly suited to bats.

(2) Development affecting built structures:

- tunnels, mines, kilns, ice-houses, adits, military fortifications, air-raid shelters, cellars and similar underground ducts and structures; unused industrial chimneys that are unlined and brick/stone construction;
- bridge structures, aqueducts and viaducts (especially over water and wet ground).

(3) Floodlighting of:

- churches and listed buildings, green space (e.g. sports pitches) within 50m of woodland, water, field hedgerows or lines of trees with connectivity to woodland or water;
- any building meeting the criteria listed in (1) above.

(4) Felling, removal or lopping of:

- woodland;
- field hedgerows and/or lines of trees with connectivity to woodland or water bodies;
- old and veteran trees that are more than 100 years old;
- mature trees with obvious holes, cracks or cavities, or that are covered with mature ivy (including large dead trees).

(5) Proposals affecting water bodies:

- in or within 200m of rivers, streams, canals, lakes, reed beds or other aquatic habitats.

(6) Proposals located in or immediately adjacent to:

- quarries or gravel pits;
- natural cliff faces and rock outcrops with crevices or caves and swallets.

(7) Proposals for wind farm developments of multiple wind turbines and single wind turbines (depending on the size and location) (NE TIN 051 – undergoing updates at the time of writing).

(8) All proposals in sites where bats are known to be present[1]

This may include proposed development affecting any type of buildings, structures, feature or location.

Notes:

1. Where sites are of international importance to bats, they may be designated as SACs. Developers of large sites 5–10km away from such SACs may be required to undertake a HRA.

Figure B: Reproduced from Collins (2016) – page 13.

Table 2 Factors affecting the probability of bats being present.

Factors affecting the probability of a building being used by bats in summer	
Increased probability	Disused or little used; largely undisturbed
	Large roof void with unobstructed flying spaces
	Large dimension roof timbers with cracks, joints and holes
	Uneven roof covering with gaps, though not too draughty
	Entrances that bats can fly in through
	Hanging tiles or wood cladding, especially on south-facing walls
	Rural setting
	Close to woodland and/or water
	Pre-20th century or early 20th century construction
	Roof warmed by the sun
	Within the distribution area of horseshoe bats
Decreased probability	Highly urbanised area with few feeding places
	Small or cluttered roof void (esp. for brown long-eared bat)
	Heavily disturbed
	Modern construction with few gaps around soffits or eaves (but be aware these may be used by pipistrelles in particular)
	Prefabricated with steel and sheet materials
	Active industrial premises
	Roof shaded from the sun
Factors affecting the probability of trees being used by roosting bats	
Increased probability	In ancient woodland or parkland
	Large trees with complex growth form
	Species that typically form cavities, such as beech, willow, oak or ash
	Visible damage caused by rot, wind, lightning strike *etc.*
	Loose bark providing cavities
Decreased probability	Coniferous plantation with no specimen trees
	Young trees with simple growth form and little damage
Factors affecting the probability of underground sites being used by roosting bats	
Increased probability	Large enough to develop stable temperature in winter
	High humidity
	Undisturbed
	Close to woodland or water (but note that bats will also use upland sites)
	Many cracks and crevices suitable for bats
Decreased probability	Small and draughty
	Heavily disturbed
	In urbanised areas
	Smooth surfaces with few roosting opportunities

Figure C: Table 2 Reproduced from Marnell *et al.* (2022).

9.3 Appendix 3 Nightly Bat Activity – Static Surveillance

Static 1

Date	Common pipistrelle	Soprano pipistrelle	Leisler's bat	Brown long-eared bat	Daubenton's bat	Natterer's bat	Myotis bat	Nathusius' pipistrelle
09/08/2023	107	180	36	2	3	0	3	0
10/08/2023	6	22	6	1	0	0	0	0
11/08/2023	29	154	2	0	1	1	1	0
12/08/2023	14	46	3	1	1	0	0	0
13/08/2023	41	37	12	2	2	0	0	0
14/08/2023	30	185	21	2	2	0	0	0
15/08/2023	41	199	21	2	2	0	5	0
	268	**823**	**101**	**10**	**11**	**1**	**9**	**0**

Static 2

Date	Common pipistrelle	Soprano pipistrelle	Leisler's bat	Brown long-eared bat	Daubenton's bat	Natterer's bat	Myotis bat	Nathusius' pipistrelle
09/08/2023	68	43	60	6	0	4	2	5
10/08/2023	37	25	27	0	2	2	3	0
11/08/2023	14	17	8	0	1	2	1	2
12/08/2023	149	97	4	3	1	1	3	0
13/08/2023	36	18	22	3	1	1	3	3
14/08/2023	95	45	27	3	3	3	3	12
15/08/2023	33	31	12	1	1	3	3	1
	432	**276**	**160**	**16**	**9**	**16**	**18**	**23**

Static 3

Date	Common pipistrelle	Soprano pipistrelle	Leisler's bat	Brown long-eared bat	Daubenton's bat	Natterer's bat	Myotis bat	Nathusius' pipistrelle
09/08/2023	133	38	16	2	2	2	0	1
10/08/2023	5	1	6	0	0	0	0	0
11/08/2023	16	10	0	0	0	0	0	1
12/08/2023	0	0	0	0	0	0	0	0
13/08/2023	29	10	7	0	1	0	1	0
14/08/2023	41	6	22	0	0	0	0	1
15/08/2023	50	10	19	1	1	1	0	3
	274	**75**	**70**	**3**	**4**	**3**	**1**	**6**

Static 4

Date	Common pipistrelle	Soprano pipistrelle	Leisler's bat	Brown long-eared bat	Daubenton's bat	Natterer's bat	Myotis bat	Nathusius' pipistrelle
09/08/2023	149	32	10	1	0	0	1	0
10/08/2023	724	269	4	0	0	1	1	1
11/08/2023	793	184	2	0	0	0	0	2
12/08/2023	1346	473	2	0	0	0	0	3
13/08/2023	381	27	6	0	0	1	0	0
14/08/2023	409	131	18	0	0	0	1	4
15/08/2023	451	64	7	0	0	0	0	10
	4253	**1180**	**49**	**1**	**0**	**2**	**3**	**20**

Static 5

Date	Common pipistrelle	Soprano pipistrelle	Leisler's bat	Brown long-eared bat	Daubenton's bat	Natterer's bat	Myotis bat	Nathusius' pipistrelle
09/08/2023	112	12	8	1	0	0	1	0
10/08/2023	501	167	1	0	0	1	1	1
11/08/2023	389	87	2	1	0	0	1	2
12/08/2023	892	267	2	0	0	0	0	0
13/08/2023	175	11	6	0	0	2	0	0
14/08/2023	311	91	11	0	0	0	1	4
15/08/2023	321	21	7	0	0	0	0	1
	2701	**656**	**37**	**2**	**0**	**3**	**4**	**8**

10. Bat Species Profile

10.1 Leisler's bat

Ireland's population is deemed of international importance and the paucity of knowledge of roosting sites, makes this species vulnerable. However, it is considered to be widespread across the island. The modelled Core Area for Leisler's bats is a relatively large area that covers much of the island of Ireland (52,820km^2). The Bat Conservation Ireland Irish Landscape Model indicated that the Leisler's bat habitat preference has been difficult to define in Ireland. Habitat modelling for Ireland shows an association with riparian habitats and woodlands (Roche *et al.*, 2014). The landscape model emphasised that this is a species that cannot be defined by habitats preference at a local scale compared to other Irish bat species but that it is a landscape species and has a habitat preference at a scale of 20.5km. In addition, of all Irish bat species, Leisler's bats have the most specific roosting requirements. It tends to select roosting habitat with areas of woodland and freshwater.

Irish Status	Near Threatened
European Status	Least Concern
Global Status	Least Concern
Irish Population Trend	2003-2013 ↑
Estimated Irish Population Size	73,000 to 130,000 (2007-2013) Ireland is considered the world stronghold for this species
Estimate Core Area (Lundy *et al. 2011*)	52,820 km^2

Taken from Roche *et al.*, 2014, Lysaght & Marnell, 2016 & Marnell *et al.*, 2019

The principal concerns for Leisler's bats are poorly known in Ireland but those that are relevant for this survey area are as follows:

- Selection of maternity sites is limited to specific habitats;
- Relative to the population estimates, the number of roost sites is poorly recorded;
- Tree felling, especially during autumn and winter months; and
- Increasing urbanisation.

10.2 Common pipistrelle

This species is generally considered to be the most common bat species in Ireland. The species is widespread and is found in all provinces. The modelled Core Area for common pipistrelles is a large area that covers much of the island of Ireland (56,485km^2) which covers primarily the east and south east of the area (Roche *et al.*, 2014). The Bat Conservation Ireland Irish Landscape Model indicated that the Common pipistrelle selects areas with broadleaf woodland, riparian habitats and low density urbanization (<30%) (Roche *et al.*, 2014).

Irish Status	Least Concern
European Status	Least Concern
Global Status	Least Concern
Irish Population Trend	2003-2013 ↑
Estimated Irish Population Size	1.2 to 2.8 million (2007-2012)
Estimate Core Area (km^2) (Lundy *et al. 2011*)	56,485

Taken from Roche *et al.*, 2014, Lysaght & Marnell, 2016 & Marnell *et al.*, 2019

Principal concerns for Common pipistrelles in Ireland that are relevant for this survey area are as follows:

- Lack of knowledge of roosting requirements
- This species has complex habitat requirements in the immediate vicinity of roosts. Therefore, careful site specific planning for this species is required in order to ensure all elements are maintained.
- Renovation or demolition of derelict buildings.
- Tree felling
- Increasing urbanisation (e.g. increase in lighting)

10.3 Soprano pipistrelle

This species is generally considered to be the second most common bat species in Ireland. The species is widespread and is found in all provinces, with particular concentration along the western seaboard. The modelled Core Area for soprano pipistrelle is a large area that covers much of the island of Ireland (62,020km^2). The Bat Conservation Ireland Irish Landscape Model indicated that the soprano pipistrelle selects areas with broadleaf woodland, riparian habitats and low density urbanisation (Roche *et al.*, 2014).

Irish Status	Least Concern
European Status	Least Concern
Global Status	Least Concern
Irish Population Trend	2003-2013 ↑
Estimated Irish Population Size	0.54 to 1.2 million (2007-2012)
Estimate Core Area (km^2) (Lundy *et al. 2011)*	62,020

Taken from Roche *et al.*, 2014, Lysaght & Marnell, 2016 & Marnell *et al.*, 2019

Principal concerns for Soprano pipistrelles in Ireland that are relevant for this survey area are as follows:

- Lack of knowledge of roosts;
- Renovation or demolition of structures;
- Tree felling; and
- Increasing urbanisation (e.g. increase in lighting).

10.4 Brown long-eared Bat

This species is generally considered to be widespread across the island. The modelled Core Area for Brown long-eared bats is a relatively large area that covers much of the island of Ireland (52,820km^2) with preference suitable areas in the southern half of the island. The Bat Conservation Ireland Irish Landscape Model indicated that the Brown long-eared bat habitat preference is for areas with broadleaf woodland and riparian habitats on a small scale of 0.5km emphasising the importance of local landscape features for this species (Roche *et al.*, 2014).

Irish Status	Least Concern
European Status	Least Concern
Global Status	Least Concern
Irish Population Trend	2008-2013 Stable
Biographical Range	km^2
Estimate Core Area (Lundy *et al. 2011)*	49,929 km^2

Taken from Roche *et al.*, 2014, Lysaght & Marnell, 2016 & Marnell *et al.*, 2019

Principal concerns for brown long-eared bats are poorly known in Ireland, but those that are relevant for this survey area are as follows:

- Selection of maternity sites is limited to specific habitats;
- Lack of knowledge of winter roosts;
- Loss of woodland, scrub and hedgerows;
- Tree surgery and felling;
- Increasing urbanisation; and
- Light pollution.

10.5 Natterer's bat

There are three species included in the *Myotis* species family and their echolocation calls are very similar across these three species. The modelled Core Area for Natterer's bats is a relatively large area that covers much of the island of Ireland (52,864km^2). The Bat Conservation Ireland Irish Landscape Model indicated that the Natterer's bat selects areas with broadleaf woodland, riparian habitats and areas with larger scale provision of mixed forest (Roche *et al.*, 2014). Therefore, it is likely that this species is more widespread within the survey area.

Irish Status	Least Concern
European Status	Least Concern
Global Status	Least Concern
Irish Population Trend	Unknown
Estimated Irish Population Size	Unknown
Estimate Core Area (Lundy *et al. 2011)*	52,864

Taken from Roche *et al.*, 2014, Lysaght & Marnell, 2016 & Marnell *et al.*, 2019

Principal concerns for Natterer's bats in Ireland that are relevant for this survey area are as follows:

- Lack of knowledge of roosting requirements;
- This species has complex habitat requirements in the immediate vicinity of roosts. Therefore careful site specific planning for this species is required in order to ensure all elements are maintained;
- Tree felling; and
- Increasing urbanisation (e.g. increase in lighting).

10.6 Daubenton's bat

The modelled Core Area for Daubenton's bats is a relatively large area that covers much of the island of Ireland (41,285km^2) reflecting the distribution of sizeable river catchments. The Irish Landscape Model indicated that the Daubenton's bat habitat preference is for areas with broadleaf woodland, riparian habitats and low density urbanisation (Roche *et al.*, 2014).

Irish Status	Least Concern
European Status	Least Concern
Global Status	Least Concern
Irish Population Trend	2008-2013 Stable
Estimated Irish Population Size	81,000 to 103,000 (2007-2012)
Estimate Core Area (km^2) (Lundy *et al. 2011)*	41,285

Taken from Roche *et al.*, 2014, Lysaght & Marnell, 2016 & Marnell *et al.*, 2019

Principal concerns for Daubenton's bats are poorly known in Ireland but those that are relevant for this survey area are as follows:

- Potential roost loss due to bridge maintenance;
- Loss of woodland and forest clearance;
- Loss of woodland, scrub and hedgerows;
- Tree surgery and felling;
- Increasing urbanisation; and
- Light pollution.

10.7 Whiskered bat

The modelled Core Area for whiskered bats is a relatively small area (29,222 km2) compared to the other two resident *Myotis* bat species. The range is restricted to southern and eastern areas of Ireland. The Irish Landscape Model indicated that the whiskered bat habitat preference is for areas of woodland cover, small areas of pasture, urban and scrub habitat (Roche *et al.*, 2014).

Irish Status	Least Concern
European Status	Least Concern
Global Status	Least Concern
Irish Population Trend	Unknown
Estimated Irish Population Size	Unknown
Estimate Core Area (km^2) (Lundy *et al. 2011)*	29,222

Taken from Roche *et al.*, 2014, Lysaght & Marnell, 2016 & Marnell *et al.*, 2019

Principal concerns for whiskered bats are poorly known in Ireland but those that are relevant for this survey area are as follows:

- Lack of knowledge of roosting requirements, swarming sites
- Riparian habitat loss
- Loss of woodland and forest clearance
- Loss of woodland, scrub and hedgerows
- Tree surgery and felling
- Increasing urbanisation
- Light pollution

10.8 Nathusius' pipistrelle

The modelled Core Area for Nathusius' pipistrelle is a relatively restricted area (13,543km^2) and these areas are primarily associated with large water bodies such as Lough Neagh and the Lough Erne complex. The Bat Conservation Ireland Irish Landscape Model indicated that the Nathusius' pipistrelle habitat preference is large waterbodies (Roche *et al.*, 2014). But due to the paucity of information on this species, the knowledge of this species preference in Ireland is limited, any records recorded for this species is important.

Irish Status	Least Concern
European Status	Least Concern
Global Status	Least Concern
Irish Population Trend	2003-2013 (limited data, probably stable
Estimated Irish Population Size	10,000 to 18,000 (2007-2013)
Estimate Core Area (km^2) (Lundy *et al. 2011)*	13,543

Taken from Roche *et al.*, 2014, Lysaght & Marnell, 2016 & Marnell *et al.*, 2019

The principal concerns for Nathusius' pipistrelle is the fact that roosting sites are poorly known in the Republic of Ireland:

- Lack of knowledge of winter sites and whether migration occurs;
- Renovation or demolition of derelict buildings and structures may cause undocumented roost losses; and
- Water pollution may be a threat to this species because it is particularly associated with lakes.

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6.0 LAND, SOILS & GEOLOGY

6.1 Background and Objectives

This chapter of the EIAR provides a baseline assessment of the environmental setting of the proposed quarry in terms of land, soils and geology and discusses the potential likely effects that the proposed development will have. Where required, appropriate mitigation measures to limit any identified significant effects to land, soils and geology are recommended.

6.2 Proposed Development Overview

The proposed development is a new quarry within a greenfield site at Rhine, Killoe, Co. Longford. An existing working quarry operated by the applicant is located to the north east of the application site which will close subject to granting of permission at the application site. The total reserve of material at the quarry is estimated to be 4.1 million tonnes of material which will be extracted over a number of phases within the proposed 25 year period. The extracted material will be processed into various grades of aggregate which will be sold to market or used to manufacture a range of concrete products.

6.3 Relevant Legislation

The Land, Soils and Geology Chapter of the EIAR is prepared in accordance with the requirements of European Union Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment (the 'EIA Directive') as amended by Directive 2014/52/EU. Regard has also been taken of the requirements of the following legislation.

- European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2001 – 2022;
- The Planning and Development Acts 2000, as amended;
- Planning and Development Regulations 2001-2022;
- S.I. No. 4 of 1995: The Heritage Act 1995, as amended; and,
- Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment, including Circular Letter PL 1/2017: Implementation of Directive 2014/52/EU on the effects of certain public and private projects on the environment (EIA Directive).

6.4 Relevant Guidance

The Land, Soils and Geology Chapter of the EIAR is carried out in accordance with guidance contained in the following:

- Environmental Protection Agency (May 2022): Guidelines on the Information to be Contained in Environmental Impact Assessment Reports;
- Environmental Protection Agency (September 2015): Draft - Advice Notes on Current Practice (in the preparation on Environmental Impact Statements);
- Environmental Protection Agency (September 2015): Draft – Revised Guidelines on the Information to be Contained in Environmental Impact Statements;
- Environmental Protection Agency (2003): Advise Notes on Current Practice (in the Preparation on Environmental Impact Statements);
- Environmental Protection Agency (2002): Guidelines on the Information to be Contained in Environmental Impact Statements;
- Institute of Geologists Ireland (2013): Guidelines for Preparation of Soils, Geology & Hydrogeology Chapters in Environmental Impact Statements;
- National Roads Authority (2005): Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes (NRA, 2005);
- Department of the Environment, Heritage and Local Government; Quarries and Ancillary Activities – Guidance for Authorities (April, 2014); and,
- Environmental Protection Agency (2006): Environmental Management in the Extractive Industry (Non-Scheduled Minerals).

6.5 Schedule of Works

6.5.1 Desk Study

A desk study of the proposed site and surrounding area was completed prior to the undertaking of field mapping and walkover assessments. The desk study involved collecting all relevant geological and hydrogeological data for the study area. This included consultation with the following:

- Environmental Protection Agency database (www.epa.ie);
- Geological Survey of Ireland (GSI) - Groundwater Database (www.gsi.ie);
- Met Eireann Meteorological Databases (www.met.ie);
- National Parks & Wildlife Services Public Map Viewer (www.npws.ie);
- EPA/Water Framework Directive "Catchments" Map Viewer (www.catchments.ie);
- Bedrock Geology 1:100,000 Scale Map Series;
- Geological Survey of Ireland (GSI) - Groundwater Body Characterisation Reports.
- Review of Geophysical Reports and Geology at a Proposed Quarry Site at Killoe, Ballinalee, Dr John Colthurst, July 2020;

6.5.2 Baseline Surveys and Investigations

To complete the Land, Soils and Geology Chapter of the EIAR, the following surveys and investigations were carried out:

- A walkover survey to assess the ground conditions and layout of the proposed site including surveys of adjacent lands;
- APEX Geophysics carried out geophysical surveys over the northern part of the site in 2018 and they completed further surveys in 2020.
- Drilling of 7 no. investigation holes/monitoring wells to assess overburden lithology, depth to the bedrock and for groundwater level monitoring and sampling;

6.5.3 Impact Assessment Methodology

Please refer to Chapter 1.0 of the EIAR for details on the impact assessment methodology (EPA, 2002, 2003, 2015 and 2022). In addition to the above methodology, the importance of the land, soils and geological environment receptors was assessed on completion of the desk study and baseline study.

Using the National Roads Authority (2008) guidance, an estimation of the importance of the land, soils and geological environments within the study area are quantified, using the criteria set out in Table 6.1.

Table 6.1: Estimation of Importance of Geology Attributes (NRA, 2008)

Importance	Criteria	Typical Example
Very High	• Attribute has a high quality, significance or value on a regional or national scale. • Degree or extent of soil contamination is significant on a national or regional scale. • Volume of peat and/or soft organic soil underlying route is significant on a national or regional scale.	• Geological feature rare on a regional or national scale (NHA/SAC). • Large existing quarry or pit. • Proven economically extractable mineral resource.
High	• Attribute has a high quality, significance or • value on a local scale. • Degree or extent of soil contamination is significant on a local scale. • Volume of peat and/or soft organic soil underlying site is significant on a local scale.	• Contaminated soil on site with previous heavy industrial usage. • Large recent landfill site for mixed wastes. • Geological feature of high value on a local scale (County Geological Site). • Well drained and/or high fertility soils. • Moderately sized existing quarry or pit . • Marginally economic extractable mineral resource.
Medium	• Attribute has a medium quality, significance or value on a local scale. • Degree or extent of soil contamination is moderate on a local scale. • Volume of peat and/or soft organic soil underlying site is moderate on a local scale.	• Contaminated soil on site with previous light industrial usage. • Small recent landfill site for mixed Wastes. • Moderately drained and/or moderate fertility soils. • Small existing quarry or pit. • Sub-economic extractable mineral resource.
Low	• Attribute has a low quality, significance or value on a local scale. • Degree or extent of soil contamination is minor on a local scale. • Volume of peat and/or soft organic soil underlying site is small on a local scale.	• Large historical and/or recent site for construction and demolition wastes. • Small historical and/or recent landfill site for construction and demolition wastes. • Poorly drained and/or low fertility soils. • Uneconomically extractable mineral resource.

The statutory criteria for the assessment of likely significant effects require that likely effects are described with respect to their extent, magnitude, type (i.e. negative, positive or neutral) probability, duration, frequency, reversibility, and transfrontier nature (if applicable).

The impact descriptors used in this assessment are those set out in (the EIA Directive) in the Glossary of effects as shown in Chapter 1.0 of this EIAR.

6.6 Existing Environment

6.6.1 Site Description and Topography

The application site consists of greenfield paddocks separated by hedgerows, an area of peatland to the northwest which was historically subject to peat extraction and an area of planted mixed woodland located on the eastern boundary.

The majority of the application site is located on the western side of a north south ridge which has a peak level of 71mOD. The extraction/manufacturing area of the application site varies from a level of 55mOD along the western boundary to 70mOD along the eastern boundary.

The main surface water course in the area is the River Camlin which flows in a south easterly direction joining the River Shannon at the Cloondara village. The river Camlin is located 360m to the southwest of the application site at its closest point. A number of tributaries flow into the River Camlin along its course including the Rhine Stream which flows in an easterly direction along the northern boundary of the existing quarry to the east of the proposed development. The Rhine Stream is located approximately 50m to the east of the point where the haul road joins the L5097 Local Road.

6.6.2 Land-use

Land-use in the vicinity of the application site include agriculture consisting of livestock farming. Historical peat extraction and commercial forestry is also evident from aerial photography. There are number residences in the immediate vicinity of the development comprising of isolated farm dwellings and ribbon development. An operational quarry is located to the north east of the application site which is operated by Rhyne Rock.

The closest licensed waste facility is Mulleady's Limited (Drumlish) which is located 6km to the northwest of the application site. The closest IPPC licenced facility is Mr Padraig Kiernan (Ballinalee Pig Farm) located 2.3km south east of the application site.

6.6.3 Local Soils and Subsoils

Based on the GSI subsoils map (www.gsi.ie), Till derived chiefly from Lower Palaeozoic rocks and peat are mapped within the site boundary and these deposits are mapped to extend to the north, south, east and west of the site. A local subsoil geology map is shown as Plate 6.1 with details of the subsoils tabulated in Table 6.2.

Plate 6.1: GSI Teagasc Soils Map

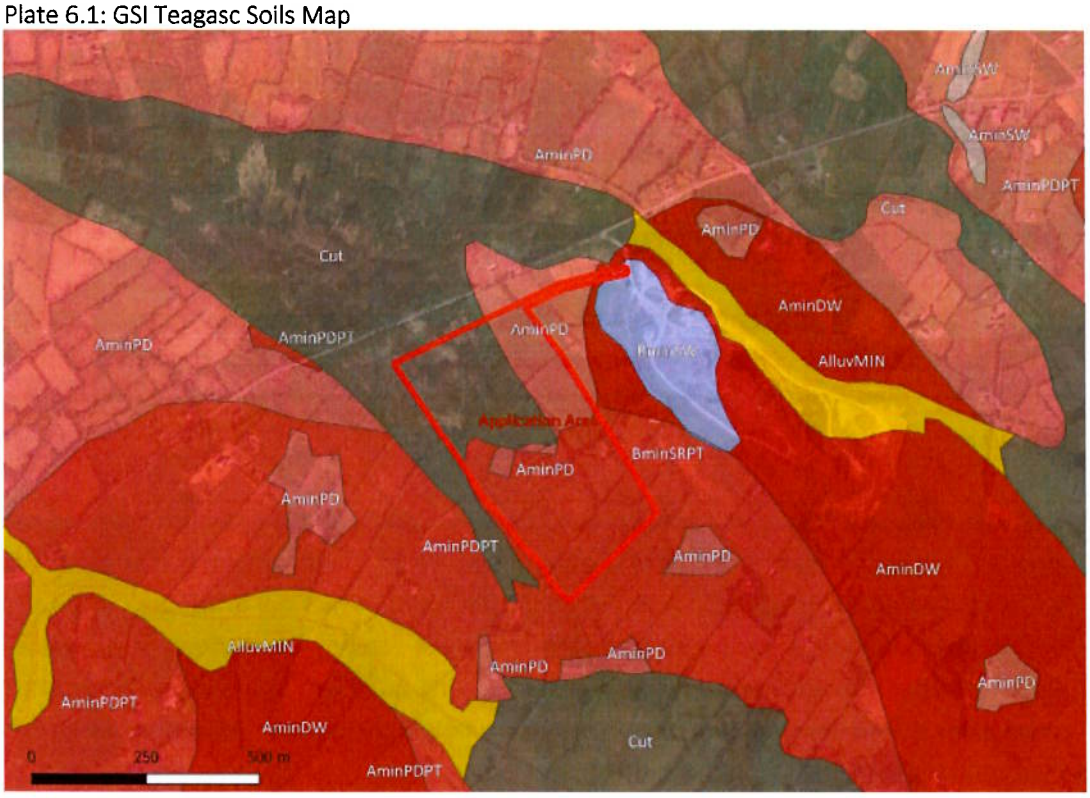


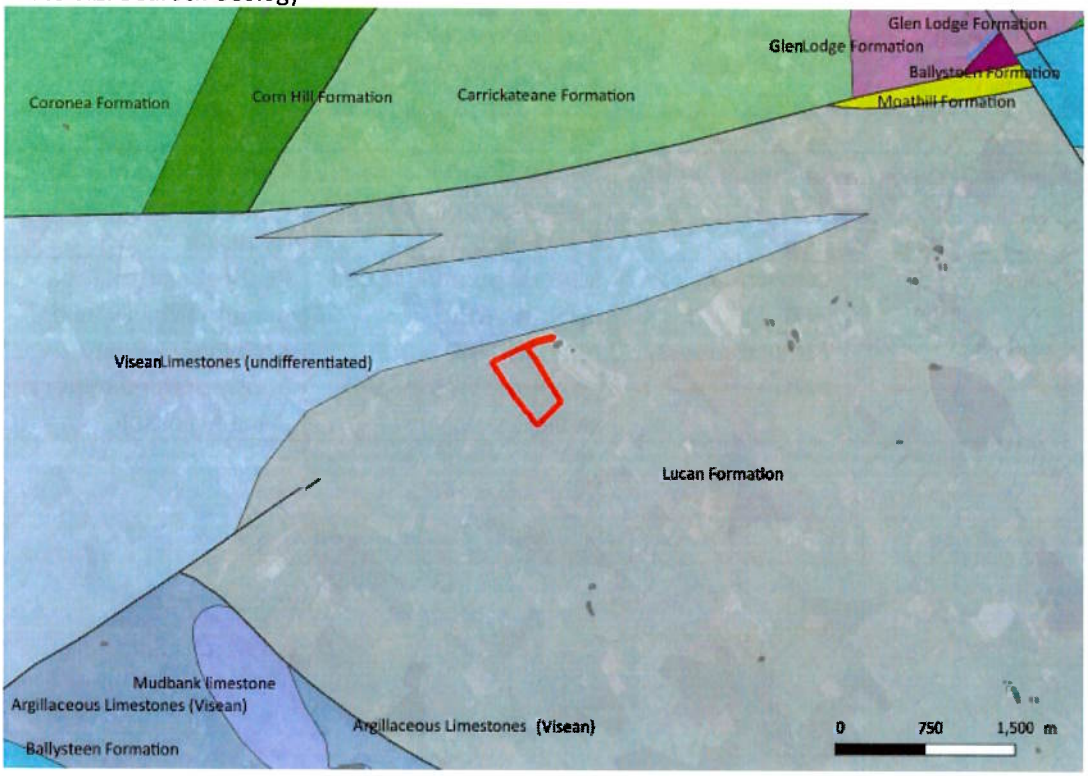
Table 6.2: Soil Types in the Vicinity of the Site

Parent Material	Cut	TLPSsS	TLPSsS
Parent Material Name	Peat	Till derived chiefly from Lower Palaeozoic rocks	Till derived chiefly from Lower Palaeozoic rocks
Parent Material Description	Cut Peat	Sandstone and shale till (Lower Palaeozoic)	Sandstone and shale till (Lower Palaeozoic)
Soil Group	Basin Peats, Blanket Peats (some)	Surface water Gleys, Ground water Gleys	Peaty Gleys
Soil Code	Cut	AminPD	AminPDPT
Soil Description	Cutaway/cutover peat	Derived from mainly non-calcareous parent materials	Derived from mainly non-calcareous parent materials
Label	Cutover/cutaway peat	Mineral poorly drained (Mainly acidic)	Peaty poorly drained mineral (Mainly acidic)
Legend	Cutover/cutaway peat	AminPD - Mineral poorly drained (Mainly acidic)	AminPDPT - Peaty poorly drained mineral (Mainly acidic)

6.6.4 Local Bedrock Geology

Based on the GSI bedrock geology map (www.gsi.ie), Dark limestone & shale (`calp) of the Lucan Formation are mapped to underlie the proposed development (Plate 6.2).

Plate 6.2: Bedrock Geology



6.6.5 Site Geology

Apex Geophysical Investigation Report was carried out in 2018 and 2020 (see Appendix 6.1) Dr John Colthurst EurGeol, PhD, PGeo was commissioned to review geophysical surveys carried out by Apex Geoservices in 2018 and 2020 and to carry out further site investigations to establish the overburden and bedrock content. A copy of Dr Colthurst report is attached in Appendix 6.2

The Geophysical Surveys included EM-31 Ground Conductivity Mapping, Electrical Resistivity Tomography (ERT) profiling, and Seismic Refraction profiling. They produced an Integrated Interpretation from the ERT and Seismic Profiling Results and they also completed a Resource Estimation.

6.6.5.1 Geologist Review

The Professional Geologist has read the APEX reports and considered them in conjunction with his knowledge of the existing quarry. The geophysical reports provide a detailed interpretation for the area southwest of the quarry.

- Overburden ranges from 0.5m to 28m in thickness. As would be expected the thickest overburden is on the line of the drumlin (APEX line R2). Most of the overburden is silt, clay and silty gravel. There may be a small deposit of sand and gravel on APEX 2018 profile R4. Resistivity values of <350 Ohm-m are typical of glacial overburden and in general the higher the resistivity within this range the gravellier the material.

- Three different types of bedrock are indicated by the resistivities. Low Resistivities (50-350 Ohm-m) are associated with mudstone or shale, medium resistivities (350-1000 Ohm-m) are interpreted as indicating interbedded shale and limestone. Higher resistivities, up to 5000 Ohm-m, are associated with cleaner limestone bedrock. All the rock exposed in the quarry would be expected to have resistivities in this higher range.

The presence of three different rock types is perhaps unexpected as the beds in the quarry are flat lying and there is no obvious evidence of faulting.

The shales and mudstones could be faulted into position, as facies changes are unlikely in this environment. An alternative explanation would be that they are present in the axial areas of synclines, but this this would require steeper dips than are seen in the existing quarry. There is some evidence that this may be the case; Apex Line R03 and S03 shows interpreted interbedded Limestone/Shale bedrock overlying better quality limestone at 100m from the start of the line.

Mudstones and shales will not produce a useable aggregate. S.R.21 requires material with less than 10% sedimentary mudrock. In addition, shales and mudstones normally have poor Los Angeles Abrasion Values, Magnesium Sulphate Soundness and a higher sulphur content. The Tobercolleen Formation, indicated in the stratigraphic table, was a source of high sulphur (pyritic) aggregate culpable for pyrite problems in the greater Dublin area and should be avoided. The shales detected by the geophysical surveys are unlikely to be the Tobercoleen Formation but in any case, they will not be a good quality aggregate.

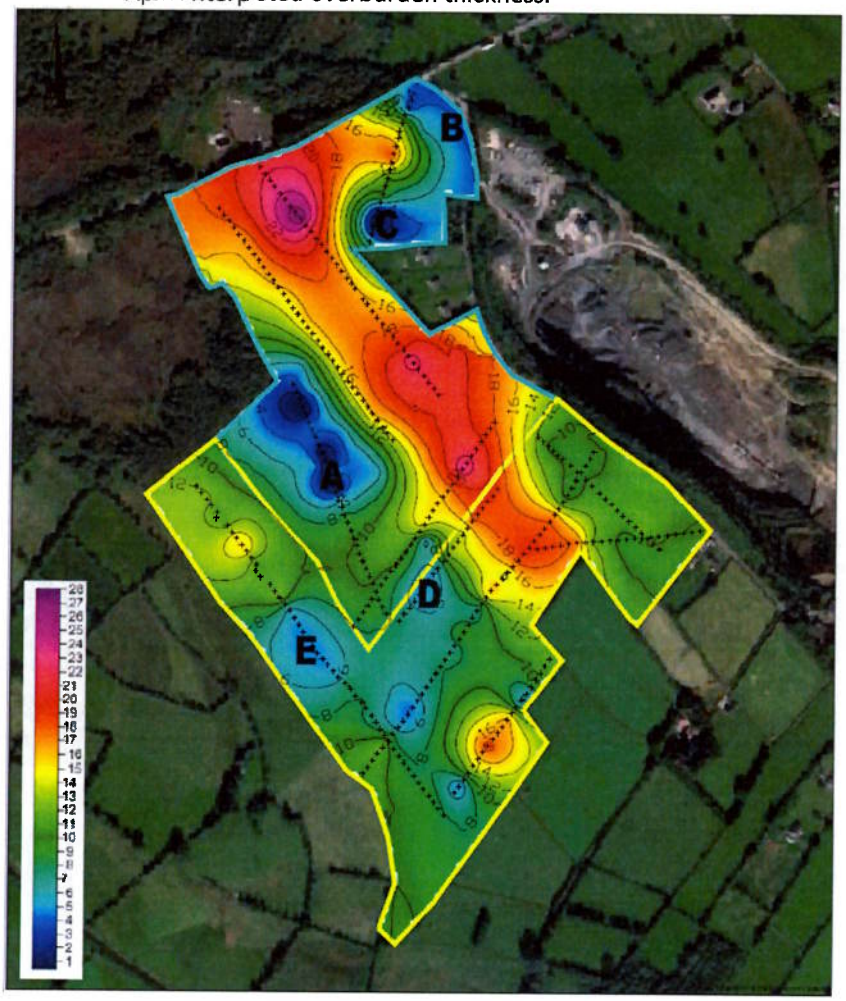
The Limestone/Shale might be useable but would almost certainly require additional processing to screen out the shaly material. It is also possible that some of this material is a

weathered version of the limestone as weathering will tend to reduce the resistivity. Apex line R5 shows a body of interbedded Limestone/Shale at 140 to 180m along the line. This could be a karsted zone within the limestones, like the large karst body present on the northeastern side of the existing quarry.

The limestone will be good quality material like the material currently being produced in the quarry.

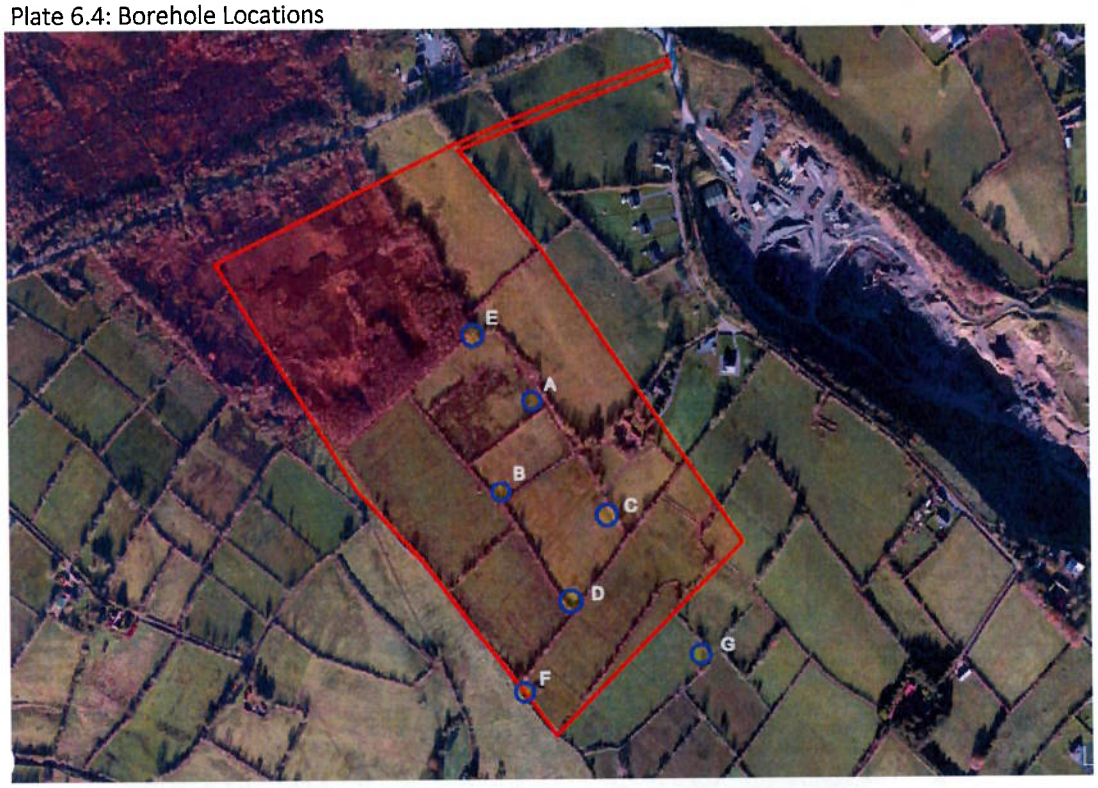
Apex have identified 5 areas, A, B, C, D, and E (Plate 6.3) where the overburden is reasonably thin 'mostly less than 5m. B and C are on the northeastern part of the site close to the entrance to the existing quarry. The bedrock here is high resistivity, indicating that it is limestone, but the area is too close to houses, the main road and a minor road to be suitable for quarrying. The other three areas, A, D and E are all southwest of the drumlin feature.

Plate 6.3: Apex Interpreted overburden thickness.



Dr.Colthurst proposed the drilling of diamond drillholes to evaluate the geophysical results and in December 2020, a drilling programme was decommissioned of the site. In total seven holes were completed as shown on Plate 6.4.

Plate 6.4: Borehole Locations



The results of drilling showed that overall the overburden ranged in thickness from 3.7 metres in Borehole E to greater than 15 metres in Boreholes F and G. The overburden consisted of heavy brown sticky boulder clay with pebbles and boulders of limestone, sandstone and Lower Palaeozoic greywacke and slate. The bedrock is fresh to very slightly weathered immediately below the overburden and there was no evidence for deep weathering or karstification.

The bedrock is similar in all the drillholes and there is no evidence of the variation suggested by the geophysics. The dominant lithology in all drillholes is a hard, silicified fine calcarenite or less commonly micrite. There is no significant shale or argillaceous mudstone present in any of the drillholes. Individual beds are variable in thickness but in general beds seem to range between 20 and 50 cms in thickness. Bedding planes are often rough or stylolitic in nature and sometimes there is a thin film of black carbonaceous material on the bedding planes.

Fossils are quite scarce but occasional crinoid fragments and brachiopods were observed. Bioturbation is common in some of the silty calcarenite units. No pyrite was observed and

dolomitization is rare, limited to a <1m interval in Borehole C. Dark grey to black chert nodules are present in all the drillholes with up to 10% chert in the chertiest sections.

It isn't possible to correlate directly from drillhole to drillhole but the sequence is similar in all of the drillholes. The interval from 22 to 33.1m in Borehole D is less cherty than anything in the other holes and a fossiliferous coarse grained biosparite at 12.1 to 12.5m in Borehole B is distinctive but cannot be recognised in any of the other holes.

Borehole B was originally planned to assess a mudstone unit indicated by the geophysics but the lithologies in the borehole are the same as those in the other holes and the different geophysical response may be due to the thicker overburden. Equally the lithologies in Borehole D are not shaley and the different geophysical response may just be due to the slight lesser amount of chert in this drillhole.

Boreholes F and G were stopped in overburden because the overburden is far too thick for viable quarrying. The thick overburden is consistent with the geophysical results and in general the geophysics has given a good picture of the overburden thickness in the area.

Geochemical Analysis

Four core samples were collected, three samples from BH-C and one sample from Borehole C. These were typical of the lithologies encountered in the drilling. The samples were sent to ALS in Loughrea for Total Whole Rock Analysis. An additional two samples of 10/14mm chips and 20 mm chips from the run of quarry production were also sent for comparative purposes. ALS crushed and pulverised the samples and analysed them by method ME-XRF26, (Whole rock by fusion /XRF).

This method identifies and quantifies the major components of the rock and reports them as % in oxide form when carbon dioxide is driven off as a loss on ignition. The CaO and MgO can be converted back to Calcium Carbonate and Magnesium Carbonate and the total amount of carbonate calculated.

The SiO_2 is a measure of the amount of quartz present, either as silicification or as chert. All the cores are composed almost entirely of carbonate and silica and the extremely low Al_2O_3 values confirm minimal argillaceous content. MgO is also low confirming that the rock is undolomitised.

The samples were also analysed for Total Sulphur (IR Spectroscopy) and Acid Soluble Sulphate (ICP-AES). Both methods are fully accurate, and the Total Sulphur (TS) and Acid

Soluble Sulphate (ASS) values averaged 0.075% TS and 0.035 % ASS. Both values are well within the specification for S.R.21 compliant aggregate.

The quantity of chert present in the drillholes is quite high and gave rise to concern as the material could be very abrasive on equipment. The average of the SiO2 in the four drillholes is 19.5% and the two samples taken from the quarry stockpiles average 27.4% so the area drilled is less siliceous than the active part of the quarry.

Conclusions

- The bedrock in the recently drilled area is like the limestone exposed in the existing active quarry.
- All the drillholes encountered siliceous fine calcarenites and micrites, no shales or calcareous mudstones were observed.
- The bedding is almost flat lying, with no evidence of folding or significant faulting.
- The overburden consists of sticky glacial till. It ranges from 3.7 metres thick in the north, Borehole E, to more than 15m in the south, boreholes F and G.
- The Silica content of the cores averages 19.5%; this is quite high but less than the silica content of the samples from the existing quarry.
- The Total Sulphur and Acid Soluble Sulphate values are low and are fully compliant for an S.R.21 aggregate

The Existing Quarry

The Geological Survey Memoir for sheet 12 provides a description of Rhyne Quarry (Killoe). "Rhyne Quarry, southwest of Ballinalee, exposes over 25m of dark grey well-bedded fine-grained and coarse-grained limestones. The beds are typically 10-20cm thick, sharp based and laminated, with occasional coarser beds rich in brachiopods, crinoids, gastropods and solitary corals (Siphonophyllia). These beds have erosive bases and are graded. The section, of probably early Holkerian age, represents a more proximal basinal facies of the Lucan Formation on the margin of the Ballinalee Basin, and some of the fossiliferous beds indicate, by their highly micritised skeletal content, close proximity to a nearby shallow water shelf facies."

The Professional Geologist has visited the quarry on several occasions as part of S.R.21 and S.R.16 compliance requirements. The quarry has a floor area of approximately 36,000 square metres, excluding offices and plant areas. The quarry is orientated northwest / southeast and access is from a ramp on the south-western side of the quarry. The quarry is 270m long and 140m wide. The upper two benches, north-western part of the quarry, illustrate

generally flat bedding of the limestone. The planned development will be on the other side of the minor road.

The existing quarry has to-date extracted two benches and a third bench is currently being developed. The limestones are flat bedded or display very gentle rolling dips. Bed thickness is variable, but most beds fall in the range 20 to 40cms. These beds are fine calcarenites or micrites and are medium to dark grey in colour. There are occasional beds, usually coarser calcarenites, up to 60cms in thickness. Most of the beds are planar with sharp bases and little or no shale is present between beds. The Professional Geologist has assessed the material in the existing quarry and it is fully compliant in terms of S.R.16 and S.R.21, i.e. the limestone is suitable for use in concrete products and is also suitable for use under concrete floors and paths.

6.6.6 Economic Geology

From viewing aerial photography there are a number of quarries located in the vicinity of the application site with the most notable being a quarry at Aughnacliffe located approximately 7km to the north east of the application site which is operated by Lagan. The applicant also operates a second quarry located approximately 7km to the north near Drumlish.

6.6.7 Geological Heritage and Designated Ecological Sites

The existing working quarry is located to the north east of the application site is classified as a Geological Heritage site due to the site being *'a good representative site for the Lower Carboniferous limestone rocks in Longford, which are poorly exposed in the county other than in quarries'*. Details in relation to the site are tabulated in Table 6.3.

Table 6.3 Geological Heritage Site Details

Site Name	IGH Theme Primary	Site Description	Geological Feature
Killoe Quarry	IGH8	A large working quarry in the Lucan Formation, of Viséan (Lower Carboniferous) age	A good representative site for the Lower Carboniferous limestone rocks in Longford

A review of the extent of ecological sites designated for nature conservation was carried out. There are seven EU designated sites (five SACs and two SPAs) located within a 15km radius of the proposed application area. Only two of these are hydrologically connected with the proposed application site, namely Lough Forbes Complex SAC and Ballykenny-Fisherstown Bog SPA. Given the considerable hydrological distance of c. 16.9km between the proposed application area and the overlapping Lough Forbes Complex SAC and Ballykenny-Fisherstown

Bog SPA, it is concluded that the potential for likely significant effects on the integrity of these two EU designated site as a result of the proposed project does not exist.

No impacts on local geological heritage sites or designated sites are expected from a land, soils and geology perspective. Indirect hydrological effects are assessed in Chapter 7.0 – Water.

6.6.8 Soil Contamination

There are no known areas of soil contamination at the site or in the surrounding area. During the site walkover and drilling investigations, no areas of contamination concern were identified and the results from the groundwater sampling (refer to Chapter 7.0 – Water) also indicate no contamination issues. As the proposed site is a greenfield site, no historical contamination issues would be expected. There are no known historic mines at or in the immediate vicinity of the proposed development, that could potentially have contaminated tailings.

6.7 Potential Impacts of the Proposed Development

6.7.1 Characteristics of the Proposed Development

The proposed development measures a total area of 18.6 hectares which will consist of an extraction area measuring 14.2 hectares and a manufacturing area measuring 2.1 hectares comprising of a concrete batching plant, block yard, processing plant, office buildings, settlement lagoon and all other associated ancillary facilities. The remaining area is made of access roads (0.7 Ha.) and landscape areas (1.6 Ha.)

Overburden will be removed in phases prior to extraction of underlying material and will be used in the construction of berms around the perimeter of the site. Overburden may also be used in restoration of the quarry once work has ceased.

Material will be extracted down to a level of 20.0mOD. Extraction of material will mainly be carried out by blasting means. Occasionally, rock breaking may be required on site. It is proposed that material will be extracted at a maximum rate of 400,000 tonnes/annum. Once extracted, material will be loaded onto dump trucks using an excavator. Material will be transported along internal haul roads to the proposed manufacturing area where it will be processed into various grades of aggregate using crushing and screening plant. Material may also be used in the manufacturing of ready-mix concrete at the proposed concrete batching plant.

Products will be transported off site to market via a proposed access road which will connect the site to the L5097 and onto the R194 regional road. It is proposed that the development will generate an Annual Average Daily Traffic (AADT) of 73 loads/day.

Water management on site will be as follows: a sump will be constructed on the quarry floor which will collect all excess water. Water will be retained for a period of time to allow suspended solids to settle. Water will then be pumped to the proposed settlement lagoon which will be constructed at the proposed manufacturing area. Water at the settlement lagoon will be used in the day-to-day operations of the quarry such as manufacturing of ready-mix concrete, aggregate washing or dust suppression. Water which is not required will be discharged off site. An application for a water discharge licence will be made to Longford Co. Co. if planning permission for the subject development is secured. Details of the water management system is given in Section 7.0 (Water).

For security reasons, very little fuel will be stored at the quarry. A small volume of fuel will be stored in a bunded fuel storage tank which will be located in the storage shed/workshop. Fuel will be delivered to the quarry by competent oil companies and dispensed into plant and machinery, at a designated refuelling location.

It is proposed that the operating hours at the development will be 07:00-19:00 Monday to Friday and 07:00-16:00 on Saturdays. The development will not operate on Sundays or Public Holiday. The proposed development will provide employment for approximately 30 people directly with further people employed indirectly (e.g., sub-contractors for blasting).

6.7.2 "Do Nothing" Scenario

If the proposed development does not go ahead, the site will remain as a greenfield site.

6.7.3 Potential Construction Phase Impacts

The proposed construction phase involves the construction of a haul road from the L5097 Local Road to the manufacturing area and the levelling of the manufacturing area where the concrete batching plant, processing plant, block yard area and settlement lagoon will be located, erection of the concrete batching plant and processing plant, construction of a concrete block yard area and settlement lagoon. The construction works associated with the proposed development will take approximately 6 - 12 months to complete. The potential impacts on land, soils and geology associated with this phase of the development are detailed below:

6.7.3.1 Operation of Plant & Machinery

The operation of plant and machinery for overburden removal, construction of the yard and haul road and erection of plant and machinery which will be mainly diesel powered and operated using hydraulics increases the potential for leaks of hydraulic oils and fuel during the construction phase.

Receptor: Soil and Subsoils
Pathway: Soil and bedrock pore space
Pre-mitigation Impact: Negative, reversible, slight, direct / indirect, unlikely, long term effect on soil and subsoils.

Mitigation Measures:
The following mitigation is proposed for:

- All plant and machinery will be inspected daily and will be serviced regularly.
- Only designated trained operators will be authorised to refuel plant on site;
- Procedures and contingency plans will be set up to deal with emergency accidents or spills;
- An emergency spill kit with oil boom, absorbers etc. will be kept on-site for use in the event of an accidental spill.

Residual Effect:
Negative, reversible, imperceptible, direct / indirect, unlikely, long-term effect on soil and subsoil.

6.7.4 Potential Operational Phase Impacts

The operational phase of the development consists of the activities that will be undertaken on a day-to-day basis. These are discussed under the following headings.

6.7.4.1 Change in Land-Use

The proposed development will result in a change in land-use which is mainly agriculture and part previously subject to peat extraction and woodland to quarrying. Agricultural land is the dominant land use in the area therefore will not result in a significant loss in the area.

Receptor: Soils, Subsoils and Bedrock
Pathway/Mechanism; Aggregate extraction
Pre-mitigation Impact: Negative, irreversible, moderate, direct, likely, permanent effect on soil, subsoils and bedrock.

Mitigation Measures:
Site earthworks and aggregate extraction will result in a direct impact on the local geological environment, albeit this is an acceptable and unavoidable part of the proposed quarry development. These impacts will be localised (i.e. only at the point of extraction) and will be mostly mitigated through the adoption of a suitable landscape and restoration plan which will be undertaken during the operational phase and on completion of extraction.

The overburden and bedrock which will be removed are not notable from a geological heritage point of view and are widely abundant in the area. The stripped topsoil will be used for berm construction and restoration on completion of extraction which will result in the creation of new habitats.

Residual Effect:
Negative, irreversible, Moderate, direct, likely, permanent effect on soils, subsoils and bedrock.

Significance of Effects:
No significant effects on soils, subsoils and bedrock are anticipated.

6.7.4.2 Contamination of Soil, Subsoils and Bedrock from Oil / Fuel Spills and Leaks

The operation of plant and machinery for overburden removal, construction of the yard and haul road and erection of plant and machinery which will be mainly diesel powered and operated using hydraulics increases the potential for leaks of hydraulic oils and fuel during the operational phase.

Only small volumes of fuel/oils will be present on-site and therefore no significant effects are expected as long at standard mitigation is implemented.

Receptor: Soil, subsoils and bedrock
Pathway: Soil and bedrock pore space
Pre-mitigation Impact: Negative, reversible, slight, direct / indirect, unlikely, long term effect on soil, subsoils and bedrock.

Mitigation Measures:
The following mitigation is proposed for:

- All plant and machinery will be inspected daily and will be serviced regularly.
- Only designated trained operators will be authorised to refuel plant on site;

- Procedures and contingency plans will be set up to deal with emergency accidents or spills;
- An emergency spill kit with oil boom, absorbers etc. will be kept on-site for use in the event of an accidental spill.

Residual Effect:
Negative, reversible, imperceptible, direct / indirect, unlikely, long-term effect on soil, subsoils and bedrock.

Significance of Effects:
No significant effects on soil, subsoil or bedrock are anticipated.

6.7.4.3 Stability of Quarry Faces

There is potential for collapse of a quarry face or a person or vehicle falling if the quarry face design and stability are inadequate, or if the measures in place to prevent such falls are insufficient.

Receptor: Soil, subsoil & bedrock
Pathway: Extraction of rock
Pre-mitigation Impact: Negative, moderate, direct / indirect, unlikely, permanent effect on soils, subsoils and bedrock.

Mitigation Measures:
Rock will be extracted in benches in line with Guidelines to the Safety, Health and Welfare at Work (Quarries) Regulations 2008 (S.I. No. 28 of 2008). A buffer will be left around the external boundary of the application site which will ensure the stability of the external quarry faces. Geotechnical assessments will be undertaken as required in line with Guidelines to the Safety, Health and Welfare at Work (Quarries) Regulations 2008 (S.I. No. 28 of 2008).

Residual Effect:
Negative, reversible, imperceptible, direct / indirect, unlikely, long-term effect on soil, subsoils and bedrock.

Significance of Effects:
No significant effects on bedrock are anticipated.

6.7.4.4 Waste Generation

Waste generated at the site will be negligible as all quarry material not exported off-site such as overburden will be used to construct landscaping berms and for restoration of the quarry which is an appropriate end use in line with the Waste Management (Management of Waste from the Extractive Industries) Regulations 2009. All waste will be stored in appropriate locations. The potential effect is assessed as neutral.

6.7.4.5 Geological Heritage Sites

The existing quarry, to the east of the proposed development, has recently been classified as a Geological Heritage site due to the site being *'A good representative site for rocks not well exposed despite being relatively resistant to erosion'*. The proposed development will not impact on the existing quarry therefore the potential effect is assessed as neutral.

6.7.4.6 Supply of Construction Material

Quarry material is a requirement for all construction projects and the granting of permission will secure a reserve of material to extract into the future which ensures that quarry material will be available locally and regionally. This is deemed to be a positive impact.

6.7.5 Potential Decommissioning Phase Impacts

The restoration plan involves allowing the water level in quarry to rise and placing overburden in areas above the water table. At that stage berms and vegetation placed on berms will have well established. No negative impacts on the land, soil and geological environments are expected during the restoration or post restoration phase. The restoration will have a positive effect in terms of returning some of the site back to agriculture while the main quarry excavation below approximately 43mOD will become flooded and become a diverse aquatic habitat.

6.7.6 Human Health Effects

Potential health effects in relation to land, soils and geology mainly occur due to direct and indirect (dust) contact with contaminated soil. However, there will be best practice controls in place to ensure any potential sources of contamination on the site will be managed appropriately.

Hydrocarbons, in the form of fuels and oils, will be used on-site during extraction works. However, the volumes will be small in the context of the scale of the project and will be handled in accordance with best practice mitigation measures. The potential residual impacts associated with soil and geology contamination and subsequent health effects are negligible.

6.7.7 Cumulative Effects on Land, Soils & Geology

The other land use activities in the area are agricultural, forestry, peat extraction and residential land use. Due to the scale of the proposed development and the lack of significant residual impacts from the development that would affect the wider environment, there will be no significant cumulative impacts to land, soils and geology resulting from this project, and other local existing developments, projects and plans. All impacts on land, soils and geology relating to the proposed project will be localised and within the development footprint. Operations at the existing quarry will cease on granting of permission at the proposed development and the existing quarry will be restored in line with a proposed restoration plan.

6.7.8 Transboundary Effects

No transboundary effects are envisaged as a result of the proposed development.

6.8 Monitoring

An inspection of the geological environment will be undertaken by a competent Geologist and Geotechnical Engineer on a regular basis as required by relevant guidance and legislation introduced or amended.

Appendix 6.1 – Apex Geophysical Investigation Report

AGP18054_02

REPORT
ON THE
GEOPHYSICAL INVESTIGATION
AT
LANDS ADJACENT TO RHYNE QUARRY, CO. LONGFORD
FOR
RHYNE ROCK LIMITED

15TH JUNE 2020

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PRIVATE AND CONFIDENTIAL

THE FINDINGS OF THIS REPORT ARE THE RESULT OF A GEOPHYSICAL SURVEY USING NON-INVASIVE SURVEY TECHNIQUES CARRIED OUT AT THE GROUND SURFACE. INTERPRETATIONS CONTAINED IN THIS REPORT ARE DERIVED FROM A KNOWLEDGE OF THE GROUND CONDITIONS, THE GEOPHYSICAL RESPONSES OF GROUND MATERIALS AND THE EXPERIENCE OF THE AUTHOR. APEX GEOPHYSICS LTD. HAS PREPARED THIS REPORT IN LINE WITH BEST CURRENT PRACTICE AND WITH ALL REASONABLE SKILL, CARE AND DILIGENCE IN CONSIDERATION OF THE LIMITS IMPOSED BY THE SURVEY TECHNIQUES USED AND THE RESOURCES DEVOTED TO IT BY AGREEMENT WITH THE CLIENT. THE INTERPRETATIVE BASIS OF THE CONCLUSIONS CONTAINED IN THIS REPORT SHOULD BE TAKEN INTO ACCOUNT IN ANY FUTURE USE OF THIS REPORT.

PROJECT NUMBER	AGP18054		
AUTHOR	**CHECKED**	**REPORT STATUS**	**DATE**
EURGEOL DR. YVONNE O'CONNELL P.GEO., PH.D. (GEOPHYSICS)	TONY LOMBARD M.SC (GEOPHYSICS)	V.01	5TH JUNE 2020
EURGEOL DR. YVONNE O'CONNELL P.GEO., PH.D. (GEOPHYSICS)	TONY LOMBARD M.SC (GEOPHYSICS)	V.02	15TH JUNE 2020

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1. EXECUTIVE SUMMARY

APEX Geosphysics Limited was commissioned by Rhyne Rock Limited to carry out a geophysical investigation to determine the potential for an extension to the Rhyne Quarry, County Longford into lands adjacent to the quarry. Adjacent lands were surveyed in 2018 and this report combines the 2018 and 2020 surveys. The combined survey area is 30.7 Ha.

The objectives of the investigation were to determine overburden thickness, to determine type of bedrock, to assess the quality of the bedrock and to estimate the volume of the rock resource.

The area under investigation is located 7.5km northeast of Longford Town, Co. Longford. The 2018 site is 15.5 Ha and the adjoining 2020 is an additional 15.2 Ha. The site topography ranges from approx. 50 m OD in the north and south, rising to approx. 72 m OD along a NNW-SSE trending drumlin through the centre of the site.

The 2018 survey was carried out between the 27th March and the 3rd of April 2018 and the 2020 survey was carried out between the 21st and 22nd May 2020. Both surveys consisted of reconnaissance EM ground conductivity mapping with follow-up 2D Electrical Resistivity Tomography (ERT) and Seismic Refraction profiling.

The geophysical data indicated predominantly thick overburden material comprising of silt/clay and sandy gravelly silt/clay with a localised deposit of silty clayey sand/gravel.

The total overburden volume for both sites is 3.6 million cu.m equivalent to a tonnage of 6.5 million tonnes (assuming a density of 1.8 gr/cc).

The geophysical data indicates the presence of 3 rock types including mudstone/shale bedrock present in two E-W trending bands in the centre/south of the surveyed areas, inter-bedded limestone and shale present in two E-W trending bands in the south and in a NNW-SSE band through the north of the surveyed areas and limestone bedrock predominantly in the centre, north and northeast of the surveyed areas.

The inter-bedded limestone and shale material may have limitations on use as an aggregate due to its argillaceous content and the presence of possible reactive minerals. It should be carefully tested and monitored, if extracted, in order to confirm suitability for purpose. The mudstone/shale material is unlikely to have any economic potential.

Taking in to consideration stand-off distances from existing properties, roads and boundaries the interpreted potential resource is located in the west of the sites. Three resource estimates have been generated based on variations in overburden thickness; up to 15 m; up to 10 m; and up to 5 m overburden over bedrock.

A max. of 4.82 million tonnes of limestone and 2.76 million tonnes of inter-bedded limestone and shale (allowing for 10% wastage) has been interpreted assuming the removal of up to 15 m of overburden (1.11 million tonnes).

If any extraction is proposed, rotary coring could be carried out to confirm the findings of the geophysical investigation including overburden thickness and suitability of rock for extraction. Sampling and testing of the rock types should be carried out including physical, mechanical and geochemical analysis of the aggregate contained in this possible resource to establish its suitability for use as a crushed aggregate.

The geophysical report should be reviewed after the completion of any direct investigation.

2. INTRODUCTION

APEX Geophysics Limited was commissioned by Rhyne Rock Limited to carry out a geophysical investigation to determine the potential for an extension to the Rhyne Quarry, County Longford into lands adjacent to the quarry. Adjacent lands were surveyed in 2018 (Apex Geoservices Ltd., 2018) and this report combines the 2018 and 2020 surveys.

2.1 Survey Objectives

The objectives of the investigation were to:

- determine overburden thickness,
- determine type of bedrock,
- assess the quality of the bedrock,
- estimate the volume of the rock resource.

2.2 Site Background

The area under investigation is located 7.5km northeast of Longford Town, Co. Longford (Fig. 2.1). The 2018 site is c. 15.5 Ha. The 2020 site covers an additional 15.2 Ha. The site topography ranges from approx. 50 m OD in the north and south, rising to approx. 72 m OD along a NNW-SSE trending drumlin through the centre of the site.

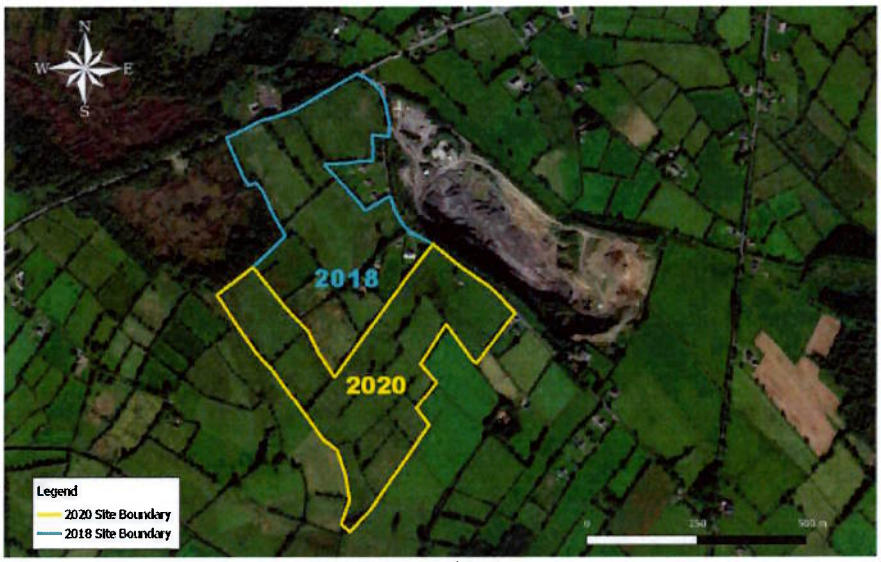

Fig 2.1: Site location.

2.2.1 Soils

The Geological Survey of Ireland (GSI) Quaternary Sediments map for the area (Fig. 2.2) indicates sandstone and shale till across the majority of the 2018 & 2020 sites with rock outcrop/subcrop at the existing quarry in the east/northeast. Peat is indicated in the west/northwest and also in the southern corner of the site. A NNW-SSE trending drumlin is mapped running through the centre of the 2018 & 2020 sites.

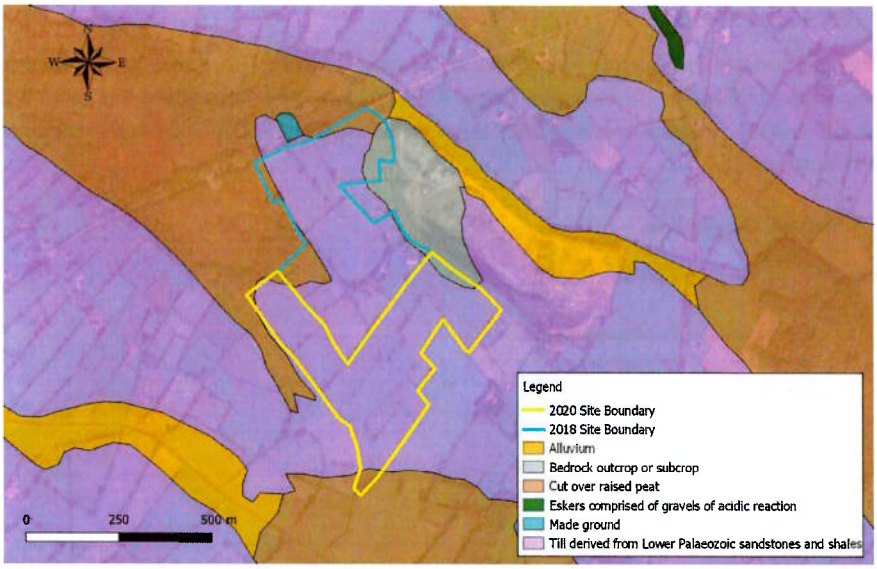

Fig 2.2: Quaternary sediments.

2.2.2 Geology

The GSI 1:100k Bedrock Geology map for the area (Figure 2.3) indicates that the survey area is underlain by the Lucan Formation ('Calp') comprising of limestone & shale. Undifferentiated Visean limestones are mapped north of the sites.

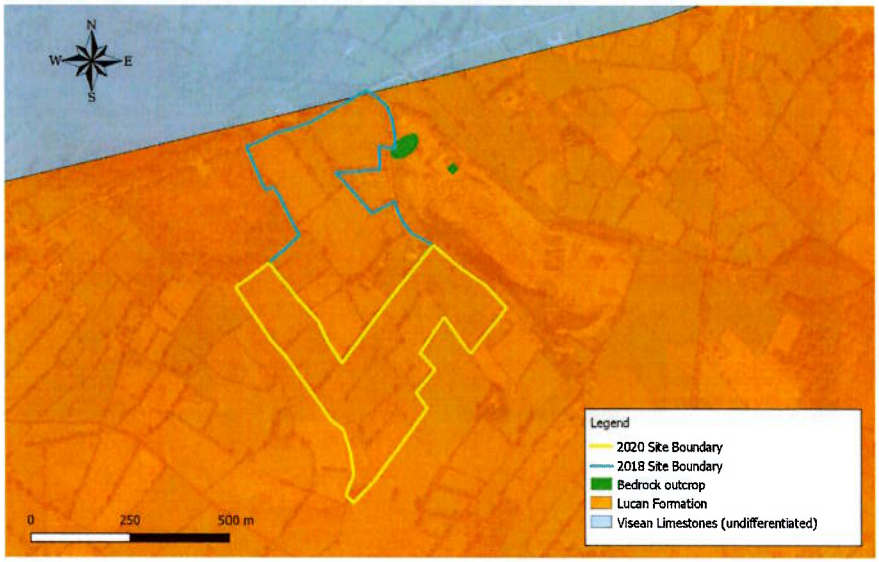

Fig 2.3: Bedrock geology.

2.2.3 Vulnerability

The groundwater vulnerability map rates how vulnerable the bedrock aquifers are to pollution from surface sources based on the soil type and thickness. The vulnerability rating for the site (Fig. 2.4) is predominantly high to extreme with an area of low to moderate vulnerability in the west/northwest. Areas of high and extreme vulnerability tend to be subject to planning restrictions in order to protect the groundwater resource.

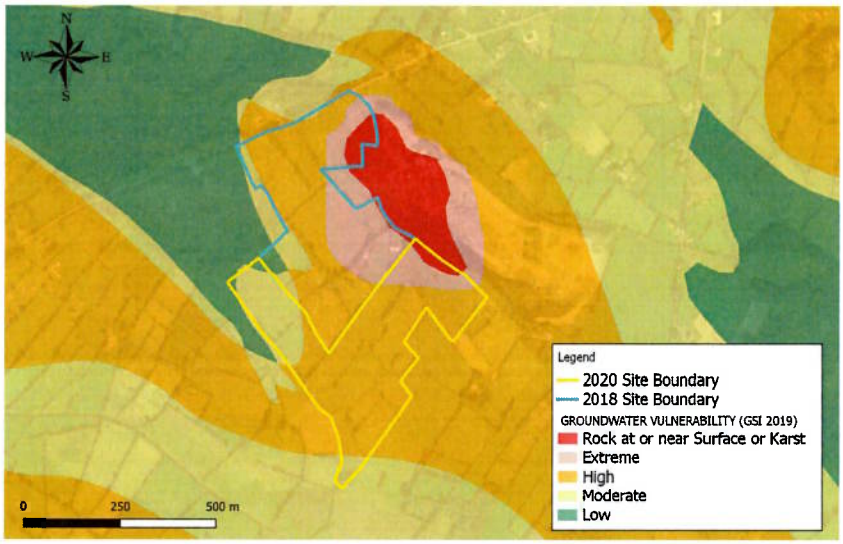

Fig 2.4: Groundwater vulnerability (GSI, 2017).

2.2.4 Aquifer Classification

The Lucan Formation (Fig. 2.5) is classified as a 'Locally Important aquifer – bedrock which is generally moderately productive' (GSI).

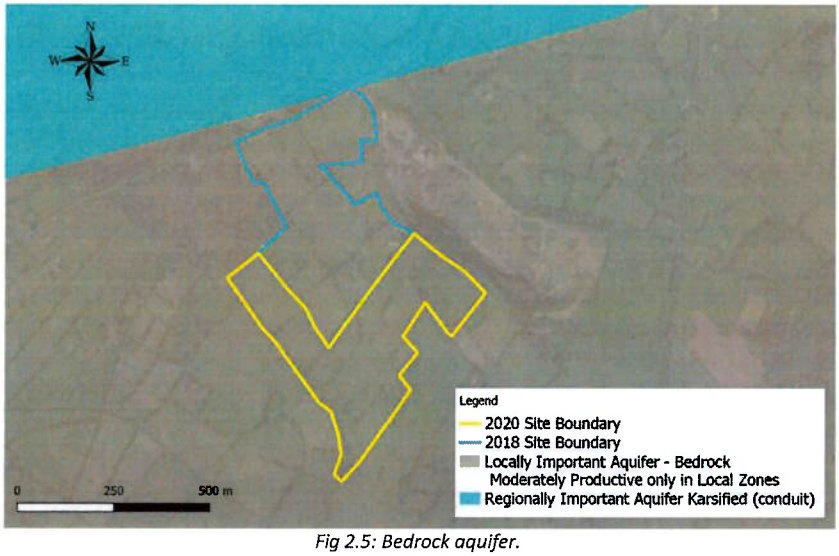

Fig 2.5: Bedrock aquifer.

2.2.5 Historical Data

The historical 6 inch sheet for the area indicates outcropping 'Calp' limestone and a quarry where the existing quarry is located (Figure 2.6). Bog is mapped to the west and northwest.

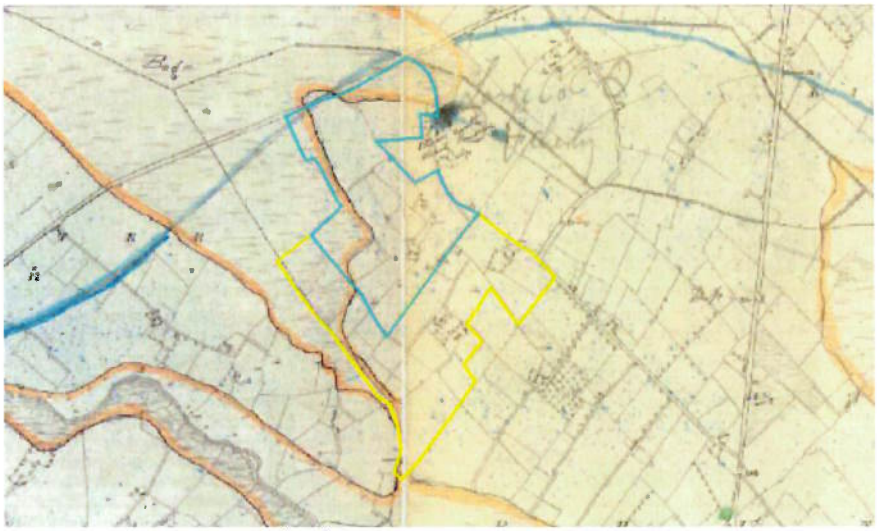

Fig 2.6: The historical 6inch map (outcrop marked as dark blue).

2.3 Survey Rationale

The 2018 and 2020 investigations consisted of reconnaissance EM ground conductivity mapping with follow-up 2D Electrical Resistivity Tomography (ERT) and Seismic Refraction profiling to target observations from the conductivity survey:

EM ground conductivity mapping operates on the principle of inducing currents in conductive substrata and measuring the resultant secondary electro-magnetic field. The strength of this secondary EM field is calibrated to give apparent ground conductivity in milliSiemens/metre (mS/m). This technique will provide information on the shallow (0-6m below ground level) variation of the superficial deposits and outline the shallow bedrock. Areas of the site with thicker overburden can exhibit higher conductivities than areas with thin overburden.

ERT images the resistivity of the materials in the subsurface along a profile to produce a cross-section showing the variation in resistivity with depth, depending on the length of the profile. Each cross-section will be interpreted to determine the material type along the profile at increasing depth, based on typical resistivities returned for Irish ground materials.

Seismic Refraction profiling measures the velocity of refracted seismic waves through the overburden and rock material and allows an assessment of the thickness and quality of the materials present to be made. Stiffer and stronger materials usually have higher seismic velocities while soft, loose or fractured materials have lower velocities. This method should allow profiling of the depth to the top of the bedrock along profiles across the site.

As with all geophysical methods the results are based on indirect readings of the subsurface properties. The effectiveness of the proposed approach will be affected by variations in the ground properties. By combining a number of techniques it is possible to provide a higher quality interpretation and reduce any ambiguities which may otherwise exist. Further information on the detailed methodology of each geophysical method employed in this investigation is given in **APPENDIX A: DETAILED GEOPHYSICAL METHODOLOGY**.

AN COIMISIÚN PLEANÁLA
21 AUG 2025
LTR DATED ____ FROM ____
LDG-
ACP- 323358-25

3. RESULTS

The 2018 survey was carried out between the 27th March and the 3rd of April 2018 and the 2020 survey was carried out between the 21st and 22nd May 2020. The geophysical survey locations are indicated on Drawing AGP18054_01 (Appendix B).

3.1 EM Ground Conductivity Mapping

The EM ground conductivity results (Drawing AGP18054_02, Appendix B) are indicative of the bulk conductivity of the ground materials from 0-6.0m bgl. The recorded conductivity values ranged from 4 to 14 mS/m and have been generally interpreted in conjunction with the ERT and Seismic data as follows:

Conductivity (mS/m)	Interpretation
<6.0	Shallow bedrock (0 - 5m bgl)
>6.0	Bedrock >5m bgl

3.2 ERT

Five ERT Profiles (R1 to R5) were recorded in 2018 and six ERT Profiles (R01to R06) were recorded in 2020. The modelled resistivity values across the site have been interpreted on the following basis.

Resistivity (Ohm-m)	Interpretation
50-100	SILT/CLAY
100-250	Sandy gravelly SILT/CLAY
250-350	Silty/clayey SAND/GRAVEL
250-350	Weathered BEDROCK
50-350	MUDSTONE/SHALE BEDROCK
350-1000	Inter-bedded LIMESTONE/SHALE BEDROCK
350-5000	LIMESTONE BEDROCK

3.3 Seismic refraction profiling

Five seismic profiles (S1 to S5) were recorded in 2018 and four (S01to S04) were recorded in 2020. The range of seismic velocities have been interpreted on the following basis:

Seismic Velocity (m/s)	Average Seismic Velocity (m/s)	Interpretation	Stiffness/Rock Quality
174-512	350	Soil	Soft/Loose
810 - 1383	1040		Firm-Stiff / Medium Dense-Dense
1307-2321	1970		Stiff-Very stiff/Dense-Very Dense
		Weathered bedrock	Poor/Fair
2798-4304	3470	Bedrock	Good

3.4 Integrated Interpretation

The ERT and Seismic Refraction results have been combined to produce the interpreted sections on Drawings AGP18054_ R01 to AGP18054_ R06 and on Drawings AGL18057_ R1 to AGL18057_ R5 (Appendix B).

Overburden:

- Overburden material has been interpreted as predominantly silt/clay (lowest soil resistivity values 50 - 100 Ohm-m) and sandy gravelly silt/clay (medium soil resistivity values 100-250 Ohm-m).
- A very small, localised deposit of silty clayey sand/gravel (with higher soil resistivity values 250-350 Ohm-m) has been interpreted on the 2018 profile R4 (Drawing AGL18057_R4).
- The interpreted overburden thickness has been plotted on Drawing AGP18054_03 and indicates that the overburden varies from 0.5 m thick (in Zones A, B and C) to 28 m underlying the drumlin.
- ≤5 m overburden has been interpreted in the northeast and centre-southwest (see Drawing AGP18054_03).
- 5 – 10 m overburden has been interpreted in the east-southeast, adjacent to the existing quarry and in the west and southwest (see Drawing AGP18054_03).
- The thickest overburden (>10 m) is interpreted running NNW-SSE along the drumlin, in the west and in the southeast (see Drawing AGP18054_03).

Bedrock:

- The geophysical data indicates the presence of three rock types which have been summarised on Drawing AGP18054_04.
- The lowest bedrock resistivities (50-350 Ohm-m) have been interpreted as indicating mudstone and/or shale bedrock. This rock type appears to be present in two E-W trending bands in the centre/south of the surveyed areas.
- Medium bedrock resistivities (350-1000 Ohm-m) have been interpreted as indicating inter-bedded limestone and shale bedrock. This rock type appears to be present in two E-W trending bands in the south and in a NNW-SSE band through the north of the surveyed areas.
- Higher bedrock resistivities (350 – 5000 Ohm-m) have been interpreted as limestone bedrock. This rock type appears to be present predominantly in the centre, north and northeast of the surveyed areas.
- In addition, a thin weathered bedrock layer has been interpreted on all geophysical profiles.
- It should be noted that the rock underling the thin overburden Zones A, B and D is predominantly limestone, the rock underling underlying Zone C appears to be inter-bedded limestone and shale while the rock underlying Zone E appears to be mudstone/shale.
- The interpreted top of the rock (in m OD) is plotted on Drawing AGP18054_05 and indicates rock levels varying from 34 to 60 m OD.

3.5 Resource Estimation

The combined survey area is 30.7 Ha. The total overburden volume for both sites has been calculated by subtracting the interpreted rock surface from the ground surface. The results indicate 3.6 million cu.m of overburden equivalent to a tonnage of 6.5 million tonnes (assuming a density of 1.8 gr/cc).

Where limestone is mapped, the high resistvities and velocities indicate good quality limestone.

The inter-bedded limestone and shale material may have limitations on use as an aggregate due to its argillaceous content and the presence of possible reactive minerals. It should be carefully tested and monitored, if extracted, in order to confirm suitability for purpose.

The mudstone/shale material will have limitations on use as an aggregate due to its argillaceous content and the presence of possible reactive minerals. It is unlikely to have any economic potential.

Taking in to consideration stand-off distances from existing properties (150 m), roads (50 m) and boundaries (20 m) the interpreted potential resource is located in the west of the site.

Three resource estimates have been calculated based on the following criteria:

- Up to 15 m overburden over limestone and limestone/shale bedrock (Drawing AGP18054_06)
- Up to 10 m overburden over limestone and limestone/shale bedrock (Drawing AGP18054_07)
- Up to 5 m overburden over limestone and limestone/shale bedrock (Drawing AGP18054_08)

The calculated overburden volumes and potential resource are as follows:

INTERPRETED RESOURCE ESTIMATIONS

		Bench (15 m)	Zone	Area * (m^2)	Total Area * (Ha)	Overburden thickness (m)	Overburden Volume (m^3)	Overburden Tonnage (million tonnes)	Rock Volume 15m Bench (m^3)	Rock Tonnage Bench (million tonnes)	less 10% wastage (million tonnes)
Allowing up to 15m Overburden	Total Overburden			83,525	8.35	up to 15 m	691,778	1.11			
	Limestone	1	1	53,480	5.35	up to 15 m	454,062	0.73	802,200	2.01	1.80
		2	2	47,484	4.75				712,260	1.78	1.60
		3	3	41,902	4.19				628,530	1.57	1.41
	Total Limestone								2,142,990	5.36	4.82
	Limestone/Shale	1	4	30,045	3.00	up to 15 m	237,716	0.38	450,675	1.13	1.01
		2	5	27,249	2.72				408,735	1.02	0.92
		3	6	24,510	2.45				367,650	0.92	0.83
	Total Limestone/Shale								1,227,060	3.07	2.76
Allowing up to 10m Overburden	Total Overburden			60,290	6.03	up to 10 m	415,779	0.67			
	Limestone	1	7	35,202	3.52	up to 10 m	234,725	0.38	528,030	1.32	1.19
		2	8	29,938	2.99				449,070	1.12	1.01
		3	9	24,803	2.48				372,045	0.93	0.84
	Total Limestone								1,349,145	3.37	3.04
	Limestone/Shale	1	10	25,088	2.51	up to 10 m	181,054	0.29	376,320	0.94	0.85
		2	11	22,437	2.24				336,555	0.84	0.76
		3	12	19,975	2.00				299,625	0.75	0.67
	Total Limestone/Shale								1,012,500	2.53	2.28
Allowing up to 5m Overburden	Total Overburden			9,082	0.91	up to 5 m	29,732	0.05			
	Limestone	1	13	9,082	0.91	up to 5 m	29,732	0.05	136,230	0.34	0.31
		2	14	6,864	0.69				102,960	0.26	0.23
		3	15	5,024	0.50				75,360	0.19	0.17
	Total Limestone								314,550	0.79	0.71

* 5 m stand-off between benches as indicated by client

4. RECOMMENDATIONS

If any extraction is proposed, rotary coring could be carried out to confirm the findings of the geophysical investigation including overburden thickness and suitability of rock for extraction.

Sampling and testing of the rock types should be carried out including physical, mechanical and geochemical analysis of the aggregate contained in this possible resource to establish its suitability for use as a crushed aggregate.

The geophysical report should be reviewed after the completion of any direct investigation.

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APPENDIX A: DETAILED GEOPHYSICAL METHODOLOGY

A combination of geophysical techniques was used to provide a high quality interpretation and reduce any ambiguities, which may otherwise exist.

EM Ground Conductivity Mapping

Principles

This is an electromagnetic technique used to investigate lateral variations in overburden material and to assist with the indication of the depth to bedrock. This method operates on the principle of inducing currents in conductive substrata and measuring the resultant secondary electro-magnetic field. The strength of this secondary EM field is calibrated to give apparent ground conductivity in milliSiemens/metre (mS/m). Readings over material such as organic waste and peat give high conductivity values while readings over dry materials with low clay mineral content such as gravels, limestone or quartzite give low readings. The EM31 survey technique determines the apparent conductivity of the different overburden layers from 0-6m bgl depending on the dipole mode used.

Data collection

The EM31 equipment used was a GF CMD-4 conductivity meter equipped with data logger. This instrument features a real time graphic display of the previous 20 measurement points to monitor data quality and results. Conductivity and in-phase values were recorded across the site. Local conditions and variations were recorded.

Data processing

The conductivity and in-phase field readings were downloaded, contoured and plotted using the SURFER 12 program (Golden Software, 2015). Data which was affected by metallic objects was removed. Assignation of material types and possible anomaly sources was carried out, with cross-reference to other data.

Electrical Resistivity Tomography (ERT)

Electrical Resistivity Tomography was carried out to provide information on lateral variations in the overburden material as well as on the underlying overburden and bedrock.

Principles

This surveying technique makes use of the Wenner resistivity array. The 2D-resistivity profiling method records a large number of resistivity readings in order to map lateral and vertical changes in material types. This method involves the use of electrodes connected to a resistivity meter, using computer software to control the process of data collection and storage.

Data Collection

ERT Profiles were recorded using ABEM Terrameter LS resistivity meter, imaging software, four takeout multicore cables and up to 48 stainless steel electrodes. Saline solution was used at the electrode/ground interface in order to gain a good electrical contact required for the technique to work effectively. The recorded data were processed and viewed immediately after surveying.

Data Processing
The field readings were stored in computer files and inverted using the RES2DINV package (Geotomo Software, 2006) with up to 5 iterations of the measured data carried out for each profile to obtain a 2D-depth model of the resistivities.

The inverted 2D resistivity models and corresponding interpreted geology are displayed on the accompanying drawings alongside the processed seismic sections. Profiles have been contoured using the same contour intervals and colour codes. Distance is indicated along the horizontal axis of the profiles.

Seismic Refraction Profiling

Principles
This method measures the velocity of refracted seismic waves through the overburden and rock material and allows an assessment of the thickness and quality of the materials present to be made. Stiffer and stronger materials usually have higher seismic velocities while soft, loose or fractured materials have lower velocities.

Seismic profiling measures the p-wave velocity (Vp) of refracted seismic waves through the overburden and rock material and allows an assessment of the thickness and quality of the materials present to be made. Stiffer and stronger materials usually have higher Vp velocities while soft, loose or fractured materials have lower Vp velocities. Readings are taken using geophones connected via multi-core cable to a seismograph.

Data Collection
A Geode high resolution 24 channel digital seismograph, 24 10HZ vertical geophones and a 10 kg hammer were used to provide first break information, with a 24 take-out cable. Equipment was carried and operated by a two-person crew.

Readings are taken using geophones connected via multi-core cable to a seismograph. The depth of resolution of soil/bedrock boundaries is determined by the length of the seismic spread, typically the depth of resolution is about one third the length of the profile.

Data Processing
First break picking in digital format was carried out using the FIRSTPIX software program to construct p-wave (Vp) traveltime plots for each spread. Velocity phases were selected from these plots using the GREMIX software program and were used to calculate the thickness of individual velocity units. Topographic data were input. Material types were assigned and estimation made of material properties, cross-referenced to ERT data. The processed seismic data are displayed in Appendix B.

Approximate errors for Vp velocities are estimated to be +/- 10%. Errors for the calculated layer thicknesses are of the order of +/-20%. Possible errors due to the "hidden layer" and "velocity inversion" effects may also occur (Soske, 1959).

Spatial Relocation

All the geophysical investigation locations were acquired using a Trimble Geo 7X high-accuracy GNSS handheld system using the settings listed below. This system allows collection of GPS data with c.20mm accuracy.

Projection:	Irish Transverse Mercator
Datum:	Ordnance
Coordinate units:	Meters
Altitude units:	Meters
Survey altitude reference:	MSL
Geoid model:	Republic of Ireland

APPENDIX B: DRAWINGS

The information derived from the geophysical investigation is presented in the following drawings:

AGP18054_01	Aerial Photo - Geophysical Locations	1:5000	@ A3
AGP18054_02	Ground Conductivity Contours (mS/m)	1:5000	@ A3
AGP18054_03	Interpreted Overburden Thickness (m)	1:5000	@ A3
AGP18054_04	Interpreted Bedrock Map	1:5000	@ A3
AGP18054_05	Interpreted Top of Bedrock (mOD)	1:5000	@ A3
AGP18054_06	Interpreted Resource Estimation (allowing up to 15 m Overburden)	1:5000	@ A3
AGP18054_07	Interpreted Resource Estimation (allowing up to 10 m Overburden)	1:5000	@ A3
AGP18054_08	Interpreted Resource Estimation (allowing up to 5 m Overburden)	1:5000	@ A3
2018 Results:			
AGL18057_R1	Results & Interpretation - R1 & S3 (2018)	1:1250	@A3
AGL18057_R2	Results & Interpretation - R2 & S4 (2018)	1:1250	@A3
AGL18057_R3	Results & Interpretation - R3 & S5 (2018)	1:1000	@A4
AGL18057_R4	Results & Interpretation - R4 (2018)	1:1000	@A3
AGL18057_R5	Results & Interpretation - R5 & S1 & S2 (2018)	1:1000	@A3
2020 Results:			
AGP18054_R01	Results & Interpretation - R01 (2020)	1:1500	@A3
AGP18054_R02	Results & Interpretation - R02 (2020)	1:1000	@A4
AGP18054_R03	Results & Interpretation - R03 & S03 (2020)	1:1000	@A4
AGP18054_R04	Results & Interpretation - R04 & S02 (2020)	1:1000	@A4
AGP18054_R05	Results & Interpretation - R05 & S01 (2020)	1:1000	@A3
AGP18054_R06	Results & Interpretation - R06 & S04 (2020)	1:1000	@A4

FIGURE 1: AERIAL PHOTO - GEOPHYSICAL LOCATIONS

SCALE 1:5000

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INDEX MAP:

LEGEND:

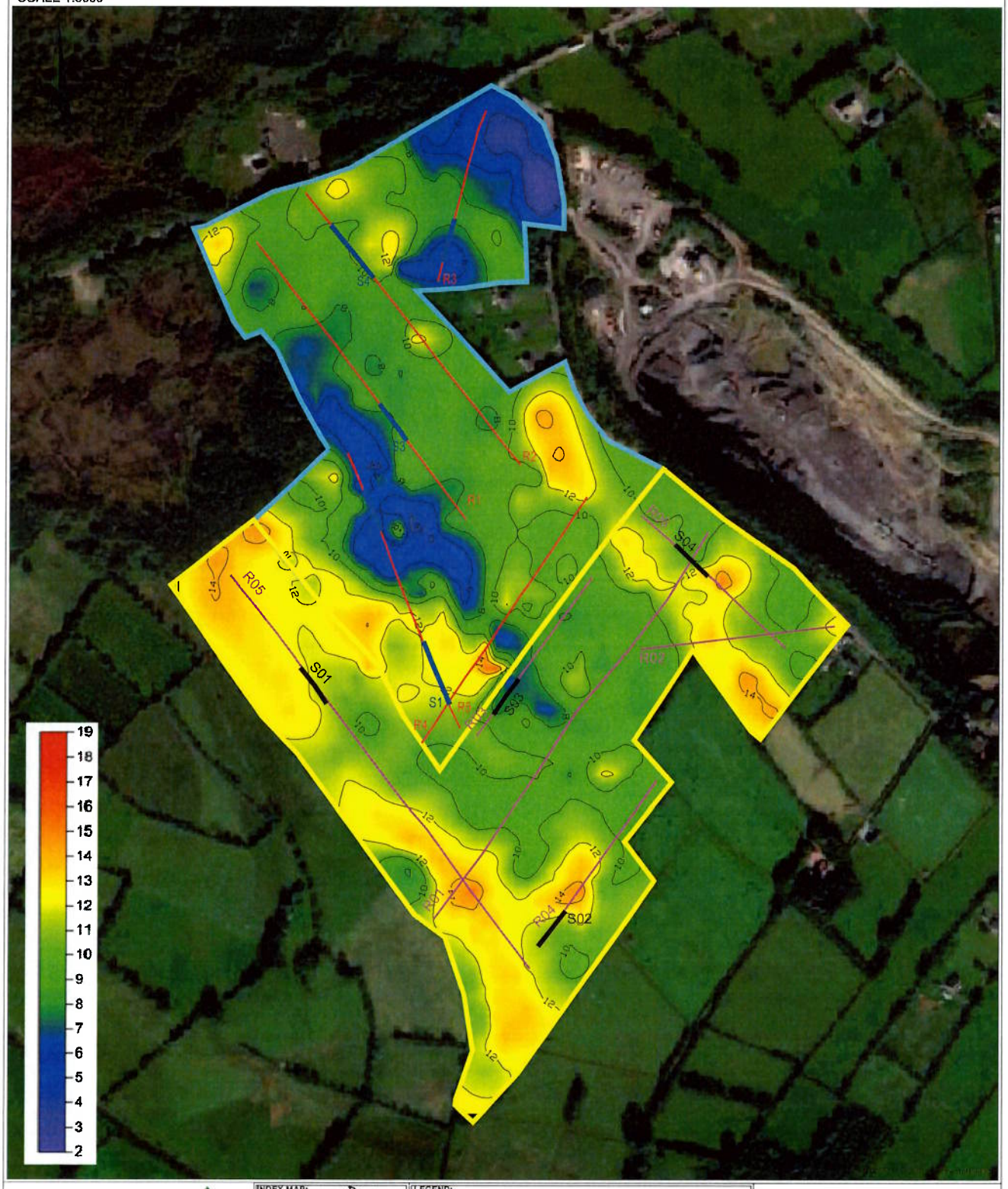
- 2020 Site
- 2018 Site
- 2020 EM conductivity station
- 2018 EM conductivity station
- R01 — 2020 2D ERT profile
- S01 — 2020 Seismic refraction profile
- R1 — 2018 2D ERT profile
- S1 — 2018 Seismic refraction profile
- Ground Elevation (mOD) - from geophysical survey

PROJECT:	RHYNE QUARRY GEOPHYSICAL SURVEY
CLIENT:	RHYNE ROCK LIMITED
DRAWING NO:	AGP18054_01
SCALE:	AS INDICATED @ A3
DATE:	05-06-2020

Version:	Date:	Drawn By:	Checked:
01	05-06-2020	YOC	TL

FIGURE 1: GROUND CONDUCTIVITY CONTOURS (mS/m)

SCALE 1:5000



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INDEX MAP:

LEGEND:

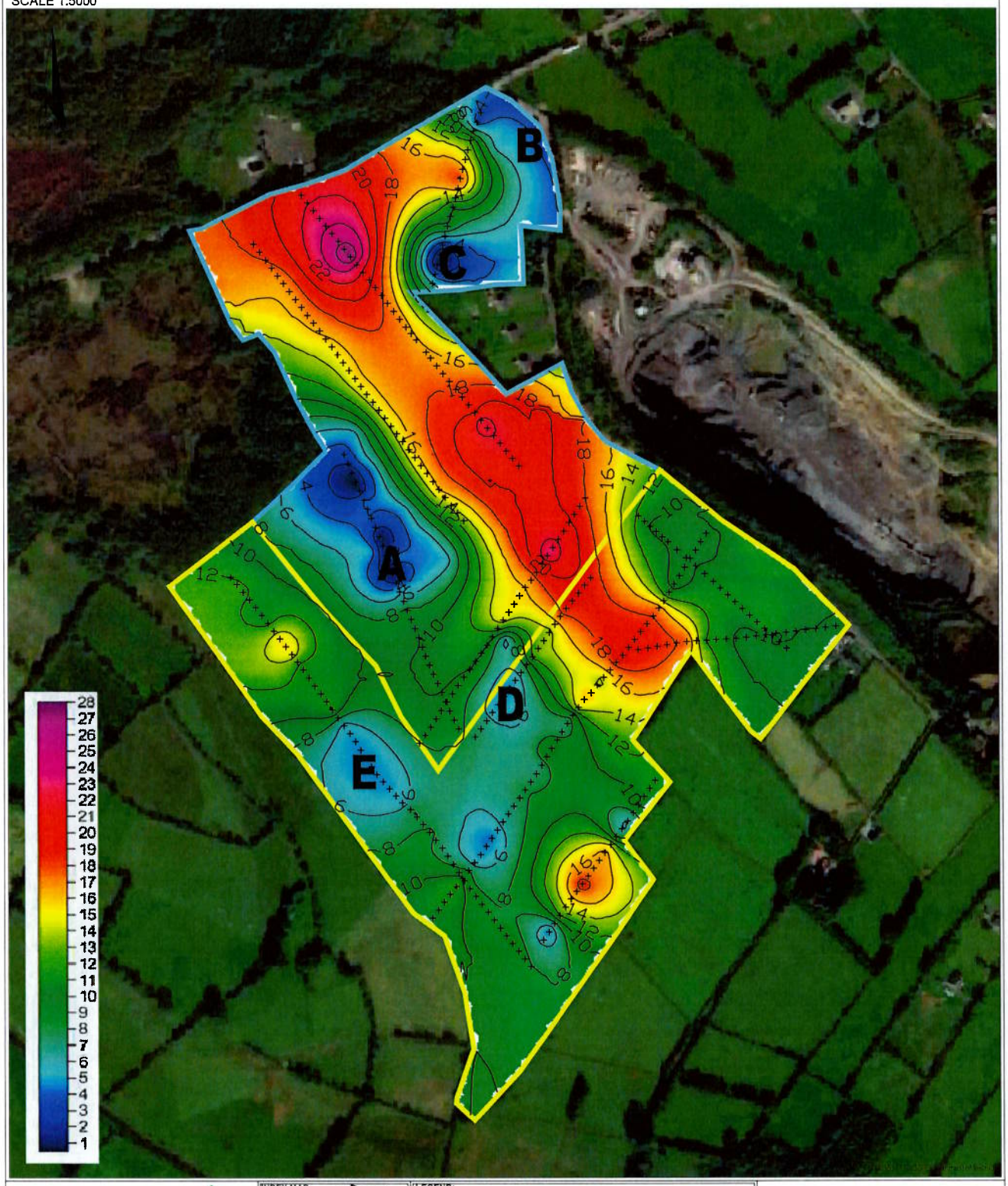
- 2020 Site
- 2018 Site
- R01 — 2020 2D ERT profile
- S01 — 2020 Seismic refraction profile
- R1 — 2018 2D ERT profile
- S1 — 2018 Seismic refraction profile

PROJECT	RHYNE QUARRY GEOPHYSICAL SURVEY
CLIENT	RHYNE ROCK LIMITED
DRAWING NO	AGP18054_02
SCALE	AS INDICATED @ A3
DATE	05-06-2020

Version:	Date:	Drawn By:	Checked:
01	05-06-2020	YOC	TL

FIGURE 1: INTERPRETED OVERBURDEN THICKNESS (m)

SCALE 1:5000



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INDEX MAP:

LEGEND:

2020 Site

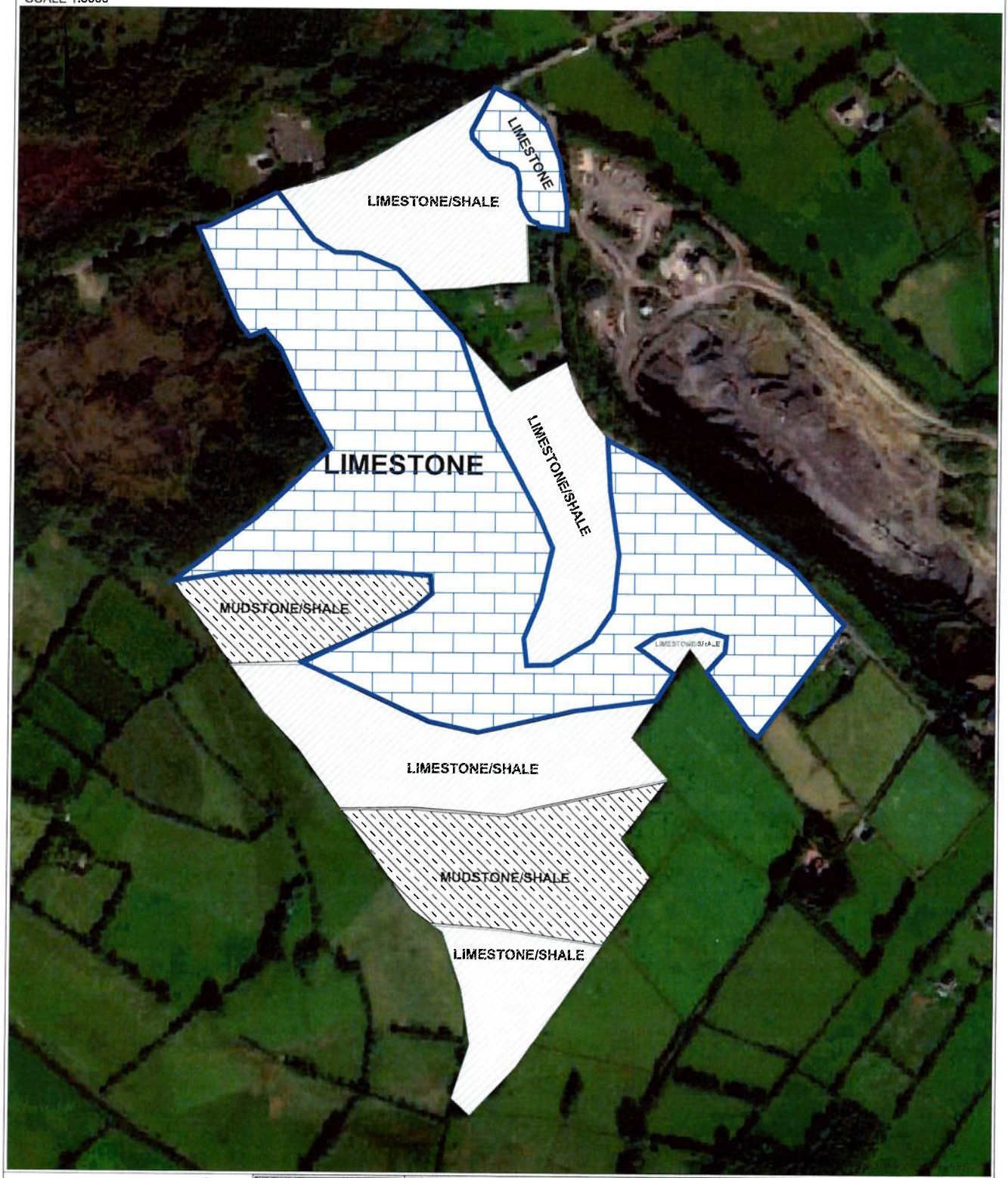
2018 Site

PROJECT:	RHYNE QUARRY GEOPHYSICAL SURVEY
CLIENT:	RHYNE ROCK LIMITED
DRAWING NO:	AGP18054_03
SCALE:	AS INDICATED @ A3
DATE:	05-06-2020

Version:	Date:	Drawn By:	Checked:
01	05-06-2020	YOC	TL

FIGURE 1: INTERPRETED BEDROCK MAP

SCALE 1:5000



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INDEX MAP:

LEGEND:

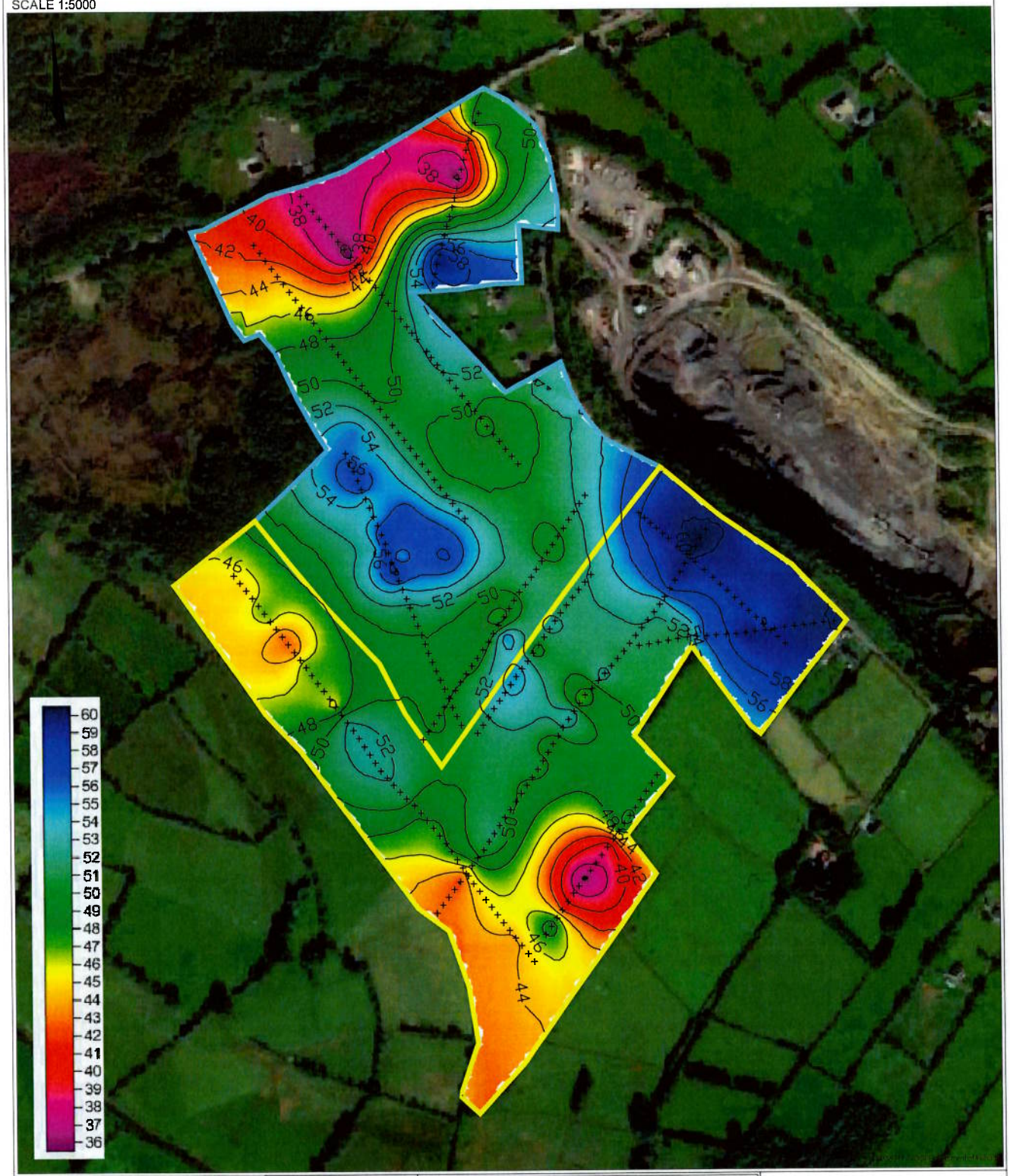
- Underlying LIMESTONE
- Underlying LIMESTONE/SHALE
- Underlying MUDSTONE/SHALE

PROJECT:	RHYNE QUARRY GEOPHYSICAL SURVEY
CLIENT:	RHYNE ROCK LIMITED
DRAWING NO:	AGP18054_04
SCALE:	AS INDICATED @ A3
DATE:	05-06-2020

Version:	Date	Drawn By:	Checked:
01	05-06-2020	YOC	TL

FIGURE 1: INTERPRETED TOP OF BEDROCK (m OD)

SCALE 1:5000



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INDEX MAP:

LEGEND:

2020 Site

2018 Site

PROJECT:	RHYNE QUARRY GEOPHYSICAL SURVEY
CLIENT:	RHYNE ROCK LIMITED
DRAWING NO:	AGP18054_05
SCALE:	AS INDICATED @ A3
DATE:	05-06-2020

Version	Date	Drawn By:	Checked:
01	05-06-2020	YOC	TL

FIGURE 1: INTERPRETED RESOURCE ESTIMATION (allowing up to 15 m OVERBURDEN)
SCALE 1:5000

INTERPRETED RESOURCE EST IMATIONS

		Bench (15 m)	Zone	Area * (m²)	Total Area * (Ha)	Overburden thickness (m)	Overburden Volume (m³)	Overburden Tonnage (million tonnes)	Rock Volume 15m Bench (m³)	Rock Tonnage Bench (million tonnes)	less 10% wastage (million tonnes)
Allowing up to 15m Overburden	Total Overburden			83,525	8.35	up to 15 m	691,778	1.11			
	Limestone	1	1	53,480	5.35	up to 15 m	454,062	0.73	802,200	2.01	1.80
		2	2	47,484	4.75				712,260	1.78	1.60
		3	3	41,902	4.19				628,530	1.57	1.41
	Total Limestone								2,142,990	5.36	4.82
	Limestone/Shale	1	4	30,045	3.00	up to 15 m	237,716	0.38	450,675	1.13	1.01
		2	5	27,249	2.72				408,735	1.02	0.92
		3	6	24,510	2.45				367,650	0.92	0.83
	Total Limestone/Shale								1,227,060	3.07	2.76

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INDEX MAP:

LEGEND

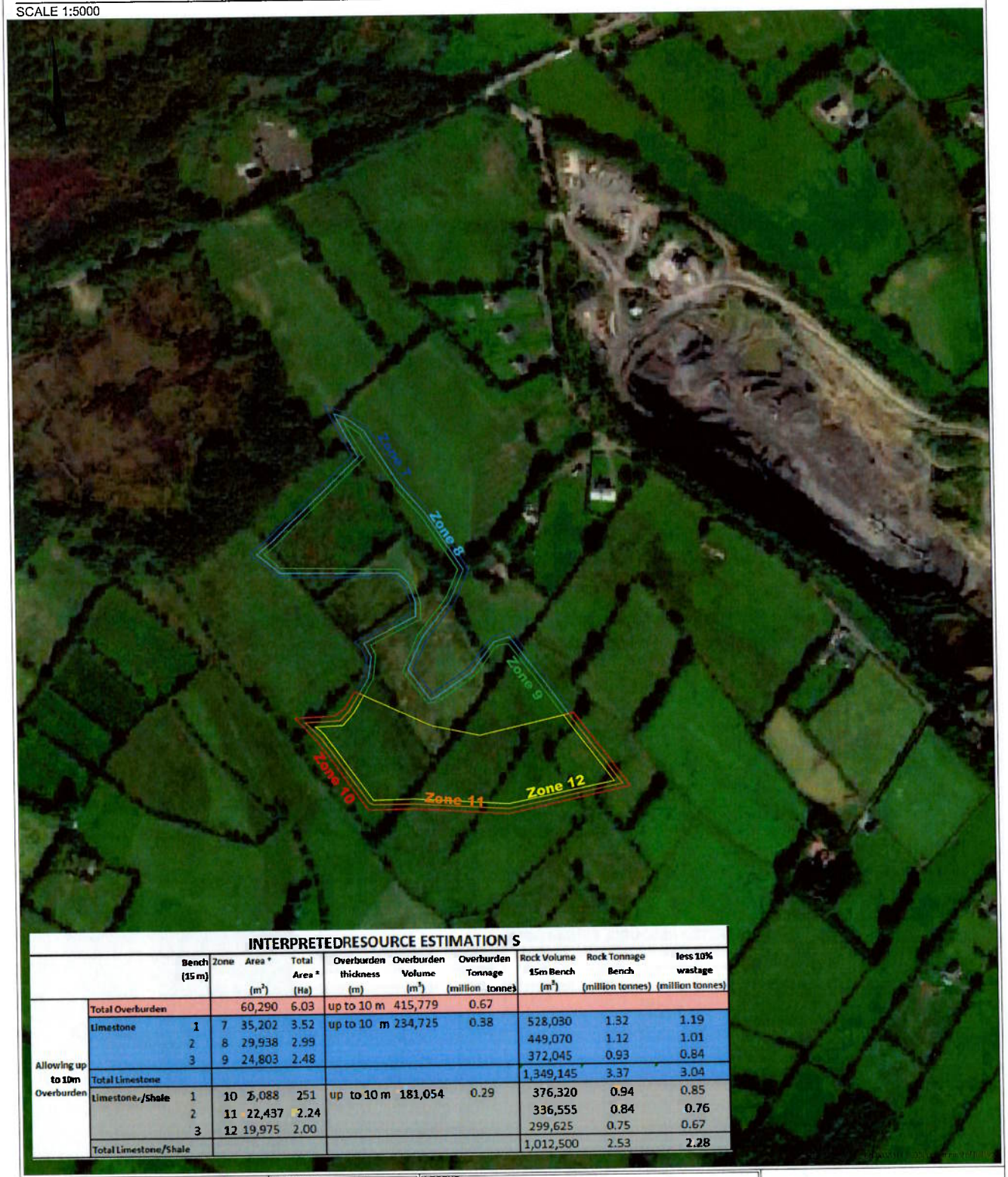
- Bench 1 LIMESTONE Bedrock
- Bench 2 LIMESTONE Bedrock
- Bench 3 LIMESTONE Bedrock
- Bench 1 LIMESTONE/SHALE Bedrock
- Bench 2 LIMESTONE/SHALE Bedrock
- Bench 3 LIMESTONE/SHALE Bedrock

PROJECT	RHYNE QUARRY GEOPHYSICAL SURVEY
CLIENT:	RHYNE ROCK LIMITED
DRAWING NO:	AGP180 54_06
SCALE:	AS INDICATED @ A3
DATE:	15-06-2020

Version:	Date:	Drawn By:	Checked:
01	15-06-2020	YOC	TL

FIGURE 1: INTERPRETED RESOURCE ESTIMATION (allowing up to 10 m OVERBURDEN)

SCALE 1:5000



INTERPRETEDRESOURCE ESTIMATION S

		Bench (15 m)	Zone	Area * (m^2)	Total Area * (Ha)	Overburden thickness (m)	Overburden Volume (m^3)	Overburden Tonnage (million tonnes)	Rock Volume 15m Bench (m^2)	Rock Tonnage Bench (million tonnes)	less 10% wastage (million tonnes)
Allowing up to 10m Overburden	Total Overburden			60,290	6.03	up to 10 m	415,779	0.67			
	Limestone	1	7	35,202	3.52	up to 10 m	234,725	0.38	528,030	1.32	1.19
		2	8	29,938	2.99				449,070	1.12	1.01
		3	9	24,803	2.48				372,045	0.93	0.84
	Total Limestone								1,349,145	3.37	3.04
	Limestone/Shale	1	10	25,088	251	up to 10 m	181,054	0.29	376,320	0.94	0.85
		2	11	22,437	2.24				336,555	0.84	0.76
		3	12	19,975	2.00				299,625	0.75	0.67
	Total Limestone/Shale								1,012,500	2.53	2.28

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INDEX MAP:

LEGEND:

- Bench 1 LIMESTONE Bedrock
- Bench 2 LIMESTONE Bedrock
- Bench 3 LIMESTONE Bedrock
- Bench 1 LIMESTONE/SHALE Bedrock
- Bench 2 LIMESTONE/SHALE Bedrock
- Bench 3 LIMESTONE/SHALE Bedrock

PROJECT:	RHYNE QUARRY GEOPHYSICAL SURVEY
CLIENT:	RHYNE ROCK LIMITED
DRAWING NO:	AGP18054.07
SCALE:	AS INDICATED @ A3
DATE:	15-06-2020

Version	Date	Drawn By:	Checked:
01	15-06-2020	YOC	TL

FIGURE 1: INTERPRETED RESOURCE ESTIMATION (allowing up to 5 m OVERBURDEN)

SCALE 1:5000

INTERPRETED RESOURCE ESTIMATIONS

		Bench (15 m)	Zone	Area * (m²)	Total Area * (Ha)	Overburden thickness (m)	Overburden Volume (m³)	Overburden Tonnage (million tonnes)	Rock Volume 15m Bench (m³)	Rock Tonnage Bench (million tonnes)	less 10% wastage (million tonnes)
	Total Overburden			9,082	0.91	up to 5 m	29,732	0.05			
Allowing up to 5m Overburden	Limestone	1	13	9,082	0.91	up to 5 m	29,732	0.05	136,230	0.34	0.31
		2	14	6,864	0.69				102,960	0.26	0.23
		3	15	5,024	0.50				75,360	0.19	0.17
	Total Limestone								314,550	0.79	0.71

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INDEX MAP:

LEGEND:

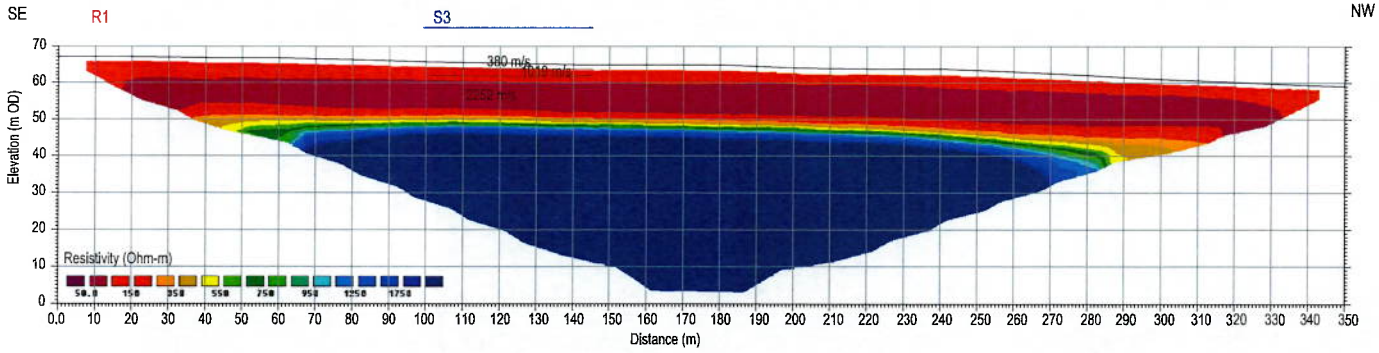
- Bench 1 LIMESTONE Bedrock
- Bench 2 LIMESTONE Bedrock
- Bench 3 LIMESTONE Bedrock
- Bench 1 LIMESTONE/SHALE Bedrock
- Bench 2 LIMESTONE/SHALE Bedrock
- Bench 3 LIMESTONE/SHALE Bedrock

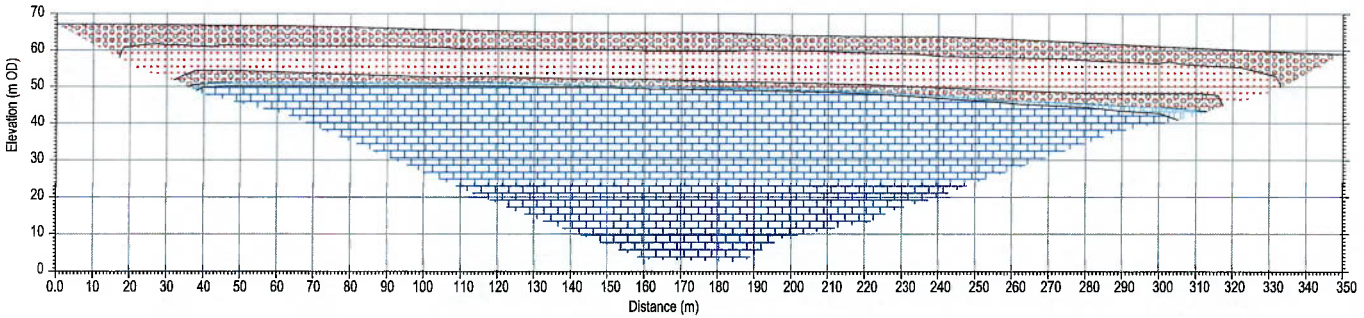
PROJECT:	RHYNE QUARRY GEOPHYSICAL SURVEY
CLIENT:	RHYNE ROCK LIMITED
DRAWING NO:	AGP18054_08
SCALE:	AS INDICATED @ A3
DATE:	15-06-2020

Version:	Date:	Drawn By:	Checked:
01	15-06-2020	YOC	TL

FIGURE 1: RESULTS & INTERPRETATION - R1 & S3 (2018)

SCALE 1:1250





LEGEND:

- SILT/CLAY
- Sandy gravelly SILT/CLAY
- Silty/clayey SAND/GRAVEL
- Weathered BEDROCK
- LIMESTONE BEDROCK
- Interbedded LIMESTONE/ SHALE BEDROCK
- MUDSTONE/SHALE BEDROCK

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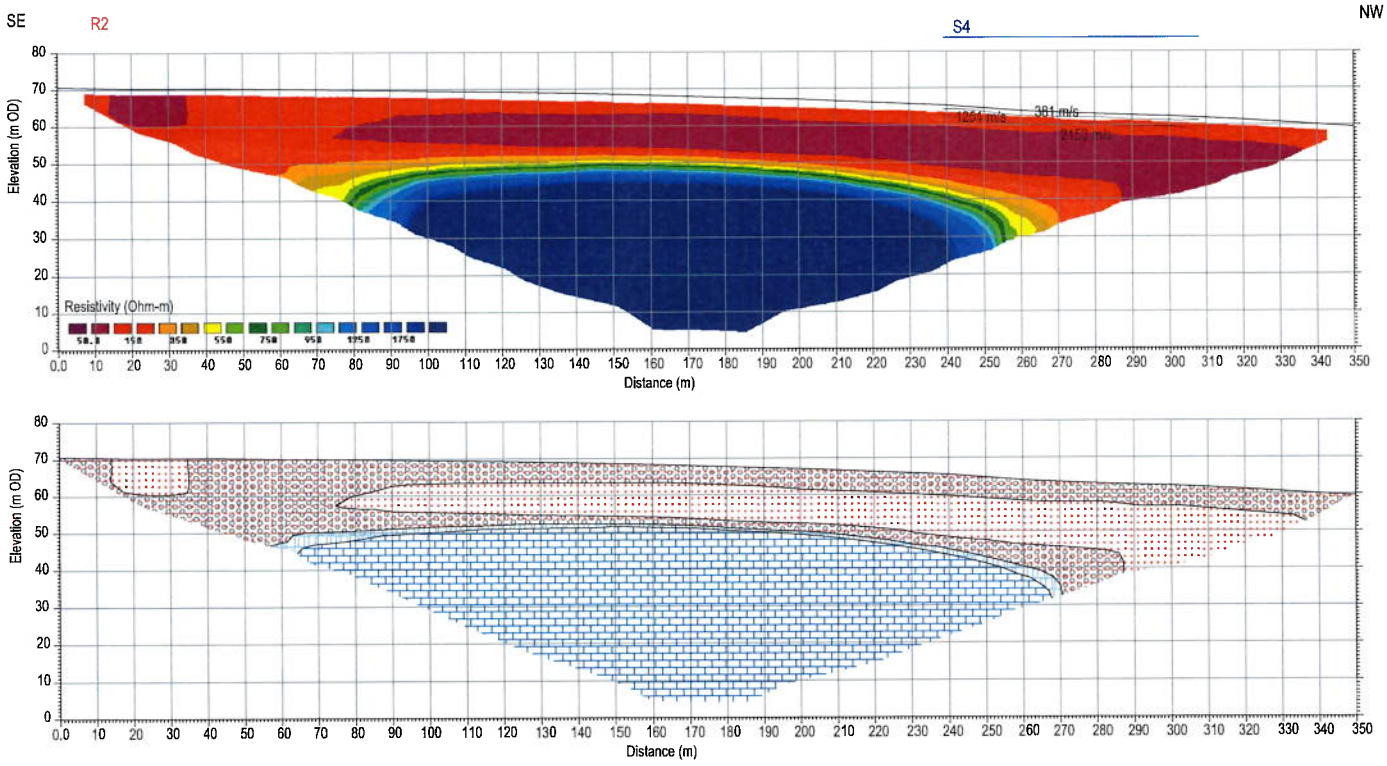
PROJECT:	RHYNE QUARRY GEOPHYSICAL SURVEY
CLIENT:	RHYNE ROCK LIMITED
DRAWING NO:	AGL18057_R1
SCALE:	AS INDICATED @ A3
DATE:	03-06-2020

Version	Date	Drawn By	Checked
01	03-06-2020	YOC	TL

FIGURE 1: RESULTS & INTERPRETATION - R2 & S4 (2018)

SCALE 1:1250



LEGEND:

- SILT/CLAY
- Sandy gravelly SILT/CLAY
- Silty/clayey SAND/GRAVEL
- Weathered BEDROCK
- LIMESTONE BEDROCK
- Interbedded LIMESTONE/ SHALE BEDROCK
- MUDSTONE/SHALE BEDROCK

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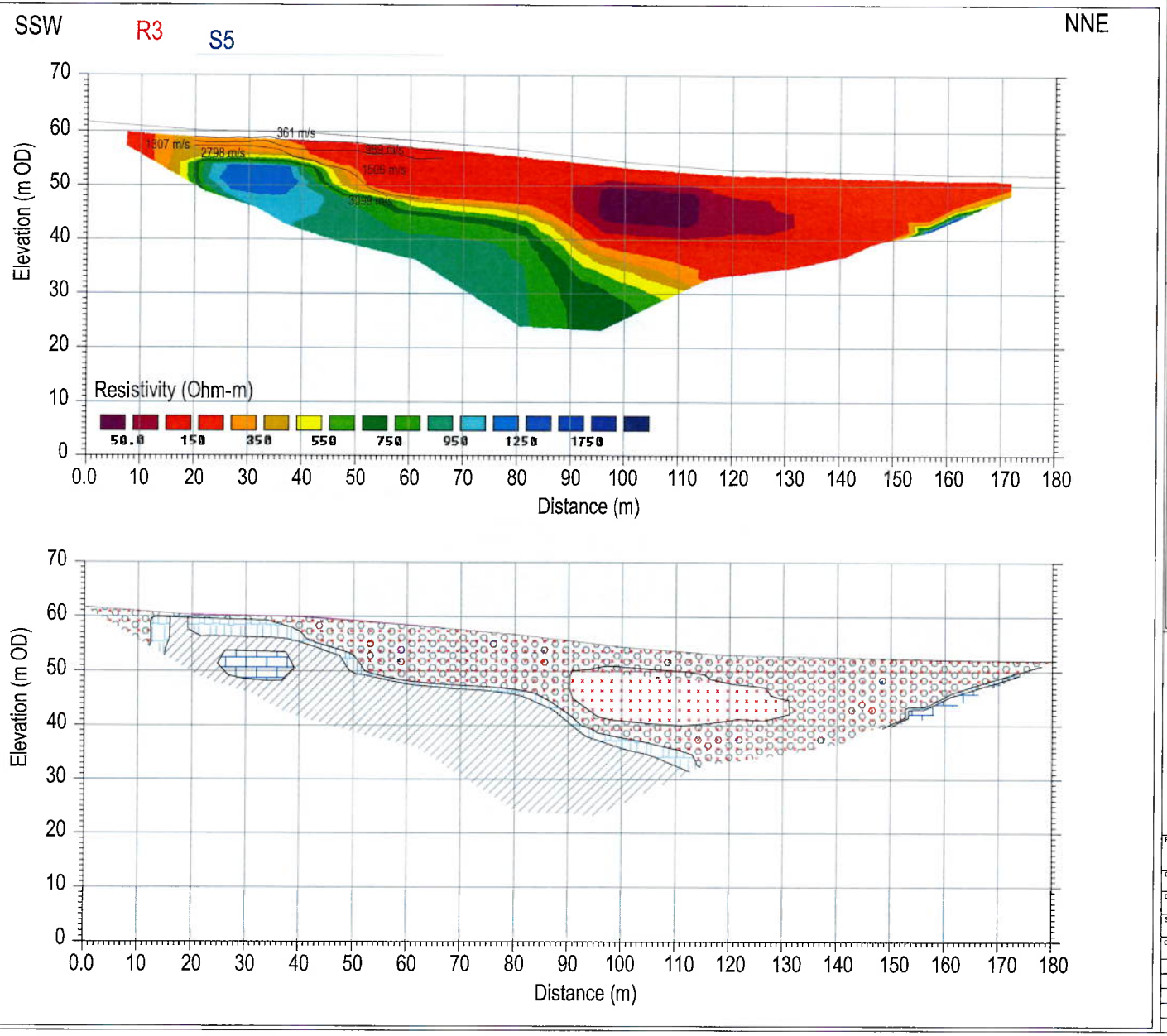
PROJECT:	RHYNE QUARRY
	GEOPHYSICAL SURVEY
CLIENT:	RHYNE ROCK LIMITED
ENVIRONMENTAL NO:	AGL18057_R2
SCALE:	AS INDICATED @ A3
DATE:	03-06-2020

Version	Date	Drawn By	Checked
01	03-06-2020	YOC	TL

FIGURE 1: RESULTS & INTERPRETATION - R3 & S5 (2018)

SCALE 1:1000



LEGEND:

- SILT/CLAY
- Sandy gravelly SILT/CLAY
- Silty/clayey SAND/GRAVEL
- Weathered BEDROCK
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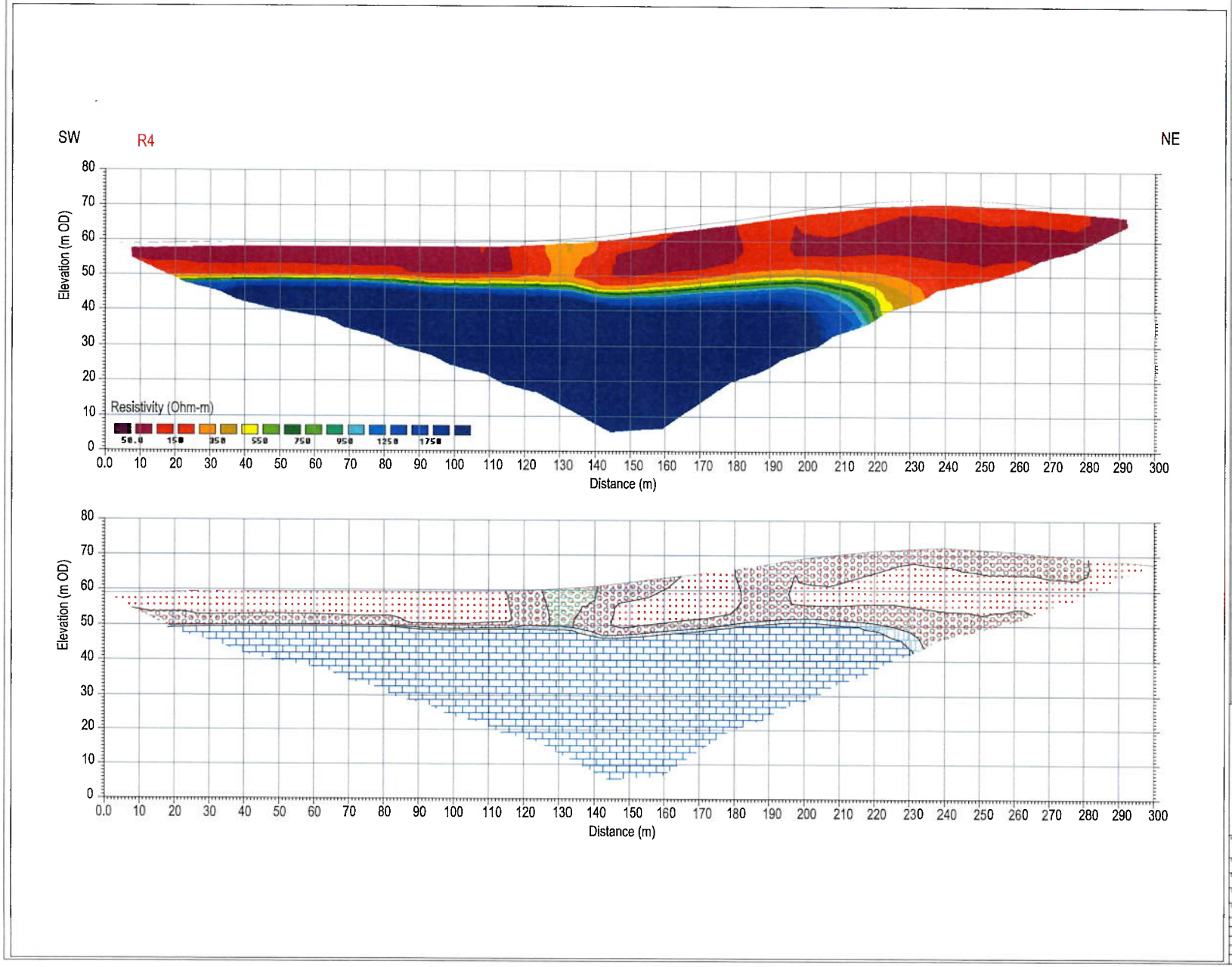
PROJECT:	RHYNE ROCK QUARRY GEOPHYSICAL SURVEY
CLIENT:	RHYNE ROCK LIMITED
DRAWING NO:	AGL18057_R3
SCALE:	AS INDICATED @ A4
DATE:	03-06-2020

Version:	Date:	Drawn By:	Checked:
01	03-06-2020	YOC	TL

FIGURE 1: RESULTS & INTERPRETATION - R4 (2018)

SCALE 1:1000



LEGEND:

- SILT/CLAY
- Sandy gravelly SILT/CLAY
- Silty/clayey SAND/GRAVEL
- Weathered BEDROCK
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- MUDSTONE/SHALE BEDROCK

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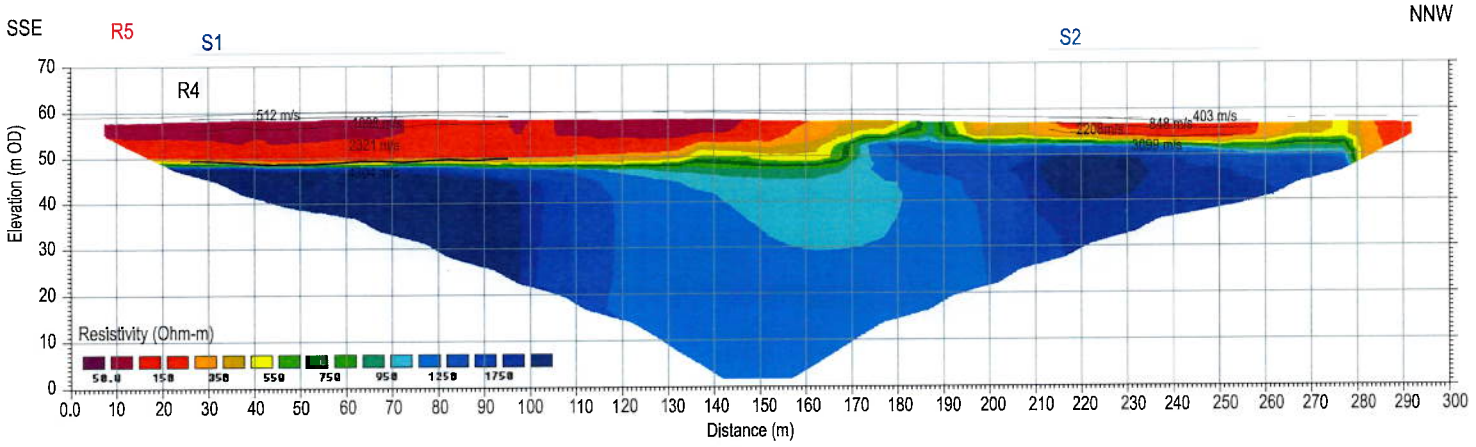
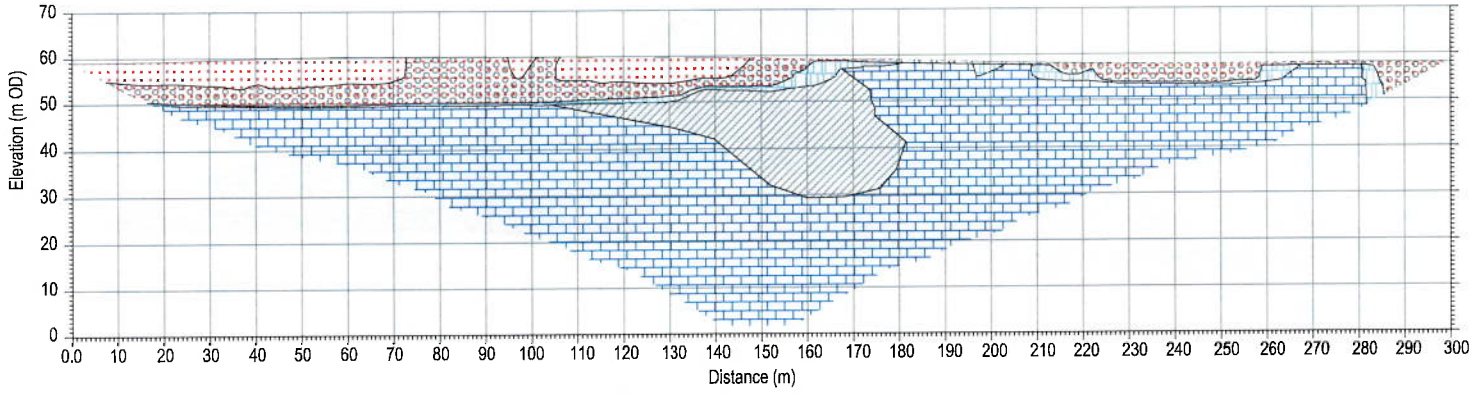
CLIENT:	RHYNE ROCK LIMITED
DRAWING NO.	AGL18057_R4
SCALE:	AS INDICATED @ A3
DATE:	03-06-2020

Version	Date	Drawn By	Checked
01	03-06-2020	YOC	TL

FIGURE 1: RESULTS & INTERPRETATION - R5 & S1 & S2 (2018)

SCALE 1:1000





LEGEND:

- SILT/CLAY
- Sandy gravelly SILT/CLAY
- Silty/clayey SAND/GRAVEL
- Weathered BEDROCK
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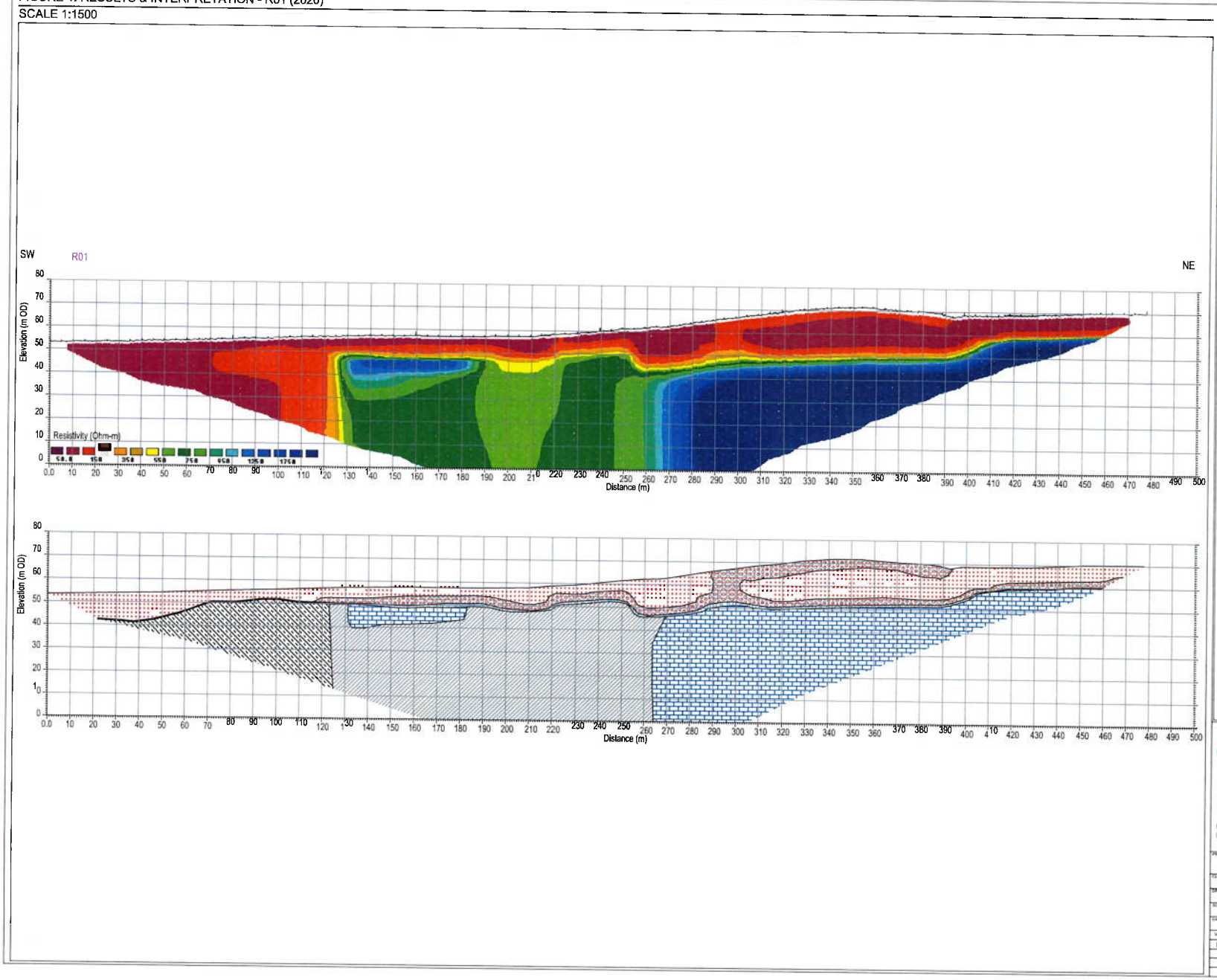
PROJECT:	RHYNE QUARRY GEOPHYSICAL SURVEY
CLIENT:	RHYNE ROCK LIMITED
DRAWING NO:	AGL18057_R5
SCALE	AS INDICATED @ A3
DATE:	03-06-2020

Version	Date:	Drawn By:	Checked
01	03-06-2020	YOC	TL

FIGURE 1: RESULTS & INTERPRETATION - R01 (2020)

SCALE 1:1500



LEGEND:

- SILT/CLAY
- Sandy gravelly SILT/CLAY
- Silty/clayey SAND/GRAVEL
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PROJECT:	RHYNE QUARRY
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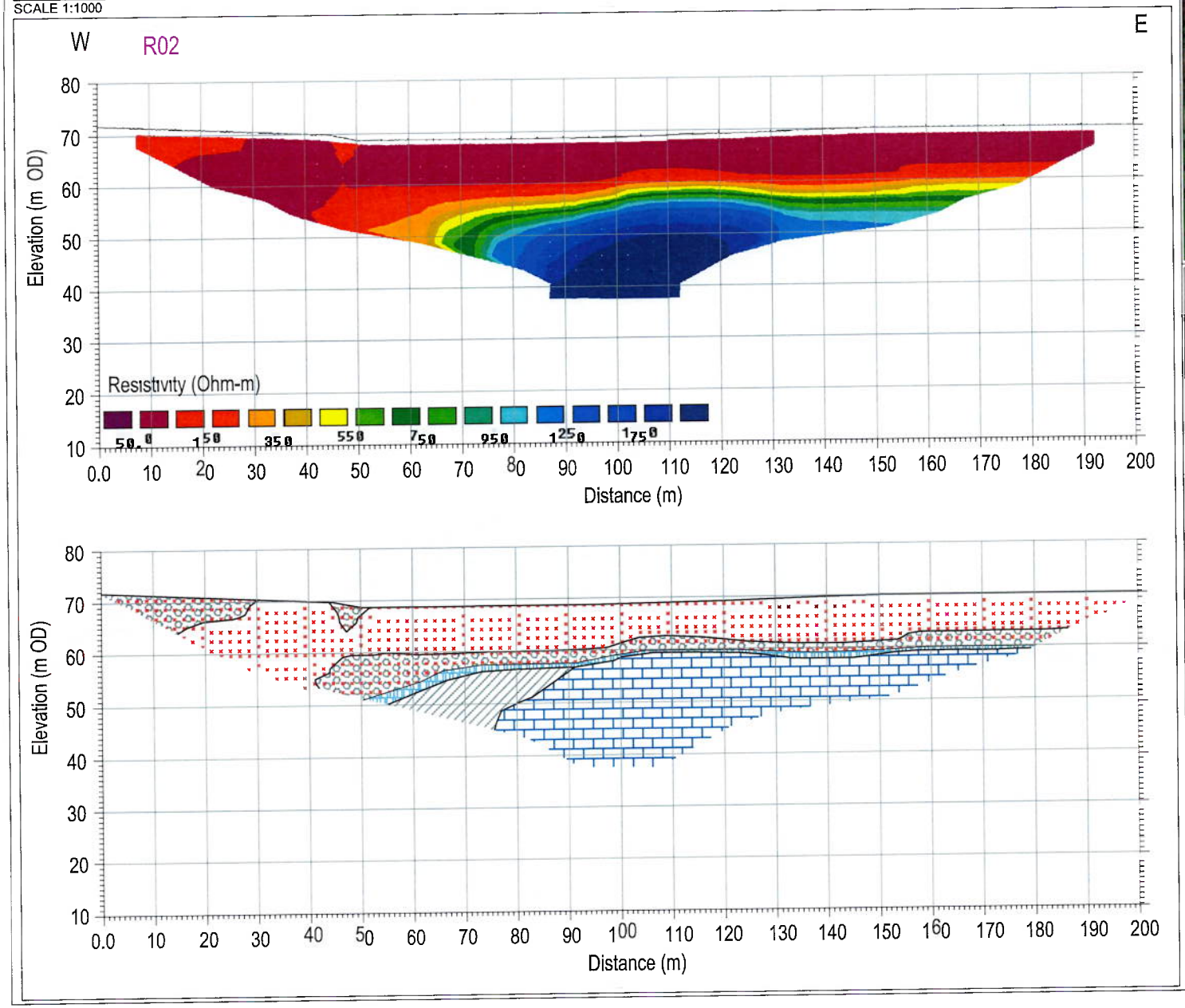
CLIENT:	RHYNE ROCK LIMITED
DRAWING NO:	AGP18054_R01
SCALE:	AS INDICATED @ A3
DATE:	05-06-2020

Version	Date	Drawn By:	Checked:
01	05-06-2020	YOC	TL

FIGURE 1: RESULTS & INTERPRETATION - R02 (2020)

SCALE 1:1000



LEGEND:

- SILT/CLAY
- Sandy gravelly SILT/CLAY
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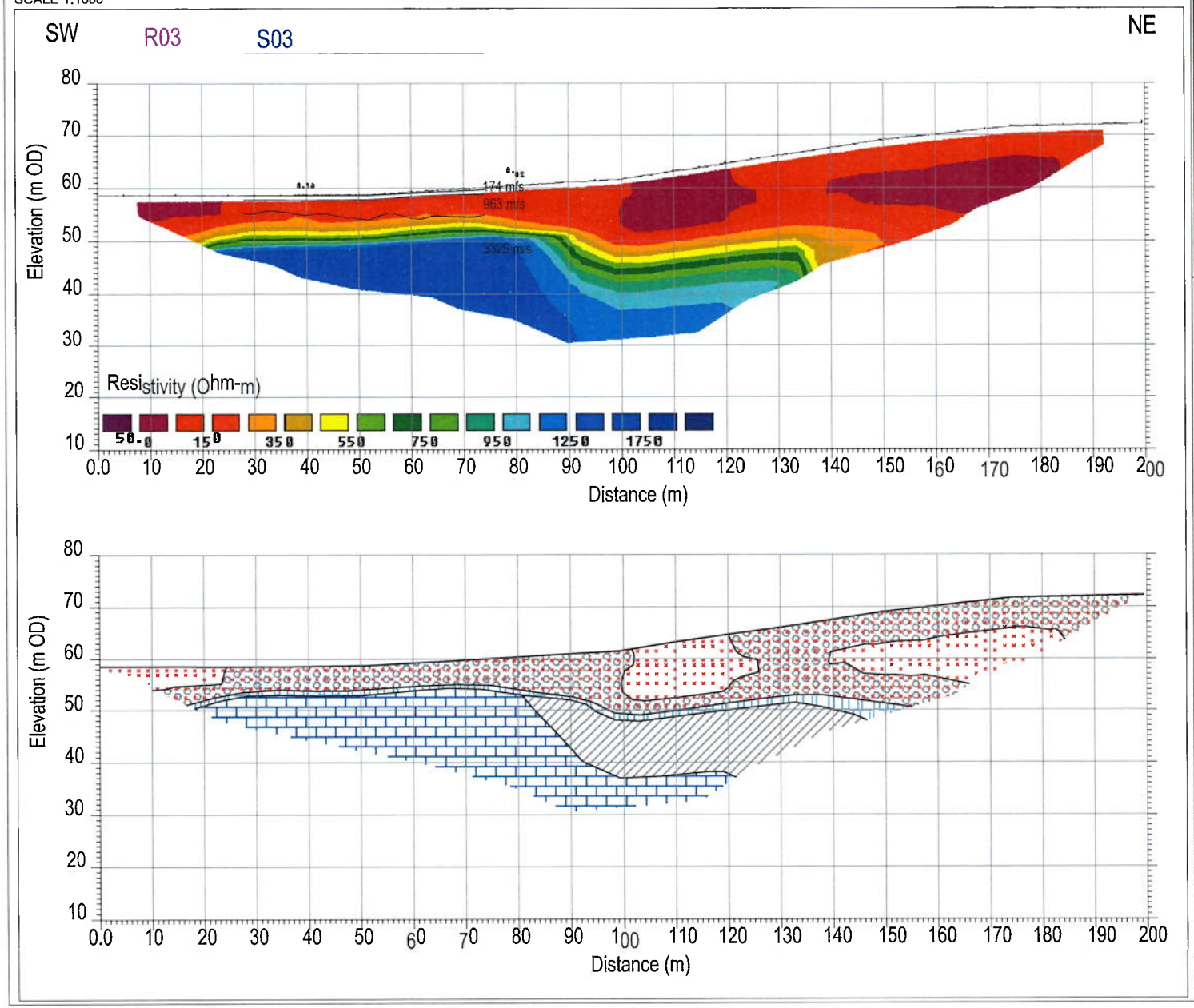
PROJECT:	RHYNE ROCK QUARRY GEOPHYSICAL SURVEY
CLIENT:	RHYNE ROCK LIMITED
DRAWING NO:	AGP18054_R02
SCALE:	AS INDICATED @ A4
DATE:	05-06-2020

Version:	Date:	Drawn By:	Checked:
01	05-06-2020	YOC	TL

FIGURE 1: RESULTS & INTERPRETATION - R03 & S03 (2020)

SCALE 1:1000



LEGEND:

- SILT/CLAY
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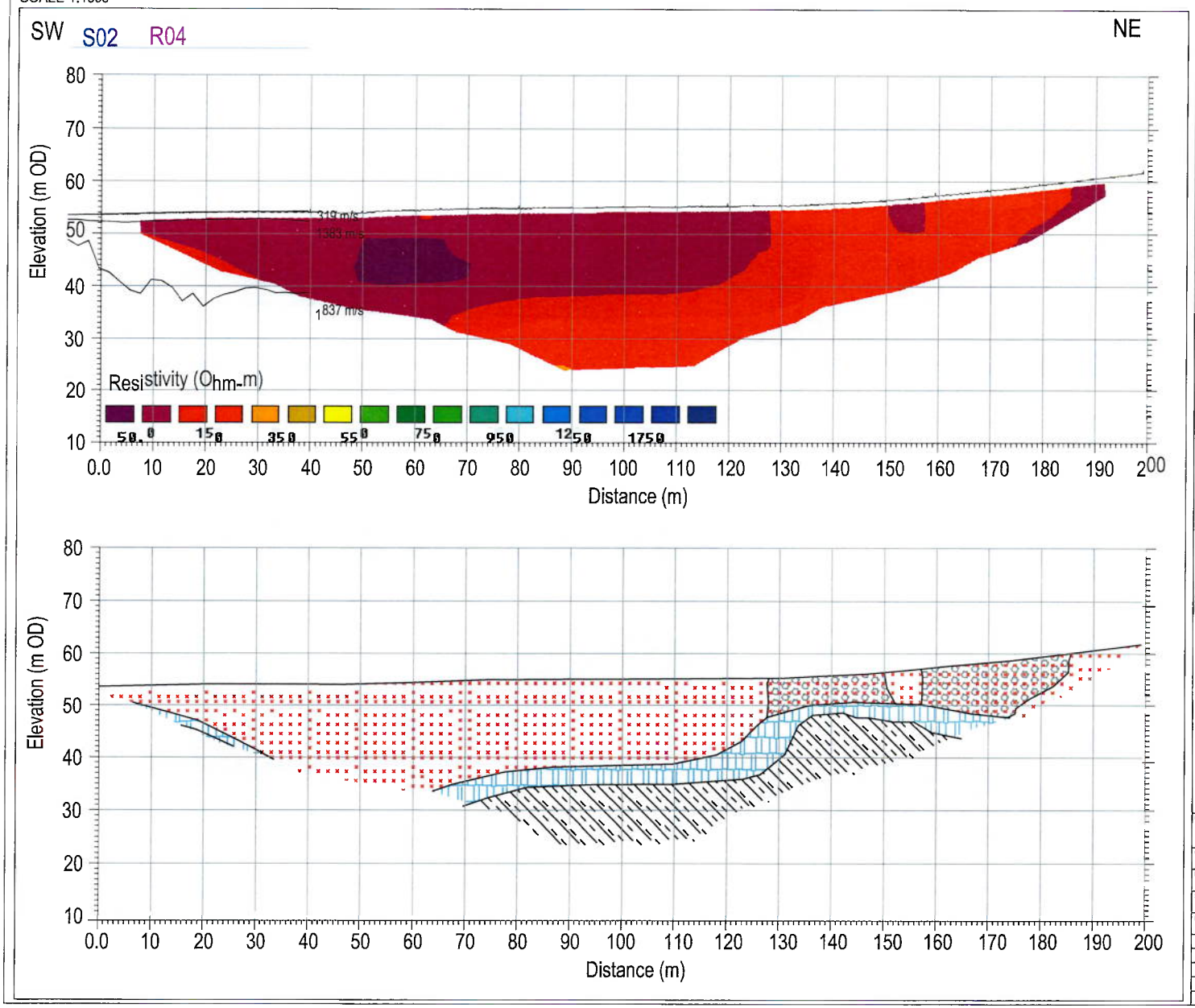
PROJECT:	RHYNE ROCK QUARRY GEOPHYSICAL SURVEY
CLIENT:	RHYNE ROCK LIMITED
DRAWING NO:	AGP18054_R03
SCALE:	AS INDICATED @ A4
DATE:	05-06-2020

Version:	Date:	Drawn By:	Checked:
01	05-06-2020	YOC	TL

FIGURE 1: RESULTS & INTERPRETATION - R04 & S02 (2020)

SCALE 1:1000



LEGEND:

- SILT/CLAY
- Sandy gravelly SILT/CLAY
- Silty/clayey SAND/GRAVEL
- Weathered BEDROCK
- LIMESTONE BEDROCK
- Interbedded LIMESTONE/ SHALE BEDROCK
- MUDSTONE/SHALE BEDROCK

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PROJECT:	RHYNE ROCK QUARRY GEOPHYSICAL SURVEY
CLIENT:	RHYNE ROCK LIMITED
DRAWING NO:	AGP18054_R04
SCALE:	AS INDICATED @ A4
DATE:	05-06-2020

Version:	Date:	Drawn By:	Checked:
01	05-06-2020	YOC	TL

FIGURE 1: RESULTS & INTERPRETATION - R05 & S01 (2020)

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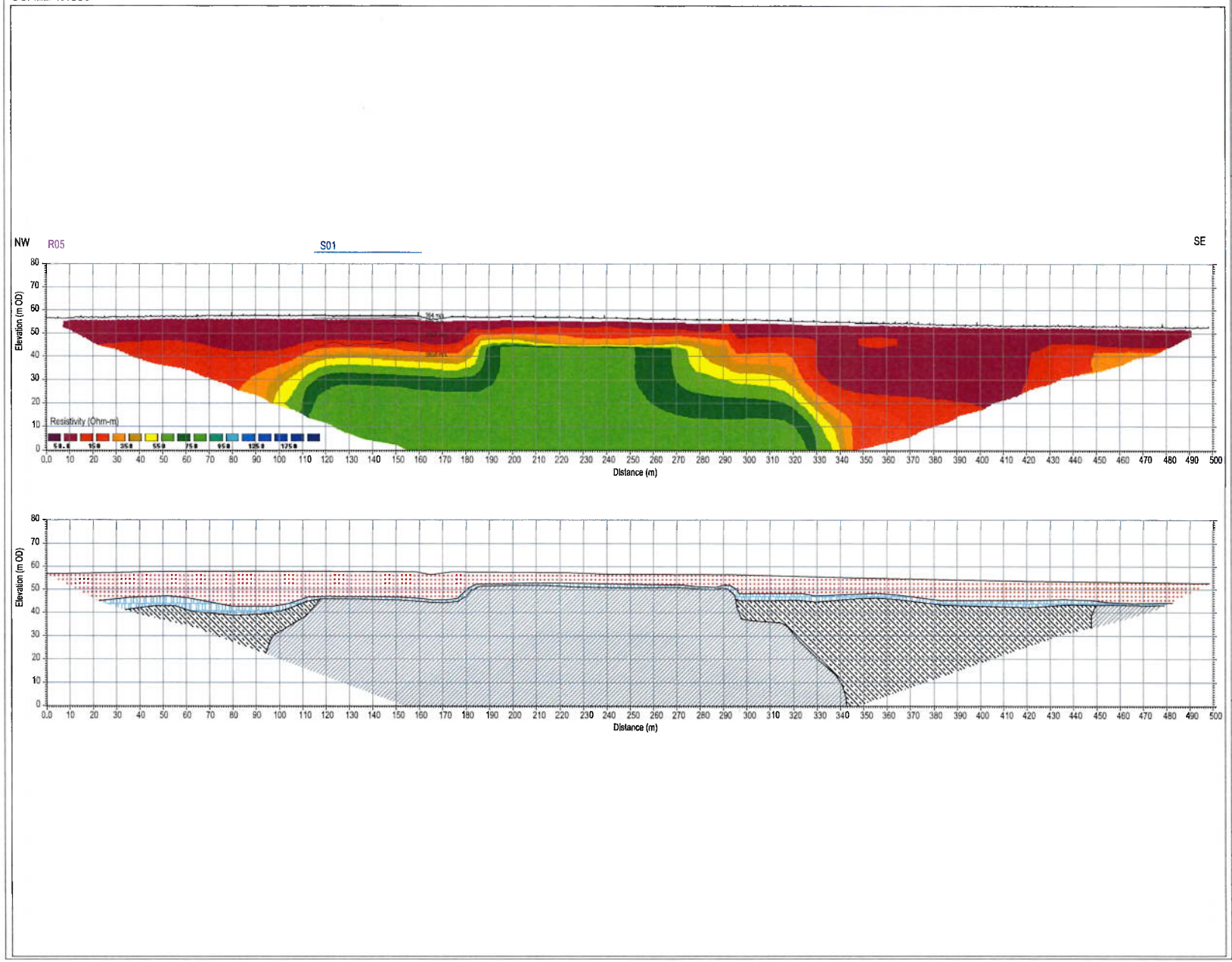

LEGEND:

- SILT/CLAY
- Sandy gravelly SILT/CLAY
- Silty/clayey SAND/GRAVEL
- Weathered BEDROCK
- LIMESTONE BEDROCK
- Interbedded LIMESTONE/ SHALE BEDROCK
- MUDSTONE/SHALE BEDROCK

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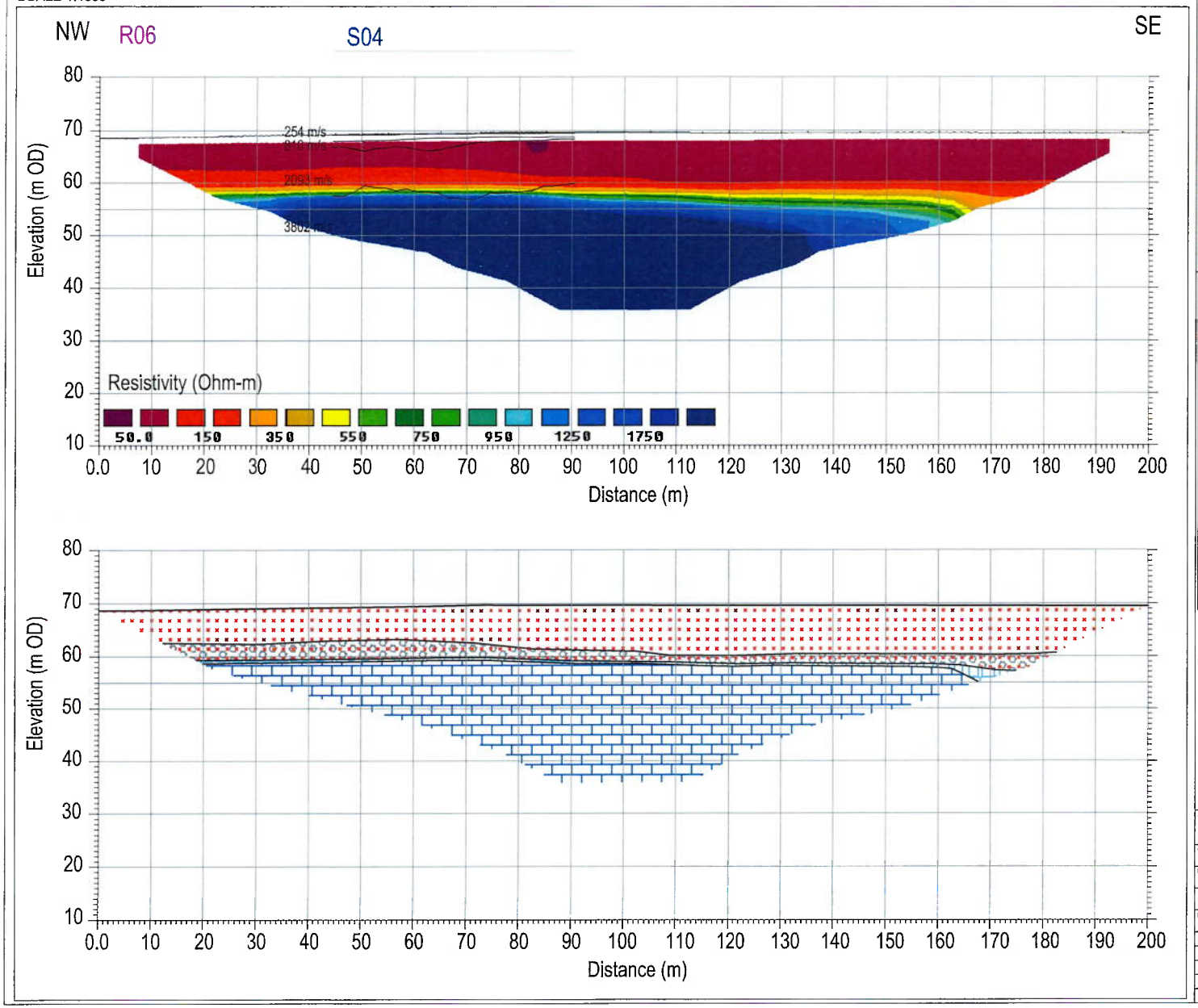
PROJECT:	RHYNE QUARRY
	GEOPHYSICAL SURVEY
CLIENT:	RHYNE ROCK LIMITED
DRAWING NO:	AGP18054_R05
SCALE:	AS INDICATED @ A3
DATE:	05-06-2020

Version	Date	Drawn By	Checked
01	05-06-2020	YOC	TL

FIGURE 1: RESULTS & INTERPRETATION - R06 & S04 (2020)

SCALE 1:1000



LEGEND:

- SILT/CLAY
- Sandy gravelly SILT/CLAY
- Silty/clayey SAND/GRAVEL
- Weathered BEDROCK
- LIMESTONE BEDROCK
- Interbedded LIMESTONE/ SHALE BEDROCK
- MUDSTONE/SHALE BEDROCK

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PROJECT:	RHYNE ROCK QUARRY GEOPHYSICAL SURVEY
CLIENT:	RHYNE ROCK LIMITED
DRAWING NO:	AGP18054_R06
SCALE:	AS INDICATED @ A4
DATE:	05-06-2020

Version:	Date:	Drawn By:	Checked:
01	05-06-2020	YOC	TL

Appendix 6.2 – Dr. John Colthurst Report - Review of Geophysical Reports and Diamond Drilling Results

Review of Geophysical Reports and Diamond Drilling Results at a Proposed Quarry Site at Killoe, Ballinalee, County Longford

12th January 2021

Report for Rhyne Rock Limited,
Killoe, County Longford

Prepared by:

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Registration Number 008

Introduction

Rhyne Rock Limited currently operate a limestone quarry at Killoe, County Longford. The Quarry has largely exhausted the reserves within its existing footprint and Rhyne Rock Limited are considering the development of a new quarry, south-west of the existing quarry. Rhyne Rock Quarry is located at Killoe, 3km west of Ballinalee and 6km east of Newtownforbes and is accessed from the R194, the regional road linking Longford and Ballinalee. The quarry is located on a low ridge which trends in a northwest / southeast direction. Much of the surrounding area is low-lying and, in some cases, poorly drained farmland. The quarry was originally opened in the 1940s and was initially operated by Longford County Council. The quarry is referred to as Rhyne Quarry in the Geological Survey of Ireland 1:100,000 scale, Bedrock Geology Map Series, Sheet 12 memoir.

Figure 1. Aerial view of Rhyne Quarry. The main road running from southwest to northeast is the R194. The site proposed for the new quarry is immediately southwest of the existing quarry.

APEX Geophysics completed geophysical surveys over the area of the proposed development.

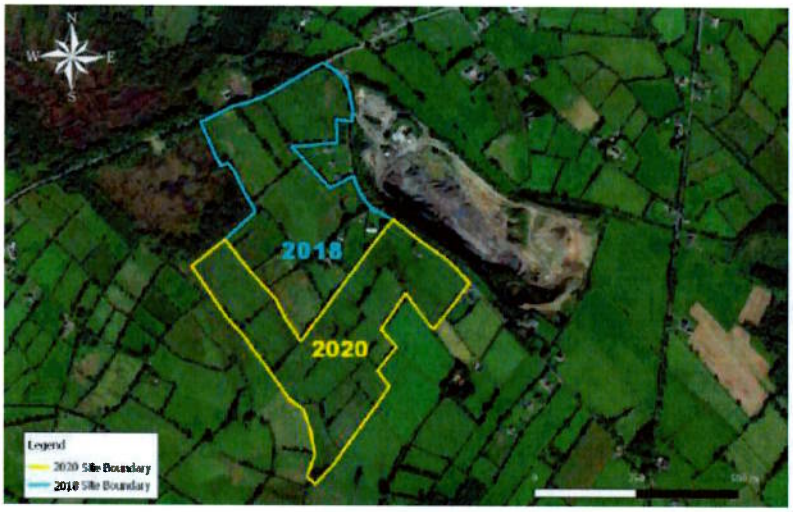


Figure 2. Image extracted from APEX report AGP18054-02, showing the areas surveyed in 2018 and 2020.

APEX Geophysics carried out geophysical surveys over the northern part of the site in 2018 and they completed further surveys in 2020.

The Geophysical Surveys included EM-31 Ground Conductivity Mapping, Electrical Resistivity Tomography (ERT) profiling, and Seismic Refraction profiling. They produced an Integrated Interpretation from the ERT and Seismic Profiling Results and they also completed a Resource Estimation.

The APEX reports are:
AGL18057_01, dated 13th April 2018
AGP18054_02, dated 15th June 2020

Geomorphology

The northeastern part of the area assessed is slightly more elevated than the surrounding farmland. The site rises to an elevation of approximately 71m in the centre of the site but is at an elevation of 55m to the northwest and south.

A drumlin feature with a northwest /southeast trend is responsible for the 71m elevation in the centre of the site. This drumlin is one of an extensive drumlin field developed as ice moved from northwest to southeast. It is composed of glacial till largely derived from Lower Palaeozoic strata, mainly greywacke sandstones and shales. There are also the remnants of a smaller drumlin, now partly quarried out, on the southern edge of the existing quarry. A scrub covered area immediately northwest of the site is the remnants of a cut away raised bog and reclaimed raised bog is also present on the western side of the site.

Soils are developed on very heavy poorly drained boulder clay. Most of the land, apart from the drumlin ridge, is of poor quality, marshy and dominated by rushes.

Regional Geology

The Killoe area is underlain by Lower Carboniferous limestones of Visean age. Natural exposures of the limestones are rare, and the existing quarry is by far the best exposure in the area.

Tara Exploration Ltd explored the area as part of Prospecting Licence 3363 and in 1990 drilled a 595m deep diamond-drillhole about 1km north of the quarry. This drilhole, 3363/1, is the basis for the lower part of the stratigraphy tabulated below. The drillhole collared in Arundian age rocks and the Chadian / Arundian boundary was at c240m. The drillhole probably collared below the stratigraphy exposed in the quarry which has been dated as Holkerian.

The Lower Carboniferous stratigraphy of the area is tabulated below.

Geological Unit	Thickness	Age	Lithology
LucanF ormation / Shelf	c450m	Asbian, Holkerian, Arundian, Chadian	Dark grey turbiditic limestone with interbedded black shale / Pale grey bedded calcarenite and micrite
Tobercolleen Formation	40m	Chadian	Calcareous and frequently pyritic mudstone
ABL and Shaly Pales	165m	Courceyan to Chadian	Calcarenite and argillaceous limestone
Upper Sandstone	20m	Courceyan	Grey sometimes calcareous sandstone
Pale Beds	50m	Courceyan	Micrite, oolite sandy limestone
Basal Sandstone	35m	Courceyan	Paleg rey and white sandstone
Unconformity	^^^^^^^^^^		
Lower Palaeozoic	>500m	Ordovician	Greywac ke andphy llite

Table 1. Carboniferous Succession.

The Existing Quarry

The Geological Survey Memoir for sheet 12 provides a description of Rhyne Quarry (Killoe) on page 63.

"Rhyne Quarry, southwest of Ballinalee, exposes over 25m of dark grey well-bedded fine-grained and coarse-grained limestones. The beds are typically 10-20cm thick, sharp based and laminated, with occasional coarser beds rich in brachiopods, crinoids, gastropods and solitary corals (Siphonophyllia). These beds have erosive bases and are graded. .... The section, of probably early Holkerian age, represents a more proximal basinal facies of the Lucan Formation on the margin of the Ballinalee Basin, and some of the fossiliferous beds indicate, by their highly micritised skeletal content, close proximity to a nearby shallow water shelf facies."

The Professional Geologist has visited the quarry on several occasions as part of S.R.21 and S.R.16 compliance requirements. The quarry has a floor area of approximately 36,000 square metres, excluding offices and plant areas. The quarry is orientated northwest / southeast and access is from a ramp on the south-western side of the quarry. The quarry is 270m long and 140m wide.

The quarry has to-date extracted two benches and a third bench is currently being developed.
The limestones are flat bedded or display very gentle rolling dips. Bed thickness is variable, but most beds fall in the range 20 to 40cms. These beds are fine calcarenites or micrites and are medium to dark grey in colour. The calcarenites are silicified and cherty nodules are developed in some areas of the quarry.

There are occasional beds, usually coarser calcarenites, up to 60cms in thickness.
Most of the beds are planar with sharp bases and little or no shale is present between beds.

The Professional Geologist has assessed the material in the existing quarry and it is fully compliant in terms of S.R.16 and S.R.21, that is the limestone is suitable for use in concrete products and is also suitable for use under concrete floors and paths.

Figure 2. Upper two benches, north-western part of the quarry, illustrating generally flat bedding of the limestone. The planned development will be on the other side of the minor road which is immediately behind the partially vegetated face at the back of the photograph.

Figure 3. Looking west, typical well-bedded limestones, almost flat lying

Figure 4. Close up of limestone beds. No shaly horizons present between beds.

APEX Report and the proposed Quarry.

The Professional Geologist has read the APEX reports and considered them in conjunction with his knowledge of the existing quarry. The geophysical reports provide a detailed interpretation for the area southwest of the quarry.

- Overburden ranges from 0.5m to 28m in thickness. As would be expected the thickest overburden is on the line of the drumlin (APEX line R2). Most of the overburden is silt, clay and silty gravel. There may be a small deposit of sand and gravel on APEX 2018 profile R4. Resistivity values of <350 Ohm-m are typical of glacial overburden and in general the higher the resistivity within this range the gravellier the material.

- Three different types of bedrock are indicated by the resistivities. Low Resistivities (50-350 Ohm-m) are associated with mudstone or shale, medium resistivities (350-1000 Ohm-m) are interpreted as indicating interbedded shale and limestone. Higher resistivities, up to 5000 Ohm-m, are associated with cleaner limestone bedrock. All the rock exposed in the quarry would be expected to have resistivities in this higher range.

The presence of three different rock types is perhaps unexpected as the beds in the quarry are flat lying and there is no obvious evidence of faulting.

The shales and mudstones could be faulted into position, as facies changes are unlikely in this environment. An alternative explanation would be that they are present in the axial areas of synclines, but this this would require steeper dips than are seen in the existing quarry. There is some evidence that this may be the case; Apex Line R03 and S03 shows interpreted interbedded Limestone/Shale bedrock overlying better quality limestone at 100m from the start of the line.

Mudstones and shales will not produce a useable aggregate. S.R.21 requires material with less than 10% sedimentary mudrock. In addition, shales and mudstones normally have poor Los Angeles

Values, Magnesium Sulphate Soundness and a higher sulphur content. The Tobercolleen Formation, indicated in the stratigraphic table, was a source of high sulphur (pyritic) aggregate culpable for pyrite problems in the greater Dublin area and should be avoided. The shales detected by the geophysical surveys are unlikely to be the Tobercoleen Formation but in any case, they will not be a good quality aggregate.

The Limestone/Shale might be useable but would almost certainly require additional processing to screen out the shaly material. It is also possible that some of this material is a weathered version of the limestone as weathering will tend to reduce the resistivity. Apex line R5 shows a body of interbedded Limestone/Shale at 140 to 180m along the line. This could be a karsted zone within the limestones, like the large karst body present on the northeastern side of the existing quarry.

The limestone will be good quality material like the material currently being produced in the quarry.

Apex have identified 5 areas, A, B, C, D, and E where the overburden is reasonably thin 'mostly less than 5m. B and C are on the northeastern part of the site close to the entrance to the existing quarry. The bedrock here is high resistivity, indicating that it is limestone, but the area is too close to houses, the main road and a minor road to be suitable for quarrying. The other three areas, A, D and E are all southwest of the drumlin feature.

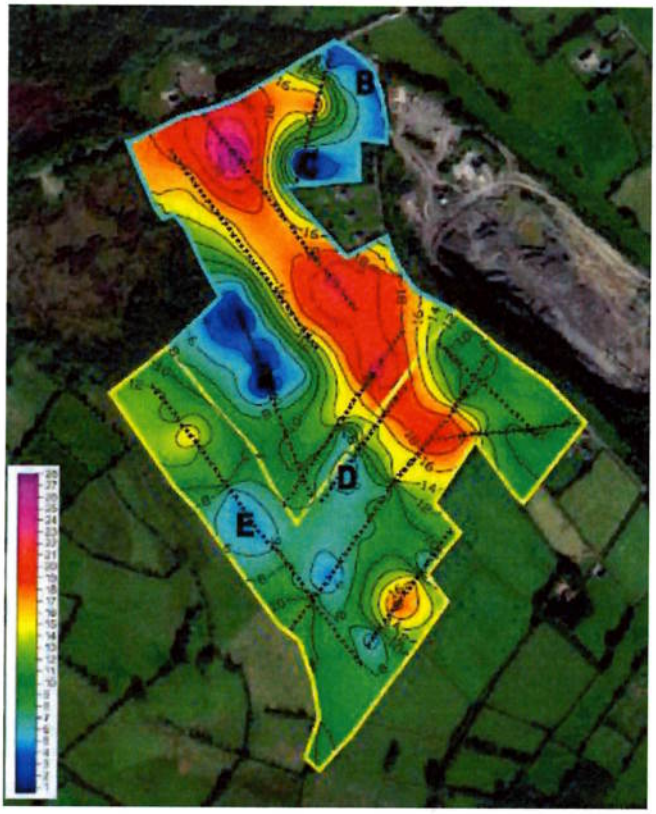


Figure 5. Interpreted overburden thickness, taken from the APEX Report, for detail see the original report.

APEX have designed a possible quarry, designed to extract the rock in areas A, D and E. The underlying rock in area A and in part of area D is limestone but area E is interpreted as being underlain by interbedded limestone and shale.

A lobe of thick overburden is interpreted to extend westwards from the drumlin and partially separates area A from area D and a wedge of poorer quality rock, likely to be mudstone, extends eastwards between areas A and E. These two lobes result in a dumbbell shaped resource with a narrow neck between the two portions of the quarry.

APEX use three different scenarios one allowing up to 15m of overburden, one allowing up to 10m of overburden and one allowing up to 5metres of overburden.

The results are as follows:

	Overburden	Limestone	Limestone/Shale
5m of overburden 3 x 15m benches	0.05mt	0.79mt	none
10m of overburden 3x 15m benches	0.67mt	3.37mt	2.53mt
15m of overburden 3 x 15m benches	1.11mt	5.36mt	3.07mt

Table 2. Resource as calculated by APEX Geophysics.

APEX discount the rock tonnage by 10% to allow for wastage. It should be noted that in the area with maximum 5m of overburden all the rock is limestone. In the other two scenarios there is limestone and shale.

If 10m of overburden is deemed acceptable a second problem could arise in accessing areas D and E because a wedge shaped block of possible mudstone is interpreted as protruding into the quarry from the west and unless removed in part this would create a very narrow neck between Area A and Areas D and E.

Figure 6. Outline of the resource defined by APEX, allowing up to 10m of overburden. Proposed rotary core drillholes have been added.

In July 2020 the author proposed the drilling of 4 diamond drillholes to evaluate the geophysical results. The proposed holes are shown in Table 3

Drillhole	Objective	Depth	Cost
A	Confirm quality of the Limestone, provide samples for testing	50m	€2900
B	Assess the likely mudstone unit	30m	€1740
C	Assess overburden thickness and underlying rock	25m	€1450
D	Assess Limestone/Shale, provide samples for testing	50m	€2900
	Total metres	**155m**	
	Mobilisation, Demobilisation, move between holes		€2000
	Logging of holes by Geologist		€1000
	Total Cost		**€11,990**

Table 3. Proposed drillholes. Figures are based on costs verbally provided by Drilling 2000 Ltd. Cost per metre of NQ drilling is €58

Diamond Drilling

In December 2020 Drilling 2000 mobilised a drill rig on the site and carried out a drilling programme. The four holes proposed in July, (A,B,C,D) were completed and an additional three holes (E, F and G) were also drilled.

Figure 7. Drillholes completed during December 2020

Drillhole	*ING easting*	*ING northing*	*Elevation (from Google Pro)*	*Overburden Thickness*	*Final depth*
A	*219230*	*279787*	*61m*	*5.2m*	*50m*
B	*219206*	*279678*	*60m*	*7.96m*	*30m*
C	*219325*	*279631*	*60m*	*10m*	*50m*
D	*219281*	*279544*	*58m*	*5.5m*	*50m*
E	*219183*	*279850*	*62m*	*3.7m*	*49.5m*
F	*219235*	*279445*	*56m*	*>16m*	*16m*
G	*219418*	*279476*	*58m*	*>15m*	*15m*

Table 4. Actual drillholes as completed. The drillholes were picked up using a hand-held GPS and elevations taken from Google Pro.

The cores were boxed and are stored in a building on the main quarry site. The geologist logged the cores and has provided logs in the form of Excel Spreadsheets for each drillhole.

The drill logs include details regarding recovery, RQD, joint frequency, and weathering as well as a description of the lithology.

Core Logging and Interpretation

Consultant Geologist John Colthurst logged all the drillholes on site.

- The numbering of the core boxes was checked.
- The marker tags were checked to ensure that they were present, in their correct places and were legible.
- The drillcore was washed, if necessary, to remove any clay adhering to it.
- The geologist checked and condensed the core prior to geotechnical logging. Any broken core was pieced back together to allow accurate core recovery estimations.
- The drillcore was logged. A combined geotechnical log and lithologic log were completed.
- Four 1m samples were collected for Total Whole Rock Analysis. The samples collected were:

  Borehole C, 19.3-20.3m, 36-37m, 48-49m, and Borehole B, 24.7-25.7m
- The samples were then dispatched to ALS Chemex in Loughrea for analysis. Two additional samples of 10/14mm and 20mm chips from the existing quarry were also sent to ALS for comparative purposes.

Geotechnical Logs

The geotechnical logs are provided as an appendix to this report. The core is examined 3m interval by 3m interval.

Definitions

Core Run: The core run is the length of core drilled between each pull of the core tube. In theory this is always 3m but, it will vary slightly depending on where the core breaks.

Total Core Recovery: The recovery is measured by the geologist, who first pieces the core together. Because the core cannot be totally pieced back together the core recovery is often slightly greater than the actual core run. The total core recovery (TCR) is the measured core recovered expressed as a percentage of the core run.

Recovery >100mm: The geologist measures all pieces of core which are greater than 100mm in length and are complete in the round. These are expressed as a percentage of the Core Run in the Rock Quality Designation (RQD). High % RQDs indicate strong fresh competent unfractured rock.

Joint Frequency: The geologist counts the number of joints over a 3m interval. For this purpose, bedding planes are counted as joints but artificial bedding breaks, created by the driller, are discounted. The higher the frequency the more thinly bedded or fractured the rock.

Number of Joints: This is a measure of the number of types of joint present. A value of 1 indicates that only the bedding is present. A value of 2 indicates the presence of a joint system. A value of 3 or more indicates several different joint systems.

Weathering: There is a system of codes in place to designate the level of weathering of rock. Codes 1 to 5 cover everything from fresh completely unaffected rock (coded 1) to totally weathered rotted rock (code 5). Almost all the Killoe rocks are coded as 1 or 2, implying that they are fresh or only slightly weathered.

Vuggy: Limestone can be massive and dense or it can on occasion be vuggy and porous. Almost all the Killoe rocks are non-vuggy. Any vuggyness is normally associated with dolomitisation.

Roughness: There is a coding system in place for the roughness of joints. This is important in engineering applications because the smoother the joint the more likely it is to fail. Because the main joint identified in Killoe quarry is the bedding and this is almost flat-lying the smoothness or otherwise of the joints is not very important but in any case the joints are rough and sometimes they are even stylolitic.

Infill: This is a category to describe the material infilling joints. In Killoe the rare joints are either tight with no infill or they contain white calcite.

The geotechnical logs of the Killoe drillholes are summarised in the table following:

Drillhole	From-To metres	Total Core Recovery	RQD	Joint frequency per metre
A	5.2-50	98%	86%	5
B	7.96-30	100%	88%	5.9
C	10-50	97%	88%	5.1
D	5.5-50	97%	90%	4.3
E	3.7-49.5	99.5%	87%	4.45
F	0-16m	No core		
G	0-15m	No core		

Table 5. Geotechnical Summary

Overall the overburden ranged in thickness from 3.7 metres in Borehole E to greater than 15 metres in Boreholes F and G. The overburden consisted of heavy brown sticky boulder clay with pebbles and boulders of limestone, sandstone and Lower Palaeozoic greywacke and slate.
The bedrock is fresh to very slightly weathered immediately below the overburden and there was no evidence for deep weathering or karstification.

Figure 8. Borehole B, Sticky boulder clay down to 6.2 metres, then fresh siliceous limestone.

The bedrock is similar in all the drillholes and there is no evidence of the variation suggested by the geophysics. The dominant lithology in all drillholes is a hard, silicified fine calcarenite or less commonly micrite (Figure 9). There is no significant shale or argillaceous mudstone present in any of the drillholes. Individual beds are variable in thickness but in general beds seem to range between 20 and 50 cms in thickness. Bedding planes are often rough or stylolitic in nature and sometimes there is a thin film of black carbonaceous material on the bedding planes.

Figure 9. Borehole B at 12.7m. Hard siliceous fresh calcarenite.

Fossils are quite scarce but occasional crinoid fragments and brachiopods were observed. Bioturbation is common in some of the silty calcarenite units. No pyrite was observed and dolomitization is rare, limited to a <1m interval in Borehole C. Dark grey to black chert nodules are present in all the drillholes with up to 10% chert in the chertiest sections (Figure 10).

Figure 10. Cherty section at 22m in Borehole B.

It isn't possible to correlate directly from drillhole to drillhole but the sequence is similar in all of the drillholes. The interval from 22 to 33.1m in Borehole D is less cherty than anything in the other holes (Figure 11) and a fossiliferous coarse grained biosparite at 12.1 to 12.5m in Borehole B (Figure 12) is distinctive but cannot be recognised in any of the other holes.

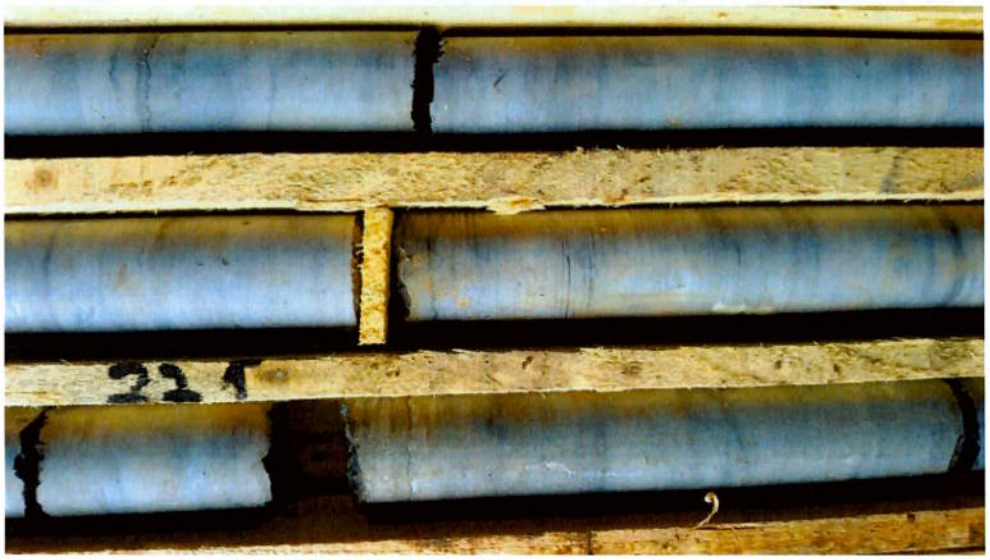


Figure 11. Borehole D, 22 metres. Chert free calcarenite, note the rough stylolitic bedding planes.

Figure 12. Coarse fossiliferous biosparite band at 12.1 to 12.5m, Borehole B

Borehole B was originally planned to assess a mudstone unit indicated by the geophysics but the lithologies in the borehole are the same as those in the other holes and the different geophysical response may be due to the thicker overburden. Equally the lithologies in Borehole D are not shaley and the different geophysical response may just be due to the slight lesser amount of chert in this drillhole.

Boreholes F and G were stopped in overburden because the overburden is far too thick for viable quarrying. The thick overburden is consistent with the geophysical results and in general the geophysics has given a good picture of the overburden thickness in the area.

Geochemical Analysis

Four core samples were collected, three samples from BH-C and one sample from Borehole C. These were typical of the lithologies encountered in the drilling. The samples were sent to ALS in Loughrea for Total Whole Rock Analysis. An additional two samples of 10/14mm chips and 20 mm chips from the run of quarry production were also sent for comparative purposes. ALS crushed and pulverised the samples and analysed them by method ME-XRF26, (Whole rock by fusion /XRF). This method identifies and quantifies the major components of the rock and reports them as % in oxide form when carbon dioxide is driven off as a loss on ignition. The CaO and MgO can be converted back to Calcium Carbonate and Magnesium Carbonate and the total amount of carbonate calculated. The SiO_2 is a measure of the amount of quartz present, either as silicification or as chert.

All the cores are composed almost entirely of carbonate and silica and the extremely low Al_2O_3 values confirm minimal argillaceous content. MgO is also low confirming that the rock is undolomitised.

The samples were also analysed for Total Sulphur (IR Spectroscopy) and Acid Soluble Sulphate (ICP-AES). Both methods are fully accurate, and the Total Sulphur (TS) and Acid Soluble Sulphate (ASS) values averaged 0.075% TS and 0.035 % ASS. Both values are well within the specification for S.R.21 compliant aggregate.

		XRF-26	XRF-26	XRF-26	Calculation	XRF-26	XRF-26	XRF-26	XRF-26	Calculation
	SAMPLE	Al2O3	BaO	CaO	CaCO3	Cr2O3	Fe2O3	K2O	MgO	MgCO3
		%	%	%	%	%	%	%	%	%
BH-C 19.3-20.3	840	0.19	0.02	43	77.3	<0.01	0.2	0.04	1.68	3.5
BH-C 36-37	841	0.31	0.02	41.4	74.4	<0.01	0.25	0.08	0.58	1.2
BH-C 48-49	842	0.3	0.02	40	71.9	<0.01	0.21	0.09	2.29	4.8
BH-B 24.7-25.7	843	0.14	0.03	46.8	84.1	<0.01	0.07	0.03	0.98	2.1
20mm	844	0.14	0.02	38.2	68.7	<0.01	0.11	0.04	1.48	3.1
10/14m	845	0.1	0.01	38.2	68.7	<0.01	0.11	0.03	1.62	3.4
		XRF-26	XRF-26	XRF-26		XRF-26	XRF-26	XRF-26	XRF-26	
		MnO	Na2O	P2O5	SO3	SiO2	SrO	TiO2	Total	LOI 1000
		%	%	%	%	%	%	%	%	%
BH-C 19.3-20.3	840	0.01	<0.01	0.01	0.15	18.07	0.04	0.01	99.2	35.77
BH-C 36-37	841	0.01	<0.01	0.02	0.34	23.55	0.04	0.02	99.8	33.18
BH-C 48-49	842	0.02	<0.01	0.01	0.07	22.27	0.03	0.02	99.34	34
BH-B 24.7-25.7	843	<0.01	<0.01	0.01	0.18	14.04	0.04	0.01	99.7	37.36
20mm	844	0.01	<0.01	0.01	0.12	27.79	0.03	0.01	99.3	31.33
10/14m	845	0.01	<0.01	0.01	0.08	26.99	0.03	0.01	99.05	31.84
		Total Carbonate %	Total SiO2 %	Total %						
BH-C 19.3-20.3	840	80.35	18.07	98.42						
BH-C 36-37	841	75.6	23.55	99.15						
BH-C 48-49	842	76.7	22.27	99.4						
BH-B 24.7-25.7	843	86.2	14.04	100.24						
20mm	844	71.8	27.79	99.59						
10/14m	845	72.1	26.99	99.09						
		S-IR08	S-ICP19							
		Total Sulphur	Acid Soluble Sulphate							
		%	%							
BH-C 19.3-20.3		0.07	0.03							
BH-C 36-37		0.13	0.04							
BH-C 48-49		0.03	0.03							
BH-B 24.7-25.7		0.07	0.03				0			
20mm		0.06	0.03							
10/14m		0.04	0.03							
		0.075	0.0325	Averages						

The quantity of chert present in the drillholes is quite high and gave rise to concern as the material could be very abrasive on equipment. The average of the SiO_2 in the four drillholes is 19.5% and the two samples taken from the quarry stockpiles average 27.4% so the are drilled is less siliceous than the active part of the quarry.

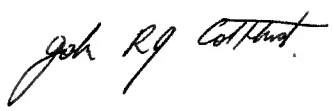
Conclusions

- The bedrock in the recently drilled area is like the limestone exposed in the existing active quarry.
- All the drillholes encountered siliceous fine calcarenites and micrites, no shales or calcareous mudstones were observed.
- The bedding is almost flat lying, with no evidence of folding or significant faulting.
- The overburden consists of sticky glacial till. It ranges from 3.7 metres thick in the north, Borehole E, to more than 15m in the south, boreholes F and G.
- The Silica content of the cores averages 19.5%; this is quite high but less than the silica content of the samples from the existing quarry.
- The Total Sulphur and Acid Soluble Sulphate values are low and are fully compliant for an S.R.21 aggregate

Attachments

Drill logs of Boreholes A to G
Test results from ALS Loughrea, supplied as Excel Spreadsheets.

Prepared by:



12/1/2021
EurGeol John Colthurst, PhD, PGeo
Blackhall, Clane, County Kildare

DRILLHOLE:			BH-A											
Easting	219230	Northing	279787		Elevation		Bearing	N/A	Inclination	-90				
Core Size: NQ From 5.2 metres to 50 metres								Logged By John Colthurst				Date	09/12/2020	
Core Size: From metres to metres								End of Hole @ 50 metres						
DEPTH		Run in metres	Recovery	% Recovery	RQD	RQD (%)	Joint Frequency	JOINTS				INFILL	LITH	COMMENT
From metres	To metres							Numb	Weath	Vuggy	Rough			
0.0	2.5	2.5	0.28											Brown sticky boulder clay
2.5	5.2	2.7	0.8											Brown sticky boulder clay
5.2	6.0	0.8	0.5	62.5	0.50	100	3	1	2		1			Fine grained dark grey calcarenite
6.0	7.0	1	0.95	95	0.60	63	7	2	2		1			Fine grained pale to medium grey calcarenite
7.0	9.8	2.8	2.8	100	2.40	86	16	2	1		1	Calcite		Dark siliceous calcarenite cherty bands
9.8	13.0	3.2	2.95	92	2.70	92	18	2	1		1	Calcite		Dark siliceous fine calcaerenite cherty bands up to 8cms, 7% chert, bioturbation.
13.0	16.0	3	3	100	2.60	87	13	1	1		1_2			
16.0	19.0	3	2.85	95	2.30	81	17	2	1_2		1			
19.0	22.0	3	3.1	103	2.30	74	23	3	1		1			Dark siliceous calcarenite/micrite, black chert nodules 3cm, <10% chert overall
22.0	25.0	3	3	100	2.65	88	15	2	1		1	Calcite		Dark micrite and fine silty calcarenite, <5% chert
25.0	28.0	3	2.95	98	1.20	41	25	2	1_2		1	CV, 26.3 - 26.8		Broken veined fine calcarenite, not much chert
28.0	31.0	3	3	100	2.50	83	16	2	1		1			Mid to darkgrey fine calcarenite, no chert
31.0	34.0	3	3	100	2.70	90	12	1	1		1	calcite		Fine grained dark grey bioturbated calcarenite
34.0	37.0	3	3.03	101	2.90	96	11	2	1		1	calcite		Siliceous mid grey silty fine calcarenite
37.0	40.0	3	2.95	98	2.75	93	12	1	1		1			Siliceous mid grey silty fine calcarenite
40.0	43.0	3	2.98	99	2.80	94	11	2	1		1			Siliceous fine calcarenite cherty nodules up to 6cm. <10% chert
43.0	46.0	3	3	100	3.00	100	8	1	1		1			Siliceous fine calcarenite <10% chert
46.0	49.0	3	3	100	3.00	100	11	1	1		1			Siliceous fine calcarenite circa 10% chert
49.0	50.0	1	1	100	1.00	100	4	1	1		1			Siliceous fine calcarenite circa 10% chert

DRILLHOLE:		BH-C												
Easting	219325	279631			Elevation		Bearing	N/A	Inclination	-90				
Core Size:	From 10 metres	to 50 metres				NQ		Logged By John Colthurst				Date	09/12/2020	
Core Size:	From 0 metres	to 10 metres				PQ		End of Hole @ 50 metres						
DEPTH								JOINTS						
From metres	To metres	Run in metres	Recovery	% Recovery	RQD	RQD (%)	Joint Frequency	Numb	Weath	Vuggy	Rough	INFILL	LITH	COMMENT
0.0	2.5	2.5	0.7											Brown sticky boulder clay
2.5	5.5	3	0.5											Limestone boulders
5.5	8.5	3	1	33		0								Stickyclay with LP and SSt boulders
8.5	10.0	1.5	0.5	33		0								Gravelly boulder clay
10.0	13.0	3	2.88	96	2.50	87	19	2	*1/2		1			Siliceous cherty calcarenite, 5-10% chert
13.0	16.0	3	2.64	88	2.46	93	18	2	1		1			Siliceous cherty calcarenite, 5-10% chert
16.0	19.0	3	2.93	98	2.62	89	11	2	1		1			Siliceous cherty calcarenite, 10% chert
19.0	22.0	3	3.05	102	2.90	95	14	2	1		1			Siliceous cherty calcarenite, 10% chert
22.0	25.0	3	2.96	99	2.54	86	14	2	1		1			Siliceous cherty calcarenite, 8- 10% chert
25.0	28.0	3	3	100	2.90	97	12	2	1		1			Siliceous cherty calcarenite, 8- 10% chert
28.0	31.0	3	3	100	2.26	75	22	2	1		1			Siliceous cherty calcarenite, 10% chert
31.0	34.0	3	2.87	96	2.60	91	13	2	1		1			Less cherty below 32m,c 5%
34.0	37.0	3	3	100	2.90	97	8	2	1		1			Less cherty 32m-38m, c 5%
37.0	40.0	3	2.75	92	2.32	84	19	*2/3	2		1			Calcite veining at 75 to SCA, 38.9-40m, 5% chert
40.0	43.0	3	2.9	97	2.06	71	19	2	1		1			Siliceous calcarenite, steeply dipping ca veinlets
43.0	46.0	3	2.85	95	2.5	88	14	2	1		1			42.9-43.8m is dolomitised, remainder cherty calcarenite
46.0	49.0	3	2.72	91	2.35	86	13	1	1		1			Dark bioturbated siliceous silty calcarenite, 5% chert
49.0	50.0	1	1.2	120	1.2	100	2	1	1		1			Dark bioturbated siliceous silty calcarenite, 5% chert

19.5-20.3m Sample for ALS Whole rock analysis
36-37m Sample for ALS Whole rock analysis
48-49m Sample for ALS Whole rock analysis

DRILLHOLE:			BH-D											
Easting	219281	Northing	279544		Elevation		Bearing	N/A	Inclination	-90				
Core Size: From 5.5 metres to 50 metres						NQ		Logged By John Colthurst			Date	09/12/2020		
Core Size: From metres to metres								End of Hole @ 30 metres						
DEPTH		Run in metres	Recovery	% Recovery	RQD	RQD (%)	Joint Frequency	JOINTS				INFILL	LITH	COMMENT
From metres	To metres							Numb	Weath	Vuggy	Rough			
0.0	2.5	2.5	0.2											Brown sticky boulder clay
2.5	5.5	3	0.4											Brown sticky boulder clay
5.5	6.3	0.8	0.25	31.3	0.20	80								Medium grey siliceous calcarenite
6.3	7.0	0.7	0.7	100.0	0.60	86	4	2	1		1			Medium grey siliceous calcarenite
7.0	10.0	3	3	100.0	1.90	63	24	2	1		1			Siliceous cherty calcarenite, c10% chert, 9.7-10m slightly weathered
10.0	13.0	3	3	100.0	2.90	97	15	2	1		1			Siliceous cherty lst, 5% chert
13.0	16.0	3	3	100.0	2.40	80	16	2	1		1			Very cherty calcarenite >10% chert, black chert nodules
16.0	19.0	3	3	100.0	2.85	95	15	1	1		1			Siliceous cherty calcarenite, 10% chert
19.0	22.0	3	3	100.0	3.00	100	8	1	1		1			Medium grey siliceous calcarenite, less than 2% chert.
														Dark carbonaceous partings on rough beddding planes.
22.0	25.0	3	3	100.0	3.00	100	9	1	1		1			Clean fine calcarenite slightly more fossiliferous.
25.0	28.0	3	3	100	3.00	100	11	1	1		1			As above, bedding planes rough to stylolitic
28.0	31.0	3	3	100	2.80	93	11	2	1		1			As above
31.0	34.0	3	3	100	3.00	100	13	1	1		1			As above to 33.1m then getting cherty
37.0	37.0	3	3	100	2.85	95	18	2	1		1			Dark siliceous bioturbated calcarenite,10% chert
37.0	40.0	3	3	100	3	100	14	1	1		1			Dark siliceous bioturbated calcarenite,10% chert
40.0	43.0	3	2.52	84	2.22	88	16	3	*1/2		1			Slightly less chert, cavity 42.5-43m
43.0	46.0	3	3	100	1.8	60	>30	2	2		1			Weathered andbroken along sub-vertical 5-10cm calcite veins
46.0	49.0	3	3	100	2.8	93	9	1	1		1			Mid grey siliceous cherty calcarenite
49.0	50.0	1	0.8	80	0.8	100	4	1	1		1			Mid grey siliceous cherty calcarenite

Bioturbation is common. Bedding contacts are often stylolitic.
Chert nodules have stylolitic margins in some cases. Limestone
is often silicified and harder than normal. It effervesces with dilute HCl
but the reaction is weaker than for pure limestone. Bedding is almost flat lying throughout.
No evidence of significant fracturing, jointing or weathering
19-33.1m is much less cherty than the rest

DRILLHOLE:				BH-E											
Easting	219183	Northing	279850		Elevation		Bearing	N/A	Inclination	-90					
Core Size:	From	metres	to	metres				Logged By John Colthurst					Date	09/12/2020	
Core Size:	From	metres	to	metres				End of Hole @ 50 metres							
DEPTH		Run in metres	Recovery	% Recovery	RQD	RQD (%)	Joint Frequency	JOINTS				INFILL	LITH	COMMENT	
From metres	To metres							Numb	Weath	Vuggy	Rough				
0.0	2.3	2.3	0.28	0.15										Brown sticky boulder clay	
2.3	3.2	0.9	0.8											Brown sticky boulder clay	
3.2	3.7	0.5	0.2	40										Brown clay, sandstone and LP pebbles	
3.7	4.5	0.8	0.8	100	0.56	70	5	2	2		1			Fine grained medium grey calcarenite	
4.5	7.5	3	2.8	93.3	1.80	64	<30	2	2		1			Broken siliceous silty calcarenite	
7.5	10.5	3	3	100.0	2.50	83	16	2	1		1			Siliceous calcarenite with 10% black chert	
10.5	13.5	3	2.93	97.7	2.65	90	14	1	1		1	Calcite		Paler calcarenite , siliceous <5% chert	
13.5	16.5	3	3.1	103.3	2.80	90	16	2	1		1			Siliceous calcarenite blackchert nodules up to 4cms	
16.5	19.5	3	3	100.0	2.70	90	11	1	1		1			Siliceous calcarenite withcherty bands c10%	
19.5	22.5	3	3	100.0	2.72	91	16	2	1		1			Siliceous calcarenite, 30cms chert 20.7-21m	
22.5	25.5	3	3	100	2.45	82	14	2	1		1			Siliceous calcarenite, >10% chert	
25.5	28.5	3	3	100	2.70	90	13	2	1		1			Siliceous calcarenite, 10% chert	
28.5	31.5	3	3	100	3.00	100	8	1	1		1			Siliceous calcarenite, 5% chert	
31.5	34.5	3	3.02	101	2.92	97	10	2	1		1			Siliceous calcarenite, 10% chert	
34.5	37.5	3	3	100	2.75	92	13	2	1		1			Siliceous mid grey silty calcarenite, less obvious chert	
37.5	40.5	3	3	100	2.70	90	11	2	1		1			Medium grey fine calcarenite, very little chert	
40.5	43.5	3	2.93	98	2.10	72	24	3	1		1			Medium grey fine calcarenite, very little chert, core is very broken	
43.5	46.5	3	3	100	2.38	79	25	3	1		1			Medium grey fine calcarenite, very little chert, core is very broken to 42m	
45.6	49.5	3	3	100	2.90	97	7	2	1		1			Siliceous fine calcarenite circa 5% chert	

DRILLHOLE:			BH-F											
Easting	219235	279445			Elevation		Bearing	N/A	Inclination	-90				
Core Size:	From 0 metres	to 16 metres				NQ		Logged By John Colthurst			Date	09/12/2020		
Core Size:	From 0 metres	to 10 metres						End of Hole @ 50 metres						

DEPTH		Run in metres	Recovery	% Recovery	RQD	RQD (%)	Joint Frequency	JOINTS				INFILL	LITH	COMMENT
From metres	To metres							Numb	Weath	Vuggy	Rough			
0.0	16.0		0.3m											Brown sticky boulder clay and pebbles, no bedrock

DRILLHOLE:		BH-G												
Easting	219418	279476			Elevation		Bearing	N/A	Inclination	-90				
Core Size:	From 0 metres	to 15 metres						Logged By John Colthurst			Date	09/12/2020		
Core Size:	From metres	to metres						End of Hole @ 50 metres						
DEPTH								JOINTS						
From metres	To metres	Run in metres	Recovery	% Recovery	RQD	RQD (%)	Joint Frequency	Numb	Weath	Vuggy	Rough	INFILL	LITH	COMMENT
0.0	2.5	2.5	0.6											Brown sticky boulder clay.
2.5	5.5	3	0.4											Brown clay with boulders
5.5	8.5	3	0.25											Limestone and chert fragments
8.5	11.5	3	0.3											Limestone and chert fragments
11.5	15.0	3.5	0.3											Pebbles and sticky clay
15m														EoH

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21 AUG 2025
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7.0 HYDROLOGY, HYDROGEOLOGY AND WATER QUALITY

7.1 Introduction

Blessington Stone & Concrete Plant Hire Ltd trading as Rhyne Rock is proposing to develop a new quarry at Rhine, Killoe in Co. Longford.

This chapter describes the existing Hydrological and Hydrogeological characteristics at the proposed development site. The surface water features and characteristics (Hydrology) are also described, as well as the site drainage and groundwater features.

An impact assessment was carried out to determine whether the project poses a significant impact to the hydrogeological and hydrological aspects of the environment and to propose mitigation measures to reduce any potential negative impact arising from proceeding with the proposed quarry.

7.1.1 Outline of Scope of Assessment

The scope of the assessment undertaken was set out as follows:

1. Gather and evaluate all relevant available information on the hydrology and hydrogeology of the proposed site area and its surrounds;
2. Characterise the hydrological and hydrogeological baseline conditions of the existing environment based on a desktop study and site investigation;
3. Identify the possible impacts of the proposed development during the quarry site preparation and operation of the project on the receiving hydrological and hydrogeological environment;
4. Develop mitigation measures to reduce or eliminate the identified negative impacts;
5. Identify any residual impacts after mitigation measures are implemented.

7.1.2 Objectives

The objectives of the assessment are as follows:

- Produce a baseline study of the existing water environment (surface water and groundwater) in the area of the proposed quarry.
- Identify likely positive and negative impacts of the proposed development on surface water and groundwater during the quarry site preparation and operational phases of the development.
- Identify mitigation measures to avoid, remediate or reduce any significant negative impacts identified.

7.1.3 Project Team

This chapter has been prepared by Aqua Geoservices Ltd. (AGS), a company specialising in Hydrogeology and Hydrology.

The consultant appointed as project manager, Bruno Teillard, is a qualified Hydrogeologist (French M.Sc. Hydrogeology) with over 25 years of experience in Ireland and abroad.

Bruno is certified as:

- a Professional Geologist (PGeo) by the Institute of Geologists of Ireland (IGI) since 2004 and,
- as a European Geologist (EurGeol) by the European Federation of Geologists (EFG) since 2005.

He is also a member of the International Association of Hydrogeologists (IAH), a professional member of the Irish Association of Economic Geology (IAEG) and an associate member of the Geological Society, NI Regional Group and Geological Society of London. Bruno is also on the Institute of Geologists of Ireland's "Register for professional hydrogeologists in respect of environmental risk assessment for unregulated waste disposal" and on the panel of independent hydrogeologist to work on Irish Water contracts nationwide.

7.2 Assessment Methodology

An examination of the existing hydrogeological and hydrological regimes and potential impacts of the proposed quarry was carried out through a combination of consultations with relevant authorities, a desktop review of the existing relevant information.

Site specific information relied on previous investigations done by others, which were complemented by:

- A walkover survey and site activities on the 23/02/22, the 24/02/22 and on the 22/03/22.
- Continuous monitoring of the groundwater level at a selected location between the 24/02/22 and the 21/03/22.
- Drilling supervision of a well on the 21/03/22.

Water quality is based on water quality monitoring undertaken at the proposed site and its surroundings and some field measurements during a walkover survey. These elements are discussed in more detail in the following sections.

7.2.1 Guidance

The assessment of the hydrogeological and hydrological conditions of the site has been undertaken in accordance with the guidance contained in the following:

- Institute of Geologists of Ireland (IGI, September 2002): "Geology in Environmental Impact Statements – a Guide";
- Environmental Protection Agency (EPA, 2002): "Guidelines on the information to be contained in Environmental Impact Statements";
- Environmental Protection Agency (EPA, 2003): "Advice Notes in Current Practices in the Preparation of Environmental Impact Statements";
- National Roads Authority (2005): "Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes";
- Coillte (2009) Forest Operations & Water Protection Guidelines;
- Institute of Geologists of Ireland (IGI, October 2013): "Guidelines for the preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statement";
- the IGI Guidelines for the preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements (October 2013);
- Environmental Protection Agency (EPA, Draft September 2015): "Revised guidelines on the information to be contained in Environmental Impact Statements";
- Environmental Protection Agency (EPA, Draft September 2015): "Advice Notes in Current Practices in the Preparation of Environmental Impact Statements";
- Environmental Protection Agency (EPA, May 2022): "Guidelines on the information to be contained in Environmental Impact Assessment Reports".

7.2.2 Desk Study Resources

The desk top study of the site and its surrounding area was completed in advance of undertaking a walkover survey. It involved a review of all available information, datasets and documentation sources pertaining to the site's natural hydrological and hydrogeological environment and involved the following:

- Review of the Environmental Protection Agency (EPA) database and "Hydrotool" Map Viewer (www.epa.ie);
- Review of existing water quality data, chemical and biological, available from the EPA;
- Review of the Geological Survey of Ireland - National Bedrock Aquifer map;
- Review of the Geological Survey of Ireland - Groundwater Database (www.gsi.ie): Examination of the Geological Survey of Ireland (GSI) online datasets pertaining to

hydrogeological features such as aquifers, wells, groundwater bodies, groundwater vulnerability and groundwater protection schemes;

- Review of the Bedrock Geology 1:100,000 Scale Map Series, Sheet 12 (Geology Longford - Roscommon). Geological Survey of Ireland (GSI, 2003).
- Review of the Geological Survey of Ireland –Longford Ballinalee Groundwater Body (GWB): Summary of Initial Characterisation Report.
- Review of CFRAM Preliminary Flood Risk Assessment (PFRA) maps (www.cfram.ie);
- Review of the Department of Environment, Community and Local Government on-line mapping viewer (www.myplan.ie).
- Review of past investigations undertaken at the site and its surroundings:
  - Report on the geophysical investigation at lands adjacent to Rhyne Quarry, Co. Longford for Rhyne Rock Limited, Apex dated 15th June 2020.
  - P.10 (location and depth of drill holes) of diamond drilling investigation carried out at the site in December 2020 by Drilling 20000 Ltd.
  - EIAR screening report for the continuance of extraction of aggregates at the existing quarry, Earth Science Partnership Ltd., 30/01/2020.
  - Review of geophysical reports and geology at proposed quarry site at Killoe, Ballinalee, Co. Longford by EurGeol. John Colthurst, PGeo., dated 21/07/20.
- Review of all relevant water related legislation including the Water Framework Directive.
- Review of relevant rainfall data from Met Éireann Meteorological Database (www.met.ie);
- Review of Water Framework Directive datasets, reports and map.
- Examination of maps and aerial photography to identify any hydro features and site topography and slope;
- Determination of the catchment(s) and drainage regime downstream of the proposed development site;
- Examination of flood risk areas by referral to the Office of Public Works (OPW) Indicative Flood Maps (www.floodinfo.ie);
- Determination of 30-year flood return period event (www.opw.hydro.net)
- Examination of National Parks and Wildlife Service (NPWS) nature conservation designations using the map viewer (www.npws.ie);
- Preparation of catchment area and other site maps using the catchment.ie map viewer.

7.2.3 Consultation

The following databases and source of information were consulted during the desk study:

1. Gather and compile all relevant available information of Hydrology and Hydrogeology for the site and surrounding area;
2. Overlay Ordnance Survey of Ireland (OSI) 1:50,000 and 1:10,560 (6") maps: the Geological Survey of Ireland Six Inch Drift Maps (6 inch to 1 mile, 1:10,560). These maps were commissioned for the entire Country in the late 1800's and are available for consultation in the Geological Survey Office in Beggars Bush, Dublin. These sheets consist of walkover survey information hand written onto the first edition Ordnance Survey County series six-inch maps, which date from around 1850. These sheets give general information on superficial soil deposits;
3. Determination of the 30-year return period flood using the Flood Study Update (FSU) web-based application portal from the OPW.
4. Geological Survey of Ireland (GSI) bedrock Memoir "Geology of the Longford - Roscommon, 2003 and accompanying 1:100,000 map sheet 12, 1999. The 1:100,000 series bedrock maps outlines the bedrock geology and geological structures in the vicinity of the development: Overlay Geological Survey of Ireland (GSI) Geology maps (1:100,000) to determine site bedrock geology and the presence of any major faults or other anomalies.
5. Overlay Environmental Protection Agency (EPA) / Teagasc (Agricultural Agriculture & Food Authority) Soils and Subsoil maps (1:50,000) to determine categories of soils and subsoil and indirectly geochemical origin for the study area.
6. Consultation with the GSI databases, publications and website in relation to geological resources, well database records and hydrogeological resources of Co. Longford.
7. Consultation with the National Parks and Wildlife Service website in relation to designated sites of Co. Longford.
8. Consultation of the Irish Water Framework Directive assessment of water quality status in the receiving waters;
9. Consultation with Met Éireann for meteorological service records for the period 1981 to 2010 of the closest pertaining synoptic and rain gauge sites.

Additional information was provided by Earth Science Partnership Ltd.

7.2.4 Methodology – Site Investigations

Site activities undertaken by AGS comprised of the following:

- A walkover survey and baseline hydrological mapping of the site and surrounding area to identify hydrological and hydrogeological features on site, wet ground, water flow directions, drainage patterns and distribution, exposures, drains etc;

- Where accessible, AGS undertook some field hydrochemistry measurements. These were carried out in-situ, using the HI 9828 multi-parameter probe, to determine pH, Total Dissolved Solids, Electrical Conductivity, Temperature;
- Confirmation of the site catchments and drainage regime using topographical data generated for the site area, and any hydrogeological / hydrological buffers to be implemented;
- Levelling of the relevant water features (monitoring wells, springs etc) to Ordnance Datum (OD). Surveying of water levels within the proposed quarry area in order to develop a groundwater table contour map.
- Following the field surveys, the results were reviewed in CORELDRAW X6 software in conjunction with publicly available hydrological and hydrogeological data from the GSI, EPA and OPW. Various maps were then produced, representing a graphical interpretation of the field results.
- Rising head tests conducted at all available corehole wells available within the proposed quarry boundaries.
- Monitoring of the water table on site between the 24/02/22 and the 21/03/22
- Drilling of a pumping well to further check groundwater conditions and eventually carry out a pumping test.
- Surface water and groundwater sampling to acquire contemporary baseline water quality data.
- Well survey in the vicinity of the proposed site to identify receptors potentially at risk.

7.2.5 Assessment Criteria

7.2.5.1 Environmental Quality Standards

Groundwater: In the absence of published criteria for good groundwater chemical status, the results obtained were compared to the European Communities Environmental Objectives (Groundwater) Regulations, 2010 (Statutory Instrument No. 9 of 2010 as amended by SI No. 366 of 2016). These Regulations establish a comprehensive system of water quality and quantity objectives for all bodies of groundwater and thereby provide a basis for systems of control for achieving those groundwater objectives, taking into account the requirements of the Water Framework Directive (2000/60/EC) and the Groundwater Directive (2006/118/EC). The Threshold Values are based on the assessment of the general quality of groundwater in a groundwater body in terms of whether its ability to support human uses has been significantly impaired by pollution.

Where there are no Threshold Values (TV) for a parameter the results are compared to the Interim Guideline Values (IGVs) "Interim report towards setting guideline values for the

protection of groundwater in Ireland", published by the EPA in June 2003. These IGVs are to be used to assist with the characterisation of groundwater bodies and to establish the need for additional investigation or further action in the event of the guideline values being exceeded.

Surface Water: The results obtained were compared to the Fresh Water Directive [2006/44/EC] and S.I. No. 272 of 2009 (as amended by S.I. No. 327 of 2012, SI No. 386 of 2015 and S.I. No. 77 of 2019). These Regulations establish a comprehensive system of water quality and quantity objectives for all bodies of surface water and thereby provide a basis for systems of control for achieving those surface water objectives, taking into account the requirements of the Water Framework Directive (2000/60/EC) and Directive (2008/105/EC) of the European Parliament. The Threshold Values are based on the assessment of the general quality of surface water in a surface water body in terms of whether its ability to support human uses has been significantly impaired by pollution.

Particular reference has also been paid to the following legislation:

- Quality of Salmon Water Regulations, 1998 resulting from the EU Freshwater Fish Directive (78/659/EEC).
- European Communities (Quality of Surface Water Intended for the Abstraction of Drinking Water) Regulations 1989, resulting from EU Directive 75/440/EEC (repealed by WFD 2000/60/EC in 2007).
- European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations, 2009

7.2.5.2 Legislative and Policy Framework

This Sub-section has been produced in accordance with the specific legislation and planning framework relevant to the consideration of hydrogeology and surface water as described in this Chapter. Relevant legislation for the impact assessment is outlined in the following bullet points:

1. Groundwater Directive (80/68/EEC) and (2006/118/EEC)
   The Groundwater Directive (80/68/EEC) aimed to protect groundwater from pollution by controlling discharges and disposals of certain dangerous substances to groundwater. The Directive was transposed into Irish Law by the Protection of Groundwater Regulations 1999 (SI No. 41 of 1999).

It was repealed by the Water Framework Directive (WFD) in 2013. New regulations are expected to enact the Water Framework Directive and its Daughter Directive on the protection of groundwater. This new Groundwater Directive (2006/118EEC) is commonly referred to as the "Groundwater Daughter Directive".

In Ireland, the original Groundwater Directive (80/68/EEC) was primarily transposed into National Legislation through:

- The Local Government (Water Pollution) Act, 1977 to 1990;
- The Local Government (Water Pollution) Regulations, 1978 (SI No. 08 of 1978);
- The Waste Water Discharge (authorisation) Regulation, 2007 (SI No. 684 of 2007).
- The Local Government (Water Pollution, Amendment) Regulations, 1999 (SI No. 42 of 1999).

2. **Water Framework Directive 2000/60/EC and SI No. 722 of 2003 European Communities (Water Policy) Regulations 2003 – 2005**

The EU Water Framework Directive (WFD) 2000/60/EC came into force on 22/12/2000 and its primary mandate for all waters to achieve "Good" ecological status by 2015. The WFD Also promotes the sustainable use of water resources, defines a management and reporting system based on River Basin Districts (RBDs) and sets environmental objectives which take into account the full range of pressures on the aquatic environment (including pollution, abstraction, flow regulation, habitat impact, etc.). A register of Protected Areas will be defined under the WFD and the criteria for sites to be included on this list are:

- Waters used for the abstraction of drinking water;
- Areas designated to protect economically significant aquatic species;
- Recreational waters;
- Nutrient sensitive areas;
- Areas designated for the protection of habitats or species.

The Working Group on Groundwater have prepared a number of guidance documents covering different aspects of the water environment, including groundwater abstractions, risks assessments etc.

The Third Cycle River Basin Management Plans and the associated Work Programme of Measures for the Western Region is pending adoption at the time of writing of this

report. This Plan will be developed to help manage the implementation of the WFD in the Shannon Region and describes actions that are proposed to protect water over the period 2022 - 2027.

7.2.5.3 Evaluation and Impact Assessment Categorisation

The assessment was prepared with regard to the "*Draft Guidelines on the Information to be contained in an EIAR*" (EPA, May 2022).

7.2.5.4 Constraint Study and Mitigation by Design, Avoidance, Prevention and Management

A key element of the EIS is the avoidance and prevention as well as the reduction of negative impacts on the receiving environment at the design and management stages.

The final design, which has been informed by the hydrological and hydrogeological conditions and constraints explained in this chapter, is outlined and described in Chapter 7.

7.3 Description of Development

Rhyne Rock currently operates a quarry at Killoe in Co. Longford.

The reserves of the existing quarry are almost depleted as the quarry is now excavating the third bench: Rhyne Rock are seeking planning permission to develop a new quarry opposite the road to the south-West of the existing quarry. The existing quarry would be restored once the proposed quarry becomes operational.

The development is required to secure a continued supply of aggregates for nationwide road making companies and Local Authorities and for the production of readymix concrete.

The excavation will be phased as described in Section 3.0 – Project Description of this EIAR. The Quarry will be worked down to c. 20m above Ordnance Datum (a.OD) in a series of up to three bench levels.

The work at the site will consist of the drilling, blasting, extraction and crushing of rocks and transport to various machines in the plant area for crushing, screening and sorting.

A new manufacturing plant will use the aggregates for the production of readymix concrete. The finished floor level of the manufacturing area will be at 54m a.OD.

7.4 Existing Environment

7.4.1 Site Location

The proposed quarry is located in the townland of Rhine, Killoe in Co. Longford, about 7km to the North-East of Longford Town. It is positioned at Irish Transverse Mercator (ITM) Reference E619188 – N779742.

The site is bordered by a Regional road R194 to the North-West and by a third-class road to the North-East (Figure 7.1; Appendix 7.1).

7.4.2 Topography

The general area is dominated by Corn Hill (278m a.OD) about 3.95km to the North of the proposed quarry area.

Locally, the lands are located on the toe slope of the aforementioned hill: the topography is generally flat with the culminating points consisting of a series of low-lying ridges (c. 60m – 70m a.OD depending on location), which is typical of an extensive drumlin field area.

The proposed quarry will be located on the South-Western flank of a low drumlin ridge (c. 72m a.OD), which trends in a NW – SE direction.

7.4.3 Site Layout

The proposed quarry will operate a series of up to three benches of about 15m to 20m each down to a final depth of 20m a.OD.

The proposed application area covers 18.6 Ha as follows:

- the extraction area will cover 14.2 Ha,
- the manufacturing and batching plant will cover 2.1 Ha.

Full details of the phasing for the proposed work are provided in Section 3 – Project Description of the EIAR.

7.4.4 Current Landuse and Size

Landuse in the vicinity of the quarry is rural and mostly comprises of low intensity pastures. A raised bog is also present to the Northwestern corner of the proposed site area and an existing quarry is located directly opposite the third-class road.

Most of the proposed site area is used as pastureland for sheep grazing with the North-Western part of the site comprising of a reclaimed raised bog and the remnants of a cut away raised bog. A small portion of the aforementioned bog comprises of woodlands.

There are a number of bungalows and houses located alongside the third-class road to the North-East of the proposed quarry and a house opposite the R194 to the North-West.

There are other houses dotted along a third-class road c. 320m to the South-West of the proposed quarry boundaries (Figure 7.2; Appendix 7.1).

7.4.5 Areas of Ecological Interest

Based on a research using the National Parks and Wildlife Services (NPWS) website, the proposed quarry area is not within or bordering any site designated or proposed for designation for nature conservation.

The closest area of ecological interest is the Carrickglass Demesne proposed National Heritage Area (pNHA No. 001822) located c. 2.7km to the South-West of the site but on a different catchment area.

The ecological importance and characteristics of the aforementioned pNHA is described in detail in the relevant Section 5.0 – Biodiversity of the EIAR.

7.4.6 Drinking Water Supplies

The general area is served by the Longford Central Public Water Scheme, which takes its source from the Lough Forbes Treatment plant.

The GSI national well database (www.gsi.ie) does not show the presence of any private wells in the vicinity of the quarry compound. The site is not located within any EPA / GSI delineated public or private groundwater supply source protection zones.

Notwithstanding the results of the above, a walkover survey covering a radius of 350m around the boundaries of the proposed site extraction area was carried out by AGS between the 23/02/22 and the 24/02/22.

During the well survey, the locations of old wells, which were shown on the historical OSI 25" maps were also assessed, where possible. The results of the well survey are summarised in Table 7-1 below, which should be read in conjunction with Figure 7.2 in Appendix 7.1. Letters were left in the mailbox of landowners if not met during the survey indicating the purpose of the

survey and requesting a phonecall, should they be relying on a private supply well for the provision of water: no response was received at the time of writing this report.

Table 7-1: Survey of the water supply sources within a 350m radius from the proposed quarry.

Ref No.	ITM Coordinates	Type of supply	Use	Distance to proposed site boundary of extraction area	Comments
Old Well 1	619141.7E – 779352.1N	Assumed dug well	No longer in use	c. 90m to the SE (no gradient).	Covered and no longer in use (source: farmer)
Old Well 2	619565.0E – 779381.9N	Assumed dug well	Likely farming	c. 310m to the SE (no gradient).	The farm is derelict. The well would be too far at no gradient to be impacted by proposed development.
Old Well 3	620101.4E – 779295.9N	Assumed dug well	Domestic / farming	c. 810m to the ESE (no gradient)	Assuming this well still exist, it would not be impacted by the proposed development.
Old Well No. 4	619893.1E – 779590.3N	Assumed dug well	Farming	c. 515m to the ENE (upgradient).	This well belongs to the owners of house 7, which is on the main. It is reportedly covered up and currently not in use. It is too far upgradient to be adversely impacted by the proposed development.
House No. 17	618558.6E – 779639.6N +/- 25m	Assumed to be a borehole*	Domestic	c. 350m to the SW (downgradient).	Although the well was not accessed during the survey, it is deemed as too far from the proposed excavation to be impacted.

* Access to the well was not authorised by landowner at the time of survey.

The drinking water supply for the proposed development will be provided by the water main.

7.4.7 Foul Waste

The proposed quarry will have a portoloo which will be maintained by a specialist contractor.

7.5 Historical Landuse of the proposed site

A detailed study of the Ordnance Survey of Ireland maps (OSI) for the period 1829 – 1841 (6" map) and for the period 1897 – 1913 (25" map) indicate that most of the land on the lower grounds originally consisted of a bog. The South Easterner corner of the site was reclaimed overtime as pasture land for sheep grazing.

7.6 Hydrology (Surface Water)

The surface hydrological environment includes all surface waters such as overland flow, rivers, lakes, wetlands, estuaries, and seas. This section discusses:

- Catchments;
- Surface water and existing drainage regime;
- Water balance;
- Flood hazard;
- Abstraction and discharges; and
- Water quality in the context of the proposed development site.

7.6.1 Climate, General Rainfall and Evapotranspiration

Long-term rainfall and evaporation data was sourced from Met Éireann. The closest rainfall gauging station in operation is located at Termonbarry, Co. Roscommon. However, this station does not provide information on a regular basis. The weather station of Mount Dillon was therefore chosen instead. Mount Dillon Weather station (Station no. 4329) is located in Co. Roscommon, c. 19.7km to the WSW of the proposed quarry boundary. It lies at an elevation of 39m above Ordnance Datum (a.OD).

The 30-year (1981–2010) average monthly rainfall recorded at Mount Dillon, is used in our calculations in Table 7-2. Met Éireann records for this station show that the Average Annual Rainfall (AAR) for the period 1981 - 2010 in the area is **1,010.1 mm/yr**. The monthly rainfall was available for the period 2019 – 2022 (to date, i.e. end of April 2022) at mount Dillon. Based on this, the AAE for this station was **1,151.5 mm/yr** over the period 2019 – 2022, which is showing an impact from climate change by comparison to the 30-year average.

Actual Evapotranspiration (AE) is the amount of water removed from the land surface through the combination of evaporation and transpiration. It is a function of solar radiation,

wind speeds, air pressure and nature of plant cover. For our calculations, the Actual Evapotranspiration was taken from the Mount Dillon synoptic station. The AE was only available for the period 2019 – 2022 (to date). The average AE for this station is **696.6 mm/yr** over the period 2019 - 2022.

Effective rainfall (ER) is the proportion of rainfall which is available to recharge groundwater. Using the following equation [1] for the period 2019 - 2022, the effective rainfall (ER) is therefore taken to be an average of **454.9mm/yr.**

$$ER = AAR - AE \quad [1]$$

The calculated effective rainfall is lower than the effective rainfall as shown in the Geological Survey of Ireland (GSI) website for the area (590.6 mm/yr). For consistency with readily available data, the effective rainfall of **590.6 mm/yr** will be used with any calculations in this report.

Table 7-2: Estimate of monthly and annual rainfall, A.E. and calculated E.R. at Rhine, Killoe, Co. Longford (2019 -2022).

Month	30-year monthly Rainfall average Mount Dillon 1981 - 2010 (mm)	Monthly AAR at Mount Dillon period 2019 – 2022 (mm)	Monthly A.E. at Mount Dillon Period 2019 - 2022 (mm)	Calculated E.R. Period 2019 – 2022 (mm)
January	101.2	83.5	12.2	71.3
February	77.7	127.6	25.1	102.5
March	85.9	93.6	48.6	45
April	64.8	51.3	80.8	-29.5
May	66.1	57.3	101.0	-43.7
June	72.7	80.8	108.4	-27.6
July	68.2	77.1	110.1	-33
August	82.8	136.8	86.6	50.2
September	79.0	94.2	56.8	37.4
October	106.2	129.4	33.3	96.1
November	99.5	86.5	13.9	72.6
December	106.0	109.8	10.2	99.6
Year	**1010.1**	**1151.5**	**696.6**	**454.9**

As shown in 7-2 above, the driest months are from April to July included, where there is a deficit of water.

7.6.2 Hydrography

A catchment, also referred to as a drainage basin and watershed, is a topographic area that collects and discharges surface streamflow through one outlet or mouth (Mays, 2012). The catchment boundary is the line dividing land where surface drainage flows toward a given stream from land where it drains into a separate stream.

Knowledge of the topographic area contributing to local surface water features such as lakes or streams and river is required as a baseline hydrological study.

It must be ascertained whether the proposed development will have negative effects on local and regional surface water features and wetland ecosystems, particularly those that are designated as SACs and additionally as pNHAs.

7.6.2.1 Regional Catchment Overview

Regionally, the site is located in the Lower Shannon surface water catchment within Hydrometric Area 26 (Upper Shannon) of the Shannon IRBD. The River Shannon flows c. 11km to the West of the proposed site boundary.

7.6.2.2 Local Catchment Delineation

Accurate elevation data is a critical measurement by which to delineate a topographic catchment. The topography of the proposed site area was accurately defined via a topographical survey undertaken by Earth Science Partnership (ESP) in 2021. The topography of the wider area is based on the Topographical information available from the GSI map viewer, which is based on OSI discovery series mapping.

Figure 7.3 illustrates the topographical contours and drainage pattern in the area surrounding the proposed quarry.

As can be seen in Figure 7.3, the proposed quarry area lies entirely within the catchment area of the Camlin River Sub Basin (RSB). The Camlin River holds the River Waterbody code: IE_SH_26C010600 and is a tributary of the Shannon River.

7.6.3 Drainage

7.6.3.1 General Drainage

The drainage of the general area follows the topography. There is a Northwest - Southeast trending watershed (Figure 7.3, Appendix 7.1) running along the North-Eastern boundary of the proposed excavation area, which divides the drainage pattern as follows:

- To the North-East of the watershed, the drainage is likely to be oriented in a Northeasterly direction, i.e. within the catchment area of the Rhine Stream (EPA Code Rhine26).

  The Rhine Stream takes its source from the Bog located to the North of the R194. From its source, it flows for c. 1.65km in a South-Easterly direction prior to its confluence with the Aghaboy Stream (EPA Code: 26A13) in Aghaboy Td.

  From there, the Aghaboy Stream flows to the South-East for c. 860m and discharges into the Camlin River

- To the South-West of the watershed, the area is entirely drained by the Camlin River (EPA Code: 26C01). This comprises the proposed excavation area and the associated manufacturing and batching plant area.

7.6.3.2 Site Drainage

The proposed application area covers 18.6 Ha and is currently a greenfield area. The area proposed for extraction and the manufacturing & batching plant lie across a bog and poorly drained soils. A ditch runs along the South-Western part of the proposed site area, which effectively drains all the proposed area to the South-West of the aforementioned watershed. Based on the soil cover and the density of drainage ditches in the area within the site and its surrounding, it is anticipated that only a small portion of the effective rainfall infiltrate to ground.

During the wet season, the soils would be rapidly saturated. Given the poorly drained soil cover, it is anticipated that most of the effective rainfall would generate surface water runoff, which is then drained by the network of ditches in the area.

Based on the topographical map for the site and as illustrated in Figure 7.3, it was calculated that both the proposed extraction area (14.2 Ha) and the Manufacturing & Batching Plant area (2.1 Ha) already drain to the large ditch running along the South-Western boundary of the quarry landholding. As the proposed extraction area is being quarried, it is essentially with surface water runoff generated on site that will have to be dealt with. It is proposed that the water be discharged back to the aforementioned ditch.

The greenfield runoff rate was established in Appendix 7.5 as being of 0.056m^3/ sec (56l/s) over the 18.05 Ha draining to the aforementioned ditch. The remaining 0.5 Ha of the proposed planned area (comprising of the access road) will naturally drain to the West in a separate catchment which will remain unaffected by the proposed quarry.

Based on the above, the catchment area and flow of the Camlin River will remain unaffected by the proposed quarry excavation. The proposed development shall have no detrimental impact on the Carrickglass Demesne pNHA. The quarry will offer a buffer capacity during period of prolonged rainfall, this is a beneficial impact of the proposed quarry development.

Please refer to Appendix 7.5 for details on storm flows and storage volumes and Appendix 7.6 for detail design of settlement lagoon.

7.6.4 River Catchment Parameters

As shown in Figure 7.1, the flows in the Camlin River are monitored as part of the Water Framework Directive at two locations, which are the Kilnagarrown Bridge (Station No. 26331) and the Argar monitoring station (Station No. 26020).

The most widely used low-flow indices in Ireland are 95%ile flow (Q95) and the Dry Weather Flow (DWF) which have been defined by the EPA as the minimum daily mean flow rate with a return period of 50 years and a 7-day 15-year sustained low flow respectively.

Using the Camlin river Characteristics at the monitoring stations mentioned above, the DWF and 95%ile flows at the point of discharge from the ditch into the Camlin river were estimated as shown in **Table 7.3** below.

Table 7-3: Characteristics of the Camlin River catchment area.

Catchment	Characteristics	Units	Value
Kilnagarrow Bridge.	Area	Km^2	93.30
	95%ile flow	m^3/s	0.223
	DWF	m^3/s	NA
Argar Station (Aghaga bridge)	Area	Km^2	122.43
	95%ile flow	m^3/s	NA
	DWF	m^3/s	0.410
Point of discharge of drain into the Camlin River	Area	Km^2	117.62
	95%ile flow	m^3/s	0.281
	DWF	m^3/s	0.394

7.6.5 Flood Risk Identification

The Office of Public Works (**OPW**) preliminary Flood Risk Assessment (PFRA), indicative river and coastal flood map (www.floodmaps.ie), CFRAM Flood Risk Assessment maps (www.cfram.ie), Department of Environment, Community and Local Government on-line planning mapping (www.myplan.ie), historical mapping (i.e. 6" and 25" base maps) and GSI groundwater flood risk were consulted to identify those areas as being at risk of flooding.

7.6.5.1 OPW PFRA Mapping

The OPW has produced **indicative** flood mapping to assist in a preliminary Flood Risk Assessment (**PFRA**). These maps were produced from a number of sources and by applying different pluvial models. This assessment was carried out based on available and readily derivable information to identify areas where there may be a significant risk of flooding. The PFRA was undertaken by:

- Reviewing records of floods that have happened in the past;
- Undertaking analyses to determine which areas might flood in the future and what the associated impact(s) might be;
- Consulting with Local Authorities and other Government Departments and Agencies.

Several scenarios were considered such as the impacts of climate change (increase in rainfall and sea level rise) and Pluvial flooding.

As can be seen in Figure 7.4, the PFRA mapping available for the area surrounding the site (PFRA Map No. 301) indicates that there may be a slight risk of pluvial flooding (100-year return event and Extreme event) across a limited section of the North-Western side of the proposed application area. No fluvial flood zones are mapped within the proposed application area.

7.6.5.2 OPW CFRAM Mapping

The objective of the PFRA was to identify areas where the risk associated with flooding might be significant. These areas, which are referred to as "Areas of Further Assessment" (AFA), are where a more detailed assessment was then undertaken to more accurately assess the extent and degree of flood risk.

The detailed assessments, which focused on the AFAs, where undertaken though CFRAM studies. The CFRAM River Flood Extents (present Day) did not show any risk of flooding within the proposed application area using Annual Exceedance Probability (AEP) of 0.1%, 1% and 10% but the Camlin River is subject to flooding in the surrounding area. This is illustrated in Figure 7.5.

As the bulk of the effective rainfall naturally ends up as surface water and as the quarry will act as a buffer prior to discharge, it is anticipated that the proposed development will not pose any additional risk of flooding downgradient. The quarry void will act as a buffer and will reduce the potential for flooding during heavy rainfalls.

7.6.5.3 GSI Mapping

The Geological Survey of Ireland (GSI) groundwater flood mapping does not report any risk of historic flooding or groundwater flood probability.

7.6.6 Surface Water Abstractions

Based on the EPA web-portal, there are no recorded significant river abstraction pressures on the Camlin River or the local tributary streams in the vicinity of the proposed site.

7.6.7 Surface Water Discharges

There is a discharge from the existing quarry operation onto the Rhine Stream to the north of the proposed site.

There are no other recorded surface water discharges into the Camlin River, or its tributary streams in the vicinity of the proposed site as indicated in the EPA maps web-portal.

Discharge from the proposed quarry will be periodic only with the water management system on site to consist of a closed system with the re-use and recycling of rainfall runoff generated within the quarry works.

As a result, any discharge from the quarry is likely to occur mostly during period of prolonged rainfalls. A discharge licence should be sought from Longford County Council.

7.6.8 Water Quality

The chemistry of water is a reflection of its quality and is influenced by the underlying geology and land use in the receiving are of the water body. The main effect of pollution on the quality of water is a reduction in oxygen concentration and nutrient enrichment, which affects its capacity to support biota such as salmonid fish.

7.6.8.1 Water Framework Directive

Under the WFD, all surface water catchments have been characterised and assigned an overall status based principally on chemical and ecological status. The status of River Waterbodies (RWBs) can range from Bad – Poor – Moderate - -Good – High. In accordance with stipulations outlined in the 3rd cycle of the WFD, the objectives for each RWB is to prevent deterioration, maintain high and good status waters, restore waters to at least a good status by 2027 where necessary and ensure that the requirements of any associated protected areas are met.

The River Sub-Basin (RSB) associated with the local and general area, which receives the discharge water from the quarry, is the Camlin_030 RSB (IE_SH_26C010600).

The River Waterbody WFD status of the Camlin_030 RSB (including all tributaries) for the period 2013-2018 (IE_SH_26C010600) is classified as "good status" (Source: EPA). The overall Risk as part of the 3rd cycle is classed as "Not at Risk" of not achieving good status with the overall objective to keep its good status by 2027.

7.6.8.2 Biological Results

The EPA regularly monitors water bodies in Ireland as part of their remit under the WFD, which requires that rivers are maintained or restored to good/favourable status.

Rivers are assigned biological quality ratings, referred to as Q values, which are based on the water quality of the water body and the composition and abundance of invertebrate communities, which are sensitive to increased levels of pollution. Table 7-4 summaries the Q value classification scheme. The monitoring location are presented in Figure 7.6 in Appendix 7.1.

Table 7-3: Biotic indices or "Q Values" reflecting water quality (EPA).

Q Value	Water Framework Directive Status	Pollution Status	Condition
Q5, Q4-5	High	Unpolluted	Satisfactory
Q4	Good	Unpolluted	Satisfactory
Q3-4	Moderate	Slightly polluted	Unsatisfactory
Q3, Q2-3	Poor	Moderately polluted	Unsatisfactory
Q2, Q1-2, Q1	Bad	Seriously polluted	unsatisfactory

There are four EPA sampling points located on the Camlin RSB in the vicinity of the application area as shown in Table 7-5 below. The overall Biological Q rating of the Camlin River in the most recent monitoring (2021) remains consistent with a generally good quality rating.

Table 7-4: Biotic indices or "Q Values" reflecting water quality (EPA) at the five closest stations to the proposed development.

Station ID	Station name	Grid ref (ITM)	1992	1996	1999	2002	2005	2008	2011	2014	2017	2020	2021
RS26C010400	Kilnacarrow Bridge	E621245.35 – N280238		4-5	4	4	4						
RS26C010500	Bridge N of Farragh crossroads(L1052)r	E1620011.6 – N778066.33	3-4										
RS26C010600	Argar Bridge	E618070.2 – N779405.9	4	3-4	3-4	4-5	4	3-4	4-5	4-5	4-5	4	4
RS26C010700	Bridge near Kiltyreher	E616527.4 – N777954.4	4	4	4	4-5	4-5		4-5	4-5	4-5	3-4	4

7.6.8.3 Surface Water Hydrochemistry

During the site visits, the water quality of some of the surface water features was monitored using a calibrated portable field monitoring HI 9828. This baseline water quality was complemented by laboratory analysis at relevant locations. Based on the results from the WFD, the "Good Status" thresholds of SI No. 272 of 2009 (and any subsequent amendments) can be applied as being the relevant Environmental Quality Standards (EQS) regulations for comparison purposes. Locations of the measurements points are provided in **Figure 7.6** of this report and the results of the survey are summarised in Table 7-6 below.

Table 7-5: Summary results of water quality monitoring in the water courses (springs, river and stream) surrounding the proposed site area at a proposed Quarry, Rhine, Killoe, Co. Longford.

Location ID	Date	Location (ITM)	pH (in pH units)	Electroconductivity (in µS/cm)	ORP (mV)	Water Temperature (in °C)
SW1 - Camlin River (L1052 bridge)	21/03/22	619977.5E – 778124.2N	7.15	494	153.9	9.39
SW2 - Rhine Stream	23/03/22	619483.3E-780118.8N	7.05	262	152.4	9.42
SW3 - Drainage ditch	24/02/22	619167.0E – 779458.4N	7.15	221	167.2	4.52
Spring 1	24/02/22, 25/02/22, 21/03/22	619084.3E – 779993.0N	Dry	Dry	Dry	Dry
Spring 2	24/02/22	619215.4E – 779359.4N	7.39	59	172.3	5.40
Spring 3	24/02/22	619086.9E – 779242.0N	7.21	62	164.6	5.22

Table 7-6: Analytical results of surface water analysis near proposed quarry at Rhine, Killoe, Co. Longford (21/03/22).

Parameters	Units of Analysis	Results of Analysis ALS report 640584 Camlin River (SW1)	Freshwater Fish Directive [2006/44/EC]	SI 272 of 2009 (Amended as per SI 327 of 2012 and SI 236 of 2018)
BOD_5	Mg/l	<1	(S) $\leq 3_1$ (C) $\leq 6_1$	Good status ≤1.5 (mean) or ≤2.6 (95%ile)
Chloride	mg/l	17.2	-	-
Orthophosphates	mg/l P	<0.05	-	Good Status ≤ 0.035 (mean) or ≤ 0.075 (95%ile)
Total Hardness (Filtered)	mg/l $CaCO_3$	251	-	-
Total Suspended Solids	mg/l	6.3	(S) ≤ 25_1 (C) ≤ 25_1	-
Ammonia	mg/l N	0.0523	-	Good Status ≤ 0.065 N (mean) or ≤ 0.14N (95%ile)
Manganese (dissolved)	?g/l	34.1	-	-
Nitrates	mg/l NO_3	7.9	-	11.95 High Status**
Sodium (dissolved)	mg/l	8.83	-	-
Potassium	mg/l	2.4	-	-
Total Organic Carbon	mg/l	6.96	-	-
Turbidity	NTU	4.78	-	-
Potassium / Sodium	ratio	0.27	-	GSI threshold of 0.4 for organic type of contamination.

* Results may be subject to issues with the laboratory ** EPA surrogate Value for "High status" (not in legislation),(C) Cyprinid waters, (S) Salmonid waters, $_1$ Guide Value, $_3$ Mandatory value as per SI No. 293 of 1988. Results are shaded where they exceed the relevant EQS

As can be seen in Table 7-6 above , the hydrochemical survey results reveal that low electro-conductivity (EC) water is the dominant water type in most of the surface water features surrounding the proposed site area:

- The Rhine stream and the drainage ditch bordering the South-Western boundary of the proposed quarry area have similar values. It should be noted that they both originate from a bog but at the time of the walkover survey there would have been a dilution taking place due to recent heavy rainfalls,
- Spring 1 was dry, only a soft patch could be found.
- Springs 2 and 3 had a very low EC, consistent with almost direct rainfall. Such results suggest more the influence of ponding water rather than water originating from the subsurface. It was noted during the fieldwork that Spring No. 3 has been partially cut by a deep drain.
- The Camlin River had a more elevated EC, thus showing an interaction with groundwater along its catchment.

The pH ranges remained almost neutral at all locations monitored. This remains well within the natural range for soft water as per the EQS for this parameter (i.e. pH between 4.5 and 9) and as per the mandatory values as per the Freshwater Fish Directive for this parameter (i.e. 6 to 9).

The results of the Oxydo-Redox Potential (ORP) show that oxidizing conditions (positive potentials) are prevalent.

A surface water sample was also taken from monitoring point SW1 (Camlin River). The sample was stored in a cool environment and shipped to ALS Global in the UK the following day where it was analysed for a list of parameters as shown in Table 7-6 above. Certificates of analysis are provided in Appendix 7.2. The analytical results were below their respective Freshwater Fish Directive (FWD) limits and/or EQS where present. These results are generally good and reflect the low pressures from the catchment area of the Camlin River in the vicinity of the site with low ammonia, Nitrate, Orthophosphates, Chloride etc.

The total Hardness from the Camlin river shows a moderately hard water (251mg/l $CaCO_3$).

7.7 Hydrogeology

The hydrogeological environment concerns groundwater and the bedrock and subsoil bodies which contain and transmit water as part of the hydrological cycle. Rainfall infiltrates the ground and recharges the groundwater table before discharging to the surface. Groundwater is an important water source as it provides base-flow to rivers and surface

water bodies. It has inherent value as a natural resource and warrants protection for the prevention of pollution and contamination. To preserve the quality of groundwater, Groundwater Protection Schemes, informed by the Geological Survey of Ireland (GSI), provide a framework to local authorities and environmental professionals in managing and protecting the resource.

The schemes are constructed by combining a number of hydrogeological factors, primarily through assessments of the relative groundwater vulnerability (i.e. sensitivity of groundwater body to pollution), the aquifer potential (i.e. ability of groundwater body to transmit significant quantities of water) and source protection zones (i.e. area of land that recharges the primary groundwater abstraction point). The following section discusses:

- Groundwater body;
- Aquifer classification;
- Vulnerability assessment;
- Abstraction; and
- Groundwater quality, in the context of the proposed development site.

Information regarding the hydrogeology was obtained from the Geological Survey of Ireland publication on the Geology of Longford and Roscommon (2003) and the GSI website.

7.7.1 Aquifer Classification

An aquifer is a groundwater body that can yield significant amounts of water that can be utilised as a drinking water resource. The presence of aquifers that are deemed to be regionally or locally important by the GSI is based on their hydrogeological characteristics and value as a potable groundwater resource. Classification is an important delineation, as aquifers are vulnerable to contamination arising from human-induced activities on the surface/ shallow subsurface; construction activities should therefore avoid, if possible, areas where groundwater is particularly vulnerable to potential pollution.

7.7.1.1 Bedrock Aquifer Hydrogeology

The proposed planning area (18.6 Ha) is underlain by Lower Carboniferous limestones of Dinantian age, referred to by the GSI as the Lucan Formation (LU). This formation consists of dark grey to black fine grained micritic limestones and is part of the Dinantian Upper Impure Limestones Groundwater Rock Unit Group (DUIL).

The Lucan Formation is in contact with the Viséan Limestones Formation (VIS) along the R194 to the North of the proposed site area for extraction. This formation is part of an outlier of

Viséan shelf limestone, which would typically consist of dolomitic crinoidal limestones. This formation is part of the Dinantian Pure Bedded Limestones Groundwater Rock Unit Group (DPBL)

Bedrock aquifer maps published on the GSI website (Figure 7-7) provide a detailed classification of the bedrock aquifer types as follows:

- The Lucan Formation, which underlies all the proposed application area has been classified by the GSI as a "Locally Important Aquifer – Bedrock which is Moderately Productive only in Local Zones" (Ll).

- The Viséan Limestones Formation has been classified by the GSI as Regionally important karstic Aquifers with potential for conduit flow (Rk_c).

Data from the GSI karst database as well as information from the GSI web portal show that although this formation is capable of significant karst development, the closest known karstic feature is located c. 6.25km to the West of the proposed site area.

It should be pointed out that, owing to its location along a ridge forming a watershed line and due to the presence of an active quarry to the North-East, the groundwater inflow from the North-Eastern part of the proposed quarry operation is assumed to be limited to the recharge.

7.7.1.2 Quaternary Aquifer Hydrogeology

Figure 7-8 illustrates the Quaternary deposits in the area. Across the proposed site area, the Quaternary deposits mainly consist of low permeability peat to the North-West and Moderate permeability Till derived from Lower Palaeozoic sandstones and shales (TLPSsS). Alluvium is found along the courses of the Camlin River and its tributary streams.

The results of the geophysical survey[1] undertaken by APEX shows that the cover of overburden material is quite thick, ranging from less than 5.0m down to over 15m across the site. This was confirmed by diamond drilling at 7 locations across the proposed site area (December 2020, Cf. report by J. Colthurst[2] in Appendix 6.2 whereby the thickness of

[1] Source: APEX report No.AGP18054_02 entitled « Report on the geophysical investigation at lands adjacent to Rhyne quarry, Co. Longford" and dated 15/06/2020.
[2] Source: "Review of geophysical reports and diamond drilling results at a proposed quarry site at Killoe, Ballinalee, Co. Longford" dated 12/01/21".

overburden ranged from c. 3.7m in the North (Corehole E) of the proposed site area down to in excess of 15m in the South (Coreholes F & G).

The results of the diamond drilling also confirmed the subsoil deposits to be consistent with "heavy brown sticky boulder clay with pebbles and boulders of limestone, sandstone and Lower Palaeozoic greywacke and slate": the Till deposits are therefore considered as aquitards and do not hold any aquifer potential. They are overlain by poorly drained soils such as surface water gleys and peaty gleys.

The peat material appears to be ombrotrophic (i.e. rain-fed) in nature: these are limited in extent but may present perched water conditions with a water potential limited by the rainfall. They do not hold any aquifer potential.

For these reasons, the quaternary deposits will not be considered any further in what follows.

7.7.2 Bedrock Aquifer Characteristics

The bedrock of this area has no inter-granular (primary) permeability and solely relies upon secondary permeability, i.e. groundwater flow occurs mainly in cracks, joints, fractures and faults.

A review of the information obtained from the geophysical survey showed that the most weathered part of the bedrock lies at the bedrock head: it remains generally thin, i.e. ranging from c. 1.0m to c. 5.0m across most of the proposed site area. This was confirmed by the drilling of 7 coreholes across the site and one borehole.

The permeability of the rock is likely to diminish very rapidly with depth. There are no faults shown across the site area or its surroundings based on the GSI maps. The results of an extensive geophysical survey undertaken by Apex within most of the proposed area (Cf. Apex report No AGP18054_02 dated 15/06/2020 in Appendix 7.1 did not show any evidence suggesting the presence of faults zones, even at depths of 60m b.GL. This was confirmed by a corehole drilling programme undertaken by others in December 2020[3].

The diamond drilling confirmed that the bedrock across the proposed planning area is consistent with the limestone exposed in the existing active quarry to the North of the proposed planning area, notably:

[3] Source: "Dr John Colthurst Report - Review of geophysical reports and diamond drilling results at a proposed quarry site at Killoe, Ballinalee, Co. Longford" dated 12/01/21". Appendix 6.2

- All the drillholes encountered siliceous fine calcarenites and micrites. No shales or calcareous mudstones were observed;
- The bedding is almost flat lying with no evidence of folding or significant faulting;
- The weathering of the rock was ranked as 1 or 2, implying the rocks are fresh or only slightly weathered. Almost all the rocks are non-vuggy.

Based on the above and the observation made by AGs in the nearby quarry, it is assumed that although joints and fractures are still present in the limestone bedrock at depth, these tend to be of a narrow aperture, which would restrict groundwater flows. This was confirmed by the drilling of a borehole under the supervision of AGS. The borehole was intended for a pumping test but did not yield any sufficient water for this purpose as it was mostly competent limestone bedrock that was encountered.

As a result, the groundwater permeability and storage of individual fractures and the degree of interconnection across the site area is anticipated to remain low, with fracturing confined to local zones. Groundwater flow paths[4] in this type of bedrock aquifer is generally short (i.e. 150m), with the bulk of the water discharging to springs and/or to streams and rivers that cross the aquifers.

The baseflow contribution to the Camlin River is anticipated to be very low in Summer, as the groundwater regime cannot sustain summer baseflows due to low storativity within the aquifer. In winter, low permeabilities will lead to a high-water table.

Owing to the layer of low to moderate permeability overburden, groundwater is anticipated to be confined and/or semi-confined (depending on location) in Winter and unconfined in Summer.

Water logging of soils was noted during the fieldwork activities in February and March 2022, especially where the ground is flatter.

As part of the fieldwork, some rising head tests were conducted in the available monitoring core holes on site. The results are provided in Appendix 7.3 and summarised in the Table below.

[4] Flow paths: is the distance from the point of recharge to the point of discharge.

A borehole was also drilled on site for the purpose of a pumping test. The borehole was dry, thus confirming the initial results of the geophysical survey and the diamond drilling programme and it was not possible to conduct a pumping test at this location.

Table 7-7: Groundwater levels and hydraulic continuity of bedrock formation at a proposed quarry in Rhine, Killoe, Co. Longford (23/02/22).

ID	A	B	C	D	E
ITM Location	E619180.8-N779789.7	E619154.9-N779692.8	E619267.3-N779645.9	E619230.1-N779556.6	E619126.4-N779863.8
Elevation of reference level (m OD)	57.875	59.844	59.50	58.58	57.579
Depth (m)	50.00	30.00	50.00	50.00	49.50
Depth to groundwater (m b.TOC) on the 23/02/22	15.72 @14:30	14.20 @15:52	18.54 @17:05	16.95 @17:20	12.10 @12:00
Depth to groundwater (m OD) on the 21/03/22	19.49 @14:48	16.98 @14:33	17.86 @14:50	16.70 @14:56	15.18 @15:03
Average Hydraulic continuity (m/s)	1.69E-7	1.10E-7	Obstructed	2.10E-7	3.42E-8

Based on the results of the rising head tests, the hydraulic conductivity of the bedrock aquifer is consistent across the site, ranging from $3.42x10^{-8}$ m/s at Corehole E up to $1.10x10^{-7}$ m/s at Corehole B. These values are deemed as very low to low. It should be noted that these coreholes were not finished as monitoring boreholes and that water may have been seeping from the saturated overburden from the layers above, thus potentially .

The average hydraulic conductivity was of the order of $1.33x10^{-7}$ m/s.

The drilling of a borehole on the 21/03/22 confirmed these results with the borehole finished at a depth of 48.17m b.GL being essentially dry: the water in the well slowly recovered from 2pm on the 21/03/22 up to 42.42m b.GL on the 22/03/22 at 10am. The water table was anticipated to be around 15 to 16m. b.GL based on the water levels measured in the nearby Coreholes.

7.7.3 Vulnerability Assessment

Groundwater vulnerability is defined as the intrinsic geological and hydrogeological characteristics that determine the ease with which groundwater may be contaminated by human activities (Daly & Warren, 1998). The vulnerability of groundwater depends on:

- The time of travel of infiltrating water (and contaminants).
- The relative quantity of contaminants that can reach the groundwater.

- The contaminant attenuation capacity of the geological materials through which the water and contaminants infiltrate.

As groundwater is hydrologically connected to the land surface, the relative vulnerability of groundwater to contamination is determined by the effectiveness of this connection. For example, groundwater that receives recharge (i.e. rainfall) more rapidly from the surface is more vulnerable to contamination than a groundwater system where recharge occurs more slowly and in lower quantities. The travel time, attenuation capacity and the quantity of contaminants are a function of the following natural geological and hydrogeological characteristics of any area:

- The type and permeability of the subsoils overlying the groundwater.
- The thickness of the unsaturated zone through which the contaminant moves.
- The recharge type (point or diffuse).

The layers of superficial deposits that overlie groundwater act to protect it but also form a pathway between surface, and potential contamination, and the groundwater itself. By establishing the characteristics of these pathway layers, the vulnerability of the underlying groundwater can be rated. The GSI have devised four vulnerability ratings, Extreme, High, Moderate and Low. The methodology for assigning these ratings is described below in Table 7-8.

The GSI Aquifer Vulnerability Map for this area (www.gsi.ie) is illustrated in Figure 7.8 (Appendix 7.1), which indicates that vulnerability of the groundwater within the proposed site is ranked as Low to moderate from the North-Western boundary to the South-Eastern boundary of the proposed planning area.

However, the results of the geophysical survey[5] suggested that the thickness of the subsoil was:

- thickest (c. 20m) in the area where the ridge formed by the drumlin is located (i.e. to the NE of the proposed planning area), as shown in 2D resistivity profiles R2, R3 and R4: the associated groundwater vulnerability should be ranked as Low to the North-Eastern boundary of the proposed area for excavation.

[5] Source: APEX report No.AGP18054_02 entitled « Report on the geophysical investigation at lands adjacent to Rhyne quarry, Co. Longford" and dated 15/06/2020.

- becoming progressively thinner to the SW (down to c. 5m) as shown in 2D profile R05. The associated groundwater vulnerability should be taken as high to the South-Western boundary of the proposed extraction area.
- The area covered by the bog was not surveyed. However, the 2D resistivity profile R05 suggest that the overburden may be c. 10m thick toward the boggy part of the proposed site area: if confirmed by direct site investigation, the associated groundwater vulnerability should be taken as moderate in this area.

Table 7-8: GSI Vulnerability Mapping Guidelines.

Vulnerability Rating	Hydrogeological Requirements (below the point of release of contaminants)				
	Subsoil Permeability (Type) and Thickness			Unsaturated Zone	Recharge Type
	high permeability (sand/gravel)	moderate permeability (sandy till)	low permeability (clayey till, clay, peat)	(sand & gravel aquifers only)	
Extreme	0-3.0m	0-3.0 m	0-3.0m	0-3.0m	point (<30 m radius)
High	>3.0	3.0-10.0m	3.0-5.0m	>3.0m	N/A
Moderate	N/A	>10m	5.0-10.0m	N/A	N/A
Low	N/A	N/A	>10.0m	N/A	N/A
Notes: i) N/A =not applicable ii) Precise permeability values cannot be given at present iii) Release point of contaminants is assumed to be 1-2 m below ground surface					

Source: Daly and Warren, 1998

7.7.4 Recharge and Runoff

The Effective Rainfall in the area is high with 590.6mm/year (source: GSI). As the topsoils are poorly drained and the subsoil would offer either a poor permeability (Peat) or moderate permeability (Till), it is assumed that only a small proportion of the ER would be available for recharge.

Although a recharge cap of 200mm/year is applied to LI aquifers to reflect their limited ability to accept water, the main limiting factor to groundwater recharge would be the ability of the topsoil and subsoil to allow the effective rainfall to infiltrate.

In addition, it should be pointed out that:

- The bedrock exposed in the existing quarry faces does not show the presence of any significant dissolution features. It is assumed that, aside from the most weathered part of the bedrock (i.e. bedrock head), the groundwater flow is limited to fractures and bedding planes (where present), with a limited interconnectivity.
- Owing to its enclosed location along a watershed line, the groundwater inflow to this area is likely to be limited to the recharge.

As a result, the recharge across the proposed excavation area and manufacturing & batching plant is considered to be as described in Table 7-9 below:

Table 7-9: Summary details of the recharge at a proposed Quarry in Rhine, Killoe, Co. Longford.

Effective Rainfall (mm/yr)	590.6
Hydrogeological Setting and description	2.ii in areas underlain by Till and overlain by poorly drained soils. 4.ii in areas underlain by Basin peat.
Soil Drainage	poor
Subsoil Type	TLPSsS and Cut over raised peat
Subsoil Permeability	Low (Peat) and Moderate (Till)
Aquifer Category	Ll: Lucan Formation
Groundwater Vulnerability	From L to H across the proposed site for extraction and associated manufacturing and batching plant
Inner Recharge Coefficient	4% in area overlain by peat and 22.50% in area overlain by Till
Recharge coefficient taken for calculations	4% (5.73 Ha) and 22.50% (10.6 Ha)
Maximum recharge capacity (mm/yr)	200mm/yr across the entire quarry area. This does not apply as estimated recharge is much lower
Overall recharge across the proposed extraction area and manufacturing/batching plant (m^3/d)	42.40 rounded to 45

The proposed extraction and associated area for the manufacturing/batching plant (combined area of c. 16.33 Ha) will result in a loss of c. **45.0m^3/d** of groundwater recharge locally. As aquifers in Ireland reject a significant part of the available recharge in the surface water in the lower grounds, this potential impact will be small.

However, and as for the existing quarry to the North, it is anticipated that very little recharge to the aquifer would occur once the upper, most permeable part of the bedrock aquifer has been removed. For this reason, it is only surface water runoff that will be generated within the site area proposed for extraction and extension.

Any excess water will generate surface water runoff, which will be dealt with by the water management system within the quarry. In most instances, the incident rainfall would tend to pond on the quarry floor levels and then evaporates and/or infiltrate back to the water table. Based on the Table 7-2 above, surface water runoff tends to be limited to periods of heavy rainfall events. Which will mainly occur during Winter.

Available water is likely to be an issue for the activities on site and it will be necessary for the quarry operator to recycle and reuse as much as possible of the surface water runoff generated within the excavation area.

7.7.5 Groundwater features, groundwater levels, flows and gradient

During the fieldwork undertaken on the 23/02/22 and 24/02/22, all the relevant groundwater water features (wells, pond, springs etc.) were surveyed and referenced to the Ordnance Datum (O.D.) level using an E300Pro ESurvey GSM Rover level.

All the wells were referenced to the Ordnance Datum (O.D.) Level. The top of the steel casings or inner plastic pipes (depending on the case) were taken as the datum point on each well from which groundwater levels measurements were taken using a dipmeter. The water levels from the relevant surface water features were also surveyed on the same day. The results are provided in Table 7-11 below.

A groundwater table contour map was then produced using a combination of the static levels taken from Table 7-11 below and illustrated on Figure 7.11 (water table on the 23/02/522) and Figure 7.12 (water table on the 21/03/22). The water table from the pond within the existing quarry was also taken.

A kriging method computation programme was selected to reliably interpolate water table altitudes and auto-correlate them between known data values in its estimation of values at unmeasured sites: This technique is replicable, accepts irregularly spaced data, uses only measured values closely surrounding points at which values are estimated, is an exact interpolator at measured data points and calculates an error of estimate.

The water table contour map is somewhat limited due to the lack of available data points on the higher and lower grounds of the operating quarry.

The direction in which groundwater moves is a function of two variables as follows:

1) the potential field of the groundwater flow system and;
2) the degree of anisotropy and orientation of the axes of permeability.

As the wells used to produce the maps are tapping the unconfined bedrock aquifers, we can assume these latter as being isotropic. In such case, the groundwater flow direction is parallel to the hydraulic gradient, i.e. it is likely to follow the local topography. This is confirmed by Figures 7.11 and 7.12 with the general groundwater flow direction orientated in an Easterly to North-Easterly direction.

The extraction areas of the existing quarry to the North-East of the site have intersected the water table and lowered it around the periphery with the excavation of each quarry bench. Management of groundwater in the existing quarry has resulted in the development of a cone of depression as shown in Figures 7.11 and 7.12, which is now well established.

Table 7-10: Summary results of relevant groundwater level monitoring, proposed Quarry, Rhine, Killoe, Co. Longford (23/02/22 and 21/03/22).

ID	Description	Easting	Northing	Static water level (in m a.OD) 23/02/22	Static water level (in m a.OD) 21/03/22
CH A	Corehole	619180.8	779789.7	42.16	38.39
CH B	Corehole	619154.9	779692.8	45.65	42.86
CH C	Corehole	619267.3	779645.9	40.96	41.64
CH D	Corehole	619230.1	779556.6	41.63	41.88
CH E	Corehole	619126.4	779863.8	45.48	42.40

The depths to groundwater indicate that the dewatering operations at the existing quarry have altered the natural groundwater flow direction locally with the bulk of the dewatering occurring within c. 200m from the quarry boundary. Beyond c. 250m, the potential impact from the quarry dewatering is likely to remain within the annual fluctuation of the water table. This is illustrated in Figures 7.11 and 7.12 whereby the variation of the water table between boreholes CH C (230m from existing quarry boundary) and CH D (c.330m from existing quarry boundary) was of only 0.67m, on the 23/02/22 and 0.24m on the 21/03/22.

It should also be pointed out that:

- the actual drawdown would in reality be much narrower and steeper toward the existing quarry faces. This is not reflected in Figures 7.11 and 7.12 due to the lack of monitoring points. This would be typical of low permeability aquifers such as the Lucan Formation.

- the existing quarry currently operates c. 20m below the floor level of the proposed new quarry. As a result its current impact on the water table is likely to be greater than the proposed new quarry.

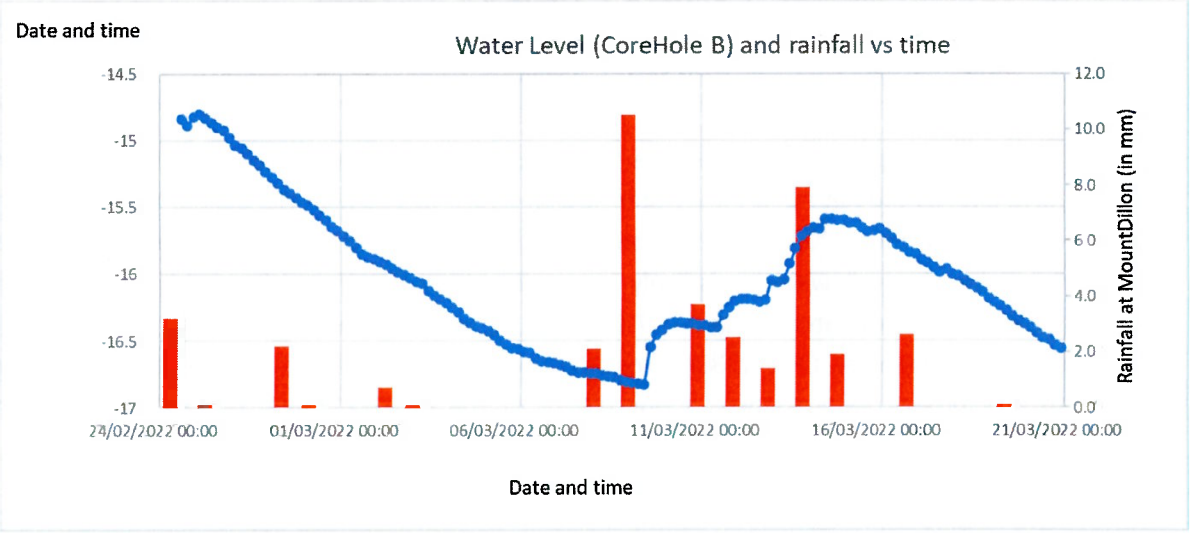
- Upon cessation of the activities within the existing quarry, the water table will recover. There will therefore be no compounded effect from the two quarries over a prolonged duration. The overall impact from the proposed quarry is anticipated to be similar to that of the existing quarry as a conservative approach.

The overall gradient of the water table under natural conditions is anticipated to be a subdued reflection of the local topography, i.e. (10/535=0.018).

Upon cessation of the quarry activities, groundwater levels will rebound to a level closer to the surface of the site area than at present.

The water table at corehole No. B was also monitored between the 24/02/22 and the 21/03/22, which is illustrated in Chart 7.1 below.

Chart 7-1 - **Water table (Corehole B) and rainfall vs time (period 24/02/22 – 21/03/22).**



As can be seen in Chart 7.1 above, the water table is highly dependant on the rainfall with a lag of circa one day: a generally decreasing trend was observed over the period considered with a recovery taking place between the 09/03/22 and the 14/03/22.

7.7.6 Quarry abstraction

The quarry activities will be undertaken below the water table within the proposed extraction area. A cone of drawdown will develop over the years. As the quarry deepens below the upper most weathered part of the bedrock, the storage capacity of the bedrock aquifer will be drained.

Groundwater inflows are anticipated to be limited to minor seepages on the quarry faces, which would mostly occur during wet periods as with the existing quarry to the North-East. As a result, there should be no need for an ongoing dewatering system within the proposed quarry.

For its daily operation, the quarry will rely on working sumps, which also receive the surface water runoff from the quarry works. These sumps will be used as the main water supply for aggregate washing and dust suppression but also for the manufacturing and batching plant.

As discussed in Sub-section 7.4.6, the potable water supply for the quarry office and canteen will be provided by the local main.

7.7.7 Quarry Discharge

AGS' experience of rock quarries in poorly/locally important aquifers in Ireland (such as the proposed quarry) shows that, once excavated significantly below the most weathered part (c. 5m to 15m) of the bedrock aquifer, the groundwater component of the volume of water abstracted at low flow (i.e. late Summer) is largely independent of the volume of the rock (size) excavated (as the permeability decreases with depth).

For this reason, it is only surface water runoff generated within the site area that will have to be dealt with. There will be the need for a water management system on site to reuse and recycle the rainfall runoff accumulating in the sumps within the quarry works. When it occurs, the discharge from the quarry will not only depends on the rainfall but also the quarry requirements in terms of dust suppression, aggregate washing and the needs of the manufacturing and batching plant.

It is anticipated that the discharge from the proposed quarry will be periodic, mostly occurring during periods of prolonged and/or extreme rainfall.

This will require grant of a discharge licence from Longford County Council.

7.7.8 Groundwater Quality

Groundwater quality is as important as the quantity available for human usage and the type and concentration of dissolved substances within a groundwater sample is a measure of its baseline hydrochemical status, indicating whether the groundwater shows signs of pollution linked to anthropogenic activities.

7.7.8.1 Water Framework Directive Water Body Status and Objective

The River Basin Management Plan (RBMP) for the period 2022 – 2027 has not yet been adopted. Based on the previous RBMP, the objectives include the following:

- Prevent deterioration and maintain a high status where it already exists.
- Protect, enhance and restore all waters with aim to achieve at least good status by 2021.
- Ensure waters in protected areas meet requirements.
- Progressively reduce chemical pollution.

Regardless of their current quality, surface waters should be treated the same in terms of the level of protection and mitigation measures employed i.e. there should be no negative change in status. Strict mitigation measures in relation to maintaining a high quality of surface water runoff from the development and groundwater protection will ensure that the status of both surface water and groundwater bodies in the vicinity of the site will be maintained (see below for WFD water body status and objectives) regardless of their existing status.

7.7.8.2 Bedrock Aquifer GWB

Groundwater Bodies (GWB) have been designated for the purpose of the Water Framework Directive (WFD) – Directive 2000/60/EC. GWBs are subdivisions of large geographical areas of aquifers that allow more effective management to protect groundwater and linked surface water or groundwater dependent features and/or eco-systems.

The proposed quarry site lies entirely within the Longford Ballinalee GWB (EU Code: IE_SH_G_149).

The Longford-Ballinalee GWB has been assigned an overall[6] "Good Status" for the period 2013-2018. The GWB risk for the 3rd Cycle was ranked as "not at risk".

[6] in respect of both quantitative status and chemical status

The objectives for the GWB is to protect its current 'Good Status' condition, requiring that their chemical and quantitative status be maintained.

Based on the EPA maps, the area is designated as "Groundwater for Drinking Water".

7.7.8.3 Groundwater Hydrochemistry

A representative groundwater sample was taken from the newly drilled borehole on site (BH1, Cf. Appendix 7.4). The groundwater sample was stored in a cool box and sent to ALS in the UK for analysis on the following day. Monitoring was also undertaken at the sump in the existing quarry on the 22/03/22 using a calibrated portable field monitoring HI 9828. The locations where the monitoring took place are illustrated in Figure 7.6. Full details of the analytical results are provided in Appendix 7.2 and are summarised in Tables 7-12 and Table 7-13 below.

All the physico-chemical parameters were below their respective Interim Guideline Values (IGV) as per EPA 2003 and/or Threshold Values (TV) as per SI No. 9 of 2010 where present.

The pH values ranged between neutral to slightly alkaline. For the sample taken on the 21/03/22, the laboratory result was above the field result, which would be expected as the pH would increase with the release of CO_2 gas from the water as soon as the sample is taken from its medium.

The redox potential (ORP) was positive thus indicating the prevalence of oxidising conditions in the groundwater.

The low result for Total Organic Carbon (TOC) indicates that the groundwater is not contaminated by any carbon-based products such as Petroleum Hydrocarbons.

Table 7-7: Results of the physico-chemical parameters analysis in groundwater at a proposed Quarry, Rhine, Killoe, Co. Longford.

Inorganic Parameters and Units of Analysis	ALS Report 640584	Walkover Survey	Interim Guideline Values EPA, 2003	Groundwater Threshold Values (S.I. No. 9 of 2010) as amended by S.I. No 366 of 2016
	22/03/22	22/03/22		
	BH1	Existing Quarry Sump		
Conductivity (µS/cm @ 20°C)	509		1,000	800 – 1,875
Conductivity (Field Measurement - µS/cm @ 20°C)	473	454	1,000	800 – 1,875
ORP (mV)	175.5	156.6	-	-
pH (Lab)	8.02		6.5 ≤ ≤9.5	No limit specified in Groundwater
pH (Field)	7.27	7.18	6.5 ≤ ≤9.5	No limit specified in Groundwater
Field Temperature (°C)	10.47	10.39	-	-
Total Organic Carbon (mg/l)	<3		No abnormal change	No limit specified in Groundwater

* Bold font implies values above EPA 2003 IGV

Table 7-8: Results of the indicator parameters analysis in groundwater carried out at a proposed Quarry, Rhine, Killoe, Co. Longford.

Inorganic Parameters	ALS Report 640584 22/03/22 BH1	Interim Guideline Values (EPA, 2003)	Groundwater TVs (S.I. No. 9 of 2010) as amended by S.I. No 366 of 2016
Total Alkalinity (mg/l $CaCO_3$)	205	**No abnormal change**	**NLSGW**
Bicarbonate Alkalinity (mg/l $CaCO_3$)	205	**NLSGW**	**NLSGW**
Total Hardness (mg/l)	232	**307**	**NLSGW**
Ammoniacal Nitrogen (mg/l as N)	**0.389**	**0.15**	**0.065 – 0.175**
Calcium (mg/l)	78.6	**200**	**NLSGW**
Chloride (mg/l Cl)	**48.6**	**30**	**24 – 187.5**
Iron (mg/l)	<0.019	**0.2**	**NLSGW**
Magnesium (mg/l)	8.7	**50**	**NLSGW**
Manganese (soluble) (µg/l)	19.4	**50**	**NLSGW**
Potassium (soluble) (mg/l K)	3.45	**5**	**NLSGW**
Sodium (soluble) (mg/l Na)	19.4	**NLSGW**	**150***
Potassium / Sodium (ratio)	0.18	**NLSGW**	**0.4 (indicator)****
Sulphate (mg/l SO_4)	12.8	**200**	**187.5**
Nitrate (mg/l as NO_3)	13.5	**25**	**37.5**
Total Dissolved Solids (mg/l)	384	**1000**	**NLSGW**
Total Suspended Solids (mg/l)	42.3	**NLSGW**	**NLSGW**

NLSGW: No limit specified in groundwater contamination * in S.I. No. 9 of 2010 only Shading and bold font imply values above EPA 2003 IGV **GSI threshold ratio for organic-type of Bold Red font implies Values above S.I. No. 366 of 2016 and subsequent amendments.

Based on one sample only, the analytical results show that the groundwater signature is predominantly calcium-bicarbonate-type, which is consistent with the underlying bedrock formation.

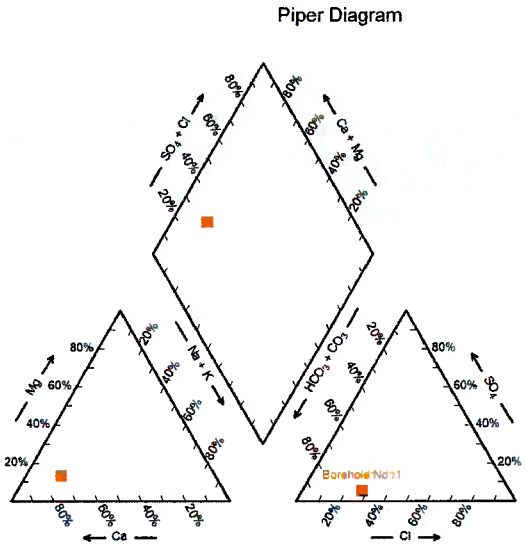


Chart 7-2 Piper Diagram from sample taken at BH1, Rhine, Killoe, Co. Longford (22/03/22).

The groundwater is also moderately hard with a total Hardness of 232mg/l.

Except for Ammonium and Chlorides, most of the parameters remained well below their respective IGV, Threshold Value as per S.I. No. 9 of 2010 (when present) and/or below the detection limit of the laboratory instrument used.

Ammonium and Chloride levels were in excess of both their EPA IGV and TV. These parameters are generally indicative of a contamination by organic waste taking place.

7.7.9 Conceptual Model

It is proposed to develop a new quarry at Rhine, Killoe in Co. Longford. The proposed application area covers a total of 18.55 Ha. The extraction area will cover a surface of 14.22 Ha down to a depth of 20m a.OD. The Area for the manufacturing & batching plant will cover an area of 2.11 Ha down to a depth of 54m a.OD. The proposed development will operate below the water table of a locally important bedrock aquifer (Ll).

The quarry is located along the North-Eastern boundary of a watershed line, within the catchment area of t he Camlin River.

The closest surface water course to the site is the Camlin River, which flows at a minimum distance of c.380m to the South-West of the proposed extraction area.

Although there is a high Effective Rainfall (590.6mm/yr) in the area, the capacity of the underlying bedrock aquifer to accept recharge is limited to 200mm/yr (Locally important bedrock aquifer). In addition, owing to a combination of poorly drained soil underlain by moderately permeable tills and/or poorly permeable peat deposits, the recharge to the bedrock aquifer is further limited and has been calculated as being of c. 45m^3/d on average across the proposed site area.

The proposed development will therefore result in the loss of c. 45m^3/d of recharge to the aquifer. As aquifers in Ireland reject a significant part of the available recharge in the surface water in the lower grounds, this potential impact will be small.

Under greenfield conditions, the bulk of the ER generated within the proposed planning area would naturally contribute to a shallow interflow and an overland flow (runoff) during the wetter months. Surface water runoff and shallow interflow generated on site are currently drained by a 1.5 to 2.0m deep ditch, which runs along the South-Western perimeter of the proposed planning area: it collects the water from the bog on site and receives additional water from a network of interconnected drains which run along the field boundaries. The greenfield runoff rate of the proposed area discharging to this drainage ditch has been calculated to be of c. 56l/s. Please refer to Appendix 7.5. The drainage ditch ultimately discharges into the Camlin River c. 435m South of the proposed application area.

The quaternary deposits in this area do not hold any groundwater potential.

The bedrock aquifer belongs to the Longford – Ballinalee Graney GWB. Site specific investigations confirmed the classification of the bedrock aquifer as a locally important aquifer with low permeability and short flowpaths.

Depending on location across the site, groundwater is anticipated to be semi-confined to confined in Winter. In Summer, the Water table is likely to be unconfined.

The bulk of the groundwater is primarily flowing within cracks, joints and fractures from the upper 5m to 15m of the bedrock head. There is very limited aquifer potential below this level as the rocks become more competent with depth. It is therefore anticipated that the permeability would rapidly decrease with depth unless a major water bearing feature would be encountered. Based on the results of the site investigations carried out to date, there are no indication that a fault or any karstic feature (due to the presence of the nearby Viséan Limestone Formation) would be encountered within 60m from the ground surface.

Given that the proposed quarry will be developed within the same bedrock aquifer as the existing quarry to the North-East, it is considered that the cone of drawdown induced by the new quarry will be similar than that of the existing quarry as follows:

- As the proposed new quarry will progressively be excavated below the water table, a cone of drawdown will extend radially around the excavation area as the quarry deepens.
- The bulk of the drawdown will radiate within 250m around the proposed excavation area with the steepest gradient located along the quarry rock faces (generally within 100m from the excavation area).
- Beyond 250m, the drawdown induced by the quarry would likely be within the order of the natural fluctuation of the water table.

As the existing quarry ceases its operation, the water table will start recovering within its void. There shall therefore be no lasting compounding effect of the quarry dewatering.

As the proposed quarry is being developed and the subsoils are stripped off, all incident rainfall within the quarry void would either evaporate or generate runoffs draining to the sumps. Once the upper most weathered part of the bedrock is excavated, only a limited recharge to the aquifer would occur.

Based on the rainfall pattern, water within the quarry is anticipated to be scarce in Summer and will have to be recycled and reuse for operational purposes. As a result, it is considered that water will only be discharged from the proposed quarry on an ad'hoc basis mostly during wet periods and depending on the requirements of the manufacturing plant.

The discharge from the quarry will be via the aforementioned drainage ditch running alongside the South-Western perimeter of the proposed quarry compound. A discharge licence will be required.

Water quality from the Camlin River is monitored by the EPA upstream and downstream from the proposed site area and no deterioration has been observed to date with the existing quarry.

As with the existing quarry to the North-West of the proposed planning area, groundwater seepages are likely to be negligible. For these reasons, it is only surface water runoff generated within the site area that will have to be dealt with by the water management system.

Groundwater vulnerability to potential contamination below the application area is currently ranked as Low to High. The groundwater vulnerability will increase to extreme once the protective layer of soil and subsoil are removed. The main potentially polluting activity within the proposed area for extraction would be the refuelling of plant by tanker truck.

A collection sump and a settlement pond will be required in the proposed excavation area for operational purposes. Details of the sizing when the quarry is fully extended is provided in Appendix 7.6.

The proposed application area is not located within a zone of contribution or source protection zone for any public or private groundwater supplies. The GSI national well data base does not show any private wells in the immediate vicinity of the quarry. The results of a well survey carried out as part of the fieldwork highlighted the presence of one private drinking water supply well located over 350m away downgradient from the proposed quarry boundary. As it is anticipated that the bulk of the cone of drawdown will be limited to 250m, the potential impact on this supply is likely to be small

There are a number of natural springs in the area. Based on a walkover survey, springs 1 to 3 are likely to be features relating to surface water ponding (Springs 1 and 2) while Spring 3 is likely to be fed by the subsurface interflow:

- Spring 1 will disappear as a result of the excavation.
- Spring 2 is a surface water-fed feature and should remain unaffected by the proposed development.
- Spring 3 has already been damaged by a deep drain running across it.
- Spring 4 is outside of the 250m drawdown zone and on a separate catchment area so will remain unaffected.

Based on the initial results of the monitoring conducted as part of this work, the groundwater quality and the surface water quality are generally good. Based on one sample only, the groundwater quality shows slight signs of contamination that are most likely the results of the use of organic fertiliser and/or animal waste.

Mitigation measures are provided in this report to prevent any potential adverse effect of the proposed development to the aquifer and surface water.

7.8 Assessment of Impacts of the Development

7.8.1 Introduction

This section addresses the potential impacts on the hydrological and hydrogeological environment from activities during excavation and operation of the project (combined under the heading of operational phase) and makes a determination on the likelihood of occurrence. The potential impacts may comprise direct and indirect impacts on the quality of surface waters and groundwater, and on the increased volume of surface water flow. Thus, the hydrological and hydrogeological assessment identified water sensitive receptors located within the proposed site area and downstream from the proposed quarry extension works.

The conventional source-pathway-target model was applied to assess potential impacts on downstream environmental receptors resulting from the development. The stepwise impact assessment process applied is presented below. The definitions and descriptions show how the source-pathway-target model and the EPA impact descriptors are combined.

- Description of Potential Impact Source: The activity that brings about the potential impact or the potential source of pollution is described. The significance of effects is briefly described.
- Pathway / Mechanism: The route by which a potential source of impact can transfer or migrate to an identified receptor is outlined. Surface water and groundwater flows are the primary pathways for quarry developments. For example, excavation or soil erosion are physical mechanisms by which a potential impact is generated.
- Receptor: A receptor is a part of the natural environment that could potentially be impacted upon, e.g. human health, plant / animal species, aquatic habitats, soils/geology, water resources, water sources. The potential impact can only arise as a result of a source and pathway being present.
- Pre-mitigation Impact: Impact descriptors which describe the magnitude, likelihood, duration and direct or indirect nature of the potential impact before mitigation is put in place.

7.8.2 Surface Water Operational Phase

Due to the geology at the site, there will only be limited groundwater inflow to the proposed quarry. It will be mainly with surface water runoff generated within the proposed quarry extension that the drainage system of the existing quarry will have to deal with.

7.8.2.1 Felling of Trees

About 1.31 Ha of the proposed area for excavation is currently covered with trees, which will need to be felled. Potential impacts during tree felling occur mainly from:

- Exposure of soil and subsoils due to vehicle tracking and skidding or forwarding extraction methods resulting in a source of suspended sediment which can become entrained in surface water runoff and enter surface water courses.
- Entrainment of suspended sediment in watercourses due to vehicle tracking through watercourses.
- Damage to roads resulting in a source of suspended sediment which can become entrained in surface water runoff and enter surface water courses.
- Release of sediment attached to timber in stacking areas.
- Nutrient release.

In Ireland, forestry is an activity that operates under strict environmental controls such as tree felling licences and also principles of sustainable forest management with great emphasis on the protection of the aquatic environment. Therefore, no significant effects are anticipated from tree felling.

Pathway / Mechanism: Drainage and surface water discharge routes.
Receptor: Surface waters and associated dependant ecosystems.
Pre-mitigation Impact: Indirect, negative, moderate, short term, medium probability impact.

7.8.2.2 Earthworks (Removal of Vegetation Cover, Excavations and Stockpiling)

Quarry excavation works will require earthworks resulting in removal of vegetation cover and excavation of soil and mineral subsoil where present. Potential sources of sediment laden water include:

- Drainage and seepage water resulting from road and excavation.
- Stockpiled excavated material providing a point source of exposed sediment.
- Construction of access road resulting in entrainment of sediment from the excavations during access road construction.
- Erosion of sediment from emplaced site drainage channels.

These activities can result in the release of suspended solids to surface watercourses and could result in an increase in the suspended sediment load, resulting in increased turbidity, which in turn could affect the water quality and fish stocks of downstream water bodies.

Potential impacts can be significant if not mitigated against.

Pathway / Mechanism: Drainage and surface water discharge routes.
Receptor: Downgradient rivers and dependant ecosystems.
Pre-mitigation Impact: Indirect, negative, significant, short term, medium probability impact.

7.8.2.3 Morphological and Surface Water Quantity Impact

Owing to its location extending along a watershed line to the North-East (local ridge), there shall be no change in the drainage patterns: the proposed areas for excavation and manufacturing plant are already drained by a local drainage ditch running alongside the South-western boundary of the proposed site area, which ultimately discharges into the Camlin River.

The proposed extension will not result in an increase in the discharge to the Camlin River as the quarry will operate on a reuse and recycle basis depending on its needs.

Most runoff would occur during the wettest period of the year. In Summer, evapotranspiration may equal or exceed rainfall leading to a soil moisture deficit. As a result, any decrease in flow in the Camlin River would be expected in the Winter months when flows are at their peak.

The Camlin River is 117.62km2 at the point of discharge from the quarry. The surface area drained by the quarry void and ancillary areas will be of 18.05 Ha, i.e. 0.15% of the total catchment area of the Camlin River, i.e. any decrease would therefore be insignificant. The quarry will act as a buffer prior to any occasional discharge taking place and thus contribute to reduce any potential risk of flooding downgradient. This is a beneficial impact from the quarry activities.

There are no recorded abstraction from the Camlin River in the area and no ecologically sensitive areas designated within 5km of the proposed site area.

Pathway / Mechanism: Site drainage network.
Receptor: Surface water flows and stream morphology.
Pre-mitigation Impact: Direct, negative, not significant, permanent, low probability impact.

7.8.2.4 Potential Impacts on Surface Water Quality

Silt laden runoff waters and contaminants (e.g. fuel and hydraulic oils, by products of blasting activities) from spillages and leaks have the potential to contaminate the water in the

excavation. When this water is discharged to the drainage ditch, it will give rise to a potential risk to surface water quality.

In wet winter weather, surface runoff within the quarry will inevitably contain an elevated suspended solids load. However, these periods tend to coincide with above average flow rates in the receiving Camlin River. Without any mitigation measures, the available dilution would already contribute to reduce the impact on surface water quality. The potential risk to surface water quality is greatest when heavy rainfall occurs during periods of low-flow when the available dilution is low.

Stream water quality of the receiving Camlin River is generally good. Mitigation measures (collection and settlement ponds) will be put in place in the proposed quarry area with sufficient capacity to deal with the silt laden runoff generated within the quarry void (Cf. Appendix 7.6).

It is anticipated that there will be no continuous discharge from the quarry to the Camlin River. However, an occasional discharge of treated water from the quarry to the Camlin River should be sought under the conditions of discharge licence.

Pathway / Mechanism: Site drainage network.
Receptor: Surface waters and associated dependant ecosystems.
Pre-mitigation Impact: Direct, negative, significant, medium term, medium probability impact.

7.8.2.5 Potential Impacts on Downstream Salmonid Fish

The Camlin River has potential as a salmonid water and is a tributary of the Shannon River.

Salmonid fish are particularly sensitive to the presence of fine sediments. Earthworks such as those proposed at the quarry extension have the potential to impact on the salmonid fish from site runoff, if the appropriate stringent mitigation measures are not put in place.

Pathway / Mechanism: Site drainage network and downstream watercourses.
Receptor: Salmonid Fish
Pre-mitigation Impact: Indirect, negative, slight, temporary, medium probability impact.

7.8.2.6 Contamination from Accidental Spills

Accidental spillage during refuelling of machinery with petroleum hydrocarbons is a significant pollution risk to groundwater, surface water and associated ecosystems, and to

terrestrial ecology. The accumulation of small spills of fuels and lubricants during routine plant use can also be a pollution risk.

Hydrocarbon has a high toxicity to humans and all flora and fauna, including fish, and is persistent in the environment. It is also a nutrient supply for adapted micro-organisms, which can rapidly deplete dissolved oxygen in waters, resulting in death of aquatic organisms. The potential effects on the surface water aquatic environment, in particular, are significant. As the quarry operate below the water table in a locally important aquifer, groundwater is being abstracted and discharged into the surface water. For this reason, it is mainly with surface water that this potential risk is deemed as significant.

Pathway / Mechanism: Groundwater flow paths and site drainage network.
Receptor: Groundwater and surface water.
Pre-mitigation Impact: Indirect, negative, significant, temporary, medium probability impact to surface water quality and groundwater quality.

7.8.3 Groundwater Operational Phase

7.8.3.1 Potential Impacts on Groundwater Quantity due to Dewatering

The proposed quarry will operate below the water table at a maximum depth of 20m a.OD., which will require a minimum of dewatering at the start of the quarry operation. As a result, a cone of drawdown will develop around the quarry excavation.

The stripping of the vegetation will result in a reduction of evapotranspiration.

The floor levels in the proposed planning application will be relatively flat, which should favour ponding and infiltration. In times of heavy rainfall, surface water runoff generated within the quarry will be drained to collection sump(s), which will locally focus further recharge.

The loss in recharge to the aquifer has been calculated as being of c. 45m^3/d. Any potential impacts on groundwater quantity at the proposed site are not anticipated to be significant for the following reasons:

- The local bedrock comprises of the Lucan Formation, which has been classified by the GSI as a locally important bedrock aquifer – bedrock which is moderately productive only in local zones. In this type of aquifer, the flow paths will be short, localised and shallow (c. 15m). This will result in very small groundwater flows.

- The results of the direct site investigations carried out to date have not shown the presence of any major water bearing features within the proposed site area, such as a fault or a fracture zone. No regional groundwater flow regime (i.e. large volumes of groundwater flow) would therefore be anticipated, and shallow groundwater inflows will largely be fed by recent rainfall and limited by low groundwater storage.

As such, it is considered that once the upper, most weathered part of the bedrock has been excavated, the contribution from the bedrock aquifer will be limited to seepages from the quarry faces.

There will therefore be no requirement to permanently reduce the local groundwater table by means of over pumping. Surface water runoffs flow will dominate over groundwater seepages and as such the drainage design is focused on these more significant flow inputs.

Upon cessation of the quarry activities, groundwater levels will rebound to a level closer to the surface of the site area than at present.

Pathway / Mechanism: Groundwater flow paths.
Receptor: Groundwater.
Pre-mitigation Impact: Direct, negative, small, temporary, low probability impact to groundwater quantity.

7.8.3.2 Potential Impacts on Groundwater Supplies and Springs

Quantitative and qualitative impacts on water supply wells and springs can potentially occur by two main pathways:

- Up-gradient wells and other hydrogeological features (such as springs) could potentially be affected by groundwater drawdown during excavation work.

- Down-gradient wells and other hydrogeological features (such as springs) whose zones of contribution may exist within the proposed working area could potentially be affected by contaminated groundwater and to a lesser extent groundwater drawdown (potentially a much larger area).

It is anticipated that there should be no noticeable effect from the lowering of the water table within the proposed development outside a radius of c. 250m from the quarry compound (beyond that distance, the reduction in the water table will be marginal, i.e. within the range of the annual fluctuation).

The area is served by a public water main. A well survey conducted as part of this study has shown that there is one domestic water well supplying house No. 17 (Cf. Figure 7.2 in Appendix 7.1).

As the exact location of the well is not known, the property boundary of house No. 17 has been taken as a reference: the well is located hydraulically downgradient from the proposed quarry area and at a minimum of 350m from the proposed quarry excavation. Based on the above, the potential impact on this supply should be marginal.

Mitigations measures are however proposed to ensure the sustainability of water in this well.

There are four natural springs recorded in the area. Based on a walkover survey, springs 1 to 3 are likely to be features relating to surface water ponding (Springs 1 and 2) and Spring 3, is likely to be fed by the subsurface interflow.

- Spring 1 will disappear as a result of the excavation: this is an inevitable consequence of the operation and cannot be mitigated.
- Spring 2 is a surface water-fed feature, which should remain unaffected by the proposed development.
- Spring 3 has already been damaged by a deep drain running across it.
- Spring 4 is located on private lands so couldn't be accessed as part of the survey: it is however located outside of the 250m drawdown zone and on a separate catchment area so it shall remain unaffected.

Pathway / Mechanism: Groundwater flow paths.
Receptor: Groundwater.
Pre-mitigation Impact: Direct, negative, small, temporary, low probability impact to groundwater quantity.

7.8.3.3 Potential Impacts on Groundwater Vulnerability

The removal of the unsaturated zone above an aquitard as well as part of the saturated zone is an inevitable consequence of the operation and cannot be mitigated.

The removal of the protective layer of soil and subsoil increases the vulnerability of groundwater beneath the site. However, due to the thin cover of topsoil and given that the bedrock is mainly outcropping in the proposed extension, the vulnerability of the aquifer in its natural state has already been rated as extreme "X" by the GSI. There will therefore be no change in the groundwater vulnerability within the proposed area for extension during the Operational Phase (and post operational phase).

Pathway / Mechanism: Groundwater flow paths.
Receptor: Groundwater.
Pre-mitigation Impact: Direct, negative, significant, permanent, high probability impact to groundwater quality.

7.8.3.4 Potential Impacts on Groundwater Quality

As the water table will be exposed in the quarry, the potential exists to cause a reduction in groundwater quality from:

- Accidental oil spillage during refuelling or vehicle maintenance operations, leakage of fuel from machinery etc;
- Storage and disposal of chemical on site;
- Storage of empty oil tanks on site;
- The use of explosive for the blasting.

It should be noted that groundwater will be drawn into the quarry from all sides by pumping (during wet season). As a result, the potential risks to groundwater quality during quarrying will be imperceptible.

After extraction from the quarry has been completed, the water table will recover and be exposed in the "quarry lake". There will therefore be an increase in the potential risk to groundwater water quality then. (See Table 7.10).

Pathway / Mechanism: Groundwater flow paths.
Receptor: Groundwater.
Pre-mitigation Impact: Direct, negative, significant, permanent, medium probability impact to groundwater quality.

7.8.4 Unplanned Events

Section 171A (b) (ii) of the Planning and Development Act 2000, as amended, in addition to the 2014 EIA Directive both require an EIAR to include such examination, analysis and evaluation of the expected direct and indirect significant effects on the environment derived from the vulnerability of the proposed development to risks of major accidents or disasters that are relevant to the development.

The unplanned events in relation to water to which the proposed development could potentially be vulnerable to include flooding associated with extreme rainfall events and accidental spillages and emissions.

7.8.4.1 Flooding

Extreme rainfall events are becoming frequent and can potentially lead to flooding of low-lying areas. Should an extreme rainfall occur, the quarry floor will be allowed to flood to attenuate the water in order to not exceed the maximum volume of water which can be discharged off site. The water will be attenuated until the storm subsides and will be discharged at the normal rate. The quarry will act as a buffer against potential risk of flooding during extreme rainfall events – this is a beneficial impact from the proposed development.

7.8.4.2 Accidental Spillages or Emissions

There is the potential for accidental spillages from plant and machinery operating at the application site to occur with the degree of impact depending on the nature of the emission.

Plant and machinery will be serviced regularly to reduce the likelihood of accidental emissions occurring. Procedures are also in place for dispensing fuel and servicing plant and machinery at the quarry. All repairs are carried out at a workshop located within the quarry yard where possible. Fuel should be stored in double skinned bunded fuel tanks.

7.9 Assessment of Indirect Impacts of the Development

7.9.1 Surface Water

The nearest designated area for conservation is the Carrickglass Demesne proposed National Heritage Area (pNHA No. 001822) located c. 750m to the South-West of the site but on a different catchment area.

No significant or perceptible hydrological impact is expected on the Carrickglass Demesne pNHA.

7.9.2 Groundwater

No indirect impacts on groundwater associated with the proposed development were identified.

7.10 Mitigation Measures

7.10.1 Overview of Mitigation Process

Taking the impact assessment process into account, the mitigation process is approached in the following manner:

- Proposed Mitigation Measures: Control measures that will be put in place to prevent or reduce all identified significant adverse impacts. In relation to quarrying activities

developments, these measures are generally provided in four types: (1) Avoidance, (2) Design, (3) Prevention and (4) Management.

- Post-mitigation Residual Impact: Impact descriptors which describe the magnitude, likelihood, duration and direct or indirect nature of the potential impacts after mitigation is put in place.
- Significance of Effects: Describes the likely significant post-mitigation effects of the identified potential impact source on the receiving environment.

7.10.2 Felling of Trees

The felling of the woodland area should be undertaken following the best practices available as follows:

Mitigation by Avoidance

There is a requirement in the Forest Service Code of Practice and in the FSC Certification Standard for the installation of buffer zones adjacent to aquatic zones at planting stage.

Mitigation by Design

Best practice methods related to water incorporated into the forestry management and mitigation measures have been derived from the Forestry Commission, Coillte and Forest Service guidelines presented herein.

Best practice methods for protection of water quality include the following:

- Machine combinations will be chosen that are most suitable for ground conditions at the time of felling and which will minimise soils disturbance.
- Checking and maintenance of roads and culverts will be ongoing through any felling operation. No tracking of vehicles through watercourses will occur, as vehicles will use road infrastructure and existing watercourse crossing points.
- Where possible, existing drains will not be disturbed during felling works.
- Ditches which drain from the area to be felled towards existing surface watercourses will be blocked, and temporary silt traps will be constructed. No direct discharge of such ditches to watercourses will occur.

Drains and sediment traps will be installed during ground preparation. Collector drains will be excavated at an acute angle to the contour (~0.3% - 3.0% gradient), to minimise flow velocities.

Main drains to take the discharge from collector drains will include water drops and rock armour, as required, where there are steep gradients, and should avoid being placed at right angles to the contour.

- Sediment traps will be sited in drains downstream of felling areas. Machine access will be maintained to enable the accumulated sediment to be excavated. Sediment will be carefully disposed of in the peat disposal areas. Where possible, all new silt traps will be constructed on even ground and not on sloping ground.
- In areas particularly sensitive to erosion, it may be necessary to install double or triple sediment traps. This measure will be reviewed on site during construction.
- All drainage channels will taper out before entering the aquatic buffer zone. This ensures that discharged water gently fans out over the buffer zone before entering the aquatic zone, with sediment filtered out from the flow by ground vegetation within the zone. On erodible soils, silt traps will be installed at the end of the drainage channels to the outside of the buffer zone.
- Drains and silt traps will be maintained throughout all felling works, thereby ensuring that they are clear of sediment build-up and are not severely eroded. Correct drain alignment, spacing and depth will ensure that erosion and sediment build-up are minimised and controlled.
- Brash mats will be used to support vehicles on soft ground, reducing peat and mineral soils erosion and avoiding the formation of rutted areas in which surface water ponding can occur. Brash mat renewal will take place when they become heavily used and worn. Provision will be made for brash mats along all off-road routes to protect the soil from compaction and rutting. Where there is risk of severe erosion occurring, extraction will be suspended during periods of high rainfall.
- Timber will be stacked in dry areas and outside the 50m watercourse buffer zones. Straw bales and check dams to be emplaced on the down gradient side of timber storage/processing sites.
- Works will be carried out during periods of no, or low rainfall, in order to minimise entrainment of exposed sediment in surface water run-off.
- Checking and maintenance of roads and culverts will be ongoing through the felling operation.
- Maintenance of machinery will not occur within 100 m of a watercourse.
- A dedicated refuelling area within the construction compounds will be used during the felling works.
- Branches, logs or debris will not be allowed to build up in aquatic zones. All such material will be removed when harvesting operations have been completed, but care will be taken to avoid removing natural debris deflectors.

Silt Traps

Silt traps will be strategically placed down-gradient within the local drains. The main purpose of the silt traps and drain blocking is to slow water flow, increase residence time, and allow settling of silt in a controlled manner. As mineral subsoils are present, additional mitigation by way of use of specialist treatment systems such as Siltbuster systems with two stage chemical dosing to aid settlement may be employed at short notice, if required.

Drain Inspection and Maintenance

The following activities will be carried out during inspection pre-felling and afterwards:

- Communication with tree felling operatives in advance to determine whether any areas have been reported where there is unusual water logging or bogging of machines.
- Inspection of all areas reported as having unusual ground conditions.
- Inspection of main drainage ditches and outfalls. During pre-felling inspection, the main drainage ditches shall be identified. Ideally, the pre-felling inspection shall be carried out during rainfall.
- Following tree felling, all main drains will be inspected to ensure that they are functioning.
- Extraction tracks near drains need to be broken up and diversion channels created to ensure that water in the tracks spreads out over the adjoining ground.
- Culverts on drains exiting the site will be unblocked.
- All accumulated silt will be removed from drains and culverts, and silt traps, and this removed material will be deposited away from any surface water features (i.e. River, streams, etc.) to ensure that it will not be carried back into the trap or surface water features during subsequent rainfall.

Surface Water Quality Monitoring

Sampling will be completed before, during (if the felling operation is conducted over a protracted time) and after the felling activity. The 'before' sampling will be conducted within four weeks of the felling activity, preferably in medium to high water flow conditions. The "during" sampling will be undertaken once a week or after rainfall events. The 'after' sampling will comprise as many samplings as necessary to demonstrate that water quality has returned to pre-activity status, i.e. where an impact has been shown.

The surface water quality monitoring proposals for tree felling will be submitted with the felling license should this latter be required. The criteria for the selection of water sampling points will include the following:

- Avoid man-made ditches and drains or watercourses that do not have year-round flows, i.e. avoid ephemeral ditches, drains or watercourses.
- Select sampling points upstream and downstream of the forestry activities.
- It is advantageous if the upstream location is outside/above the forest in order to evaluate the impact of land-uses other than forestry.
- Where possible, three downstream locations should be selected: one immediately below the forestry activity, the second at exit from the woodland, and the third some distance from the second (this allows demonstration of no impact through dilution effect or contamination by other land-uses where impact increases at third downstream location relative to second downstream location).

Post-mitigation Impact (residual): Indirect, negative, slight, short term, low probability impact.

Significance of Effects: No significant residual impacts on the aquatic environment are anticipated.

7.10.3 Earthworks (Removal of Vegetation Cover, Excavations and Stockpiling)

The key mitigation measure during the construction phase is the avoidance of sensitive aquatic areas where possible. The proposed mitigations measures will:

- Avoid physical damage to watercourses, and associated release of sediment.
- Avoid the entry of suspended sediment from earthworks into watercourses.

Mitigation by Avoidance

As can be seen in Figure 7.3 and Figure 7.13, all of the proposed area for extraction is drained by a drainage ditch running alongside the South-Western boundary of the planning area.
It is proposed to create a buffer zone around the drainage ditch so as to ensure that adequate room is maintained for the proposed drainage mitigation measures to be properly installed and operate effectively before this area be stripped off.

Mitigation by Design

Where necessary, the following controls will be put in place:

- Provision of interceptor drains, diversion drains and silt traps where necessary – these will be maintained for the duration of the excavation work on an ad hoc basis;
- Small working areas;
- Temporary sumps/attenuation lagoons, prior to discharge into the settlement ponds at the bottom of the excavation;

- Use of outfall controls such as buffered outfalls, vegetation filters, silt bags, sedimats etc.

Management of runoff from subsoil storage areas

- The land in the proposed quarry will only be stripped as required in order to limit the length of time the soil is exposed to erosion thereby restricting the generation of silt in surface runoff.
- Where possible the land will be stripped in dry weather to reduce nutrient loss, sustain soil condition and reduce the generation of silt-laden runoff.
- All bare/disturbed surfaces shall be reinstated, and soil mounds shall be re-vegetated as rapidly as possible in order to reduce erosion and restrict silt generation in water.
- The slope of the soil storage mounds shall be minimised, their general shape should be in a manner as to avoid any potential for water ponding.
- As the pit is being worked, land shall be restored in order to reduce any potential for surface runoff.
- Replacement of topsoil and restoration of the site will reduce the vulnerability of groundwater beneath the site on closure.

Post-mitigation Impact (residual): Indirect, negligible, short term, low probability impact on local surface water bodies.

Significance of Effects: Given the level of protection provided by the proposed SUDs drainage measures, no significant residual effects are anticipated.

7.10.4 Morphological and Surface Water Quantity

Mitigation by Design

As indicated, the loss of c. 18.05 Ha from the overall catchment area of the Camlin River cannot be mitigated. However, it should be noted that most of the surface water runoff generated within the quarry is ultimately discharged back to the Camlin River. Appendix 7-5 provides a greenfield runoff rate for the site of 0.056m^3/s, which shall serve as the basis for the maximum allowable discharge from the site.

As a result, the direct impact on the flow of the Camlin River will be negligible.

The effect of the quarry during a heavy/extreme rainfall event will be to act as a buffer and flatten out flood peaks over several days and therefore reduce the potential for flooding resulting from such events. This is a beneficial impact of the development.

Post-mitigation Impact (residual) on water quantity impact: Neutral, direct, negligible, permanent, low probability impact (on quantity).
Significance of Effects: No significant residual impacts on site drainage patterns are anticipated.

7.10.5 Surface Water Quality

Mitigation by Design

Management of inflows and subsequent treatment prior to discharge into the drainage network will be undertaken as follows:

- Appropriate interceptor drainage to prevent upslope surface runoff from entering excavations will be put in place.
- If required, pumping of excavation inflows from a sump will prevent build-up of water in the excavation.
- The pumped water volumes will be discharged via volume and sediment attenuation sumps within the quarry.
- There will be no direct discharge to surface watercourses, and therefore no risk of hydraulic loading or contamination will occur.

Mitigation by Management

The proposed drainage management measures and pollution prevent measures will ensure that the excavation of the proposed area will be operated without impacting on downstream surface waters.

- The excavation area will not create significant groundwater management issues as it is anticipated that groundwater inflow will be small.
- Any ponding water that could be generated within the excavation and/or the haulage road should be mitigated by the scrapping off the silts that create the ponding conditions in the first place. These silts can be stockpiled and reused as part of the restoration plan.
- To remain efficient, any settlement lagoons will be maintained on an ad hoc basis as is currently the case in the existing quarry.
- Non continuous monitoring shall be implemented to satisfy the conditions of any discharge licence that would be required. It is recommended that the parameters to be monitored be as follows:
    - pH,
    - Turbidity,
    - Temperature,

- Dissolved oxygen,
- BOD_5,
- COD,
- Total Suspended Solids,
- Ammonia and un-ionised ammonia,
- Nitrates.
- Orthophosphates.

The frequency of monitoring shall be as per discharge licence requirements.

Post-mitigation Impact (residual): Indirect, negligible, short term, low probability impact on local surface water bodies.

Significance of Effects: No significant residual impacts on surface water quality are anticipated.

7.10.6 Downstream Salmonid Fish

This section describes how surface water runoff will be managed at the site in order to avoid significant impacts on downstream surface waters, thereby protecting downstream salmonid fish in the River Trough and River Blackwater.

Mitigation by Management

While settlement pond(s) form an important element of the drainage proposals for the site, run off from the proposed site will be continually checked along the drainage infrastructure areas to ensure that they are in good working order at all times.

If issues are noted during these inspections, they will be fixed. If necessary, additional measures will be used to prevent any risk of failure in the settling capacity of the final settlement pond, i.e. prior to discharge. Such measures will include additional silt bags, silt fences or sedimats to increase treatment capacity. Appendix 7.6 shows that when the quarry is fully developed, the settlement pond should cover a minimum area of c. 310m^2, which would be easily accommodated in the lower bench.

In the event that a local failure occurs, the problem will be identified and remedied immediately.

Provision for additional pumping equipment, sediments, silt bags and silt fencing materials will be available on site at all times, for use in emergency situations.

The measures that have been prescribed and the approach taken follows best practice and has been successfully employed on similar development schemes in similar forestry sites.

In summary, the proposed development will not result in any significant effects on salmonid fish providing that the mitigation measures provided in Appendix 7.6 are adhered to and that a water management plan is put in place. In addition, it should be pointed out that:

- There will be no direct emissions to watercourses during the lifespan of the quarry extension.
- A monitoring of the quarry discharge should be designed to minimise the potential for failure of any silt control measures and to be able to respond in the highly unlikely event of a failure in the proposed control measures.

Post-mitigation Impact (residual): Indirect, negative, imperceptible, temporary, low probability impact.

Significance of Effects: No significant residual impacts on the aquatic environment are anticipated.

7.10.7 Contamination from Accidental Spills

Mitigation by Design

Oils and fuels will be used in plant and equipment during the extraction phase of the proposed quarry. Storage of fuels, lubricants and hydraulic fluids shall occur mainly at the dedicated area within the proposed quarry yard, thereby ensuring that the area in which fuels, lubricants and hydraulic fluids are stored will be properly secured against unauthorised access or vandalism and protected against accidental spillage.

Mitigation by Prevention

Within the proposed quarry works there may be a requirement for short-term storage of fuels for diesel generators used on site. The following procedures will be implemented during the operational phase of the quarry deepening:

- Fuels and oils will be carefully handled to avoid spillages.
- Any spillage of fuels, lubricants or hydraulic oils will be immediately contained, and the contaminated soil removed from the site and disposed of appropriately.
- Any waste oils and hydraulic fluids will be collected in leak-proof containers and removed from the site for disposal or recycling.
- As a minimum, simple spill protection equipment that will be held locally will include specialist absorbent mats / pillows and granules for containment / cleanup of oil. Adequate quantities will be held in stock and be available for immediate use.

- Appropriate spill control equipment, such as oil soakage pads, will be available on site to deal with any accidental spillage and emergency response procedures will be put in place.
- Designated contractors' personnel will be trained and certified in oil spill control and clean up procedures, and in the proper and safe disposal of any waste generated through such an event.

Post-mitigation Impact (residual): Indirect, negligible, brief, low probability impact on local surface water bodies.

Significance of Effects: No significant residual impacts on surface water quality are anticipated.

7.10.8 Groundwater Quantity

As with the existing quarry, it is anticipated that the bulk of the cone of drawdown induced by the proposed quarry will be limited to 250m around the quarry excavation. No domestic water supplies were identified within this perimeter. However, the well supplying house No. 17 is located at a minimum distance of 350m (based on property boundary) downgradient from the proposed quarry boundary. This well is located on private lands, which was not accessible at the time of survey. It is assumed that this well is boreholes and not a dug well.

As a preventative measure, it would be recommended to monitor the water level fluctuations within the well using automated water level recorders.

The monitoring should ideally start prior to the start of any work within the proposed quarry so as to establish a baseline for the water table at different times of the year. The data from the logger should be retrieved on a quarterly basis and reviewed by a hydrogeologist.

7.10.9 Groundwater Quality

The main potential impacts to groundwater during the operational phase of the quarry are linked to the contamination from accidental spills. The associated mitigations measures are provided in sub section 7.11.7. above.

Other potential risk pertains to the use of emulsion explosives for blasting purposes, which is mitigated as follows:

Mitigation by Management

Implementing such measures as part of a standard operating procedure will eliminate or minimize the potential for these substances to dissolve in or become associated with water. The specific measures included can be grouped into the following four basic categories:

7.10.9.1 Education / Training of Explosive Users

Both the owners/operators are aware of the location where explosives are being used and the personnel working with commercial explosives should be well informed of all applicable regulations as well as any potential consequences associated with the products' exposure to water.

7.10.9.2 Selection of Appropriate Explosive for the Job and Conditions

Selecting the proper explosive for the particular job is critical to the prevention of surface or groundwater impact.

ANFO (ammonium nitrate - fuel oil) is not water-resistant and should be avoided at the Quarry as contact with water is likely.

Various types of commercial explosives are available to withstand exposure to water. Water-resistant explosives include the cartridge forms of gelatinous nitroglycerin, watergels and emulsions.

7.10.9.3 Explosives Loading and Handling

All excess product in augers or hoses is to be recovered and used either in the next blasthole or recycled in the mixer/holding tank.

Explosive spillage around the blasthole collar is to be controlled and any such spillage should be placed into the blasthole before stemming.

Minimize the amount of time that explosives are exposed to wet conditions within the blasthole. The blast should be initiated as near the time the loading is completed as safety and operational procedures allow.

Avoid having explosives exposed to precipitation.

To assure complete detonation of explosives placed into the ground, a sufficient number of boosters must be used.

7.10.9.4 Attention to Technical Matters

- The actual physical conditions into which explosives are being placed must be taken into account.
- Personnel responsible for loading explosives into the boreholes should be in continuous communication with the drillers of those boreholes or supplied with adequate drill logs, so that any knowledge regarding fractures, crevices or cavities is obtained.
- Choosing and placing the correct drilling patterns that results in the optimal use of explosives with all the explosives undergoing complete detonation.
- Quality assurance/quality control measures to maintain drilling accuracy that prevents the detonation in one blasthole from impacting the proper detonation in a nearby blasthole.
- Selecting the appropriate drilling equipment so that adequate borehole quality is maintained.
- Where appropriate to ensure complete detonation, two (2) primers will be used in each blasthole; one near the top and one near the bottom of the explosive column.
- Correct selection of delay timing for each blasthole to ensure detonation of the entire pattern, and the prevention of cut-off blastholes.

7.10.9.5 Monitoring

The following additional mitigation measures are proposed to mitigate against any potential negative impacts on the receiving water environment:

- In order to identify any impacts on groundwater quality as a result of the activities within the proposed application area, groundwater monitoring should be undertaken on a quarterly basis from upgradient and downgradient of the proposed quarry.

  A baseline water quality monitoring should be undertaken in advance of any excavation taking place.

  Water from the two domestic wells downgradient could be used as part of the groundwater quality monitoring, providing that access be granted by their respective landowners.

- It is recommended that groundwater samples should be analysed for the following target list parameters:
  - Suspended Solids
  - Turbidity
  - Nitrate

- Total Ammonia
- Total Petroleum Hydrocarbons.

Post-mitigation Impact (residual): Indirect, imperceptible, brief, low probability impact on groundwater body.

Significance of Effects: No significant residual impacts on groundwater quality are anticipated.

After the operational phase ceases, the water table will recover and form a "quarry lake". There will therefore be an increase in the potential risk to groundwater water quality then. The restoration plan for the quarry will have to address the issue of groundwater quality and include measures to ensure that groundwater quality is maintained in a satisfactory condition.

7.11 Cumulative Impacts

There is another quarry located just upgradient from the proposed quarry under the same ownership as the proposed quarry.

As the proposed quarry will effectively replace the existing quarry, which has reached its lifespan, no significant cumulative hydrological or hydrogeological impacts are anticipated from the proposed new quarry at Rhine, Killoe, Co. Longford.

7.12 Conclusion

Consideration of groundwater hydrogeology and surface water hydrology of the proposed development and the receiving environment indicates that there is potential for local impacts during the operational phase of the proposed quarry extension.

The proposed quarry will result in the loss of approximately 0.15% of the catchment area of the Camlin River at the point of discharge from the proposed quarry, which cannot be mitigated. Most of the water drained within the proposed quarry, will however discharge back to the Camlin River via an existing drainage ditch. The overall water budget of the receiving water from the Camlin River will therefore not be affected.

The proposed quarry will also result in the loss of one spring (spring 1) which lies within the proposed area for extraction, which cannot be mitigated. In late February and late March 2022, only a wet patch of land was found at its location and it is implied that Spring 1 has been naturally covered by topsoils already. Other Springs (spring 2 and spring 3) will not be affected

by the proposed quarry as they are surface water fed feature (Spring 2) or receive water from the interflow but have been altered by drainage work already (Spring 4).

The bulk of the cone of drawdown induced by the quarry is likely to occur within 250m from the quarry boundaries. Beyond this distance, the drawdown would likely remain within the order of the natural fluctuation of the water table. One water supply well has been identified c. 350m downgradient from the proposed quarry boundary, which is beyond the 250m distance. As a result, this well should not be adversely impacted by the proposed quarry activities.

Pollution control and other preventative measures have been incorporated into the project design to minimise any adverse impacts to water quality. Mitigation drainage designs are required so that no residual significant impacts will occur on the water environment or on sensitive downstream aquatic receptors (salmonid fish).

7.13 References

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Appendix 7.1 – Figures

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Figure 7.1: Location Map
Ref. No. 402-22
Project: Rhine, Killoe, Co. Longford
Size: A4
Date: 10/02/22
Scale:

0 500 1000 Metres

Legend:

- Landholding boundary.
- Application area for proposed quarry
- OPW flow monitoring station
- Point of discharge of ditch

Sources of information:

Department of Communications, Climate Action & Environment

Geological Survey Suirbhéireacht Gheolaíochta Ireland | Éireann

epa MAPS

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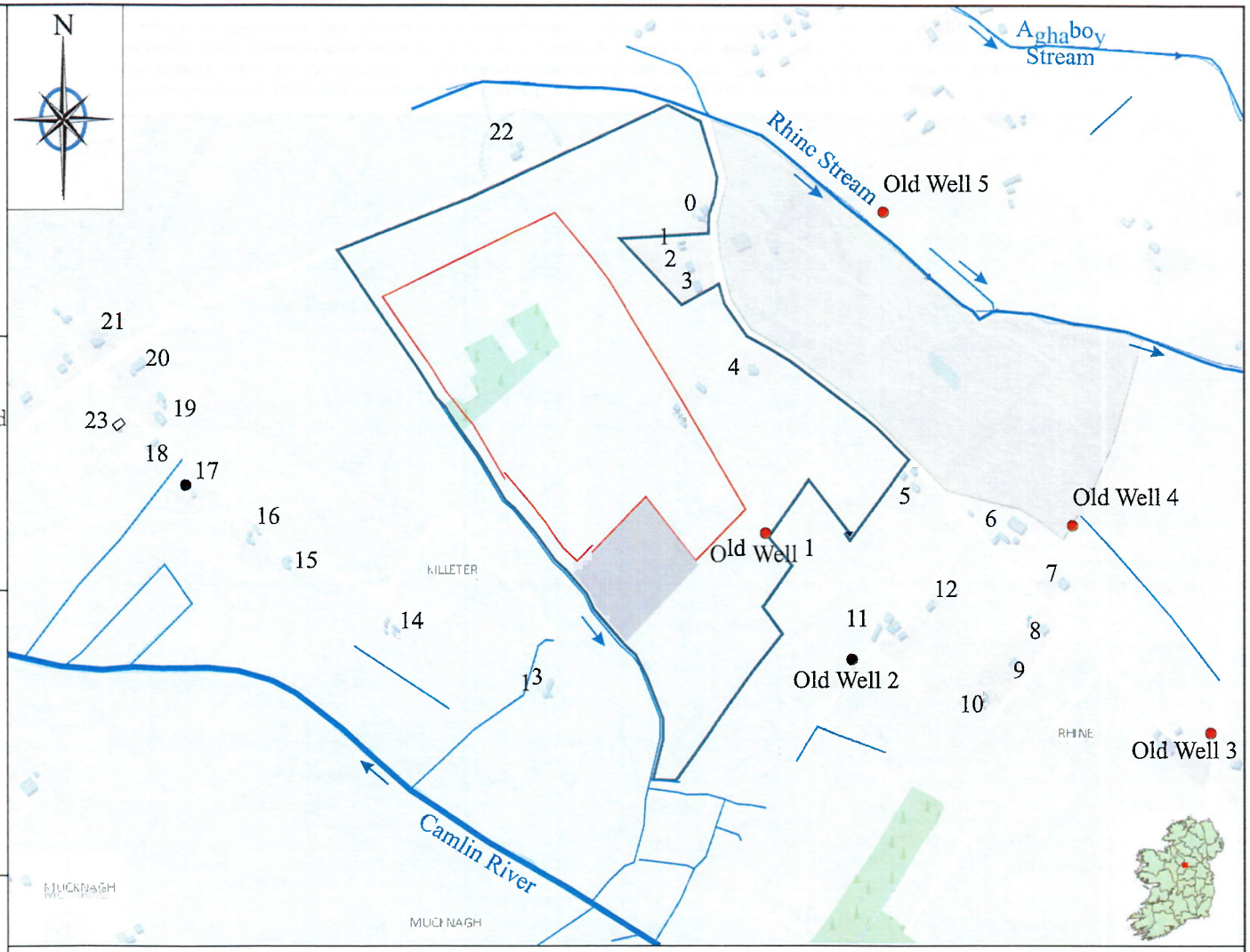
Figure 7.2: Water features
Ref. No. 402-22
Project: Rhine, Killoe, Co. Longford
Size: A4
Date: 10/02/22
Scale:

0 100 200 Metres

Legend:

- Water supply well
- Old well (OSI 25" map)



Sources of information:

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Figure 7.3: Topography and drainage
Ref. No. 402-22
Project: Rhine, Killoe, Co. Longford
Size: A4
Date: 25/03/22
Scale:

0 100 200 Metres

Legend:

- River
- Stream
- Drains
- Quarry landholding
- Proposed extraction area (14.22 Ha)
- Manufacturing & batching plant (2.11 Ha)

Sources of information:

Department of Communications, Climate Action & Environment

Geological Survey Suirbhéireacht Gheolaíochta Ireland | Éireann

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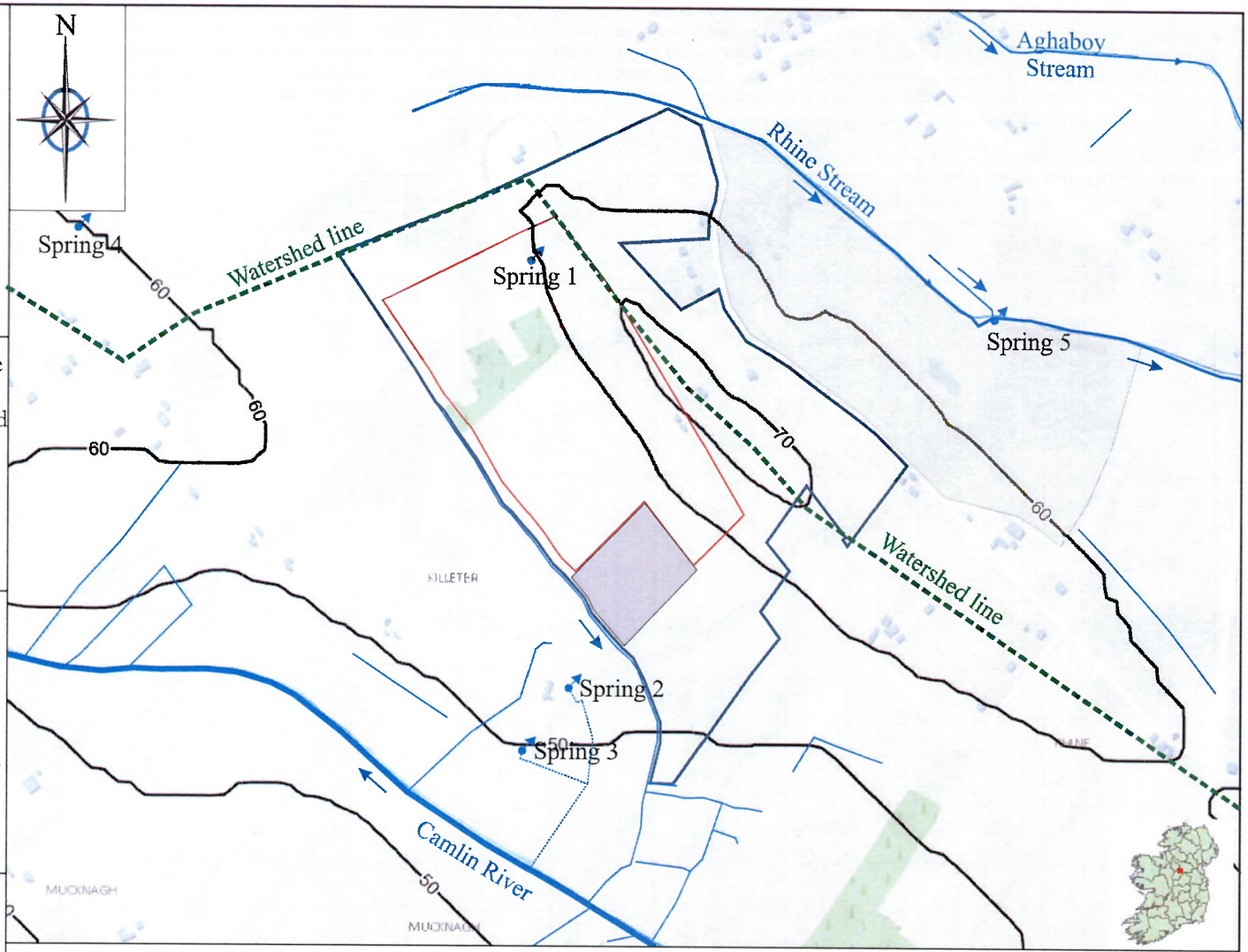

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Figure 7.4: PFRA Map No. 301 **Ref. No.** 402-22
Project: Rhine, Killoe, Co. Longford
Size: A4
Date: 10/04/22
Scale:

0 500 1000 Metres

Legend:

- Fluvial - Indicative 1% AEP (100-yr) Event
- Fluvial - Extreme Event
- Coastal - Indicative 0.5% AEP (200-yr) Event
- Coastal - Extreme Event
- Pluvial - Indicative 1% AEP (100-yr) Event
- Pluvial - Extreme Event
- Groundwater Flood Extents

Sources of information:

OPW
OSi Ordnance Survey Ireland

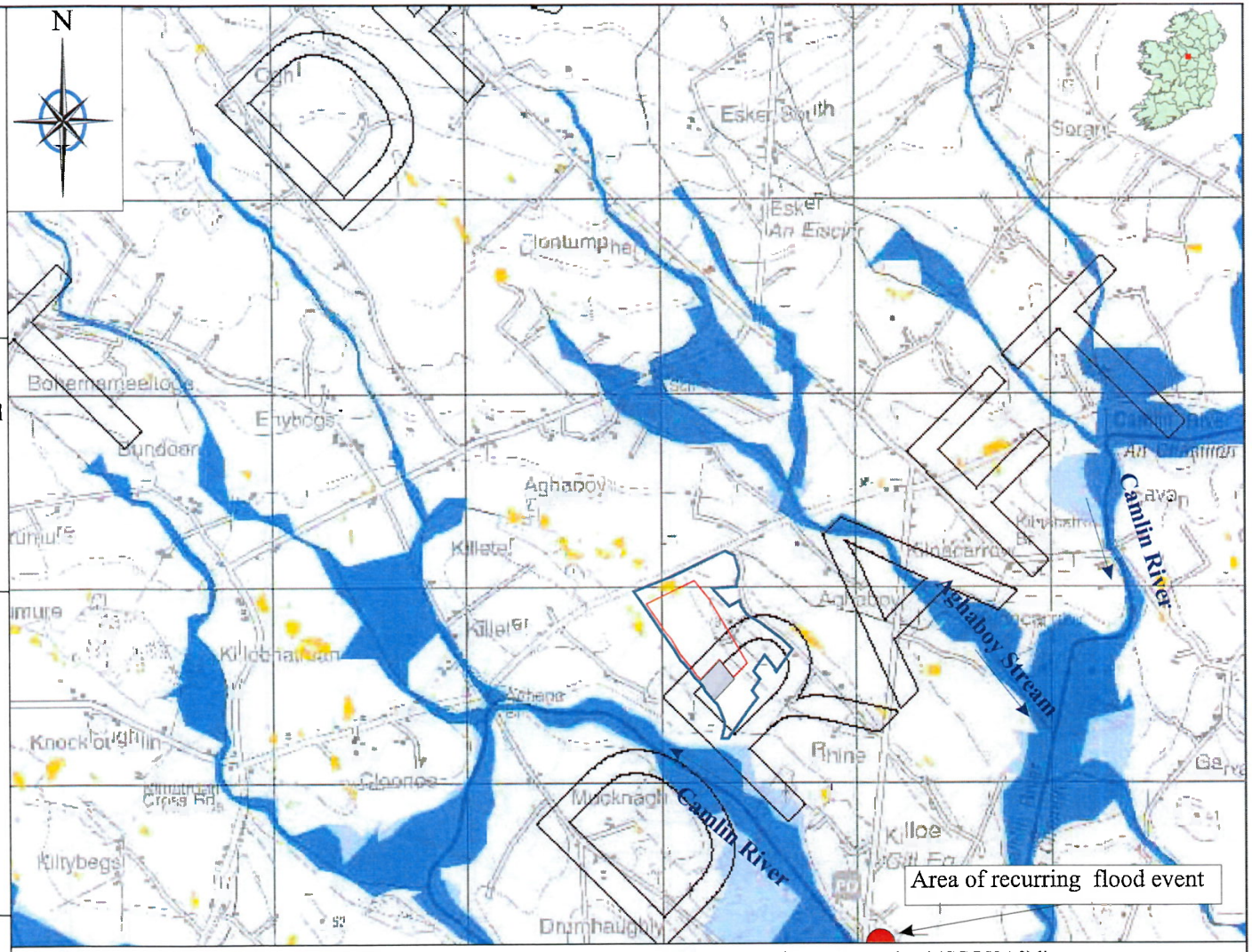

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Figure 7.5: CFRAM Map
Ref. No. 402-22
Project: Rhine, Killoe, Co. Longford
Size: A4
Date: 10/04/22
Scale:

0 400 **Metres**

Legend:

- Low Probability flood events, (AEP) of 0.1%
- Medium Probability flood events, AEP of 1%
- High probability of flood events, AEP of 10%

Sources of information:

OPW

Ordnance Survey Ireland

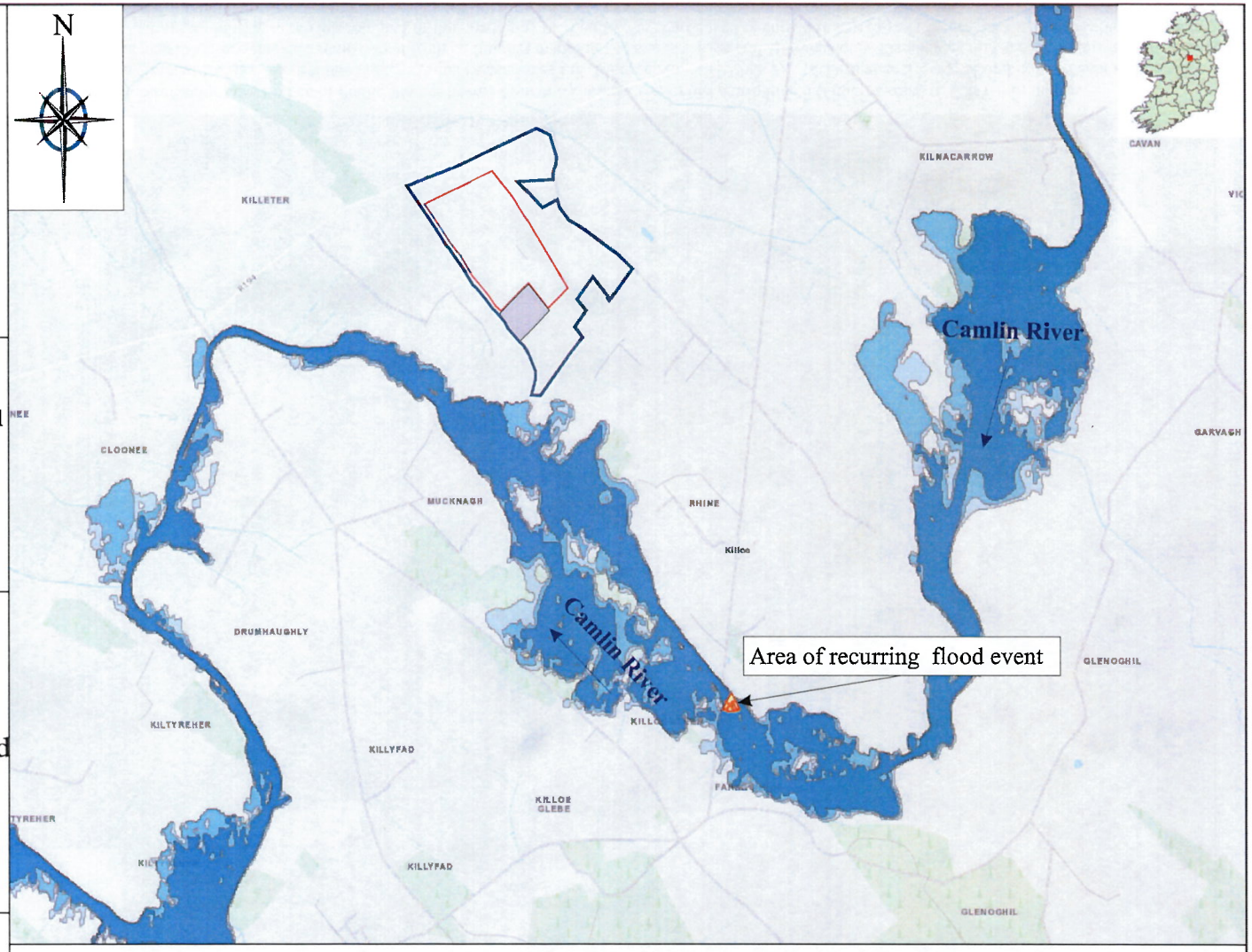

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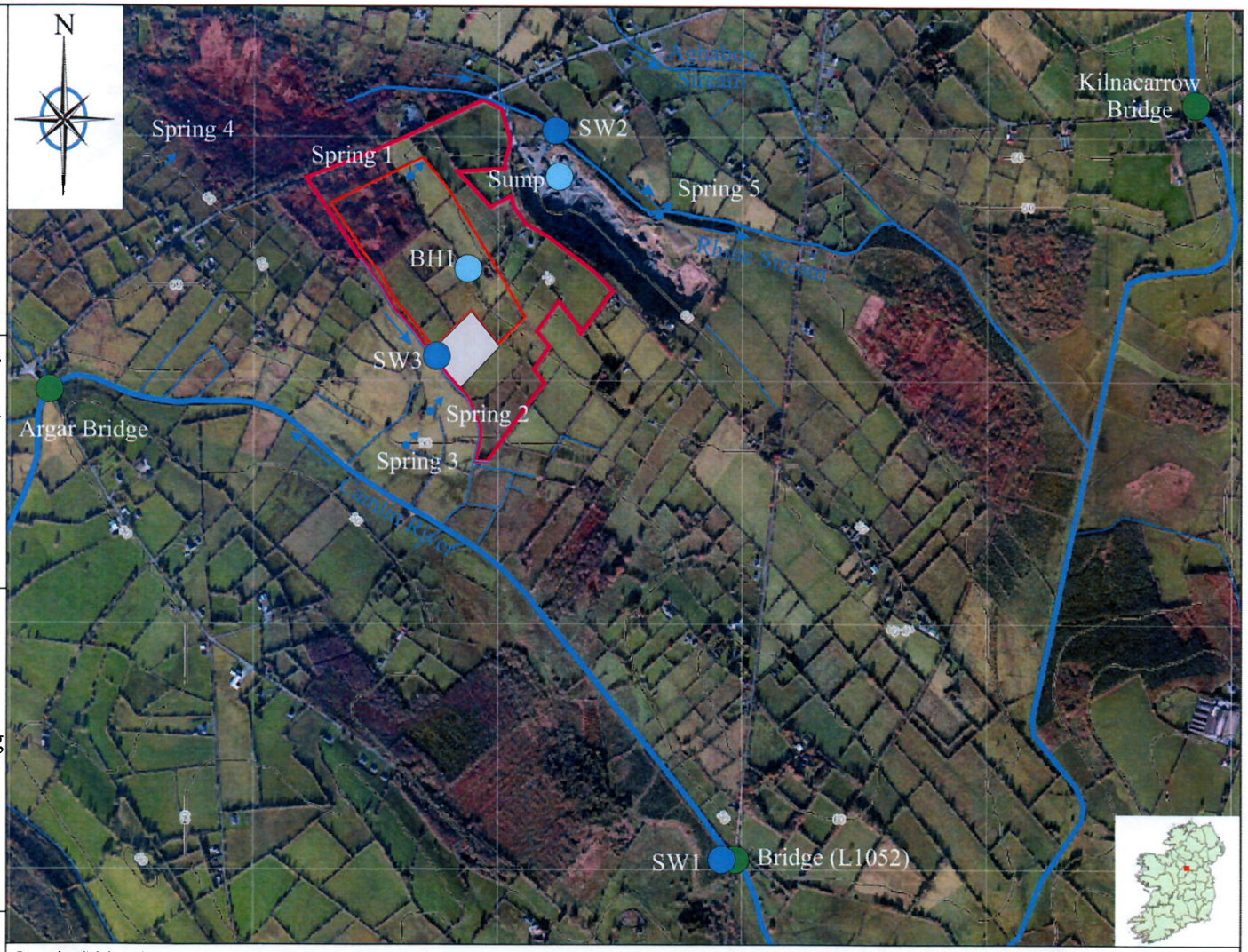
Figure 7.6: Monitoring locations **Ref. No.** 402-22
Project: Rhine, Killoe, Co. Longford
Size: A4
Date: 10/04/22
Scale:

0 300 **Metres**



Legend:

- EPA monitoring points (Q-values)
- Surface Water monitoring points
- Groundwater monitoring point

Sources of information:

OPW
OSi Ordnance Survey Ireland

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Figure 7.7: Aquifers Map
Ref. No. 402-22
Project: Rhine, Killoe, Co. Longford
Size: A4
Date: 25/03/22
Scale:

0 300 600 Metres

Legend:

- Lucan Formation (LU): Locally important aquifer - Bedrock, which is Moderately productive only in local Zones (Ll).
- Visean Limestones (VIS): Regionally Important aquifer - Karstified conduit flow (Rkc)

Sources of information:

Department of Communications, Climate Action & Environment

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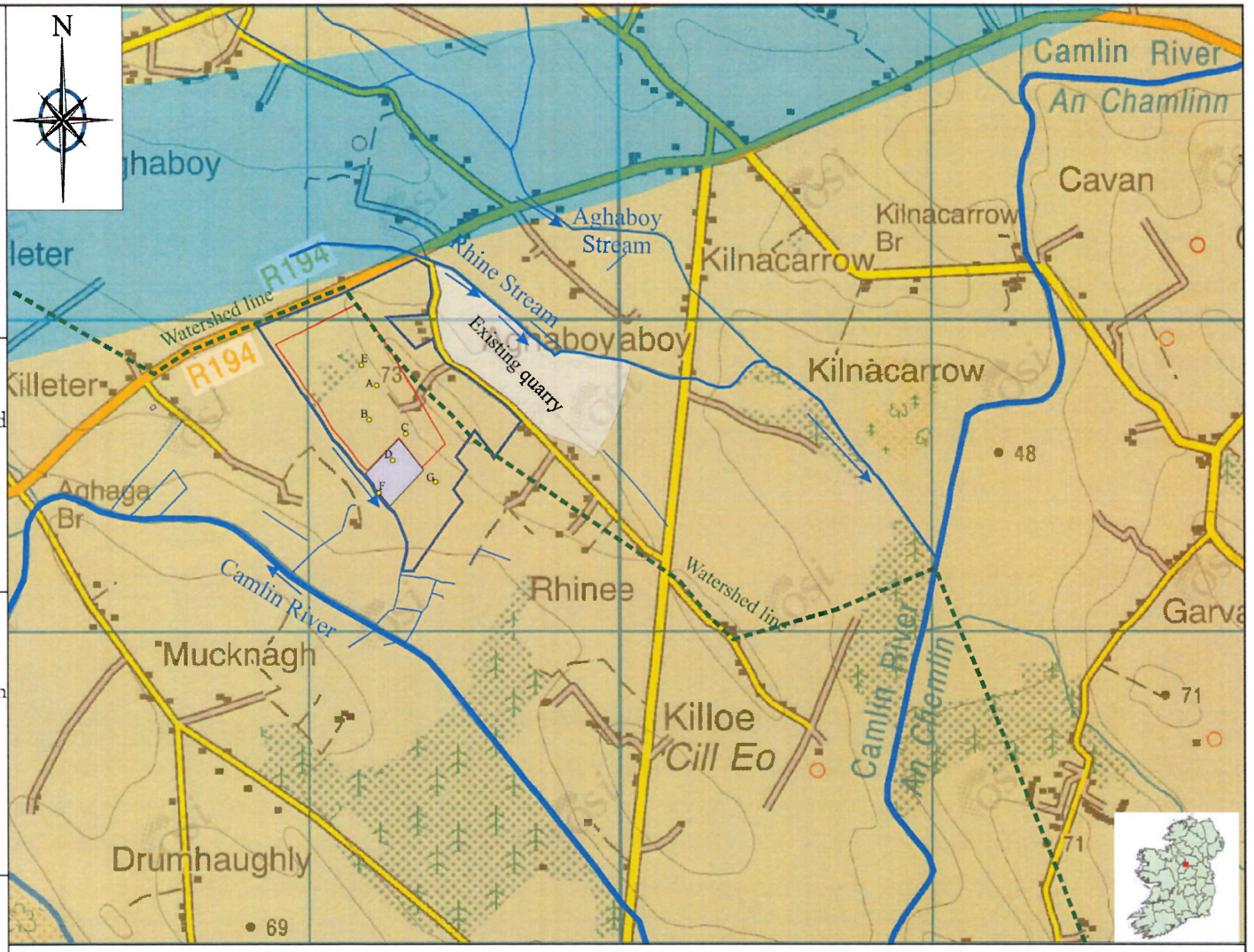

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Figure 7.8: Quaternary Map
Ref. No. 402-22
Project: Rhine, Killoe, Co. Longford
Size: A4
Date: 25/04/22
Scale:

0 300 600 Metres

Legend:

- Till derived from Lower Palaeozoic sandstones and shales (TLPSsS)
- Alluvium
- Cut over raised Peat
- Eskers comprised of gravels of acidic reaction (AcEsk).
- Bedrock outcrop or subcrop (rck)

Sources of information:

Department of Communications, Climate Action & Environment
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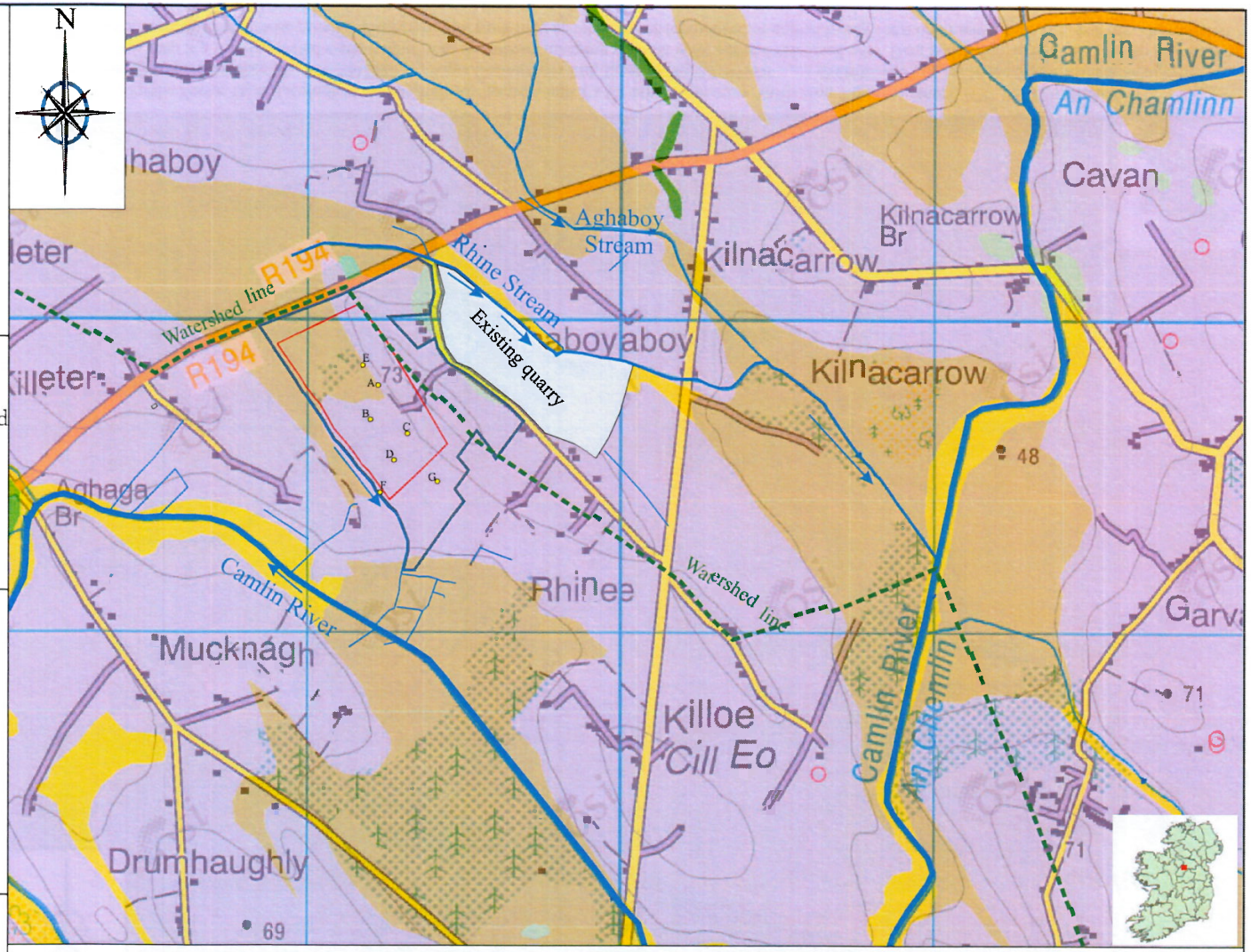

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Figure 7.9: Groundwater vulnerability
Ref. No. 402-22
Project: Rhine, Killoe, Co. Longford
Size: A4
Date: 25/04/22
Scale:

0 300 600 Metres

Legend:

- Extreme (X) - Rock at or near Surface or Karst
- Extreme (E)
- High (H)
- Moderate (M)
- Low (L)

Sources of information:

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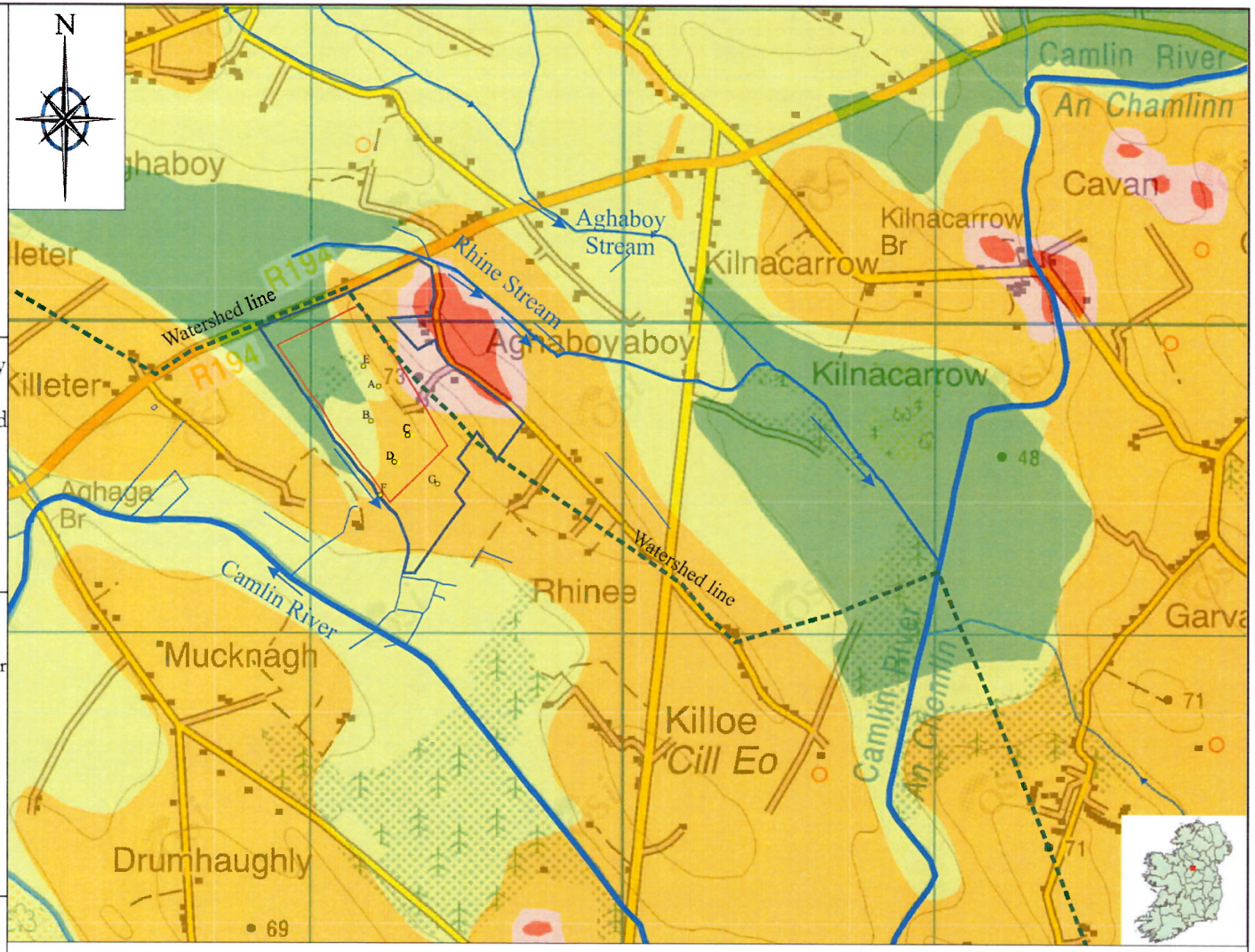

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Figure 7.10: Groundwater recharge
Ref. No. 402-22
Project: Rhine, Killoe, Co. Longford
Size: A4
Date: 25/04/22
Scale:

0 300 600 Metres

Legend:
(Within proposed extraction area)

- 24mm/yr
- 133mm/yr

Sources of information:

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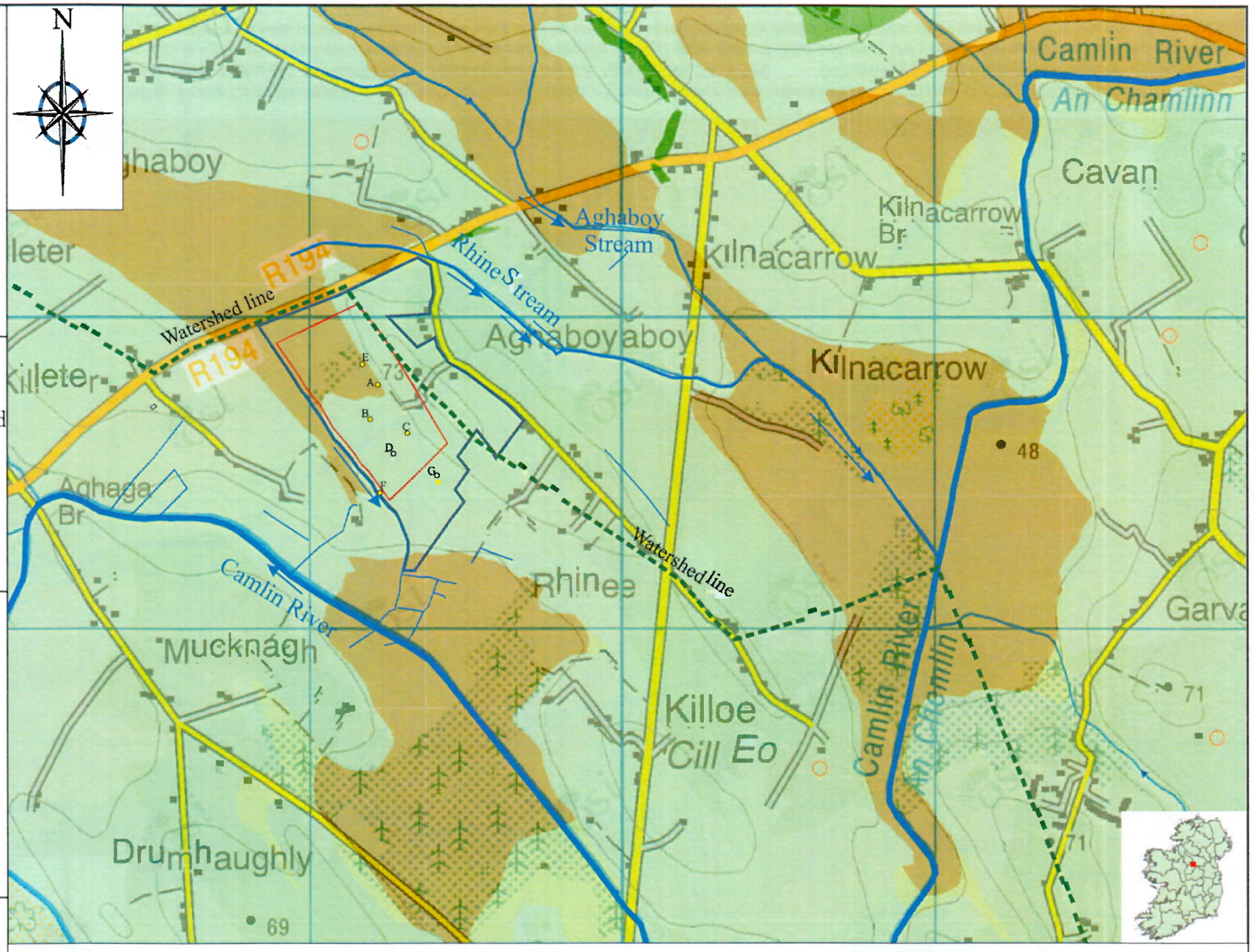

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Figure 7.11: Water Table (23/02/22)
Ref. No. 402-22
Project: Rhine, Killoe, Co. Longford
Size: A4
Date: 20/05/22
Scale:

0 100 200 Metres

Legend:

Water table iso contours (23/02/22)

Groundwater flow direction

Sources of information:

Department of Communications, Climate Action & Environment

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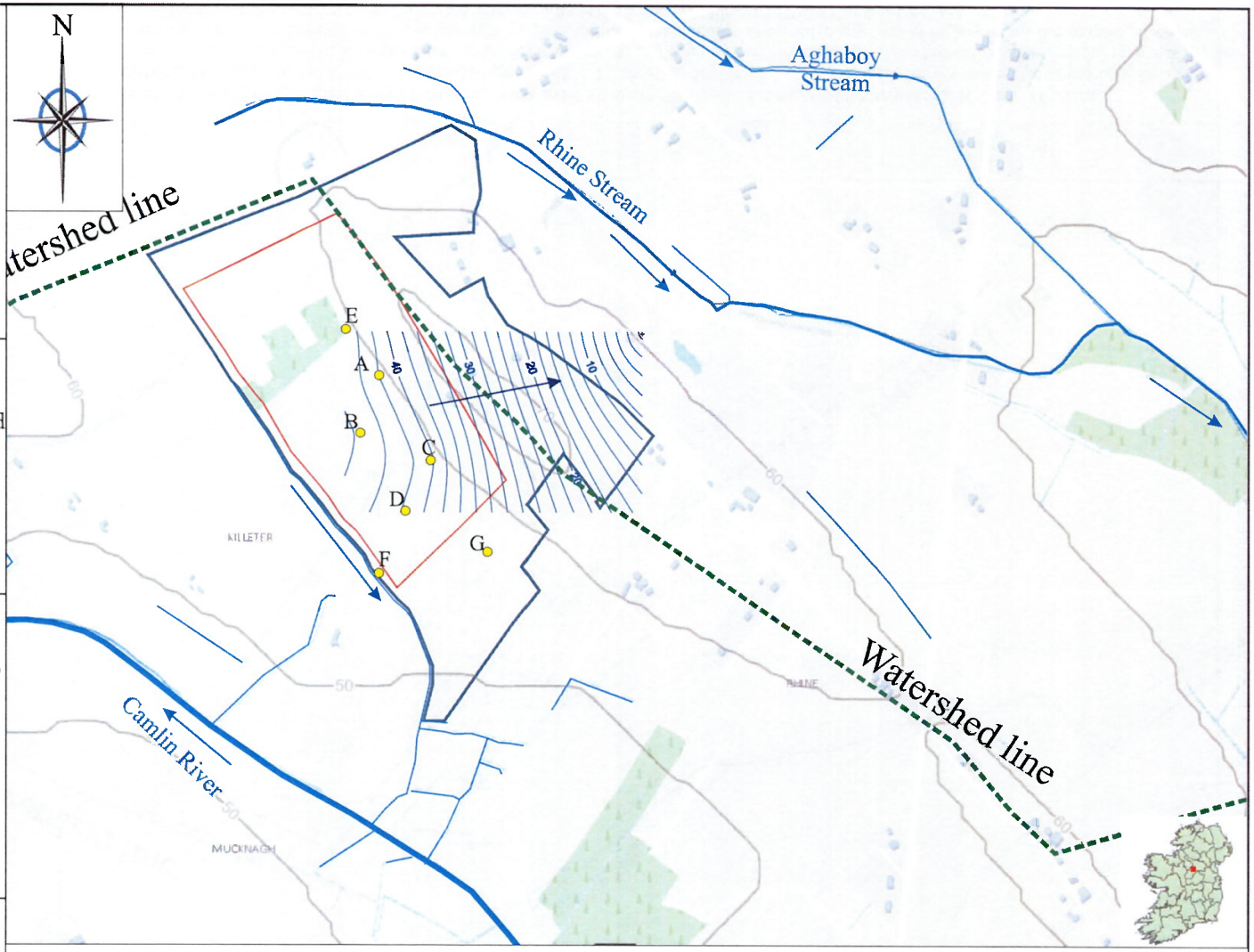

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Figure 7.12: Water Table (21/03/22)
Ref. No. 402-22
Project: Rhine, Killoe, Co. Longford
Size: A4
Date: 20/05/22
Scale:

0 100 200 Metres

Legend:

Water table iso contours (21/03/22)

Groundwater flow direction

Sources of information:

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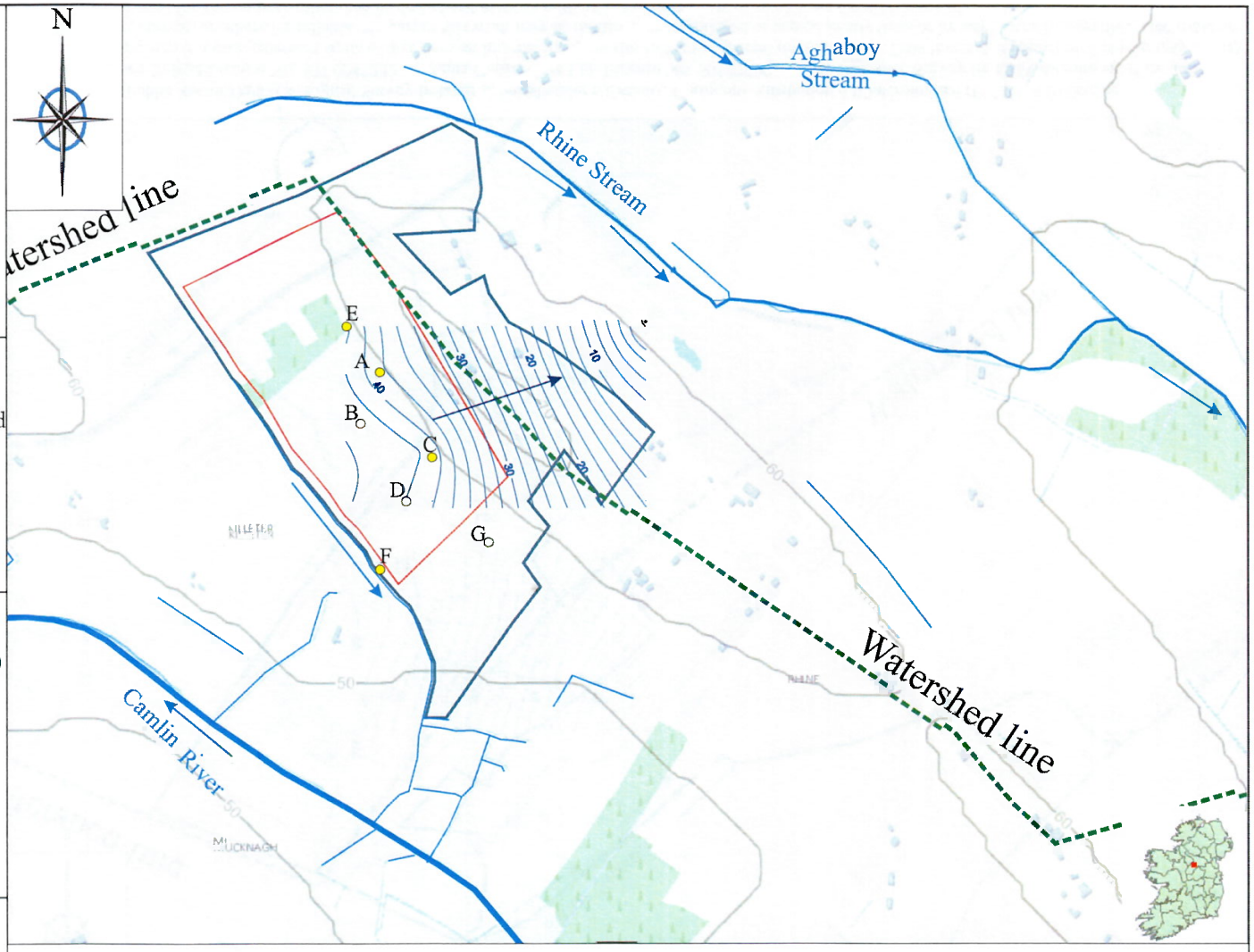

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Figure 7.13: Location Map | **Ref. No.** 402-22 | **Date:** 20/05/22

Project: Rhine, Killoe, Co. Longford

Legend:

- Area to be drained to quarry void (18.05 Ha)
- Current drainage (greenfield)
- Water catchment divide
- Application area (18.55 Ha)
- Ownership Boundary

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Sources of information: Earth Science Partnership Ireland Job EI 161, Figure 3.0 rev.0 dated Sept 2021

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Appendix 7.2 – Analytical Results of Water Tests

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Deeside
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Fax: (01244) 528701
email: hawardencustomerservices@alsglobal.com
Website: www.alsenvironmental.co.uk

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Attention: Bruno Teillard

CERTIFICATE OF ANALYSIS

Date of report Generation:	01 April 2022
Customer:	Aqua Geoservices Ltd
Sample Delivery Group (SDG):	220324-61
Your Reference:	402-22
Location:	Rhine, Killoe, Co Longford
Report No:	640584
Order Number:	

We received 2 samples on Thursday March 24, 2022 and 2 of these samples were scheduled for analysis which was completed on Friday April 01, 2022. Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation.

Should this report require incorporation into client reports, it must be used in its entirety and not simply with the data sections alone.

Chemical testing (unless subcontracted) performed at ALS Life Sciences Ltd Hawarden.

All sample data is provided by the customer. The reported results relate to the sample supplied, and on the basis that this data is correct.
Incorrect sampling dates and/or sample information will affect the validity of results.
The customer is not permitted to reproduce this report except in full without the approval of the laboratory.

Approved By:

Sonia McWhan
Operations Manager

Validated

CERTIFICATE OF ANALYSIS

SDG: 220324-61 Report Number: 640584 Superseded Report:

Client Ref.: 402-22 Location: Rhine, Killoe, Co Longford

Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
26019250	BH 1			22/03/2022
26019249	SW 1			22/03/2022

Only received samples which have had analysis scheduled will be shown on the following pages.

Validated

CERTIFICATE OF ANALYSIS

SDG: 220324-61 | Report Number: 640584 | Superseded Report:

Client Ref.: 402-22 | Location: Rhine, Killoe, Co Longford

Results Legend

X Test

N No Determination Possible

Sample Types -

S - Soil/Solid
UNS - Unspecified Solid
GW - Ground Water
SW - Surface Water
LE - Land Leachate
PL - Prepared Leachate
PR - Process Water
SA - Saline Water
TE - Trade Effluent
TS - Treated Sewage
US - Untreated Sewage
RE - Recreational Water
DW - Drinking Water Non-regulatory
UNL - Unspecified Liquid
SL - Sludge
G - Gas
OTH - Other

			Lab Sample No(s)						
						26019250			26019249
			Customer Sample Reference			BH 1			SW 1
			AGS Reference						
			Depth (m)						
			Container	1/plastic (ALE221)	H2SO4 (ALE244)	HNO3 Filtered (ALE204)	1/plastic (ALE221)	250ml BOD (ALE212)	H2SO4 (ALE244)	HNO3 Filtered (ALE204)
			Sample Type	GW	GW	GW	SW	SW	SW	SW
Alkalinity as CaCO3	All	NDPs: 0 Tests: 1		X						
Ammonium Low	All	NDPs: 0 Tests: 2			X				X	
Anions by Kone (w)	All	NDPs: 0 Tests: 2		X			X			
BOD True Total	All	NDPs: 0 Tests: 1						X		
Conductivity (at 20 deg.C)	All	NDPs: 0 Tests: 1		X						
Dissolved Metals by ICP-MS	All	NDPs: 0 Tests: 2				X				X
pH Value	All	NDPs: 0 Tests: 1		X						
Phosphate by Kone (w)	All	NDPs: 0 Tests: 1					X			
Suspended Solids	All	NDPs: 0 Tests: 2		X			X			
Total Dissolved Solids	All	NDPs: 0 Tests: 1		X						
Total Organic and Inorganic Carbon	All	NDPs: 0 Tests: 2			X				X	
Turbidity in waters	All	NDPs: 0 Tests: 1					X			

Validated

CERTIFICATE OF ANALYSIS

SDG: 220324-61 **Report Number:** 640584 **Superseded Report:**

Client Ref.: 402-22 **Location:** Rhine, Killoe, Co Longford

Results Legend	Customer Sample Ref.	BH 1	SW 1				
# ISO17025 accredited.							
M mCERTS accredited.							
aq Aqueous / settled sample.	Depth (m)	-	-				
diss.filt Dissolved / filtered sample.	Sample Type	Ground Water (GW)	Surface Water (SW)				
tot.unfilt Total / unfiltered sample.	Date Sampled	22/03/2022	22/03/2022				
* Subcontracted - refer to subcontractor report for accreditation status.	Sample Time	13:00:00	13:00:00				
** % recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery	Date Received	24/03/2022	24/03/2022				
(F) Trigger breach confirmed	SDG Ref	220324-61	220324-61				
1-4 [a-d] Sample deviation (see appendix)	Lab Sample No.(s)	26019250	26019248				
	AGS Reference						

Component	LOD/Units	Method						
Suspended solids, Total	<2 mg/l	TM022	42.3 #	6.3 #				
Alkalinity, Total as CaCO3	<2 mg/l	TM043	205 #					
Alkalinity, Bicarbonate as CaCO3	<2 mg/l	TM043	205					
BOD, unfiltered	<1 mg/l	TM045		<1 #				
Organic Carbon, Total	<3 mg/l	TM090	<3 #	6.96 #				
Ammoniacal Nitrogen Low as NH3	<0.01 mg/l	TM099		0.0523 #				
Ammoniacal Nitrogen Low as NH4	<0.01 mg/l	TM099	0.389 #					
Conductivity @ 20 deg.C	<0.02 mS/cm	TM120	0.509 #					
Dissolved solids, Total (meter)	<5 mg/l	TM123	384 #					
Manganese (diss.filt)	<3 µg/l	TM152	19.4 #	34.1 #				
Sodium (Dis.Filt)	<0.076 mg/l	TM152	19.4 #	8.83 #				
Magnesium (Dis.Filt)^	<0.036 mg/l	TM152	8.7 #					
Potassium (Dis.Filt)	<0.2 mg/l	TM152	3.45 #	2.4 #				
Calcium (Dis.Filt)	<0.2 mg/l	TM152	78.6 #					
Iron (Dis.Filt)	< 0.019 mg/l	TM152	<0.019 #					
Hardness, Total as CaCO3	<0 .65 mg/l	TM152	232	251				
Phosphate (Ortho as PO4)	<0.05 mg/l	TM184		<0.05 #				
Sulphate	<2 mg/l	TM184	12.8 #					
Chloride	<2 mg/l	TM184	48.6 #	17.2 #				
Nitrate as NO3	<0.3 mg/l	TM184	13.5	7.9				
Turbidity	<0.1 ntu	TM195		4.78 ♦ #				
pH	<1 pH Units	TM256	8.02 #					

Validated

CERTIFICATE OF ANALYSIS

SDG: 220324-61 | Report Number: 640584 | Superseded Report:

Client Ref.: 402-22 | Location: Rhine, Killoe, Co Longford

Table of Results - Appendix

Method No	Reference	Description
TM022	Method 2540D, AWWA/APHA, 20th Ed., 1999 / BS 2690: Part120 1981;BS EN 872	Determination of total suspended solids in waters
TM043	Method 2320B, AWWA/APHA, 20th Ed., 1999 / BS 2690: Part109 1984	Determination of alkalinity in aqueous samples
TM045	MEWAM BOD5 2nd Ed.HMSO 1988 / Method 5210B, AWWA/APHA, 20th Ed., 1999; SCA Blue Book 130	Determination of BOD5 (ATU) Filtered by Oxygen Meter on liquids
TM090	Method 5310, AWWA/APHA, 20th Ed., 1999 / Modified: US EPA Method 415.1 & 9060	Determination of Total Organic Carbon/Total Inorganic Carbon in Water and Waste Water
TM099	BS 2690: Part 7:1968 / BS 6068: Part2.11:1984	Determination of Ammonium in Water Samples using the Kone Analyser
TM120	Method 2510B, AWWA/APHA, 20th Ed., 1999 / BS 2690: Part 9:1970	Determination of Electrical Conductivity using a Conductivity Meter
TM123	BS 2690: Part 121:1981	The Determination of Total Dissolved Solids in Water
TM152	ISO 17294-2:2016 Water quality - Application of inductively coupled plasma mass spectrometry (ICP-MS)	Analysis of Aqueous Samples by ICP-MS
TM184	EPA Methods 325.1 & 325.2,	The Determination of Anions in Aqueous Matrices using the Kone Spectrophotometric Analysers
TM195	Colour and Turbidity of water. Methods for the Examination of Waters and Associated Materials. HMSO, 1981, ISBN 0 11 751955 3.	Determination of Turbidity in Waters & Associated Matrices
TM256	The measurement of Electrical Conductivity and the Laboratory determination of pH Value of Natural, Treated and Wastewaters. HMSO, 1978. ISBN 011 751428 4, Standard Methods for the examination of waters and wastewaters 20th Edition, PHA, Washington DC, USA. ISBN 0-87553-235-7 and The Determination of Alkalinity and Acidity in water HMSO, 1981, ISBN 0 11 751601 5.	Determination of pH, EC, TDS and Alkalinity in Aqueous samples

NA = not applicable.

Chemical testing (unless subcontracted) performed at ALS Life Sciences Ltd Hawarden.

Validated

CERTIFICATE OF ANALYSIS

SDG: 220324-61 Report Number: 640584 Superseded Report:
Client Ref.. 402-22 Location: Rhine, Killoe, Co Longford

Test Completion Dates

Lab Sample No(s)	26019250	26019249
Customer Sample Ref.	BH 1	SW 1
AGS Ref.		
Depth		
Ty pe	Ground Water	Surface Wate r
Alkalinity as CaCO3	31-Mar-2022	
Ammonium Low	30-Mar-2022	30-Mar-2022
Anions by Kone (w)	31-Mar-2022	30-Mar-2022
BOD True Total		30-Mar-2022
Conductivity (at 20 deg.C)	30-Mar-2022	
Dissolved Metals by ICP-MS	31-Mar-2022	31-Mar-2022
Nitrite by Kone (w)	28-Mar-2022	28-Mar-2022
pHValue	31-Mar-2022	
Phs phate by Kone (w)		30-Mar-2022
Suspended Solids	01-Apr-2022	01-Apr-2022
Total Dissolved Solids	30-Mar-2022	
Total Organic and InorganicCarbon	26-Mar-2022	26-Mar-2022
T urbiditjn waters		28-Mar-2022

Appendix

General

1. Results are expressed on a dry weight basis (dried at 35ºC) for all soil analyses except for the following: NRA and CEN Leach tests, flash point LOI, pH, ammonium as NH4 by the BRE method, VOC TICs and SVOC TICs.

2. If sufficient sample is received a sub sample will be retained free of charge for 30 days after analysis is completed (e-mailed) for all sample types unless the sample is destroyed on testing. The prepared soil sub sample that is analysed for asbestos will be retained for a period of 6 months after the analysis date. All bulk samples will be retained for a period of 6 months after the analysis date. All samples received and not scheduled will be disposed of one month after the date of receipt unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage. ALS reserve the right to charge for samples received and stored but not analysed.

3. With respect to turnaround, we will always endeavour to meet client requirements wherever possible, but turnaround times cannot be absolutely guaranteed due to so many variables beyond our control.

4. We take responsibility for any test performed by sub-contractors (marked with an asterisk). We endeavour to use UKAS/MCERTS Accredited Laboratories, who either complete a quality questionnaire or are audited by ourselves. For some determinands there are no UKAS/MCERTS Accredited Laboratories, in this instance a laboratory with a known track record will be utilised.

5. If no separate volatile sample is supplied by the client, or if a headspace or sediment is present in the volatile sample, the integrity of the data may be compromised. This will be flagged up as an invalid VOC on the test schedule and the result marked as deviating on the test certificate.

6. NDP - No determination possible due to insufficient/unsuitable sample.

7. Results relate only to the items tested.

8. LoDs (Limit of Detection) for wet tests reported on a dry weight basis are not corrected for moisture content.

9. **Surrogate recoveries** - Surrogates are added to your sample to monitor recovery of the test requested. A % recovery is reported, results are not corrected for the recovery measured. Typical recoveries for organics tests are 70-130%. Recoveries in soils are affected by organic rich or clay rich matrices. Waters can be affected by remediation fluids or high amounts of sediment. Test results are only ever reported if all of the associated quality checks pass; it is assumed that all recoveries outside of the values above are due to matrix affect.

10. Stones/debris are not routinely removed. We always endeavour to take a representative sub sample from the received sample.

11. In certain circumstances the method detection limit may be elevated due to the sample being outside the calibration range. Other factors that may contribute to this include possible interferences. In both cases the sample would be diluted which would cause the method detection limit to be raised.

12. For dried and crushed preparations of soils volatile loss may occur e.g volatile mercury.

13. For leachate preparations other than Zero Headspace Extraction (ZHE) volatile loss may occur.

14. For the BSEN 12457-3 two batch process to allow the cumulative release to be calculated, the volume of the leachate produced is measured and filtered for all tests. We therefore cannot carry out any unfiltered analysis. The tests affected include volatiles GCFID/GCMS and all subcontracted analysis.

15. Analysis and identification of specific compounds using GCFID is by retention time only, and we routinely calibrate and quantify for benzene, toluene, ethylbenzenes and xylenes (BTEX). For total volatiles in the C5-C12 range, the total area of the chromatogram is integrated and expressed as ug/kg or ug/l. Although this analysis is commonly used for the quantification of gasoline range organics (GRO), the system will also detect other compounds such as chlorinated solvents, and this may lead to a falsely high result with respect to hydrocarbons only. It is not possible to specifically identify these non-hydrocarbons, as standards are not routinely run for any other compounds, and for more definitive identification, volatiles by GCMS should be utilised.

16. We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample. Other coarse granular material such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

17 Data retention. All records, communications and reports pertaining to the analysis are archived for seven years from the date of issue of the final report.

18. **Tentatively Identified Compounds (TICs)** are non-target peaks in VOC and SVOC analysis. All non-target peaks detected with a concentration above the LoD are subjected to a mass spectral library search. Non-target peaks with a library search confidence of >75% are reported based on the best mass spectral library match. When a non-target peak with a library search confidence of <75% is detected it is reported as "mixed hydrocarbons". Non-target compounds identified from the scan data are semi-quantified relative to one of the deuterated internal standards, under the same chromatographic conditions as the target compounds. This result is reported as a semi-quantitative value and reported as Tentatively Identified Compounds (TICs). TICs are outside the scope of UKAS accreditation and are not moisture corrected.

19. **Sample Deviations**

If a sample is classed as deviated then the associated results may be compromised.

1	**Container with Headspace provided for volatiles analysis**
2	**Incorrect container received**
3	**Deviation from method**
4	**Matrix interference**
♦	**Sample holding time exceeded in laboratory**
@	**Sample holding time exceeded due to late arrival of instructions or samples**
§	**Sampled on date not provided**

20. **Asbestos**

When requested, the individual sub sample scheduled will be analysed in house for the presence of asbestos fibres and asbestos containing material by our documented in house method TM048 based on HSG 248 (2021), which is accredited to ISO17025. If a specific asbestos fibre type is not found this will be reported as "Not detected". If no asbestos fibre types are found all will be reported as "Not detected" and the sub sample analysed deemed to be clear of asbestos. If an asbestos fibre type is found it will be reported as detected (for each fibre type found). Testing can be carried out on asbestos positive samples, but, due to Health and Safety considerations, may be replaced by alternative tests or reported as No Determination Possible (NDP). The quantity of asbestos present is not determined unless specifically requested.

Identification of Asbestos in Bulk Materials & Soils

The results for identification of asbestos in bulk materials and soils are obtained from supplied bulk materials andd soils which have been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2021).

The results for identification of asbestos in soils are obtained from a homogenised sub sample which has been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central

Asbestos Type	Common Name
Chrysotile	White Asbestos
Amosite	Brown Asbestos
Crocidolite	Blue Asbestos
Fibrous Actinolite	-
Fibrous Anthophyllite	-
Fibrous Tremolite	-

Visual Estimation Of Fibre Content

Estimation of fibre content is not permitted as part of our UKAS accredited test other than: - Trace - Where only one or two asbestos fibres were identified.

Respirable Fibres

Respirable fibres are defined as fibres of <3 µm diameter, longer than 5 µm and with aspect ratios of at least 3:1 that can be inhaled into the lower regions of the lung and are generally acknowledged to be most important predictor of hazard and risk for cancers of the lung.

Further guidance on typical asbestos fibre content of manufactured products can be found in HSG 264.

The identification of asbestos containing materials and soils falls within our schedule of tests for which we hold UKAS accreditation, however opinions, interpretations and all other information contained in the report are outside the scope of UKAS accreditation.

Appendix 7.3 – Hydraulic Test Results

Permeability Test Sheet.

Corehole:	A
Client:	Blessington Stone & Concrete
Location:	Rhine, Killoe, Co. Longford
Job No.	402-22
Site Scientist:	Bruno Teillard
Date of Test	23/02/2022

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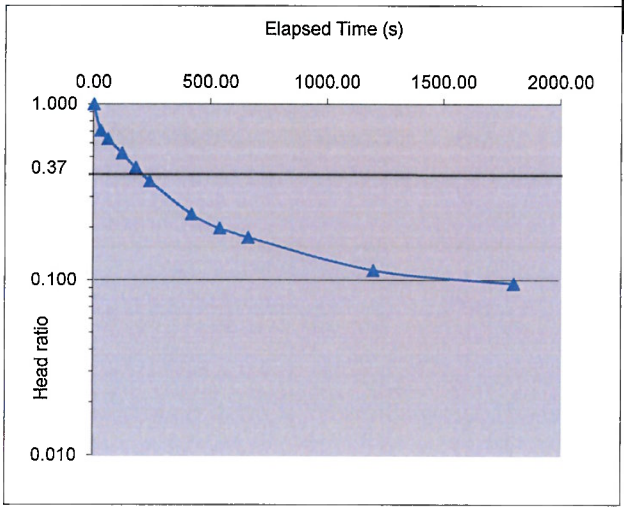
Details of Piezometer	Unit	Value
Elevation of casing	m. a.G.L.	58.2
Elevation of inner casing	m. a.O.D.	58.20
Ground Surface Elevation	m. a.O.D.	57.87
I.D. of drilled borehole	m.	0.050
Initial Standing Water Level	m. b.TOC	15.72
Total Depth	m. b.G.L.	50.00

I.D. Internal Diameter
G.L. Ground Level
O.D. Ordnance Datum
m. metre(s)
TOC Top of Casing

Test Data 1			
Elapsed Time (seconds)	WL (m. b.TOC)	H_t (m)	Head Ratio (H_t/H_o)
0.00	18.450	2.73	1.000
30.00	17.660	1.94	0.711
60.00	17.460	1.74	0.637
120.00	17.160	1.44	0.527
180.00	16.910	1.19	0.436
240.00	16.730	1.01	0.370
420.00	16.370	0.65	0.238
540.00	16.260	0.54	0.198
660.00	16.200	0.48	0.176
1200.00	16.030	0.31	0.114
1800.00	15.980	0.26	0.095

WL Water Level as a function of time
H_o Initial displacement (at t=0)
H_t Displacement as a function of time



Permeability Estimation (After BS 5930:1999 & Horvslev)

Values specific to well design			
Parameter	Description	Unit	Value
r	Radius of standpipe	m.	0.025
A	Cross Section. area of casing	m^2	1.96E-03
L	Length of gravel pack	m.	50.00
D	External Diameter of hole	m.	0.050
F_m	Intake Factor for k_m	none	47.472
T_L	Time Lag (H_t/H_o = 0.37)	s.	240
k_m	**Mean permeability**	**m/s**	**1.72E-07**

Permeability Test Sheet.

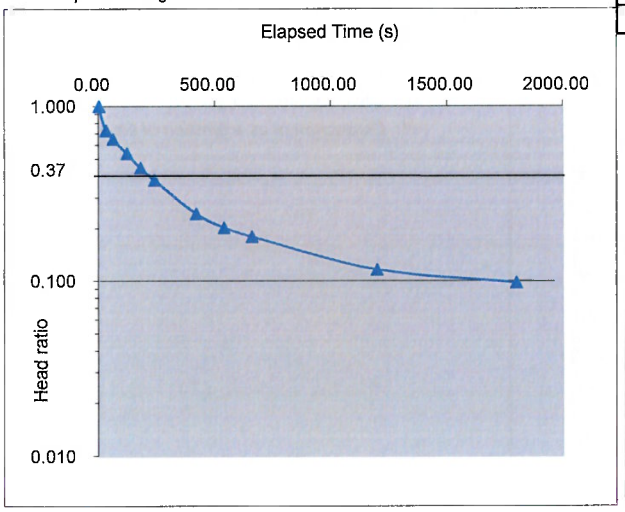
Corehole:	A
Client:	Blessington Stone & Concrete
Location:	Rhine, Killoe, Co. Longford
Job No.	402-22
Site Scientist:	Bruno Teillard
Date of Test	23/02/2022

Details of Piezometer	Unit	Value
Elevation of casing	m. a.G.L.	58.2
Elevation of inner casing	m. a.O.D.	58.20
Ground Surface Elevation	m. a.O.D.	57.87
I.D. of drilled borehole	m.	0.050
Initial Standing Water Level	m. b.TOC	15.85
Total Depth	m. b.G.L.	50.00

I.D. Internal Diameter
G.L. Ground Level
O.D. Ordnance Datum
m. metre(s)
TOC Top of Casing

Test Data 2			
Elapsed Time (seconds)	WL (m. b.TOC)	H_t (m)	Head Ratio (H_t/H_o)
0.00	18.520	2.67	1.000
30.00	17.790	1.94	0.727
60.00	17.590	1.74	0.652
120.00	17.290	1.44	0.539
180.00	17.040	1.19	0.446
240.00	16.860	1.01	0.378
420.00	16.500	0.65	0.243
540.00	16.390	0.54	0.202
660.00	16.330	0.48	0.180
1200.00	16.160	0.31	0.116
1800.00	16.110	0.26	0.097

WL Water Level as a function of time
H_o Initial displacement (at t=0)
H_t Displacement as a function of time



Permeability Estimation (After BS 5930:1999 & Horvslev)

Values specific to well design			
Parameter	Description	Unit	Value
r	Radius of standpipe	m.	0.025
A	Cross Section. area of casing	m^2	1.96E-03
L	Length of gravel pack	m.	50.00
D	External Diameter of hole	m.	0.050
F_m	Intake Factor for k_m	none	47.472
T_L	Time Lag (H_t/H_o = 0.37)	s.	251.05
k_m	**Mean permeability**	**m/s**	**1.65E-07**

Head	0.135	
Minutes	180	
ratio	1335	
From 0.243 to 0.37		0.127
Time	251.05	

Permeability Test Sheet.

Corehole:	B
Client:	Blessington Stone & Concrete
Location:	Rhine, Killoe, Co. Longford
Job No.	402-22
Site Scientist:	Bruno Teillard
Date of Test	23/02/2022

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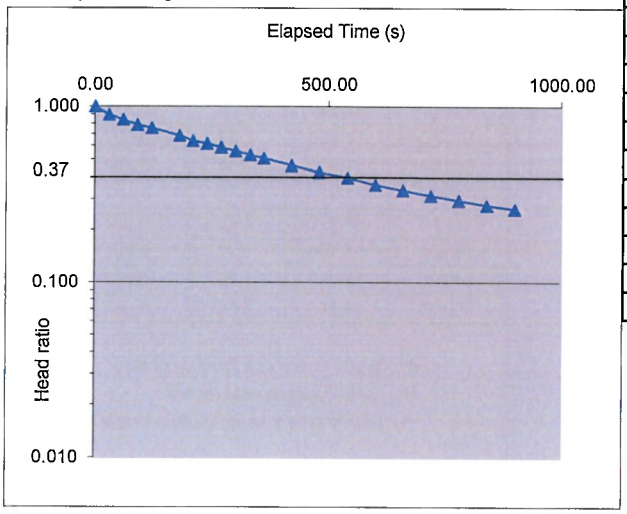
Details of Piezometer	Unit	Value
Elevation of casing	m. a.G.L.	59.844
Elevation of inner casing	m. a.O.D.	59.84
Ground Surface Elevation	m. a.O.D.	59.52
I.D. of drilled borehole	m.	0.050
Initial Standing Water Level	m. b.TOC	14.20
Total Depth	m. b.G.L.	30.00

I.D. Internal Diameter
G.L. Ground Level
O.D. Ordnance Datum
m. metre(s)
TOC Top of Casing

Test Data 1			
Elapsed Time (seconds)	WL (m. b.TOC)	H_t (m)	Head Ratio (H_t/H_o)
0.00	20.670	6.47	1.000
30.00	20.020	5.82	0.900
60.00	19.650	5.45	0.842
90.00	19.290	5.09	0.787
120.00	19.080	4.88	0.754
180.00	18.610	4.41	0.682
210.00	18.330	4.13	0.638
240.00	18.180	3.98	0.615
270.00	17.990	3.79	0.586
300.00	17.810	3.61	0.558
330.00	17.640	3.44	0.532
360.00	17.490	3.29	0.509
420.00	17.200	3.00	0.464
480.00	16.950	2.75	0.425
540.00	16.770	2.57	0.397
600.00	16.540	2.34	0.362
660.00	16.380	2.18	0.337
720.00	16.230	2.03	0.314
780.00	16.110	1.91	0.295
840.00	15.990	1.79	0.277
900.00	15.900	1.70	0.263



WL Water Level as a function of time
H_o Initial displacement (at t=0)
H_t Displacement as a function of time

Permeability Estimation (After BS 5930:1999 & Horvslev)

Values specific to well design			
Parameter	Description	Unit	Value
r	Radius of standpipe	m.	0.025
A	Cross Section. area of casing	m^2	1.96E-03
L	Length of gravel pack	m.	30.00
D	External Diameter of hole	m.	0.050
F_m	Intake Factor for k_m	none	30.515
T_L	Time Lag (H_t/H_o = 0.37)	s.	586
k_m	**Mean permeability**	**m/s**	**1.10E-07**

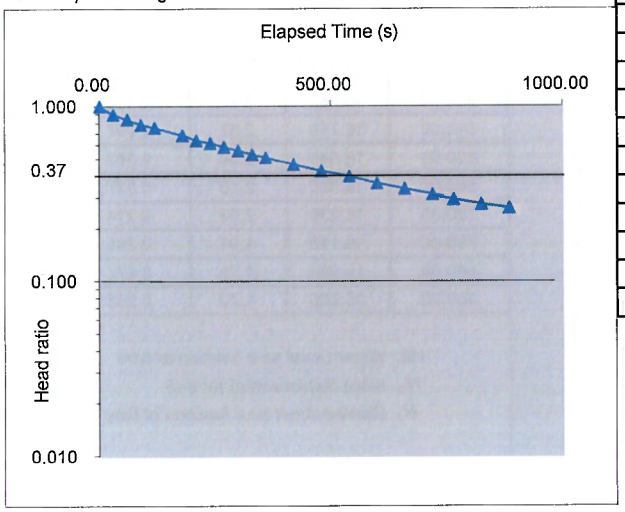
Head	0.036	
Minutes	60	
ratio	1687.8	
From 0.362 to 0.37		0.008
Time	585.94	

Permeability Test Sheet.

Corehole:	B
Client:	Blessington Stone & Concrete
Location:	Rhine, Killoe, Co. Longford
Job No.	402-22
Site Scientist:	Bruno Teillard
Date of Test	23/02/2022

Details of Piezometer	Unit	Value
Elevation of casing	m. a.G.L.	59.844
Elevation of inner casing	m. a.O.D.	59.84
Ground Surface Elevation	m. a.O.D.	59.52
I.D. of drilled borehole	m.	0.050
Initial Standing Water Level	m. b.TOC	15.19
Total Depth	m. b.G.L.	30.00

I.D. Internal Diameter
G.L. Ground Level
O.D. Ordnance Datum
m. metre(s)
TOC Top of Casing



Test Data 2			
Elapsed Time (seconds)	WL (m. b.TOC)	H_t (m)	Head Ratio (H_t/H_o)
0.00	21.660	6.47	1.000
30.00	21.010	5.82	0.900
60.00	20.640	5.45	0.842
90.00	20.280	5.09	0.787
120.00	20.070	4.88	0.754
180.00	19.600	4.41	0.682
210.00	19.320	4.13	0.638
240.00	19.170	3.98	0.615
270.00	18.980	3.79	0.586
300.00	18.800	3.61	0.558
330.00	18.630	3.44	0.532
360.00	18.480	3.29	0.509
420.00	18.190	3.00	0.464
480.00	17.940	2.75	0.425
540.00	17.760	2.57	0.397
600.00	17.530	2.34	0.362
660.00	17.370	2.18	0.337
720.00	17.220	2.03	0.314
780.00	17.100	1.91	0.295
840.00	16.980	1.79	0.277
900.00	16.890	1.70	0.263

WL Water Level as a function of time
H_o Initial displacement (at t=0)
H_t Displacement as a function of time

Permeability Estimation (After BS 5930:1999 & Horvslev)

Values specific to well design			
Parameter	Description	Unit	Value
r	Radius of standpipe	m.	0.025
A	Cross Section. area of casing	m^2	1.96E-03
L	Length of gravel pack	m.	30.00
D	External Diameter of hole	m.	0.050
F_m	Intake Factor for k_m	none	30.515
T_L	Time Lag (H_t/H_o = 0.37)	s.	586
k_m	**Mean permeability**	**m/s**	**1.10E-07**

Head	0.036	
Minutes	60	
ratio	1687.8	
From 0.362 to 0.37		0.008
Time	585.94	

Permeability Test Sheet.

Corehole:	D
Client:	Blessington Stone & Concrete
Location:	Rhine, Killoe, Co. Longford
Job No.	402-22
Site Scientist:	Bruno Teillard
Date of Test	23/02/2022

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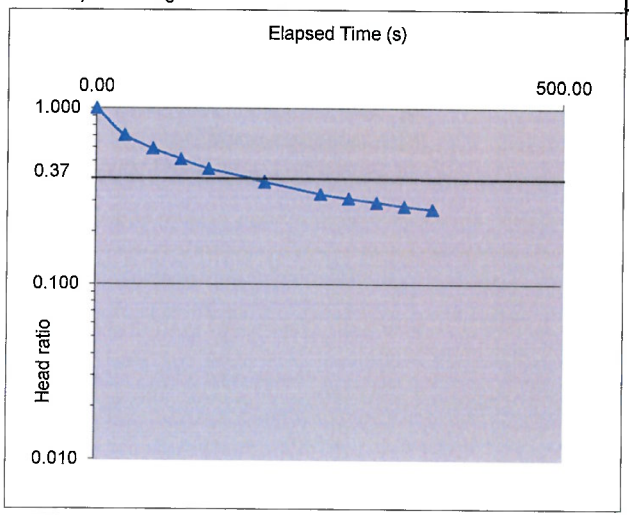
Details of Piezometer	Unit	Value
Elevation of casing	m. a.G.L.	58.58
Elevation of inner casing	m. a.O.D.	58.58
Ground Surface Elevation	m. a.O.D.	58.337
I.D. of drilled borehole	m.	0.050
Initial Standing Water Level	m. b.TOC	16.95
Total Depth	m. b.G.L.	50.00

I.D. Internal Diameter
G.L. Ground Level
O.D. Ordnance Datum
m. metre(s)
TOC Top of Casing

Test Data 1			
Elapsed Time (seconds)	WL (m. b.TOC)	H_t (m)	Head Ratio (H_t/H_o)
0.00	18.270	1.32	1.000
30.00	17.880	0.93	0.705
60.00	17.730	0.78	0.591
90.00	17.630	0.68	0.515
120.00	17.550	0.60	0.455
180.00	17.460	0.51	0.386
240.00	17.385	0.44	0.330
270.00	17.360	0.41	0.311
300.00	17.340	0.39	0.295
330.00	17.320	0.37	0.280
360.00	17.305	0.36	0.269

WL Water Level as a function of time
H_o Initial displacement (at t=0)
H_t Displacement as a function of time



Permeability Estimation (After BS 5930:1999 & Horvslev)

Values specific to well design			
Parameter	Description	Unit	Value
r	Radius of standpipe	m.	0.025
A	Cross Section. area of casing	m^2	1.96E-03
L	Length of gravel pack	m.	50.00
D	External Diameter of hole	m.	0.050
F_m	Intake Factor for k_m	none	47.472
T_L	Time Lag (H_t/H_o = 0.37)	s.	197
k_m	**Mean permeability**	**m/s**	**2.10E-07**

Permeability Test Sheet.

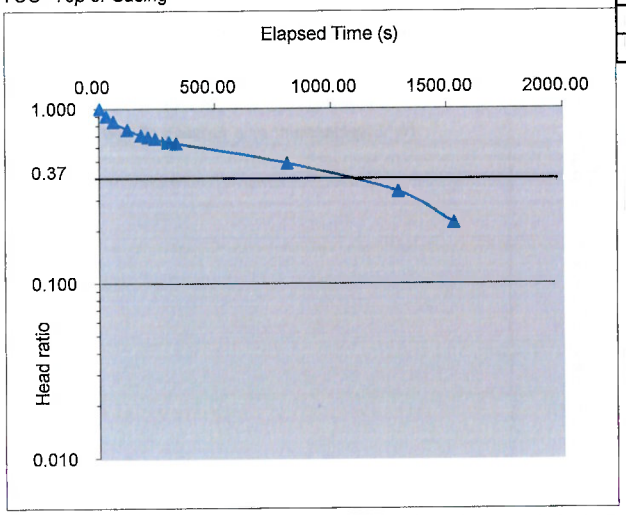
Corehole:	E
Client:	Blessington Stone & Concrete
Location:	Rhine, Killoe, Co. Longford
Job No.	402-22
Site Scientist:	Bruno Teillard
Date of Test	23/02/2022

Details of Piezometer	Unit	Value
Elevation of casing	m. a.G.L.	57.579
Elevation of inner casing	m. a.O.D.	57.58
Ground Surface Elevation	m. a.O.D.	57.198
I.D. of drilled borehole	m.	0.050
Initial Standing Water Level	m. b.TOC	12.10
Total Depth	m. b.G.L.	49.50

I.D. Internal Diameter
G.L. Ground Level
O.D. Ordnance Datum
m. metre(s)
TOC Top of Casing

Test Data 1			
Elapsed Time (seconds)	WL (m. b.TOC)	H_t (m)	Head Ratio (H_t/H_o)
0.00	16.630	4.53	1.000
30.00	16.210	4.11	0.907
60.00	15.920	3.82	0.843
120.00	15.550	3.45	0.762
180.00	15.300	3.20	0.706
210.00	15.220	3.12	0.689
240.00	15.150	3.05	0.673
300.00	15.030	2.93	0.647
360.00	14.980	2.88	0.636
840.00	14.320	2.22	0.490
1320.00	13.620	1.52	0.336
1560.00	13.110	1.01	0.223

WL Water Level as a function of time
H_o Initial displacement (at t=0)
H_t Displacement as a function of time



Permeability Estimation (After BS 5930:1999 & Horvslev)

Values specific to well design			
Param eter	Description	Unit	Value
r	Radius of standpipe	m.	0.025
A	Cross Section. area of casing	m^2	1.96E-03
L	Length of gravel pack	m.	49.50
D	External Diameter of hole	m.	0.050
F_m	Intake Factor for k_m	none	47.059
T_L	TimeLag (H_t/H_o = 0.37)	s	1213
k_m	**Mean permeability**	**m/s**	**3.44E-08**

Permeability Test Sheet.

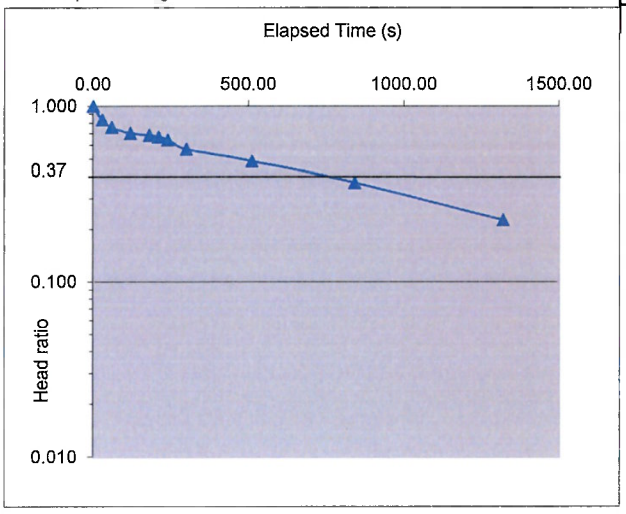
Corehole:	E
Client:	Blessington Stone & Concrete
Location:	Rhine, Killoe, Co. Longford
Job No.	402-22
Site Scientist:	Bruno Teillard
Date of Test	23/02/2022

Details of Piezometer	Unit	Value
Elevation of casing	m. a.G.L.	57.579
Elevation of inner casing	m. a.O.D.	57.58
Ground Surface Elevation	m. a.O.D.	57.198
I.D. of drilled borehole	m.	0.050
Initial Standing Water Level	m. b.TOC	12.12
Total Depth	m. b.G.L.	49.50

I.D. Internal Diameter
G.L. Ground Level
O.D. Ordnance Datum
m. metre(s)
TOC Top of Casing

Test Data 2			
Elapsed Time (seconds)	WL (m. b.TOC)	H_t (m)	Head Ratio (H_t/H_o)
0.00	16.720	4.60	1.000
30.00	15.970	3.85	0.837
60.00	15.600	3.48	0.757
120.00	15.350	3.23	0.702
180.00	15.270	3.15	0.685
210.00	15.200	3.08	0.670
240.00	15.080	2.96	0.643
300.00	14.750	2.63	0.572
510.00	14.370	2.25	0.489
840.00	13.820	1.70	0.370
1320.00	13.160	1.04	0.226

WL Water Level as a function of time
H_o Initial displacement (at t=0)
H_t Displacement as a function of time



Permeability Estimation (After BS 5930:1999 & Horvslev)

Values specific to well design			
Parameter	Description	Unit	Value
r	Radius of standpipe	m.	0.025
A	Cross Section. area of casing	m^2	1.96E-03
L	Length of gravel pack	m.	49.50
D	External Diameter of hole	m.	0.050
F_m	Intake Factor for k_m	none	47.059
T_L	Time Lag (H_t/H_o = 0.37)	s.	840
k_m	**Mean permeability**	**m/s**	**4.96E-08**

Appendix 7.4 – Borehole Details

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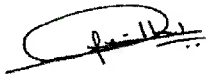
FACTUAL REPORT ISSUE FORM

(Private & Confidential)

Drilling of Borehole BH 1 at Rhine, Killoe, Co. Longford. (Drilling)

Status :	Factual Report	**Date issued:** 11/04/221
Client:	Blessington Concrete & Stone Ltd.	**Version:** 1
Contact:	Mr. Michael Blessington	**Author:** EurGeol, Bruno Teillard, PGeo, M.Sc. Hydrogeology
Address:	Killoe, Co. Longford, Ireland.	

Project No	402-22 o.AGP18054_02		
Document Title	Drilling of Borehole BH1 at Rhine, Killoe, Co. Longford		
Version History	Factual Report released 11th of April 2022		
Author	EurGeol Bruno Teillard, PGeo M.Sc. Hydrogeology		
Signed on behalf of Aqua Geoservices		**Signed on behalf of the client***	

* Where it is a requirement that this report be issued to a regulatory or other authority, then the client should sign the appropriate place in the above table and, unless specifically agreed in writing to the contrary, forward copies to the appropriate authority (e.g. EPA etc.)

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LIST OF ABBREVIATIONS

The following abbreviations are used in this report:

AGS	Aqua Geoservices Ltd.
a.OD	above Ordnance Datum
BCS	Blessington Concrete & Stone Ltd.
b.GL	Below ground Level
DGE	Doran Ground Engineering Ltd.
EFG	European Federation of Geologists
EPA	Environmental Protection Agency
EurGeol	European Geologist
GSI	Geological Survey of Ireland
IAEG	Irish Association of Economic Geology
IAH	International Association of Hydrogeologists
IGI	Institute of Geologists of Ireland
ITM	Irish Transverse Mercator
m.	metres
m b.GL	metres below Ground Level
m b.TOC	metres below Top of Casing
OD	Ordnance Datum
OPW	Office of Public Works
PGeo	Professional Geologist

I. INTRODUCTIO N

Blessington Concrete & Stone Ltd. (**BCS**) intend are seeking planning permission to develop a new quarry at Rhine, Killoe, Co. Longford.

As part of the site investigations, it was required to drill an exploration well to confirm some of the results obtained from a geophysical survey and carry out a pumping test if significant groundwater was obtained.

This report details the drilling work carried out between the 21/03/22 and the 22/03/22.

I.1 Scope of Work

The objectives of the drilling are to confirm the initial results of a geophysical survey undertaken by APEX[1] across the area for planning and establish the preliminary flow from the well. Should this preliminary flow be deemed as sufficient, a pumping test would then be undertaken to assess some of the hydraulic charcateristics of the underlying bedrock aquifer.

AGS supervised and managed all aspects of the drilling contract, i.e.

- Log the borehole according to BS 5930:2015 + A1:2020.
- Log the water strikes recorded and assess their flow (where possible).
- Ensure that the objectives of the drilling are met.
- Review the construction of the exploration well depending on ground conditions.
- Review and approve invoices from the driller for the work carried out.

This study has been undertaken by Aqua Geoservices Ltd., a company specialising in Geology, Hydrogeology & Hydrology. It has been prepared in accordance with the best practices used in groundwater investigations.

I.2 Project Team

The consultant appointed as project manager, Bruno Teillard, is a qualified Hydrogeologist (French M.Sc. Hydrogeology) with over **25** years of experience in Ireland and abroad. Bruno is certified as:

- a Professional Geologist (PGeo) by the Institute of Geologists of Ireland (**IGI**) since 2004 with the membership No. 149 and,
- as a European Geologist (EurGeol) by the European Federation of Geologists (**EFG**) since 2005 with the membership No. 564.
- a "registered professional hydrogeologist in respect of environmental risk assessment for unregulated waste disposal" by the Institute of Geologists of Ireland.
- a fellow member of the Geological Society of London.

He is also a member of:

- the International Association of Hydrogeologists since 2000 with membership No. 84024,
- of the Irish Association of Economic Geology (**IAEG**) and,
- an associate member of the Geological Society, NI Regional Group.
- Bruno is also approved as a competent hydrogeologist to work on Irish Water's projects countrywide.

[1] Source: APEX report No.AGP18054_02 entitled « Report on the geophysical investigation at lands adjacent to Rhyne quarry, Co. Longford" and dated 15/06/2020.

He has extensive experience in hydrological (surface water) and hydrogeological (groundwater) studies in Ireland for a wide range of scenario situations, including development and protection of groundwater resource, wastewater disposal, wastewater discharge license applications, site suitability assessment and assimilative capacity studies.

I.3 Consultations

As part of the study process, databases in the following organizations were consulted:

- Environmental Protection Agency (**EPA**), PO Box 3000, Johnstown Castle Estate, Wexford, Y35 W821
- Geological Survey of Ireland (**GSI**), Beggars Bush, Haddington Rd, Dublin 4.
- Met Eireann, Glasnevin Hill, Dublin 9, Ireland.

I.4 Assessment and Reporting

The assessment and reporting took place following the drilling of the exploration well. They consist of the following elements:

- Description of the existing environment (Geology and hydrogeology);
- Presentation the study findings;
- Compilation and analysis of the data gathered;
- Preparation of a comprehensive report.

II DRILLING

The contract to carry out the drilling was awarded to Doran Ground Engineering Ltd. from Borris, in Co. Carlow.

Daily drilling records and descriptions of the drill cuttings are contained in the borehole log provided in **Appendix 1** of this report.

Samples of drill cuttings were collected at regular intervals during the drilling and/or when conditions changed within the lithology of the bedrock. They were subsequently dried and bagged for logging. The logs were prepared by the AGS' site Hydrogeologist, Bruno TEILLARD. Photographic records of the drill cuttings (upon washing of the fines) are presented in **Appendix 2.**

Illustrations and comments on the daily site activities are provided in **Appendix 3** of this report.

II.1 Siting of Exploration Well

Based on the results of a geophysical survey and the initial assessment of the area by AGS in late February 2022 and taking not consideration the site constraints for the access of a 40t drill rig on site, it was recommended to drill the exploration well at coordinates 619250E – 779745N on the Irish Transverse Mercator (**ITM**).

II.2 Access

Access was undertaken via a newly built access route prepared by BCS across the field leading to the proposed drilling location at the exploration well BH-1 (**Figure 1**).

A 40t truck-mounted Reichdrill T690 was brought on the day of drilling (21/03/22).

Prior to the start of drilling, the proposed area was scanned using an underground cable locator to check for the presence of buried utility lines.

II.3 Equipment Used

Details of the various tools and supplies used as part of this drilling are provided below:

Description	Length	Diameter	Notes
Liner	0.35m	-	-
8" drillbit	1.55m (drillbit)	8" (200mm)	-
6" drillbit	1.15m (drillbit)	6" (150mm)	
Rods	6.09m	-	-
6" Steel casing	1 x 6.00m	150`mm ID	All 12m installed with 0.48m above ground level at time of completion
Table top during drilling	0.98m a.GL	-	-

Table 2.1 – Summary description equipment and supplies used for the drilling of the Exploration Well BH-1 at Rhine townland, Killoe, Co. Longford.

II.4 Drilling & Construction of BH-1

Drilling started at 10:57am on the 21/03/22 and finished at 2:16pm on the same day.

On the day of drilling, the weather was dry and sunny.

The drilling of the exploration well consisted of two stages as follows:

- **The first stage** consisted of drilling the upper part of the well with the view to seal off any potential ingress of shallow/subsurface groundwater from entering the well and to prevent loose material (topsoil and subsoil) from caving behind the drillbit.

  The borehole was drilled at 200mm (8") diameter within the subsoil and the upper part of the bedrock down to a depth of 6.0m below Ground Level (**b.GL**), within competent bedrock.

  The 8" drillbit was then withdrawn and a 150mm Internal Diameter (**ID**) steel casing was then installed. A shoe was installed on top of the casing to push it down into position using Down-The-Hole-Hammer (**DTHH**).

  The steel casing was pushed down to a final depth of 5.45m b.GL. It was not hammered down in the event that it would need to be withdrawn to convert the exploration well into an abstraction well.

  The top of the steel casing remained 0.55m above Ground Level (**a.GL**).

- **The second stage** consisted of drilling the lower part of the exploration well.

  Material that had caved inside the steel casing was first cleared up. Drilling resumed at 6" (150mm) from 6.0m b.GL down to a final depth of 50.3m b.GL.

  The well could not be developed by airlifting as there was not a sufficient amount of water within the well to do so.

As this well is located within the proposed area for excavation, it will be decommissioned as the quarry progress deeper. Because it was dry within competent bedrock, there was no need to install an inner PVC casing and wellscreen.

A lockable well cap was installed by DGE on the 13/04/22. The top of the borehole was then painted with an anti-rust yellow paint.

II.5 Egress

The rig left the site on the 21/03/22.

Upon completion of the work, the drill cuttings were used to level off the drilling area.

III GEOLOGY

The reader is invited to refer to the borehole log (**Appendix 1**) and the photographic record of the site work (**Appendix 2**) for further details.

III.1 Topsoil & Overburden

The topsoil consisted of a thin layer (0.50m) of hardcore material used as part of the access road.

This was underlain by a light brown till down to 2.84m b.GL. The till deposit was moist and comprised of limestone gravels within a silty CLAY matrix.

III.2 Bedrock

The bedrock was encountered at 2.84m b.GL. It consisted of competent dark grey to black Limestone down to the final depth of 50.30m b.GL. There were only minor calcite inclusions in the drill cuttings recovered.

III.3 Hydrogeology

The borehole was essentially dry, and it was not possible to conduct a flow test in this well. By the following morning (22/03/22), the water had recovered from 50.3m b.GL up to 42.42m below the Top of the Casing (**b.TOC**).

IV CONCLUSIONS

A borehole was drilled at a selected location within the proposed planning area for a quarry at Rhine townland, Killoe, in Co. Longford.

The contractor selected for the drilling was Doran Ground Engineering Ltd. from Borris, Co. Carlow.

The drilling of the Exploration Well BH-1 was carried out on the 21/03/22 under the supervision of AGS' hydrogeologist, EurGeol Bruno Teillard PGeo. The borehole was completed on the 13/04/22 with the provision of a lockable well cap.

The exploration well BH-1 was drilled at diameter of 200mm (8") down to 6.00m deep, which was cased with a 150mm (6") I.D. steel casing down to 5.45m b.GL. Drilling then resumed down to the target depth of 50.3m b.GL at a diameter of 150mm (6").

Bedrock was encountered at a depth of 2.84m b.GL and consisted of a light brown till (moist).

The underlying bedrock was essentially dry and consisted of competent (hard) rock comprising of dark grey to black limestones.

This result was consistent with the findings of the geophysical investigation for the area (line R1 as per Apex report No. AGP18054_02, dated 15/06/20).

V. RECOMMENDATIONS

It is not possible to conduct a pumping test at this location. The results obtained during this drilling confirmed the findings of the geophysical survey across the site and the results of a diamond drilling investigation.

No further work is warranted.

The borehole BH-1 is to remain on site as a monitoring well until it is decommissioned.

VI REFERENCES

DELG/EPA/GSI, 1999. Groundwater Protection Schemes. Dept. of the Environment & Local Government; Environmental Protection Agency; Geological Survey of Ireland.

EPA website www.epa.ie

EPA (2011) Drinking Water Advice Note No. 7: Source Protection and Catchment Management to Protect Groundwater Sources.

EPA (2011) Drinking Water Advice Note No. 8: Developing Drinking Water Safety Plans.

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European Communities (Drinking Water) Regulations (2014). S.I. No. 122 of 2014.

European Communities Environmental Objectives (Groundwater) Regulations (2010) S.I. No. 9 of 2010.

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IGI (2007) Guidelines for Drilling Wells for Private Water Supplies (March 2007). http://www.igi.ie/publications/codes-guidelines.htm

Water Wells and Boreholes (second Edition), Bruce Misstear, David Banks and Lewis Clark. Wiley Blackwell, 2016.

FIGURE

Aqua GeoServices
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Greenhills Road
Wicklow Town
Co. Wicklow
A67 X236
info@aquageo.ie

Figure 1: Drilling location
Ref. No. 402-22
Project: Rhine, Killoe, Co. Longford
Size: A4
Date: 10/02/22
Scale:

0 100 200 Metres

Legend:

- River
- Stream
- Borehole BH-1
- Diamond Drilling coreholes

Sources of information:

Department of Communications, Climate Action & Environment

Geological Survey Suirbhéireacht Gheolaíochta Ireland | Éireann

epa MAPS

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APPENDIX 1 - BOREHOLE LOG.

Aqua GeoServices

Aqua GeoServices Ltd.,
Waverley House
Greenhills Road
Wicklow Town,
Co. Wicklow
info@aquageo.ie

Borehole No.	BH-1	Drilling Contractor:	Doran Ground Eng. Ltd.
Client:	Blessington Concrete & Stone Ltd.	Drilling Method:	Air Rotary
Project No.:	402-22	Date started:	21/03/22
Location:	Rhine, Killoe, Co. longford	Date completed:	21/03/22

Top of Wellhead:	c. 61.50m a.OD	Depth of steel casing:	5.45m b.GL	I.D. of Drilled Hole (mm).	200, 150
Ground Surface:	c. 60.95m a.OD	Internal steel casing Diameter:	150mm	Static Water Level:	42.42m. b.TOC (recovering 22/03)
Boring Depth:	53.30m b.GL	Top of inner casing (a.GL):	0.55m	Depth to Bedrock:	2.84m b.GL
Well Depth:	53.30m b.GL	Top of inner casing (a.OD):	c. 61.50m	ITM Grid Ref:	619249E - 779745N +/- 10m

Description	Depth (in m)	Legend	Construction	Information on Water (m. b.GL)
0.00m- 0.50m. hardcore limestone gravels,moist.	0		ID 160mm	
0.50m- 2.84m: Light brown Gravels in light brown gravelly silty CLAY matrix, dry. Gravels size range from 2mm upto 23mm and are angular to subrounded in shape The gravels derive from black limestone.	2		ID 200mm	
2.84m- 12.35m: Competent bedrock consisting of dark grey limestone, dry. Minor inclusions of calcite. Drill cutting size ranged from mostly dust up to c. 10mm.	4, 6, 8, 10, 12			
12.35m - 18.44m: Competent bedrock comprising of dark grey to Black limestone, dry. The drill cuttings size ranged from mostly dust up to 7mm.	14, 16, 18		ID 150mm	Dry
18.44m - 34.00m: Competent bedrock consisting of black limestone, dry. Drill cuttings size ranged from mostly dust (<<1mm) up to c. 12mm. minor inclusions of calcite observed.	20, 22, 24, 26, 28, 30, 32, 34			

General remarks:

Drilled at 200mm from 0.0m to c. 6.00m below Ground Level (b.GL)
Drilled at 150mm from 6.00m b.GL down to 53.30m b.GL
Installed 6.00m of 160mm ID steel casing down to 5.45m b.GL.

Drill cuttings were evenly spread around the well.

Well head cover was installed on the 13/04/22 and painted.

LEGEND

150mm ID steel liner

Aqua GeoServices
Aqua Geoservices Ltd.,
Wavecrest House
Greenhills Road
Wicklow Town,
Co. Wicklow
info@aquageo.ie

Borehole No: BH-1		Drilling Contractor: Doran Ground Eng. Ltd.
Client: Blessington Concrete & Stone Ltd.		Drilling Method: Air Rotary
Project No.: 402-22		Date started: 21/03/22
Location: Rhine, Killoe, Co. longford		Date completed: 21/03/22

Top of Wellhead:	c. 61.50m a.OD	Depth of steel casing:	5.45m b.GL	I.D. of Drilled Hole (mm):	200, 150
Ground Surface:	c. 60.95m a.OD	Internal steel casing Diameter:	150mm	Static Water Level:	42.42m. b.TOC (recovering 22/03)
Boring Depth:	53.30m b.GL	Top of inner casing (a.GL):	0.55m	Depth to Bedrock:	2.84m b.GL
Well Depth:	53.30m b.GL	Top of inner casing (a.OD):	c. 61.50m	ITM Grid Ref:	619249E - 779745N +/- 10m

Description	Depth (in m)	Legend	Construction	Information on Water (m. b.GL)
	34			
34.00m - 53.30m: Competent bedrock consisting of black limestone, dry. Drill cuttings size ranged from mostly dust (<<1mm) up to c. 6mm. minor inclusions of calcite observed.	36, 38, 40, 42, 44, 46, 48, 50, 52		ID 150mm	Dry Water table slowly recovering (22/03/22)
	54, 56			

General remarks:

Drilled at 200mm from 0.0m to c. 6.00m below Ground Level (b.GL)
Drilled at 150mm from 6.00m b.GL down to 53.30m b.GL
Installed 6.00m of 160mm ID steel casing down to 5.45m b.GL.

Drill cuttings were evenly spread around the well.

Well head cover was installed on the 13/04/22 and painted.

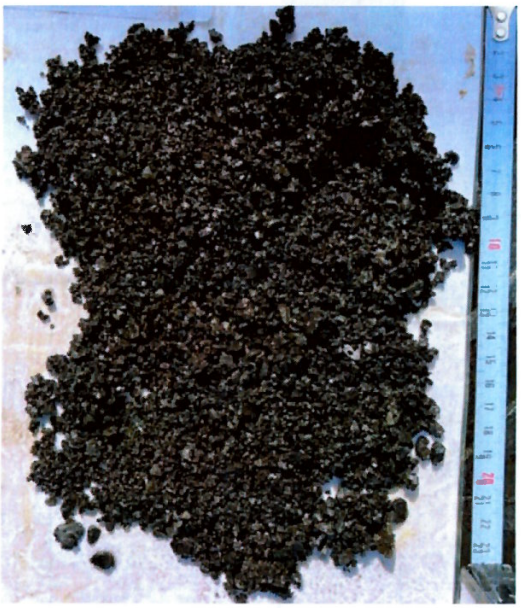
LEGEND

150mm ID steel liner

APPENDIX 2 - PHOTOG RAPHICRECORD OF THEDRILL CUTTINGS

Photograph 1: 2.84m – 6.00m b.GL. Competent bedrock consisting of dark grey limestone with few inclusions of calcite, dry. The drill cuttings recovered ranged from mostly dust up to c.4mm.

Photograph 2: 6.00m – 12.35m b.GL. Competent bedrock consisting of dark grey limestone with few inclusions of calcite, dry. The drill cuttings recovered ranged from mostly dust up to c.10mm.



Photograph 3: 12.35 - m – 18.44m b.GL. Competent bedrock consisting of black grey to black limestone, dry. The drill cuttings recovered ranged frommostly dust up to c.7mm.

Photograph 4: 18.44m – 24.53m b.GL. Competent bedrock consisting of black limestone with few inclusions of calcite, dry. The drill cuttings recovered ranged from mostly dust up to c.10mm.

Photograph 5: 24.53m – 30.62m b.GL. Competent bedrock consisting of dark grey limestone with few inclusions of calcite, dry. The drill cuttings recovered ranged from mostly dust up to c.12mm.

Photograph 6: 30.62m – 36.71 b.GL. Competent bedrock consisting of dark grey to black limestone with few inclusions of calcite, dry. The drill chippings recovered ranged from mostly dust up to c. 5mm.

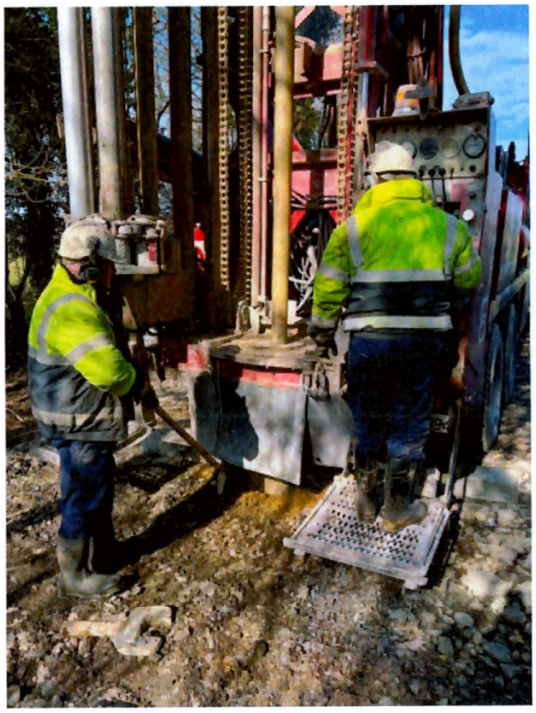
Photograph 7: 36.71m – 42.80m b.GL. Competent bedrock consisting of black limestone with few inclusions of calcite present. Bedrock chippings range from mostly dust up to c.6mm.

Photograph 8: 42.80m – 53.30m b.GL. Competent bedrock consisting of black limestone with few inclusions of calcite present. Bedrock chippings range from mostly dust up to c.4mm.

APPENDIX 3 - PHOTOGRAPHIC RECORD OF SITE WORK ACTIVITIES

Photograph 1 – Installation of the 40t Reichdrill T690 on location for the drilling of BH-1 (21/03/22 @ 10:30am)

Photograph 2 – Zoom on 8" (200mm) drill bit upon completion of drilling of upper part of the well. The drillbit is 1.55m long on its own. The tabletop was at 0.98 above Ground Level.



Photograph 3 – Drilling through the subsoil (21/03/22).

Photograph 4 – Bedrock reached at 2.84m b.GL (21/03/22).

Photograph 5 – Drilling through upper part of the bedrock (c. 5.50m).

Photograph 6 – Installation of 6.00m of steel casing (21/03/22 @ 11:25am).

Photograph 7 – Hammering casing down into position (21/03/22 @ 11:42am).

Photograph 8 – Drilling through competent bedrock (c. 26m deep).

Photograph 9 – Drilling through competent bedrock (c. 40m deep).

Photograph 10 – Drilling through competent bedrock (c. 50m deep).

Photograph 11 – Checking water level on the morning of the 22/03/22 (10:40am).

Photograph 12 – Well cover installed and painted (13/04/22).

Appendix 7.5 – Determination of Water Flow & Storage Volumes

Determination of storm water flows and storage volumes for the proposed quarry at Rhine, Killoe, Co. Longford

1. GREENFIELD RUNOFF RATES

In order to estimate the Greenfield runoff rate of the site in its original state (pre-quarrying), the formula provided in the Dublin Corporation Storm Water Management Policy Technical Guidelines and the Sustainable Urban Design (SuDS) Guidelines were used.

The pre-development run-off has been calculated using the following formula:

$$Q_{BAR} = 0.00108x\ (AREA)^{0.89} \times (SAAR)^{1.17} \times (SOIL)^{2.17} = 0.163m^3/s$$

Where:

AREA = catchment of fully excavated quarry, i.e. 18.05 Ha (0.1805km^2)

SAAR = Standard Annual Average Rainfall (mm) = 1,010mm (Source: Met Eireann for MountDillon).

SOIL = soil Index (values range from 0.015 – 0.5). Value taken to be 0.3 based on Flood Studies report and observations made on site

Based on the table above, the **greenfield runoff rate** for the site which would have entered the catchment of the Camlin River via the local drainage system is given as **0.0565m^3/s (56.5l/s) in its natural state.**

2. STORM WATER ESTIMATES

The water management system within the quarry shall be able to accommodate periods of extreme rainfall and have the capacity to buffer any discharge to the local drainage system so as not to impact on the receiving environment and not increase any potential for flooding downgradient.

It should be pointed out that the proposed excavation area is bordered to the North-East by a watershed line and it is therefore only the water falling within the quarry void that will have to be dealt with by the proposed water management system.

2.1 Storm rainfall intensities

Storm rainfall intensities at the proposed site location were obtained from Met Éireann and are presented in **Appendix 8_7** of this report.

2.2 Surface water runoff calculations

Upon development of the proposed quarry, the total catchment area generating surface water runoff over the quarry will be of **18.05 Ha**. Using a conservative runoff coefficient of 90% over bare rock and considering that 100% of each area will consist of bare rock / hardstanding areas, the associated runoff rates and runoff volumes for a 100year return period storm will be as shown in **Table 2.2.1** below:

DURATION	Rainfall (mm) for a 100-year Return Period	Runoff Volume (m^3)	Runoff rate (m^3/s)
5 mins	13.5	2193.08	7.31
10 mins	18.8	3054.06	5.09
15 mins	22.1	3590.15	3.99
30 mins	27.3	4434.89	2.46
1 hours	33.8	5490.81	1.53
2 hours	41.8	6790.41	0.94
3 hours	47.3	7683.89	0.71
4 hours	51.6	8382.42	0.58
6 hours	58.5	9503.33	0.44
9 hours	66.2	10754.19	0.33
12 hours	72.3	11745.14	0.27
18 hours	81.8	13288.41	0.21
24 hours	89.4	14523.03	0.17
2 days	99	16082.55	0.09
3 days	108.2	17577.09	0.02
4 days	116.7	18957.92	0.05
6 days	132.2	21475.89	0.04
8 days	146.2	23750.19	0.03
10 days	159.3	25878.29	0.03
12 days	171.6	27876.42	0.03
16 days	194.7	31629.02	0.02
20 days	216.3	35137.94	0.02
25 days	241.8	39280.41	0.02

Table 2.2.1 Runoff volumes and rates given for a 100-year storm event at Rhine, Killoe in Co. Longford.

2.3 Storm Water Management Policy

Rainfall runoff from Greenfield areas has very different characteristics to developed runoff. The differences can be summarised under three main headings:

- Quality of runoff: Greenfield areas generally produce cleaner runoff than runoff from developed areas (Sediments, BOD, pathogens, metals, hydrocarbons etc.);
- Volume of runoff: Greenfield areas produce no runoff for small events and due to infiltration, less runoff for large events;
- Rates of runoff: Greenfield sites produce slower, later runoff for all types of events.

The objective of a drainage system should therefore be to mimic the pre-development conditions of the site in terms of these parameters.

2.4 Storm Retention

Good practice in hydrology is achieved by providing "long term" storage to protect the receiving water body from the effects of the increased volume of runoff compared to Greenfield conditions.

As a precautionary measure, it is proposed to detain and release more slowly the storm flow from the site so that it does not exceed the greenfield flood runoff rate.

Good practices generally allow for a 30-year or a 100-year return period events. The following **Table 2.4.1** presents the storage calculations for the site for on-site detention based on 100year return storm event and the natural greenfield runoff rate calculated above.

DURATION	Rainfall (mm) for a 100 Year Return Period	Runoff Volume (m^3)	Runoff rate (m^3/s)	Permissible Runoff from developed area (m^3/s)	Storage Volume Required (m^3)
5 mins	13.5	2193.08	7.31	0.0565	2176.13
10 mins	18.8	3054.06	5.09	0.0565	3020.16
15 mins	22.1	3590.15	3.99	0.0565	3539.30
30 mins	27.3	4434.89	2.46	0.0565	4333.19
1 hours	33.8	5490.81	1.53	0.0565	5287.41
2 hours	41.8	6790.41	0.94	0.0565	6383.61
3 hours	47.3	7683.89	0.71	0.0565	7073.69
4 hours	51.6	8382.42	0.58	0.0565	7568.82
6 hours	58.5	9503.33	0.44	0.0565	8282.93
9 hours	66.2	10754.19	0.33	0.0565	8923.59
12 hours	72.3	11745.14	0.27	0.0565	9304.34
18 hours	81.8	13288.41	0.21	0.0565	9627.21
24 hours	89.4	14523.03	0.17	0.0565	**9641.43**
2 days	99	16082.55	0.09	0.0565	6319.35
3 days	108.2	17577.09	0.02	0.0565	-
4 days	116.7	18957.92	0.05	0.0565	-
6 days	132.2	21475.89	0.04	0.0565	-
8 days	146.2	23750.19	0.03	0.0565	-
10 days	159.3	25878.29	0.03	0.0565	-
12 days	171.6	27876.42	0.03	0.0565	-
16 days	194.7	31629.02	0.02	0.0565	-
20 days	216.3	35137.94	0.02	0.0565	-
25 days	241.8	39280.41	0.02	0.0565	-

Table 2.5.1 On-site stormwater Storage requirements for a 100-year return period Storm.

The combined storage volume within the proposed quarry, when fully extended, shall accommodate a minimum required storage volume of 5,642.43m^3 rounded to **5,650m^3 for a 100-year return period with a 24-hour duration.**

Under extreme conditions, the working sump in the lower bench will be allowed to flood so as to offer the required storage capacity.

3. REUSE OF WATER

All water collected within the quarry void shall be directed to a collection sump in the lower bench of the extraction area. The size of the collection sump shall be determined pro rata of the phasing of the work.

As the water flows through the collection sump, suspended solids in the water will settle out of suspension. The size of the lagoon shall be sufficient to accommodate settlement of suspended solids (Cf. **Appendix 8_6**).

Based on the current rainfall pattern, it is assumed that during dry weather conditions, the water will have to be reused and recycled on site.

Although the amount of water to be redirected for reuse will be dependent on the needs of the manufacturing area, it is anticipated that the annual average daily use of water in the production yard will be similar to that of the existing quarry, i.e. $51m^3/d^1$.

The water will be recycled for use in the processing of material, production and the wheelwash etc. Only water which is surplus to requirements, such as extreme weather conditions (cf. below), will be discharged off-site.

4. DISCHARGE OFF SITE

In extreme weather conditions, water may be discharged off site. Using the greenfield runoff calculated above, the permissible discharge should not be greater than 56.5l/s.

Prior to discharge, water shall be pumped from the bottom sump (or any other sump) to a newly constructed system consisting of a discharge manhole, an oil interceptor a flow measuring chamber and a final outlet/sampling chamber before entering the local drainage ditch.

Water will be pumped from the lagoon to the manhole at the top of the quarry. From here it will pass through an oil interceptor to remove any hydrocarbons that may be present. The water meter will measure the discharge of the flow on a continuous basis. The flow metre shall be automated of manual, in this later option, it should be recorded manually on a daily basis.

It will be necessary to obtain a discharge licence to ensure compliance with regulations.

[1] Source: Water management Plan for quarry located at Rhine, Killoe, Co. Longford, Earth Science Partnership, April 2020.

Appendix 7.6 – Design of Settlement Lagoons

1. Settlement Process

In a rock quarry, the production of significant quantities of particles finer than 2μm in diameter requires higher energy inputs than are available in either the loading of blasted stones or trafficking by haulage roads (this would not be the case if we were dealing with a sandpit).

In order to be effective for capturing a design size particle by gravity, it must allow for the flow of water through the system and provide sufficient time for deposition of sediments. The proposed method to accomplish this is to capture the designe size particle with no treatment incoming runoff waters.

2. Determination of types of sediments

The main function of sediment basin/ponds is simply to store water for a period of time giving the suspended solids an opportunity to sink to the bottom, leaving clarified water.

The following table 2.1 summarises the results of the jar tests undertaken at the existing quarry in Rhine, Killoe, Co. Longford. It is anticipated that similar conditions will occur in the proposed quarry as both are tapping the same bedrock formation.

The times provided in the table below are for an almost clear water to be obtained. In all the case, 90% of the sediments were deposited within 1 hour.

Sample taken from	Time 1	Time 2	Time 3	Average Time
Surface water runoff discharging to Bottom sump	<3h	<4h	<4h	<3h

Table 2.1 – Results of Jar tests at existing Quarry in Rhine, Killoe, Co. Longford.

The results of the jar tests showed that the bulk of the particles in suspension settling within 2 minutes (fine sands) and the finest particles settling within 3 to 4 hours (silts).

3. Calculation of maximum allowable flowrate

Based on the results of the jar tests, the percentage of particles that are Equal to or Greater than a design size particle (PEG) should be taken as 0.02mm.

Stokes' Law applies for particles where the Reynolds Number is less than 1. The following table summarises the settlement velocities from particles at various temperatures using stokes Law:

$$V_s = \frac{g\,(\varrho_s - \varrho_w)d^2}{18\,\nu\,\mu_w}$$

Where:

V_s is the settlement velocity of particles
g is the acceleration of gravity ($9.81 m/s^2$)
ϱ_s is the density of the particle ($2.65 g/cm^3$)
ϱ_w is the density of fluid ($1.0 g/cm^3$ for water)
μ_w is the dynamic viscosity of water (1.002E-3 @20°C)
d is the diameter of the particle considered

Based on the Stokes' law, the settlement velocity of particles in water can be calculate for variable particle sizes and densities and variable water temperatures. This is summarised in Table 3.1 below.

Particle Size		0.02mm		0.025mm		0.03mm	
Water T emperature	Particle Density	V_s	SOR	V_s	SOR	V_s	SOR
°C	g/cm ^{3}	m/s	$m^3/m^2/d$ ay	m/s	$m^3/m^2/day$	m/s	$m^3/m^2/day$
5	2	1.43E-04	12.4	2.24E-04	19.4	3.23E-04	27.9
5	2.3	1.86E-04	16.1	2.91E-04	25.2	4.20E-04	36.2
5	2.65	2.37E-04	20.4	3.70E-04	31.9	5.32E-04	46.0
10	2	1.67E-04	14.4	2.60E-04	22.5	3.75E-04	32.4
10	2.3	2.17E-04	18.7	3.39E-04	29.3	4.88E-04	42.1
10	2.65	2.75 6E04	23.8	4.30E-04	37.1	6.19E-04	53.5
20	2	2.18E-04	18.8	3.40E-04	29.4	4.90E-04	42.3
20	2.3	2.83E-04	24.4	4.42E-04	38.2	6.36E-04	55.0
20	2.65	3.59E-04	31.0	5.61E-04	48.5	8.08E-04	69.8

Table 3.1 – Settlement Velocities for particles at various temperatures.

In the worst-case scenario to ensure all particle of 0.02mm and above are settled under cold conditions the best settlement velocity will be that which allows 0.02mm particles of density 2.0 x 10^{-3} kg/m^3 in a water temperature of 5°C to settle out of suspension. A settlement velocity of 1.86 x 10^{-4} m/s will achieve this. This represents a surface water overflow rate (SOR) of 12.4m^3/m^2/day.

The maximum allowable flow rate through the lagoon is **12.4m^3/m^2/day.**

4. Associated vertical fall velocity

The sediment basins shall, at a minimum, be able to accommodate a 90% reduction of inflow of suspended soil particles having diameters of 0.02mm (i.e. coarse silts) and larger and/or provide sufficient retention time for full settlement to occur.

Sedimentation velocities (Vp) are calculated using Stoke's law as per the following equation:

$$Vp = \frac{(g \times (\rho p - \rho e) \times d^2)}{(18 \times h)} = 2.22 \times 10^{-4} m/s \qquad \textbf{[Equation 1]}$$

Where:

Vp:	Vertical fall velocity of particles (in m/s)	g:	gravitational acceleration (9.81 m/s^2)
ρp:	soil particle density (2633kg/m^3)	ρe:	mass density of water (1000kg/m^3)
d:	diameter of particles for sedimentation (m)		
h:	dynamic viscosity of water at 4°C (0.0016 Pa.s).		

5. Determination of discharge rates

The discharge rate that is used in designing a water storage and sedimentation basin must fit the runoff conditions that are usually observed during the most frequent rain events and not for a discharge rate that is too high. However, good practices in surface water management generally require sizing using a 100-year return period.

To achieve high sedimentation efficiency while keeping the storage volume within acceptable limits, the recommendation is to manage the runoff from 90% of rainfall events on an annual basis.

Although the quarry does not discharge to the environment (except on an occasional basis), the greenfield runoff rate was calculated as being of 0.0565m^3/s for the site (Cf. **Appendix 8.5**).

6. Calculation of minimum water area in basin

The design of settling ponds, tanks and lagoons must ensure that the overflow rate is less than the settling rate of the smallest particle size intended to be detained. The minimum water area of pond (SA_{min}) required to achieve the required settlement depends on flow rate and free particle settlement rate. The relationship is independent of depth and is determined using Equation 2 (Jerald S. Fifeld, 2004) below:

SAmin = (SF x Q) / Vp = 305.4m² rounded to 310m² [Equation 2]

Where:

SAmin = Minimum Surface Area of Sediment Basin (in m^2)

SF = Safety Factor of 1.2 (SI Units)

Q = Design Discharge from the Sediment Basin (m^3/s) = 0.0565

Vp = Vertical Velocity of Design Particles (m/s) = 2.22E-4.

7. Calculation of Water Balance for the Site

To quantify the future quantities of surface water runoff that will be generated as a result of the precipitation falling on the quarry as a whole, a water balance calculation was undertaken.

Notwithstanding any evaporation taking place and based on the 30-year rainfall average at Mount Dillon for the period 1981 – 2010 (1010mm/yr), the daily average volume over the 18.05 Ha of the proposed quarry area was calculated as follows:

$$\text{Daily Volume} = \frac{\text{(catchment area) x (30-year average rainfall at MountDillon)}}{365} = \frac{\text{18.05Ha x 1010mm/yr}}{365}$$

When the quarry is fully extended, the daily average volume will therefore be of 499.47m^3/day rounded to **500m^3/d**.

It is estimated that the average daily water usage of the proposed quarry will be similar to that of the existing quarry, i.e. **50m^3/d**. As a result, the daily average surplus of water from the quarry will be of c. **449m^3/d.**

Using the Surface Overflow Rate of 12.4m^3/m^2/d, this would result in a surface area of **36.2m^2, which is well below the proposed minimum surface area of the sediment basing of 310m^2.**

As a conservative approach, the minimum surface area for settlement when the quarry is fully extended should be of c. 305m^2.

There will be ample capacity within the lower bench of the quarry floor to achieve this.

Appendix 7.7 – Met Eireann Rainfall Records

Met Eireann
Return Period Rainfall Depths for sliding Durations
Irish Grid: Easting: 219236, Northing: 279605,

	Interval		Years												
DURATION	6months,	1year,	2,	3,	4,	5,	10,	20,	30,	50,	75,	100,	150,	200,	250,	500,
5 mins	2.6,	3.7,	4.2,	5.0,	5.5,	6.0,	7.3,	8.9,	9.9,	11.3,	12.5,	13.5,	15.0,	16.1,	17.0,	N/A ,
10 mins	3.7,	5.1,	5.8,	7.0,	7.7,	8.3,	10.2,	12.4,	13.8,	15.7,	17.4,	18.8,	20.8,	22.4,	23.7,	N/A ,
15 mins	4.3,	6.0,	6.9,	8.2,	9.1,	9.8,	12.0,	14.5,	16.2,	18.5,	20.5,	22.1,	24.5,	26.4,	27.9,	N/A ,
30 mins	5.7,	7.8,	8.9,	10.6,	11.7,	12.5,	15.2,	18.3,	20.3,	23.0,	25.5,	27.3,	30.2,	32.4,	34.2,	N/A ,
1 hours	7.5,	10.2,	11.6,	13.6,	14.9,	16.0,	19.3,	23.0,	25.4,	28.7,	31.6,	33.8,	37.2,	39.8,	41.9,	N/A ,
2 hours	10.0,	13.3,	15.0,	17.5,	19.2,	20.4,	24.5,	28.9,	31.8,	35.7,	39.1,	41.8,	45.8,	48.8,	51.3,	N/A ,
3 hours	11.7,	15.5,	17.5,	20.3,	22.2,	23.6,	28.1,	33.1,	36.2,	40.6,	44.4,	47.3,	51.7,	55.0,	57.8,	N/A ,
4 hours	13.2,	17.3,	19.5,	22.5,	24.6,	26.1,	31.0,	36.4,	39.8,	44.5,	48.5,	51.6,	56.3,	59.9,	62.8,	N/A ,
6 hours	15.5,	20.2,	22.7,	26.1,	28.4,	30.2,	35.6,	41.6,	45.4,	50.6,	55.1,	58.5,	63.6,	67.5,	70.7,	N/A ,
9 hours	18.3,	23.6,	26.4,	30.3,	32.9,	34.8,	40.9,	47.6,	51.8,	57.5,	62.4,	66.2,	71.8,	76.1,	79.6,	N/A ,
12 hours	20.5,	26.4,	29.4,	33.6,	36.4,	38.5,	45.2,	52.3,	56.8,	63.0,	68.3,	72.3,	78.3,	82.9,	86.6,	N/A ,
18 hours	24.1,	30.8,	34.2,	39.0,	42.1,	44.5,	51.9,	59.8,	64.8,	71.6,	77.4,	81.8,	88.4,	93.4,	97.5,	N/A ,
24 hours	27.1,	34.4,	38.1,	43.3,	46.7,	49.3,	57.3,	65.8,	71.2,	78.4,	84.7,	89.4,	96.4,	101.7,	106.0,	120.6,
2 days	33.7,	41.9,	45.9,	51.5,	55.1,	57.8,	66.3,	75.1,	80.6,	88.0,	94.3,	99.0,	106.1,	111.3,	115.6,	129.9,
3 days	39.4,	48.3,	52.6,	58.6,	62.5,	65.4,	74.3,	83.5,	89.2,	96.9,	103.4,	108.2,	115.4,	120.8,	125.1,	139.5,
4 days	44.6,	54.1,	58.7,	65.1,	69.2,	72.2,	81.5,	91.2,	97.1,	105.1,	111.7,	116.7,	124.1,	129.6,	134.0,	148.7,
6 days	54.0,	64.6,	69.7,	76.8,	81.2,	84.6,	94.7,	105.0,	111.4,	119.8,	126.9,	132.2,	139.9,	145.7,	150.3,	165.5,
8 days	62.7,	74.3,	79.8,	87.4,	92.2,	95.8,	106.6,	117.6,	124.4,	133.3,	140.7,	146.2,	154.3,	160.3,	165.1,	180.9,
10 days	70.9,	83.4,	89.3,	97.4,	102.5,	106.3,	117.7,	129.4,	136.4,	145.8,	153.5,	159.3,	167.7,	173.9,	178.9,	195.2,
12 days	78.7,	92.0,	98.3,	106.9,	112.3,	116.3,	128.3,	140.5,	147.9,	157.6,	165.6,	171.6,	180.3,	186.8,	191.9,	208.8,
16 days	93.7,	108.5,	115.4,	124.9,	130.8,	135.1,	148.2,	161.4,	169.3,	179.7,	188.4,	194.7,	204.0,	210.8,	216.2,	234.0,
20 days	108.0,	124.2,	131.7,	141.9,	148.3,	153.0,	167.0,	181.0,	189.4,	200.5,	209.6,	216.3,	226.1,	233.2,	239.0,	257.6,
25 days	125.4,	143.0,	151.2,	162.3,	169.2,	174.2,	189.3,	204.3,	213.3,	225.1,	234.7,	241.8,	252.2,	259.7,	265.7,	285.3,

NOTES:
N/A Data not available
These values are derived from a Depth Duration Frequency (DDF) Model
For details refer to:
'Fitzgerald D. L. (2007), Estimates of Point Rainfall Frequencies, Technical Note No. 61, Met Eireann, Dublin',
Available for download at www.met.ie/climate/dataproducts/Estimation-of-Point-Rainfall-Frequencies_TN61.pdf

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8.0 CLIMATE

8.1 Introduction

This section of the EIAR assesses the development in terms of climate and climate change and assesses potential impacts that the development may have with regards to climate.

The topic of 'Climate' is more often discussed with reference to 'Climate Change' which is any significant change in the measures of climate lasting for an extended period of time. In other words, climate change includes major changes in temperature, precipitation, or wind patterns, among others, that occur over several decades or longer.

8.2 Methodology

The methodology for the description of the current climate in the region of the proposed development included a desk study review of the data available from Met Éireann, EPA and other bodies which have responsibility for the Climate of Ireland. Met Éireann Data was used to assess the climate in the region of the application site.

Climate change is a significant change in the average weather or climate that a region experiences. Climate change can be caused by natural factors such as variations in solar intensity or volcanic eruptions. The term climate change is now generally used to refer to changes in our climate due to the build-up of Greenhouse Gases (GHGs) in the atmosphere. This build-up of GHGs is caused by excess emissions due to certain human activities, like burning fossil fuels for energy, transport and heating.

8.3 Greenhouse Gas Emissions

8.3.1 Kyoto Protocol

The Kyoto Protocol was adopted in Kyoto, Japan on the 11th December, 1997, but not enacted or enforced until the 16th February, 2005. The protocol was adopted to help combat the adverse effects of climate change, or global warming.

Recognising that developed countries were principally responsible for the current high levels of GHG emissions in the atmosphere as a result of more than 150 years of industrial activity, the Protocol placed a heavier burden on developed nations under the principle of "common but differentiated responsibilities."

Under the Kyoto Protocol, Ireland was required to limit total national greenhouse gas emissions to 314.2 Mtonnes of CO_2eq over the five-year period 2008 – 2012 which is equivalent to 62.8 Mtonnes of CO_2eq per annum. The Kyoto Protocol limit was calculated being as 13% above Ireland's 1990 baseline value which was established and fixed at 55.61 Mtonnes of CO_2eq following an in-depth review of Ireland's 2006 greenhouse gas

inventory submission to the UNFCCC (United Nations Framework Convention on Climate Change).

8.3.2 Paris Agreement 2015 (COP 21)

COP21 was the 21st session of the Conference of the Parties (COP) to the United Nations Convention. A legally binding, global agreement on climate change was agreed in Paris on 12th December 2015. It is a legally binding, global agreement on climate change which aims to strengthen the ability of countries to deal with the impacts of climate change. It sets out a long-term goal to limit global warming to below 2°C above pre-industrial levels, and to pursue efforts to limit the temperature increase to 1.5°C. The Agreement requires each Party to prepare and communicate a Nationally Determined Contribution (NDC) that it intends to achieve. NDCs are submitted every five years to the United Nations Framework Convention on Climate Change (UNFCCC). Ireland will contribute to the Agreement through the NDC tabled by the EU on behalf of Member States in 2016, which commits to a 40% reduction in EU-wide emissions by 2030 compared to 1990. All Parties are required to submit new or updated NDCs in 2020.

8.3.3 Madrid 2019 (COP 25)

The 25th United Nations Climate Change conference COP25 was held in Madrid in December, 2019. The European Union launched its most ambitious plan, 'The European Green New Deal' which aims to lower CO_2 emissions to zero by 2050. The deal includes proposals to reduce emissions from the transport, agriculture and energy sectors and will affect the technology chemicals, textiles, cement and steel industries. Measures such as fines and pay-outs by member states who rely on coal power will be in place to encourage the switch to renewable clean energies such as wind. In March 2020, the European Commission put forward the proposal for a European climate law to establish the framework for achieving EU climate neutrality and to set in legislation the EU's 2050 climate-neutrality objective.

8.3.4 Glasgow 2021 (COP 26)

COP26 took place in Glasgow, Scotland between October and November 2021. The summit was centred around the fact that "climate change is the greatest risk facing us all." The UK, as hosts for the summit, have developed a ten point plan to deliver a green industrial revolution, seeking to lead the world in tackling and adapting to climate change. The key items COP26 seeks to achieve are:

- Secure global net zero by mid-century and keep 1.5 degrees within reach
- Adapt to protect communities and natural habitats
- Mobilise finance
- Work together to deliver

The summit highlighted that the Paris Agreement is working, with leaders outlining national targets and efforts to further reduce emissions. All world leaders at the summit confirmed the need to work together to achieve climate action. There were a number of significant announcements including the following:

- The launch of the Global Methane Pledge saw over 100 countries committing collectively to reduce global methane emissions by 30% by 2030."
- A commitment of public funds for forest conservation and a global roadmap to make 75% of forest commodity supply chains sustainable.
- Countries covering more than 90% of the world's forests endorsed the Declaration on Forests & Land Use committing to work collectively to halt and reverse forest loss and land degradation by 2030.
- A 10-year plan to work together to create green jobs and beginning with power, road transport, steel, hydrogen and agriculture to making clean technologies and solutions the most affordable, accessible and attractive option before 2030

8.3.5 United Nations Sustainable Development Summit 2019

Transforming our World: the 2030 Agenda for Sustainable Development which includes 17 No. Sustainable Development Goals (SDGs) and 169 No. targets were adopted by all UN Member States at a UN summit held in New York in 2015. The agenda is universally applicable with all countries having a shared responsibility to achieve the goals and targets which came into effect on January 1st, 2016. The goals and targets, which are to be actioned over the 15-year period, are integrated and indivisible i.e., all must be implemented together by each Member State.

On 24 and 25 September 2019, Heads of State and Government gathered at the United Nations Headquarters in New York to follow up and comprehensively review progress in the implementation of the 2030 Agenda for Sustainable Development and the 17No Sustainable Development Goals (SDGs). The event was the first UN summit on the SDGs since the adoption of the 2030 Agenda in September 2015.

8.4 European Union Context

8.4.1 European Green Deal - European Climate Law (2021)

The European Green Deal, which was initially introduced by the European Commission in December 2019, sets out the 'blueprint' for the 27-country bloc to change from a high to a low carbon economy, without reducing prosperity. This will also improve people's quality of life, through cleaner air and water, better health, and a thriving natural world. The Green Deal is intended to work through a framework of regulation and legislation setting clear overarching targets, such as net zero carbon emissions by 2050 and a 55% cut in emissions by 2030 (compared with 1990 levels). These targets demonstrate the ambition necessary to keep the global temperature increase to well below 2°C and

pursue efforts to keep it to 1.5°C as per the Paris Agreement. Regarding the energy sector, the Green Deal focuses on three key principles:

- Ensuring a secure and affordable EU energy supply.
- Developing a fully integrated, interconnected, and digitalised EU energy market.
- Prioritising energy efficiency, improving the energy performance of our buildings and developing a power sector based largely on renewable sources.

The European Climate Law 2021 writes into law the objectives set out above in the European Green Deal for Europe's economy and society. Climate neutrality by 2050 means achieving net zero greenhouse gas emissions for EU countries as a whole, mainly by cutting emissions, investing in green technologies and protecting the natural environment. The Climate Law includes:

- A legal objective for the Union to reach climate neutrality by 2050.
- An ambitious 2030 climate target of at least 55% reduction of net emissions of greenhouse gases.
- A process for setting a 2040 climate target, based on an indicative greenhouse gas budget for 2030-2050 to be published by the Commission.
- The establishment of European Scientific Advisory Board on Climate Change, that will provide independent scientific advice.
- Stronger provisions on adaptation to climate change.
- Strong coherence across Union policies with the climate neutrality objective.

The law aims to ensure that all EU policies contribute to this goal and that all sectors of the economy and society play their part. All 27 EU Member States have committed to turning the EU into the first climate neutral continent by 2050. In July 2021, the European Commission adopted a set of proposals to make the EU's climate, energy, transport, and taxation policies fit for reducing net greenhouse gas emissions by at least 55% by 2030, compared to 1990 levels.

Achieving these emission reductions in the next decade which is crucial to Europe becoming the world's first climate-neutral continent by 2050. The proposed development would serve the demand for material from existing customers in the local area thereby not requiring material to be hauled over long distances form alternative quarries. The applicant also proposes to research and implement systems for recycling of aggregates as an alternative to virgin material in uses such as general fill, road construction etc. However, market demand for such materials is low.

8.4.2 EU Emissions Trading System (EU ETS)

The EU emissions trading system (EU ETS) is the world's first major carbon market and remains the biggest one. The system was first introduced in 2005 and has undergone several changes since then. The implementation of the system has been divided up into distinct trading periods over time, known as phases which are detailed below.

- Phase 1 (2005-2007)
- Phase 2 (2008-2012)
- Phase 3 (2013-2020)
- Phase 4 (2021-2030)

The EU ETS:

- Operates in all EU countries plus Iceland, Liechtenstein and Norway.
- Limits emissions from more than 11,000 heavy energy-using installations (power stations & industrial plants) and airlines operating between these countries.
- Covers around 40% of the EU's greenhouse gas emissions.

The EU ETS works on a 'cap and trade' basis, so there is a 'cap' or limit set on the total greenhouse gas emissions allowed by all participants covered by the system and this cap is converted into tradable emission allowances.

Within the cap, participants receive or buy emission allowances, which they can trade with one another as needed. They can also buy limited amounts of international credits from emission-saving projects around the world. The limit on the total number of allowances available ensures that they have a value.

The system covers the following sectors and gases, focusing on emissions that can be measured, reported and verified with a high level of accuracy:

- Carbon dioxide (CO_2) from
  - Power and heat generation.
  - Energy-intensive industry sectors including oil refineries, steel works and production of iron, aluminium, metals, cement, lime, glass, ceramics, pulp, paper, cardboard, acids and bulk organic chemicals.
  - Commercial aviation
- Nitrous oxide (N_2O) from production of nitric, adipic and glyoxylic acids and glyoxal
- Perfluorocarbons (PFCs) from aluminium production.

8.4.3 Intergovernmental Panel on Climate Change

The Intergovernmental Panel on Climate Change released their Sixth Assessment Report Climate Change 2021: The Physical Science Basis in August 2021 which categorically states the rise in global temperatures and increase in frequency and severity of natural disasters experienced across the world is related to human activity. It indicates that climate change has and will negatively impact all aspects of human life and unless immediate action is taken. It states that the aim to curtail global temperature rise to 1.5 degrees is now not possible however, maintaining just a 2-degree rise may be possible, only with immediate and large-scale action is taken to reduce greenhouse gas emissions. The report is hopeful that if global emissions can be cut in half by 2030 and that if net zero emissions can be achieved by 2050 the rise in temperatures can be halted and possibly reversed. This report is a stark warning that decarbonisation must be increased additional efforts made to reduce carbon emissions across all sectors.

Greenhouse gas (GHG) emissions resulting from the provision of energy services have contributed significantly to the historic increase in atmospheric GHG concentrations with most of the observed increase in global average temperature since the mid-20th century is very likely due to the observed increase in anthropogenic GHG emissions with the consumption of fossil fuels accounts for the majority of global anthropogenic GHG emissions. There are multiple options for lowering GHG emissions from the energy system while still satisfying the global demand for energy services. Wind energy has significant potential to reduce GHG emissions. Moreover, attempts to measure the relative impacts of various electricity supply technologies suggest that wind energy generally has a comparatively small environmental footprint.

8.5 National Legislation and Policy

In contrast to sectors in the EU ETS, which are regulated at EU level, Member States are responsible for national policies and measures to limit emissions from the sectors covered by Effort Sharing Legislation. Examples of potential policies and measures include:

- reducing transport needs.
- promoting public transport.
- a shift away from transport based on fossil fuels.
- support schemes for retrofitting buildings.
- more efficient heating and cooling systems.
- renewable energy for heating and cooling.
- more climate-friendly farming practices.
- conversion of livestock manure to biogas.

Measures taken at EU level will help Member States to reduce emissions. For example:

- CO_2 emission standards for new cars and vans will cut emissions from road transport.

- Emission reductions from buildings will be aided by measures to improve the energy performance of buildings, eco-design requirements for energy-related products, and energy labelling systems to inform consumers.
- Restrictions on fluorinated industrial gases (F-gases) and implementation of other EU environmental policies, e.g. on soil protection and waste, will also contribute to reaching the national targets.

The Effort Sharing Decision covers the six greenhouse gases controlled by the Kyoto Protocol:

- carbon dioxide (CO_2)
- methane (CH_4)
- nitrous oxide (N2O)
- hydrofluorocarbons (HFCs)
- perfluorocarbons (PFCs)
- sulphur hexafluoride (SF_6).

The Effort Sharing Regulation adds to those nitrogen trifluorides (NF_3), which is a very small source in the EU. The targets apply to domestic greenhouse gas emissions from IPCC source categories of energy, industrial processes and product use, agriculture, and waste.

They do not apply to emissions covered by the EU ETS and emissions and removals from land use, emission and removals from land use change and forestry (LULUCF), which are covered by the Kyoto Protocol and from 2021 by the LULUCF Regulation.

8.5.1 Climate Action and Low Carbon Development (Amendment) Act, 2021

The Climate Action and Low Carbon Development (Amendment) Act 2021, which was signed into law on the 23rd July 2021, legally binds Ireland to achieve Net-Zero emissions no later than 2050, and to a 51% reduction in emissions by 2030. The Act provides the framework for Ireland to meet its international and EU climate commitments and to become a leader in addressing climate change. As indicated by the premise of the legislation, the reduction of emissions is a key proponent of the Climate Action and Low Carbon Development (Amendment) Bill 2021 and incorporates the following key provisions:

- Embeds the process of setting binding and ambitious emissions-reductions targets in law.
- Provides for a national climate objective, which commits to pursue and achieve no later than 2050, the transition to a climate resilient, biodiversity-rich, environmentally sustainable and climate-neutral economy.

- Provides that the first two five-year carbon budgets proposed by the Climate Change Advisory Council should equate to a total reduction of 51% over the period to 2030, relative to a baseline of 2018.
- The role of the Climate Change Advisory Council has been strengthened.
- The government must adopt carbon budgets that are consistent with the Paris agreement and other international obligations.
- Actions for each sector will be detailed in the Climate Action Plan which must be updated annually.
- Local Authorities must prepare individual Climate Action Plans which will include both mitigation and adaptation measures and will be updated every five years.

The applicant proposes to invest in equipment which have a high energy efficiency when updating plant, equipment and vehicles associated with the quarry. Also, renewable energy sources will be used to supplement power suppliers to administrative buildings. The Proposed Development is therefore considered compliant with the relevant planning policies and objectives set out at both the European (e.g. European Green Deal) and National tiers of governance.

8.5.2 The Climate Action Plan 2023

The Climate Action Plan (CAP 2023) was published on the 21st of December 2022 by the Department of Communications, Climate Action and Environment and featured 183 No. action plans which set out how Ireland would meet its EU targets to reduce its carbon emissions by 30% between 2021 and 2030 and laid the foundations for achieving net zero carbon emissions by 2050.

The plan implements the carbon budgets and sectoral emissions ceilings and sets out a roadmap for taking decisive action to halve our emissions by 2030 and reach net zero no later than 2050, as committed to in the Programme for Government. Climate Action Plan 2023 sets out how Ireland can accelerate the actions that are required to respond to the climate crisis, putting climate solutions at the centre of Ireland's social and economic development.

As part of the National Climate Change Action Plan, County Longford produced and adopted a new Climate Adaptation Strategy in their Climate Action Plan 2024 – 2029, which was made available to the public from 25th March 2024. The strategy is developed to increase resilience to climate change by planning and implementing appropriate adaptation measures.

8.5.3 Ireland's Greenhouse Gas Emissions Projection 2023

The EPA is responsible for compiling the inventories of greenhouse gas emissions for Ireland and for reporting the data to the relevant European and international institutions. As such, Ireland's legal reporting obligations require that the EPA submit data to the European Commission and the United Nations Framework Convention on Climate Change (UNFCCC).

The EPA published a document called Ireland Greenhouse Gas Emissions Projections in June 2023 and they gave two possible scenarios when estimating to calculate the predicted emission levels as follows.

1. "With Existing Measures" (WEM) scenario.

The WEM scenario assumes that no additional policies and measures, beyond those already in place by the end of 2021 (latest national greenhouse gas emission inventory), are implemented.

2. "With Additional Measures" (WAM) scenario.

The WAM scenario assumes that in addition to the existing measures, there is also full implementation of planned government policies and measures to reduce emissions such as those in the 2023 Climate Action Plan.

Greenhouse gas emissions projections show total emissions decreasing from the latest Inventory (2021) levels by 15% by 2030 under the With Existing Measures (WEM) scenario. Greenhouse gas emissions projections show total emissions decreasing by 32% under the more ambitious With Additional Measures (WAM) scenario

8.5.4 Programme for Government: Our Shared Future

The Department of the Taoiseach published the Programme for Government on the 29th of October 2021. The programme states the importance addressing the changing climates:

'The next ten years are critical if we are to address the climate and biodiversity crisis which threatens our safe future on this planet.'

The programme states in relation to natural resources:

'We will harness the natural resources to meet our needs in this country, without compromising the ability of future generations to meet theirs'.

And

'We will work in partnership with industry, retailers, and consumers to promote a more sustainable and responsible system and culture for consumption, use and re-use of materials and end of use recycling and disposals. We will also work with the EU implementing the agreed Circular Economy approach'.

8.5.5 Assessing Greenhouse Gas Emissions and Evaluating their Significance

The Institute of Environmental Management and Assessment (IEMA) provides information to assist practitioners with addressing greenhouse gas (GHG) emissions assessment and mitigation in Environmental Impact Assessment (EIA).

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

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

The IEMA published a document in 2020 called Environmental Impact Assessment Guide to: Climate Change Resilience & Adaptation. The climate change risk assessment outlined by IEMA in appendix 1 of their report will be used to assess how the proposed development vulnerabilities to climate change.

8.5.6 Longford County Council Climate Adaptation Strategy

Under the National Adaption Frameworks (NAF) the Environment Directorate of Longford County Council developed the Climate Adaptation Strategy for Longford County. The Climate Change Adaptation Strategy takes on the role as the primary instrument at local level to:

- Bring forward the implementation of climate resilient actions in a planned and proactive manner.

- Ensure the proper comprehension of the key risks and vulnerabilities of climate change.
- Ensure that climate adaptation considerations are mainstreamed into all plans and policies and integrated into all operations and function of Longford County Council

Longford County Council has committed to achieving net-zero emissions by 2050 by delivering services in an environmentally sustainable manner and by working with the community, agricultural and business sectors to deliver on common goals. Longford County Council has implemented the Climate Action Plan 2024 – 2029 and will deliver transformative change and measurable climate action in their towns, villages, and rural communities. Longford County Council will measure and report on key metrics and set targets to continually improve performance. The Plan will be reviewed annually.

In respect of the proposed quarry development the following strategies are relevant:
Transport - Support localisation of services to minimise the need for most common travel patterns.
Minerals - Locate developments strategically to minimise the need to travel, subject to health aspects/business needs.

Rhyne Rock are a local quarry supplying stone locally in Longford and the surrounding area. The replacement of the existing quarry with the proposed development within the same area, is a key example of "localisation of services to minimise need for Common Travel patterns".

This proposed quarry will replace the existing quarry and principally services the locality providing quarry and concrete products for local development works. This business is located "strategically to minimise the need to travel" and the current application is to continue quarrying in an area already quarried.

As stated previously, the applicant proposes to invest in equipment which have a high energy efficiency when updating plant, equipment and vehicles associated with the quarry. Also, renewable energy sources will be used to supplement power suppliers to administrative buildings.

8.6 Existing Environment

8.6.1 Land-Use

Land-use in the vicinity of the application site include agriculture consisting of livestock farming. Historical peat extraction and commercial forestry is also evident from aerial photography. There are number residences in the immediate vicinity of the development

comprising of isolated farm dwellings and ribbon development. An operational quarry is located to the northeast of the application site which is operated by Rhyne Rock. The closest licensed waste facility is Mulleady's Limited (Drumlish) which is located 6km to the northwest of the application site. The closest IPPC licenced facility is Mr Padraig Kiernan (Ballinalee Pig Farm) located 2.3km southeast of the application site.

8.6.2 Characteristics of the Development

The proposed development measures a total area of 18.6 hectares which will consist an extraction area measuring 14.2 hectares and a manufacturing area measuring 2.1 hectares comprising of a concrete batching plant, block yard, processing plant, office buildings, settlement lagoon and all other associated ancillary facilities. The remaining land (2.3ha) consists of access roads and landscaped area.

Overburden will be removed in phases prior to extraction of underlying material and will be used in the construction of berms around the perimeter of the site. Overburden may also be used in restoration of the quarry once work has ceased.

Material will be extracted down to a level of 20.0mOD. Extraction of material will mainly be carried out by blasting means. Occasionally, rock breaking may be required on site. It is proposed that material will be extracted at a maximum rate of 400,000 tonnes/annum. Once extracted, material will be loaded onto dump trucks using an excavator. Material will be transported along internal haul roads to the proposed manufacturing area where it will be processed into various grades of aggregate using crushing and screening plant. Material may also be used in the manufacturing of ready-mix concrete at the proposed concrete batching plant.

Products will be transported off site to market via a proposed road which will connect the site to the L5097 and onto the R194 regional road. It is proposed that the development will generate an Annual Average Daily Traffic (AADT) of 73 loads/day.

Water management on site will be as follows: a sump will be constructed on the quarry floor which will collect all excess surface water. Water will be retained for a period of time to allow suspended solids to settle. Water will then be pumped to the proposed settlement lagoon which will be constructed at the proposed manufacturing area. Water at the settlement lagoon will be used in the day-to-day operations of the quarry such as manufacturing of ready-mix concrete, aggregate washing or dust suppression. Water which is not required will be discharged off site. An application for a water discharge licence will be made to Longford Co. Co. if planning permission for the subject development is secured.

For security reasons, very little fuel will be stored at the quarry. A small volume of fuel will be stored in a bunded fuel storage tank which will be located close to the site office. Fuel will be delivered to the quarry by competent oil companies and dispensed into plant and machinery, at a designated refuelling location.

It is proposed that the operating hours at the development will be 07:00-19:00 Monday to Friday and 07:00-16:00 on Saturdays. The development will not operate on Sundays or Public Holiday. The proposed development will provide employment for approximately 30 people directly with further people employed indirectly (e.g., sub-contractors for blasting).

8.6.3 Regional & Local Climate

The Irish regional climate is subject to strong maritime influences, the effects decreasing with increasing distance from the Atlantic coast. The climate is typical of the Irish climate, which is temperate maritime, characterized by mild temperatures, high levels of precipitation, and relatively consistent weather patterns influenced by the North Atlantic Drift, an extension of the Gulf Stream. Over the summer months the influence of anti-cyclonic weather conditions on the western and north-western region results in dry continental air interspersed by the passage of Atlantic frontal systems.

During much of the winter period the climate is characterised by the passage of Atlantic low-pressure weather systems and associated frontal rain belts. Occasionally the establishment of a high-pressure area or anticyclone over Ireland results in calm conditions and during the winter months these are characterised by clear skies and the formation of low-level temperature inversions with light wind conditions at nighttime. Winters are generally mild, and summers are cool, with average temperatures ranging from around 4°C in winter to 15°C in summer.

Climate change is expected to bring significant changes to Ireland's climate and weather patterns. The increase in greenhouse gas concentrations, primarily carbon dioxide (CO_2) and methane (CH_4), is contributing to global warming and altering the Earth's climate systems.

Ireland's temperate maritime climate is expected to undergo significant changes in the coming decades due to climate change and increased greenhouse gas concentrations.

Table 8.1: Summary of observed and projected climate changes and impacts for Ireland.

Parameter	Observed	Projected	Example of Biophysical Impacts
Temperature	Average temperatures have increased by 0.8°C since 1900. The number of warm days (over 20°C) has increased while the number of cold days (below 0°C) has decreased.	Projections indicate an increase in average temperatures across all seasons (0.9-1.7°C). The number of warm days is expected to increase and heat waves are expected to occur more frequent	Incidences of cold stress are likely to decrease while incidences of heat stress will increase. The duration of the growing season will increase, occurring earlier and extending farther.
Precipitation	Increase in average annual national rainfall of approximately 60mm in the period 1981-2010, compared to period 1961-1990. The largest increases are observed over the west of the country.	Significant reductions are expected in average levels of annual rainfall. Projections indicate a substantial increase in the frequency of heavy precipitation events in Winter and Autumn	The increased occurrence of dry spells will result in increased pressure on water supply. An increase in the frequency of extreme precipitation events will result in increased flood risk.
Wind Speeds and Storms	No long-term change in average wind speed. The number and intensity of storms in the North Atlantic has increased by approx. three storms per decade since 1950.	Projections indicate an overall decrease in wind speed. The number of very intense storms is projected to increase over the North Atlantic region. Projections suggest that the winter storms may extend over Ireland more often.	Increases in extreme wind speeds may impact on wind turbines and the continuity of power supply. Infrastructure will be at risk due to the increased occurrence of intense storms.
Sea Level and Sea Surface Temperature	Sea level measurements from Newlyn, in southwest England, show a sea level rise of 1.7cm per decade since 1916. Sea surface temperatures have increased by 0.85°C since 1950, with 2007 the warmest year in Irish coastal records.	Sea levels will continue to rise for all coastal areas, by up to 0.8 m by 2100. Sea surface temperatures are projected to continue warming. Projections indicate a warming of 1.9°C by the end of the century	Significant increase in areas at risk of coastal inundation and erosion. Increased risk to coastal aquifers and water supply. Change in distribution of fish species. Implications for fisheries and aquaculture industries.

Rising temperatures, will alter precipitation patterns, sea level rise, and increased storm intensity. These are some of the key challenges that Ireland will likely face. As a result, it is crucial for the country to continue its efforts to both mitigate and adapt to these changes in order to minimize the negative impacts on its environment, economy, and society.

Table 8.1 summarises climate impact projections for Ireland. Estimates of projections confidence are derived from published projection data from the National Adaptation Framework 2018.

The closest Met Eireann Synoptic Station to the proposed development is at Mullingar which is located approximately 36km to the southeast of the application site. The climate for the period of 2001 to 2003 together with the 30 year average (LTA) is tabulated in Table 8.2 below. Parameters recorded at the station include temperature, relative humidity, sunshine and wind speed and direction.

Table 8.2: Monthly & Annual Mean Weather at Mullingar Station

Total rainfall in millimetres

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2024	83.1	91.9	117.3	63.9									356.2
2023	81.1	29.8	141.4	82.8	36.4	53.3	178.8	114.3	132.9	104.5	71.2	132.0	1158.5
2022	47.6	131.8	46.2	48.7	53.4	100.6	31.6	35.2	104.1	208.8	109.3	84.5	1001.8
2021	126.9	80.3	80.9	25.5	107.4	17.4	74.9	142.1	58 1	97.7	41.6	128.0	980.8
LTA	92.5	70.3	76.6	65.9	69.2	73.8	71.1	86.1	78.3	104.3	88.1	94.7	970.9

Mean temperature in degrees Celsius

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2024	4.4	7.0	7.0	9.0									6.5
2023	5.3	6.8	6.9	8.7	12.3	15.9	14.5	15.3	14.3	10.8	6.8	6.5	10.4
2022	5.1	6.2	6.6	8.1	12.0	13.5	16.2	15.5	12.9	11.3	8.2	3.4	9.9
2021	3.3	5.6	7 .4	7.0	9.3	13.8	17.1	14.9	14.5	11.4	7.8	6.3	9.9
LTA	4.6	4.7	6.3	7.9	10.6	13.2	15.0	14.6	12.6	9.5	6.6	4 7	9.

Mean 10cm soil temperature at 0900 UTC

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2024	3.9	6.2	6.6	n/a									5.6
2023	5.0	6.3	6.4	9.2	13.9	16.9	16.1	16.1	14.9	11.2	7.4	6.4	10.8
2022	5.2	5.8	5.6	8.3	12.8	14.5	17.0	16.3	13.9	11.1	8.0	4.3	10.3
2021	3.6	4.7	6.8	7.8	10.5	15.1	17.7	15.8	15.2	11.7	8.2	6.3	10.3
LTA	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	

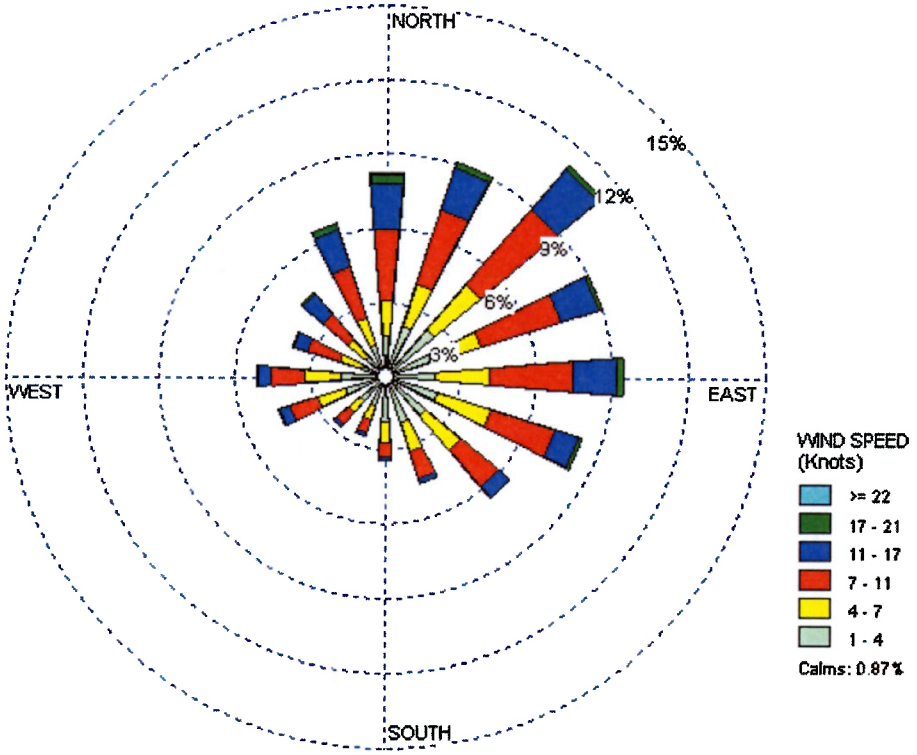
Evaporation (mm)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2024	13.8	22.7	44.1	30.9									111.5
2023	12.4	23.6	43.8	76.5	116.2	133.4	102.2	95.1	62.8	32.9	13.4	12.1	724 4
2022	12.1	25.1	58.0	78.0	107.1	108.2	111.8	111.5	60.5	35.3	16.9	8.0	732.5
2021	8.5	26.9	46.1	81.4	102.1	115.9	120.8	83.4	55.7	34.9	14.9	12.1	702.7
LTA	13.8	25.2	461	75.5	103.7	113.0	109.2	89.4	61.4	32.3	14.2	9.7	693.5

%

The prevailing wind direction for the area blows from a westerly, south westerly direction as presented in the windrose for the Mullingar Met Station is illustrated in Plate 8.1. According to the windrose, the predominant wind direction is from a south easterly direction which is the prevailing wind direction in Ireland.

Plate 8.1: Mullingar Windrose Detailing Wind Speed and Direction (Blowing to)



The moderating influence of the Atlantic Ocean is felt throughout Ireland. The annual mean temperature for different areas in Ireland varies between mountainous regions, lowlands and the coast. Mean daily maximum temperatures are typically between 13.7 to 16.01° C and mean daily minimum temperatures are typically between 5.55 to 7.58° C for the area surrounding Mullingar weather station, refer to Table 8.2. There has been a steady increase in mean daily minimum temperature from 2012 to 2023. Trends are less apparent in the mean daily maximum temperature and mean daily rainfall.

8.7 Impact Assessment

There are no specific tools developed for assessing climate change for the extraction industry. The Institute of Environmental Management and Assessment (IEMA) published a document in 2020 called Environmental Impact Assessment Guide to: Climate Change Resilience & Adaptation. The climate change risk assessment outlined by IEMA in their report will be used to assess the how the proposed development vulnerabilities to climate change.

The following steps are used to carry out the assessment:

- identifying potential climate change risks to a scheme or project;
- assessing these risks (potentially prioritising to identify the most severe)
- Formulating mitigation actions to reduce the impact of the identified risks.

The guidance note states:

> *'Definitions of likelihood and magnitude will vary from scheme to scheme and should be tailored to a specific project. It is not within the scope of this guidance to prescribe a single approach to the assessment of likelihood and magnitude of climate impacts.'*

Table 8.3 shows the severity scores used in Canadian Risk Assessment methodology PIEVC. This severity scoring system will be used as part of the assessment on the proposed development.

Table 8.3: Severity Score

Score	Severity
0	Negligible or Not Applicable
1	Very Low/Unlikely/Rare/Measurable Change
2	Low/Seldom/Marginal/Change in Serviceability
3	Occasional Loss of Some Capacity
4	Moderate Loss of Some Capacity
5	Likely Regular/Loss of Capacity and Loss of Some Function
6	Major/Likely/Critical Loss of Function
7	Extreme/Frequent/Continuous/Loss of Asset

Table 8.4 shows the probability scores used in Canadian Risk Assessment methodology PIEVC. This probability scoring system will be used as part of the assessment on the proposed development.

Table 8.4: Probability Score

Score	Probability	
0	<0.1%	< 1 in 1,000
1	1%	1 in 100
2	5%	1 in 20
3	10%	1 in 10
4	20%	1 in 5
5	40%	1 in 2.5
6	70%	1 in 1.4
7	>99%	> 1 in 1.01

Table 8.5: Risk Based Matrix

Severity								
7	0	7	14	21	28	35	42	49
6	0	6	12	18	24	30	36	42
5	0	5	10	15	20	25	30	35
4	0	4	8	12	16	20	24	28
3	0	3	6	9	12	15	18	21
2	0	2	4	6	8	10	12	14
1	0	1	2	3	4	5	6	7
0	0	0	0	0	0	0	0	0
	0	1	2	3	4	5	6	7

Probability

Low Risk Medium Risk High Risk

The assessment results are shown in Table 8.6 which shows the weather events that have potential to impact the proposed development. The assessment shows risk of different weather events/unplanned events impacting the proposed development.

Table 8.6: Show the Results of the Climate Change Risk Assessment

Weather Event	Probability Score	Severity	Risk Rating	Risk Category
Temperature Extremes	4	1	4	Low risk
Flooding	3	3	9	Low risk
High Wind Speeds	3	2	6	Low risk
Fire	1	5	5	Low risk
Landslide	1	4	4	Low risk
Lightning	2	3	6	Low risk

8.7.1.1 Mitigating Measures

The mitigation measures proposed are designed to increase the resilience of the proposed development to climate change, unplanned events and increased extreme weather events. The mitigation measures increase the projects capacity to absorb climate change related weather events. Based on the climate change risk assessment mitigation measure to improve the resilience of the proposed development are provided in Table 8.7.

Table 8.7: Mitigation Measures Related to Weather Events

Weather Event	Risk of Likely Effects	Mitigating measures
Flooding	Flooding from rising groundwater levels and extreme rainfall events could result in asset damage, with the potential for subsequent loss of containment of fuel or other substances stored and handled on Site. The frequency of these natural events could increase as a result of climate change.	No additional mitigation proposed
High Wind Speeds	Potential accidents caused by severe winds could Include impact damage from windblown debris.	The Proposed Development will be designed in accordance with the appropriate geotechnical design standards to withstand the forces generated by wind on the systems and structures.
Temperatures Extremes	Fluctuations in temperature might lead to a need for more frequent maintenance or upgrades of equipment to handle these extremes	No additional mitigation proposed.
Lightning	Direct or indirect lightning strikes have the potential to cause a major accident due to electrical energy which can result in fires and equipment damage. This can cause harm to people working at the Proposed Development, damage to the Site infrastructure and harm to the environment in the event of a major fire. Lightning could also present a source of ignition to flammable materials resulting in a major fire. which could harm people both onsite and offsite.	Safety in design is the key mitigation and the proposed development will be constructed in accordance with all relevant safety codes, standards and Directives.

8.7.2 Construction Phase

The construction phase of the proposed development will consist of the levelling of the manufacturing area where the concrete batching plant, processing plant, block yard area and settlement lagoon will be located, erection of the concrete batching plant and processing plant, construction of a concrete block yard area and settlement lagoon. The construction works associated with the proposed development will take approximately 6-12 months to complete.

8.7.2.1 Direct Effect

Due to the low level of activity and length of time associated with this phase of the development, plant and machinery operating during the construction phase will lead to a temporary, negative, imperceptible effect in a localised area.

8.7.2.2 Indirect Effect

No indirect impacts are envisaged.

8.7.2.3 Mitigation

- All construction vehicles and plant will be maintained in good operational order while onsite, thereby minimising any emissions that arise.
- The majority of aggregate and concrete materials for the construction of the proposed development will be sourced from the existing quarry which is only a short distance from the application site.
- Strict adherence to 'good site/engineering practices' such as switching off all vehicles and plant when not in use.

8.7.2.4 Residual Impacts

No significant, long-term, adverse residual impacts are predicted.

8.7.3 Operational Phase

The operational phase involves the extraction and processing of rock from the quarry and the production of concrete which is broken down as follows.

- Office

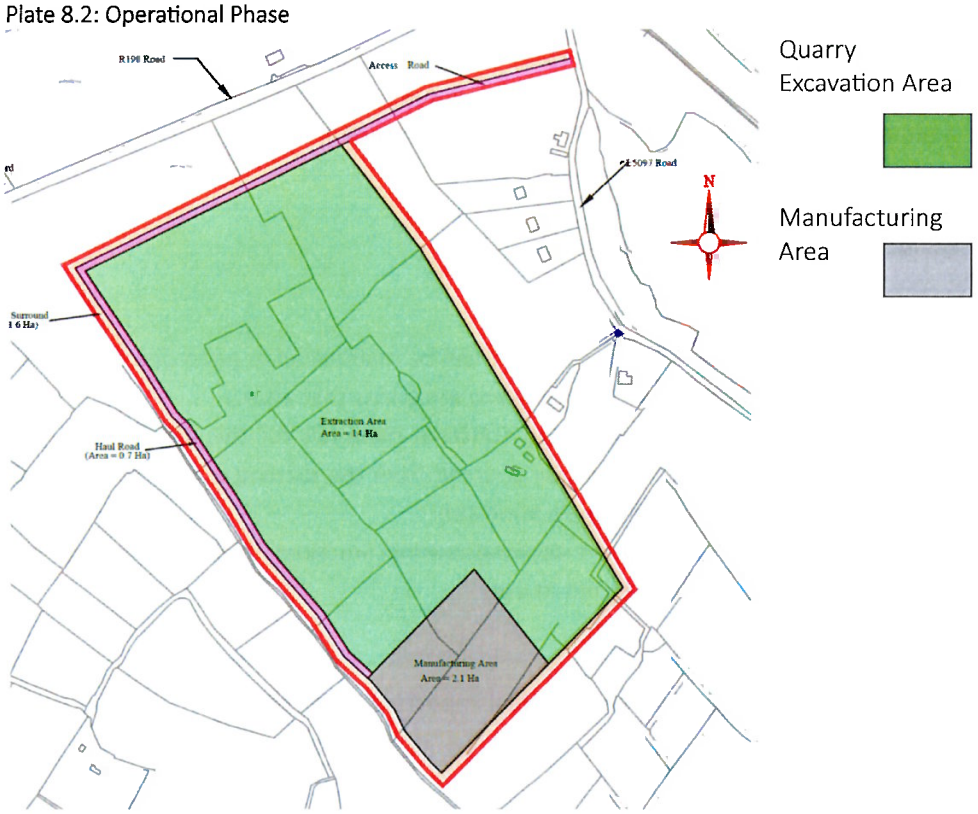
Office facilities within the site will consume 10,000 kWh of energy annually, resulting in 3.01 tCO2e emissions.

- Aggregate Production

For the aggregate exported off-site, 1553.72 tCO_2e. is emitted during the processing phase. This assumes an annual extraction quantity of 350,000 tonnes and that the aggregate will be reused off-site. Additionally, the transport emissions associated with exporting the aggregate off-site via Heavy Goods Vehicles (HGVs) amount to 724.2 tCO_2e. The HGVs are estimated to travel a distance of 675,000 km annually. The emissions caused by employees travelling to the site is 33.24 tCO_2e., assuming there is 10 employees each travelling 50km each day.

Therefore, the total emissions due to aggregate production is 2,311.16 tCO2e

Plate 8.2: Operational Phase



- Concrete Production

For the concrete exported off-site we have taken the output capacity of the concrete production plant as 10,000 m^3/year. Based on this output, 4,100 tCO2e. is emitted per year during the processing phase. Additionally, the transport emissions associated with exporting the concrete off-site via Heavy Goods Vehicles (HGVs) amount to 72.5 tCO2e. The concrete HGVs are estimated to travel a distance of 150,000 km annually. The total emissions due to concrete production and delivery is estimated at 4,172.5 tCO2e.

Therefore, the total emissions generated by the operational phase of the project is 6,483.66 tCO2e. per year over a 25 year period.

8.7.3.1 Direct Impact

Plant and machinery carrying out day-to-day activities associated with the extraction, processing, production of concrete products will generate exhaust emissions which will result in a slight, long term, negative effect in a localised area.

8.7.3.2 Indirect Effect

No indirect impacts are envisaged.

8.7.3.3 Mitigation

The following mitigation measures will be practiced at the proposed development in order to limit the effects of the development on the local and regional climate:

- Strict adherence to 'good site/engineering practices' such as switching off all vehicles and plant when not in use.
- Plant will be serviced regularly to ensure efficient fuel consumption.
- Energy consumption and emission volumes will be considered when purchasing new plant and vehicles.
- It is proposed to implement energy audits in order to assess energy requirements and areas where energy usage can be reduced which will lead to a reduction in greenhouse gas emissions.

8.7.3.4 Residual Impacts

No significant, long-term, adverse residual impacts are predicted.

8.7.4 Decommissioning Phase and After Use

The decommissioning phase involves the removal of plant and machinery and Planting of side slopes. The bottom of the quarry will be allowed to fill with water to create a freshwater lake.

Plate 8.3: Decommissioning and After Use

Final decommissioning and after use will allow the quarry to fill with water to form a freshwater lake and amenity area

It is proposed that where possible the site will be planted with native woodland. The screening berms and landscape planting area will be retained resulting in the drawdown of tCO_2e.

8.7.4.1 Direct Impact

Plant and machinery carrying out activities associated with the decommissioning phase will result in a temporary, negative, imperceptible effect in a localised area.

8.7.4.2 Indirect Effect

No indirect impacts are envisaged.

8.7.4.3 Mitigation

Mitigation measures proposed for the decommissioning phase and after use are the same as the operational phase:

- Strict adherence to 'good site/engineering practices' such as switching off all vehicles and plant when not in use.
- Plant will be serviced regularly to ensure efficient fuel consumption.

- Energy consumption and emission volumes will be considered when purchasing new plant and vehicles.
- It is proposed to implement energy audits in order to assess energy requirements and areas where energy usage can be reduced which will lead to a reduction in greenhouse gas emissions.

8.7.4.4 Direct Impact

Plant and machinery carrying out activities associated with the decommissioning phase will result in a temporary, negative, imperceptible effect in a localised area.

8.7.4.5 Indirect Effect

No indirect impacts are envisaged.

8.7.5 Cumulative Effect

Other potential contributors to climate in the study area include road traffic and agriculture. The cumulative effect is assessed as a temporary, negative, slight effect in a localised area.

8.7.6 Transboundary Effect

There will be no transboundary impact associated with the decommissioning phase of the proposed development.

8.7.7 "Do Nothing" Effect

If the proposed development were not to proceed, the site would remain as a greenfield site.

8.7.8 "Worst Case" Effect

In terms of climate, the use of poorly maintained, inefficient, diesel-powered plant and machinery would generate emissions in excess of that expected from a normal operating quarry.

8.8 Technical Difficulties

No technical difficulties were encountered.

8.9 Monitoring

It is proposed to implement energy audits in order to assess energy requirements and areas where energy usage can be reduced which will lead to a reduction in greenhouse gas emissions.

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Appendices

Appendix 9.1 - Ambient Air Quality Standards.
Appendix 9.2 – Emission Factors.

9.0 AIR QUALITY

9.1 Introduction

This chapter assesses the likely impact on air quality and climate associated with the proposed development at a greenfield site in Rhyne, Co. Longford. The proposed site is 18.55 ha and comprises an extraction area (14.2 ha) and a manufacturing area (2.1 ha). The proposed development will involve the extraction of material down to a level of 20mOD.

This chapter was completed by Ciara Nolan, an environmental consultant in the air quality section of AWN Consulting Ltd. She holds an MSc. (First Class) in Environmental Science from University College Dublin and has also completed a BSc. in Energy Systems Engineering. She is an Associate Member of both the Institute of Air Quality Management (AMIAQM) and the Institution of Environmental Science (AMIEnvSc). She has been active in the field of air quality for over 4 years, with a primary focus on consultancy.

9.2 Methodology

9.2.1 Criteria for Rating of Impacts

The rating of potential environmental effects of the development on air quality and climate is based on the criteria presented in Table 3.3 of the EPA (2022) document titled *"Guidelines on the Information to Be Contained in Environmental Impact Assessment Reports"*. These criteria consider the quality, significance, duration and types of effect characteristics identified.

Ambient Air Quality Standards

In order to reduce the risk to health from poor air quality, national and European statutory bodies have set limit values in ambient air for a range of air pollutants. These limit values or "Air Quality Standards" are health or environmental-based levels for which additional factors may be considered. The applicable standards in Ireland include the Air Quality Standards Regulations 2011, which incorporate EU Directive 2008/50/EC (see Table 9-1). The ambient air quality standards applicable for PM_{10} and $PM_{2.5}$ are outlined in this Directive. These standards have been used in the current assessment to determine the potential impact of PM_{10} and $PM_{2.5}$ emissions from the development on air quality.

There are no statutory limits on dust deposition and the focus is on the prevention of nuisance and minimising air borne dust emissions where practicable. Although coarse dust is not regarded as a threat to health, it can create a nuisance by depositing on surfaces. No statutory or official air quality criterion for dust annoyance has been set in Ireland, UK, Europe or at World Health Organisation level.

The most commonly applied guideline is the German TA Luft (German VDI, 2002) guideline of 350 mg/(m^2*day) as measured using Bergerhoff type dust deposit gauges as per the German Standard Method for determination of dust deposition rate (VDI 2119). This is commonly applied to ensure that no nuisance effects will result from specified industrial activities. Below these thresholds dust problems are considered less likely. Dust deposition is normally measured by gravimetrically determining the mass of particulates and dust deposited over a specified surface area over a period of one month (30 days +/- 2 days).

Recommendations outlined by the Department of the Environment, Heritage & Local Government (2004), apply the Bergerhoff limit of 350 mg/(m^2*day) to the land ownership boundary of quarries. This standard can be applied to the development in regard to dust deposition.

Table 9-1: Air Quality Standards 2011 & TA Luft

Pollutant	Regulation Note 1	Limit Type	Value
Particulate Matter (as PM_{10})	2008/50/EC	24-hour limit for protection of human health - not to be exceeded more than 35 times/year	50 µg/m^3
		Annual limit for protection of human health	40 µg/m^3
Particulate Matter (as $PM_{2.5}$)	2008/50/EC	Annual limit for protection of human health	25 µg/m^3
Dust deposition (non-hazardous dust)	TA Luft (German VDI 2002)	Average daily dust deposition at the boundary of the site	350 mg/(m^2*day) Total Dust

Note 1 EU 2008/50/EC – Clean Air For Europe (CAFÉ) Directive replaces the previous Air Framework Directive (1996/30/EC) and daughter directives 1999/30/EC and 2000/69/EC

Climate Agreements

Ireland is party to both the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol. The Paris Agreement, which entered into force in 2016, is an important milestone in terms of international climate change agreements and includes an aim of limiting global temperature increases to no more than 2°C above pre-industrial levels with efforts to limit this rise to 1.5°C. The aim is to limit global GHG emissions to 40 gigatonnes as soon as possible whilst acknowledging that peaking of GHG emissions will take longer for developing countries. Contributions to GHG emissions will be based on Intended

Nationally Determined Contributions (INDCs) which will form the foundation for climate action post 2020. Significant progress was also made in the Paris Agreement on elevating adaption onto the same level as action to cut and curb emissions.

In order to meet the commitments under the Paris Agreement, the EU enacted *Regulation (EU) 2018/842 on binding annual greenhouse gas emission reductions by Member States from 2021 to 2030 contributing to climate action to meet commitments under the Paris Agreement and amending Regulation (EU) No. 525/2013* (the Regulation). The Regulation aims to deliver, collectively by the EU in the most cost-effective manner possible, reductions in GHG emissions from the Emission Trading Scheme (ETS) and non-ETS sectors amounting to 43% and 30%, respectively, by 2030 compared to 2005. Ireland's obligation under the Regulation is a 30% reduction in non-ETS greenhouse gas emissions by 2030 relative to its 2005 levels.

In 2015, the Climate Action and Low Carbon Development Act 2015 (No. 46 of 2015) (Government of Ireland, 2015) was enacted (the Act). The purpose of the Act was to enable Ireland *'to pursue, and achieve, the transition to a low carbon, climate resilient and environmentally sustainable economy by the end of the year 2050'* (3.(1) of No. 46 of 2015). This is referred to in the Act as the *'national transition objective'*. The Act made provision for a national mitigation plan, and a national adaptation framework. In addition, the Act provided for the establishment of the Climate Change Advisory Council with the function to advise and make recommendations on the preparation of the national mitigation and adaptation plans and compliance with existing climate obligations.

The *Climate Action Plan* (CAP) (Government of Ireland, 2019), published in June 2019, outlines the current status across key sectors including Electricity, Transport, Built Environment, Industry and Agriculture and outlines the various broadscale measures required for each sector to achieve ambitious decarbonisation targets. The CAP also details the required governance arrangements for implementation including carbon-proofing of policies, establishment of carbon budgets, a strengthened Climate Change Advisory Council and greater accountability to the Oireachtas. The CAP has set a built environment sector reduction target of 40 - 45% relative to 2030 pre-NDP (National Development Plan) projections. There are no targets specific to the mining, quarrying or extractive industry.

Following on from Ireland declaring a climate and biodiversity emergency in May 2019 and the European Parliament approving a resolution declaring a climate and environment emergency in Europe in November 2019, the Government approved the publication of the General Scheme for the Climate Action (Amendment) Bill 2019 in December 2019

(Government of Ireland, 2019) followed by the publication of the Climate Action and Low Carbon Development (Amendment) Act 2021 (S.I. 32 of 2021) (hereafter referred to as the 2021 Climate Act) (Government of Ireland, 2021). The 2021 Climate Act was prepared for the purposes of giving statutory effect to the core objectives stated within the CAP.

The purpose of the 2021 Climate Act is to provide for the approval of plans *'for the purpose of pursuing the transition to a climate resilient and climate neutral economy by the end of the year 2050'*. The 2021 Climate Act will also *'provide for carbon budgets and a decarbonisation target range for certain sectors of the economy'*. The 2021 Climate Act defines the carbon budget as *'the total amount of greenhouse gas emissions that are permitted during the budget period'*.

The 2021 Climate Act removes any reference to a national mitigation plan and instead refers to both the Climate Action Plan, as published in 2019 which has since been amended with the 2024 plan currently in place, and a series of National Long Term Climate Action Strategies. In addition, the Environment Minister shall request each local authority to make a 'local authority climate action plan' lasting five years and to specify the mitigation measures and the adaptation measures to be adopted by the local authority.

9.2.2 Dispersion Modelling Methodology

The methodology used as part of this assessment involved undertaking a desk-based study to examine all relevant information relating to air quality conditions in the vicinity of the application site.

The air quality assessment has been carried out following procedures described in the publications by the EPA (EPA, 2015, 2017, 2020a) and using the methodology outlined in the guidance documents published by the USEPA (USEPA, 2004, 2005, 2019). The air dispersion modelling input data consisted of information on the physical environment, design details from all emission sources on-site and five full years of meteorological data. Using this input data the model predicted ambient ground level concentrations and deposition rates beyond the land ownership boundary for each hour of the modelled meteorological years. The model post-processed the data to identify the location and maximum of the worst-case ground level concentration. This worst-case concentration and deposition rate was then added to the background concentration and deposition rate to give the worst-case predicted environmental concentration (PEC) and deposition flux. The PEC was then compared with the relevant ambient air quality standard to assess the significance of the releases from the site.

In order to assess the dust deposition flux at the land ownership boundary, and the PM_{10} and $PM_{2.5}$ concentrations associated with the quarrying activities at sensitive locations beyond the land ownership boundary, air dispersion modelling was undertaken. Modelling using the United States Environmental Protection Agency (USEPA) new generation dispersion model AERMOD (USEPA 2019) (version 21112) was used as recommended by the USEPA (USEPA 2017). The model is a steady-state Gaussian plume model used to assess pollutant concentrations associated with industrial sources. The model has been designated as the regulatory model by the USEPA for modelling emissions from industrial sources in both flat and rolling terrain (USEPA 2017). The AERMET meteorological pre-processor (USEPA 2018) was used to generate hourly boundary layer parameters for use by AERMOD. Dust generation rates were calculated from factors derived from empirical assessment and detailed in the USEPA database entitled "*Compilation of Air Pollution Emission Factors*", Volume 2, AP-42 (1986, updated periodically) (USEPA 1986). The emission factors have been presented in Appendix 9.2.

Process Emissions

Quarrying activities typically emit dust. Dust is characterised as encompassing particulate matter with a particle size of between 1 and 75 microns (1-75µm). Deposition typically occurs in close proximity to the site and potential impacts generally occur within 500 metres of the dust generating activity as dust particles fall out of suspension in the air. Larger particles deposit closer to the generating source and deposition rates will decrease with distance from the source. Sensitivity to dust depends on the duration of the dust deposition, the dust generating activity, and the nature of the deposit. Therefore, a higher tolerance of dust deposition is likely to be shown if only short periods of dust deposition are expected and the dust generating activity is either expected to stop or move on.

The potential for dust to be emitted will depend on the type of activity being carried out in conjunction with environmental factors including levels of rainfall, wind speed, wind direction and dust prevention measures in place. This chapter identifies and quantifies the dust sources from the pit.

The overall application area is 18.6 ha, with an extraction area of 14.2 ha. The site will be accessed via an access road directly off the L5097 which connects directly to the R194 regional road.

It is proposed to extract up to a maximum of 400,000 tonnes of material per annum from the quarry. The material to be extracted is a mix of limestone and shale. This extraction rate has been used in order to estimate the impact of the quarry in the surrounding environment.

There is predicted to be up to 73 truck movements in and out of the site per day. For the purposes of this assessment an estimate of 6 truck movements in and out of the site per hour has been assumed. The hours of operation at the site will be Monday to Friday 07:00 to 19:00 and Saturday 07:00 to 16:00. These hours have been used for the purpose of the assessment.

The following operations will be the main dust generating sources or activities at the site:

- Topsoil removal of proposed extraction area
- Movement of empty trucks along paved public roads
- Movement of empty trucks along unpaved haul roads
- Extraction of material
- Screening of material
- Stockpiling of material
- Loading of material
- Movement of full trucks along unpaved haul roads
- Movement of full trucks along paved public roads
- Wind erosion at dump areas, stockpiles and exposed pit surface
- Concrete batching within manufacturing area
- Manufacturing of concrete blocks

The formulae and emission rates for the onsite activities are outlined in Appendix 9.2.

Dust Generation Rates

Dust generation rates depend on the site activity, particle size, the moisture content of the material and weather conditions. Dust emissions are dramatically reduced where rainfall has occurred due to the cohesion created between dust particles and water and the removal of suspended dust from the air. It is typical to assume no dust is generated under "wet day" conditions where rainfall greater than 0.2mm has fallen.

Large particle sizes (greater than 75 microns) fall rapidly out of atmospheric suspension and are subsequently deposited in close proximity to the source. Particle sizes of less than 75 microns are of interest as they can remain airborne for greater distances and give rise to potential dust nuisance at the sensitive receptors. This size range would broadly be described as silt. Emission rates are normally predicted on a site-specific particle size distribution for each dust emission source. In the absence of such information, the particle size distribution outlined in AP-42 Appendix B.2.2 for Category 3 (mechanically generated

aggregate) (USEPA 1986) has been used and is outlined in Table 9-2. The moisture content of the extracted limestone has been estimated at 2.1%.

Table 9-2: Category 3 Mechanically Generated Aggregate Taken From AP-42 (USEPA 1986)

Cumulative % ≤ Stated Size	Particle Size, µm	Minimum Value	Maximum Value	Standard Deviation
4	1.0	-	-	-
11	2.0	-	-	-
15	2.5	3	35	7
18	3.0	-	-	-
25	4.0	-	-	-
30	5.0	-	-	-
34	6.0	15	65	13
51	10.0	23	81	14

Dust deposition typically occurs in close proximity to the dust-generating source. The immediate vicinity of the site is a predominantly rural area. There are a low number of sensitive locations present which can be affected by dust deposition. There are approximately 29 houses within 500m of the overall land ownership boundary. Generally, the potential for severe dust impacts is greatest within 100m of dust generating activities, though residual impacts can occur for distances beyond 100m.

A receptor grid was created at which concentrations would be modelled. The receptor grid was based on a Cartesian grid with the site at the centre. The inner grid measured 2.5km x 2.5km with the site at the centre and concentrations calculated at 62.5 m intervals. The outer grid measured 5km x 5km with the site at the centre and with concentrations calculated at 250 m intervals. Boundary receptor locations were also placed along the land ownership boundary of the site, at 25 m intervals. Nearby sensitive residential properties were also added to the model as discrete receptors giving a total of 2,319 calculation points for the model. Receptors were modelled at a height of 1.5m to represent breathing height. The modelling has investigated the deposition and concentrations of dust, PM_{10} and $PM_{2.5}$ for the activities outlined above.

9.2.3 Road Traffic

There is the potential for emissions from road vehicles accessing the site to impact air quality and climate. Pollutants such as NO_2, PM_{10}, $PM_{2.5}$ and CO_2 are emitted from road vehicles.

The UK Highways Agency guidance *LA 150* (2019a) states the following scoping criteria shall be used to determine whether the air quality impacts of a project can be scoped out or

require an assessment based on the changes between the do something traffic (with the project) compared to the do minimum traffic (without the project):

- Annual average daily traffic (AADT) changes by 1,000 or more;
- Heavy duty vehicle (HDV) AADT changes by 200 or more;
- A change in speed band;
- A change in carriageway alignment by 5m or greater.

The following scoping criteria from the UK DMRB climate guidance document *LA 114 Climate* (UK Highways Agency 2019b) are used to determine whether a detailed climate assessment is required for a proposed project during the operational stage:

- A change of more than 10% in AADT;
- A change of more than 10% to the number of heavy duty vehicles; and
- A change in daily average speed of more than 20 km/hr.

If any of the road links impacted by a proposed development meet any of the above criteria, then a detailed assessment is required.

The above scoping criteria for both air quality and climate have been used in the current assessment to determine whether the impacted road links require modelling. The proposed development will generate an Annual Average Daily Traffic (AADT) of 73 loads/day. Therefore, the change in traffic is significantly below the assessment criteria outlined above and therefore a detailed modelling assessment was not required as impacts are predicted to be imperceptible.

9.3 Existing Environment

9.3.1 Meteorological Conditions

Meteorological conditions significantly affect the level of dust emissions and subsequent deposition downwind of the source. The most significant meteorological elements affecting dust deposition are rainfall and wind-speed. High levels of moisture either retained in soil or as a result of rainfall help suppress the generation of dust due to the cohesive nature of water between dust particles. Rain also assists in removing dust from the atmosphere through washout. Wind can lift particles up into the air and transport the dust downwind as well as drying out the surface. The worst dust deposition conditions typically occur, therefore, during dry conditions with strong winds.

The closest representative Met Éireann synoptic station to the site is at Mullingar, Co. Westmeath, which is approximately 34 km south east of the application area.

Dust emissions are dramatically reduced where rainfall has occurred due to the cohesion created between dust particles and water and the removal of suspended dust from the air. It is typical to assume no dust is generated under "wet day" conditions where rainfall greater than 0.2 mm has fallen. Information collected from Mullingar Meteorological Station (Met Eireann, 2021) identified that typically 209 days per annum are "wet". Thus, approximately 57% of the time no significant dust generation will be likely due to meteorological conditions.

Wind frequency is also important as dust can only be dispersed by winds, and deposition of dust is a simple function of particle size, wind speed and distance. The closer the source of dust is to a receptor; the higher the potential risk of impact of dust blow. The prevailing winds in the area are north-westerly to southerly, thereby predominantly dispersing any potential dust emissions to the south-east and north of the site (see Figure 9.1). The mean monthly wind speed was approximately 3.9 m/s over the 30 year period 1979 – 2008 (more recent 30 year averages are not available).

All meteorological data referenced within this report is provided by Met Éireann (source www.met.ie) (Met Eireann, 2021).

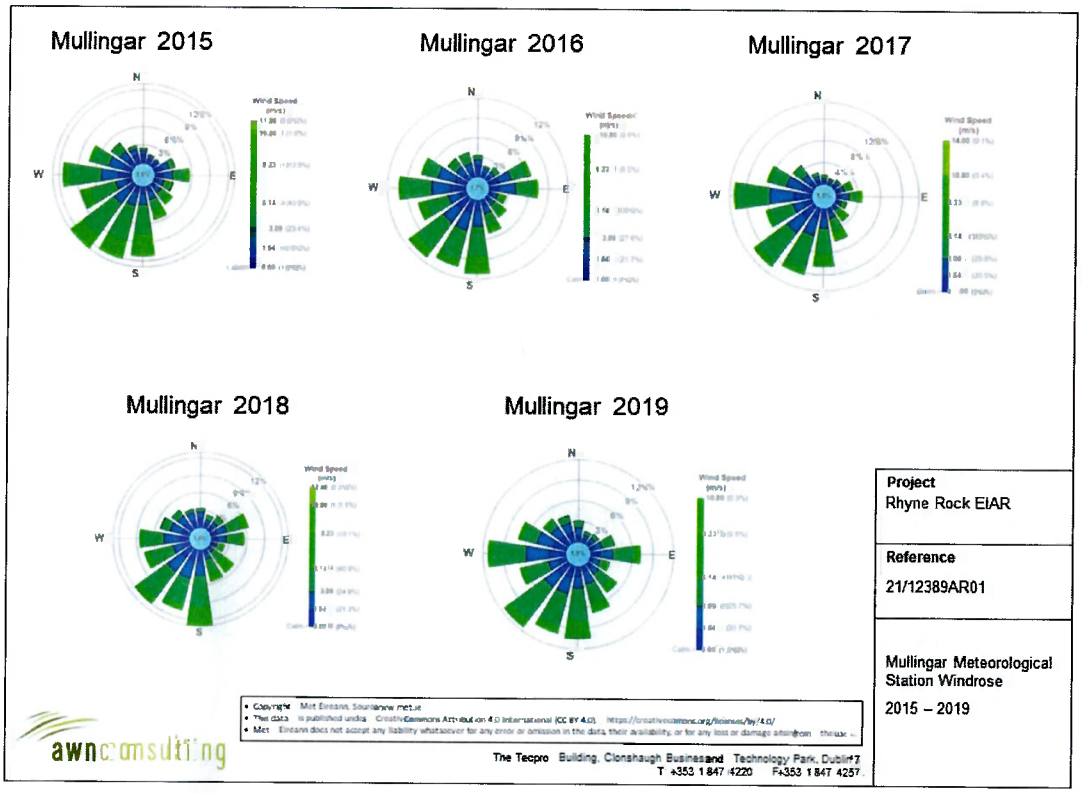

Figure 9.1: Mullingar Meteorological Station Windrose 2015 - 2019

9.3.2 Background Sources of Dust

The sources of dust arising from the site contribute to background levels of dust. Dust is present naturally in the air from a number of sources including weathering of minerals, and pick-up across open land and dust generated from fires. Monitoring of dust deposition is not currently on site as it is a greenfield location and therefore background levels for the immediate vicinity of the site are not available.

However, a study by the UK ODPM (UK ODPM, 1986) gives estimates of likely dust deposition levels in specific types of environments. In open country a level of 39 mg/(m^2*day) is typical, rising to 59 mg/(m^2*day) on the outskirts of town and peaking at 127 mg/(m^2*day) for a purely industrial area. A level of 39 mg/m^2*day can be estimated as the background dust deposition level for the region of the proposed quarry at Rhine, Killoe, Co. Longford.

9.3.3 Background Sources of PM_{10} and $PM_{2.5}$

Long-term PM_{10} monitoring was carried out at the urban Zone D locations of Castlebar and Claremorris in 2019. The average annual mean concentrations measured at the two sites were 16 µg/m^3 and 11 µg/m^3 respectively (Table 9-3). Long-term PM_{10} measurements

carried out at the rural Zone D location in Kilkitt in 2019 gave an average level of 7 µg/m^3 (EPA, 2020b). The 90.4th percentile of 24-hour results was also below the limit value of 50 µg/m^3 at all locations. Based on the above information a background concentration of 10 µg/m^3 has been used in this assessment.

In relation to the maximum 24-hour averaging period (as a 90.4th%ile), a value of 15 µg/m^3 was employed using the methodology outlined in Appendix E of AG4 (EPA, 2020a) based on average data from the rural Zone D monitoring site in Kilkitt over the period 2015 – 2019.

Table 9-3: Trends in Zone D Air Quality – PM_{10} (µg/m^3)

Station	Averaging Period	Year				
		2015	2016	2017	2018	2019
Castlebar	Annual Mean PM_{10} (µg/m^3)	13	12	11	11	16
	90th %ile 24-hr PM_{10} (µg/m^3)	22	20	19	20	24
Kilkitt	Annual Mean PM_{10} (µg/m^3)	9	8	8	9	7
	90th %ile 24-hr PM_{10} (µg/m^3)	18	15	14	15	13
Claremorris	Annual Mean PM_{10} (µg/m^3)	10	10	11	12	11
	90th %ile 24-hr PM_{10} (µg/m^3)	17	17	17	20	20

The results of $PM_{2.5}$ monitoring at the Zone D location of Claremorris over the period 2015 – 2019 (EPA, 2020b) indicated an average $PM_{2.5}/PM_{10}$ ratio ranging from 0.4 – 0.6. Based on this information, a conservative ratio of 0.65 was used to generate a background $PM_{2.5}$ concentration of 6.5 µg/m^3.

In relation to the annual averages, the ambient background concentration is added directly to the process concentration. However, in relation to the short-term peak concentration, concentrations due to emissions from elevated sources cannot be combined in the same way. Guidance from the UK DEFRA (UK DEFRA, 2016) and the EPA (EPA, 2020a) advises that for PM_{10} an estimate of the maximum combined pollutant concentration can be obtained as shown below:

PM_{10} - The 90.4th%ile of total 24-hour mean PM_{10} is equal to the maximum of either A or B below:

a) 90.4th%ile of 24-hour mean background PM_{10} + annual mean process contribution PM_{10}

b) 90.4th%ile 24-hour mean process contribution PM_{10} + annual mean background PM_{10}.

9.3.4 Dust Sensitive Receptors

There are varying degrees of dust sensitivity depending on the receptor type. Those of highest sensitivity have the greatest risk of being adversely impacted by increases in ambient dust levels. However, this principle does not always apply and variation from the standard can occur depending on local factors such as rainfall and wind direction and receptor distance from the source. Table 9-4 categorises dust sensitive receptors depending on their level of sensitivity, high, medium or low.

Table 9-4: Levels of Sensitivity per Receptor Type

High Sensitivity	Medium Sensitivity	Low Sensitivity
Hospitals and clinics	Schools	Farms
Retirement homes	Residential areas	Light and heavy industry
Hi-tech industries	Food retailers	Outdoor storage
Painting and furnishing	Greenhouses and nurseries	
Food processing	Horticultural land	
	Biodiversity	

The receptor types in the study area consist of medium and low sensitivity receptors consisting mainly of residential areas and farms. There are a limited number of human receptors in the vicinity of the application site in the form of occupied dwellings. There are 34 dwellings located within 500m of the landownership boundary. Vegetation, berms and the natural topography can act as breaks between the sources and the receptors. Tree lines can also act as an efficient dust filter and can be a useful dust control safeguard.

9.3.5 Climate Baseline

Anthropogenic emissions of greenhouse gases in Ireland included in the EU 2020 strategy are outlined in the most recent review by the EPA which details final emissions up to 2019 (EPA, 2021a). The data published in 2021 states that Ireland has exceeded its 2019 annual limit set under the EU's Effort Sharing Decision (ESD), 406/2009/EC1 by 6.85 Mt. For 2019, total national greenhouse gas emissions are 59.78 million tonnes carbon dioxide equivalent (Mt CO_2eq) with 45.58 MtCO_2eq of emissions associated with the ESD sectors for which compliance with the EU targets must be met. Agriculture is the largest contributor in 2019 at 35.3% of the total, with the transport sector accounting for 20.3% of emissions of CO_2.

GHG emissions for 2019 are 4.4% lower than those recorded in 2018. Emission reductions have been recorded in 6 of the last 10 years. However, compliance with the annual EU targets has not been met for four years in a row. Emissions from 2016 – 2019 exceeded the annual EU targets by 0.29 MtCO_2eq, 2.94 MtCO_2eq, 5.57 MtCO_2eq and 6.85 MtCO_2eq respectively.

Agriculture is consistently the largest contributor to emissions with emissions from the transport and energy sectors being the second and third largest contributors respectively in recent years.

The EPA 2020 GHG Emissions Projections Report for 2020 – 2040 (EPA, 2021b) notes that there is a long-term projected decrease in greenhouse gas emissions as a result of inclusion of new climate mitigation policies and measures that formed part of the National Development Plan (NDP) which was published in 2018 and the Climate Action Plan published in 2019. Implementation of these are classed as a "*With Additional Measures scenario*" for future scenarios. A change from generating electricity using coal and peat to wind power and diesel vehicle engines to electric vehicle engines are envisaged under this scenario. While emissions are projected to decrease in these areas, emissions from agriculture are projected to grow steadily due to an increase in animal numbers. However, over the period 2013 to 2020 Ireland is projected to cumulatively exceed its compliance obligations with the EU's Effort Sharing Decision (Decision No. 406/2009/EC) 2020 targets by approximately 12.2MtCO_2eq under the "With Existing Measures" scenario and under the "With Additional Measures" scenario (EPA, 2021b). The projections indicate that Ireland can meet its non-ETS EU targets over the period 2021 – 2030 assuming full implementation of the 2019 Climate Action Plan and the use of the flexibilities available.

9.4 Characteristics of the Development

The proposed development measures a total area of 18.6 hectares which will consist of the following:

- An Extraction Area measuring 14.2 hectares.
- A Manufacturing Area measuring 2.1 hectares comprising of a concrete batching plant, processing plant, office buildings, settlement lagoon and all other associated ancillary facilities.
- Access road.

Overburden will be removed in phases prior to extraction of underlying material and will be used in the construction of berms around the perimeter of the site. Overburden may also be used in restoration of the quarry once work has ceased.

Material will be extracted down to a level of 20mOD. Extraction of material will mainly be carried out by blasting means. Occasionally, rock breaking may be required on site. It is proposed that material will be extracted at a maximum rate of 400,000 tonnes/annum. Once extracted, material will be loaded onto dump trucks using an excavator. Material will be transported along internal haul roads to the proposed manufacturing area where it will be

processed into various grades of aggregate using crushing and screening plant. Material may also be used in the manufacturing of ready-mix concrete at the proposed concrete batching plant.

Products will be transported off site to market via a proposed road which will connect the site to the L5097 and onto the R194 regional road. It is proposed that the development will generate an Annual Average Daily Traffic (AADT) of 73 loads/day.

Water management on site will be as follows: a sump will be constructed on the quarry floor which will collect all excess surface water. Water will be retained for a period of time to allow suspended solids to settle. Water will then be pumped to the proposed settlement lagoon which will be constructed at the proposed manufacturing area. Water at the settlement lagoon will be used in the day-to-day operations of the quarry such as manufacturing of ready-mix concrete, aggregate washing or dust suppression. Water which is not required will be discharged off site. An application for a water discharge licence will be made to Longford Co. Co. if planning permission for the subject development is secured.

For security reasons, very little fuel will be stored at the quarry. A small volume of fuel will be stored in a bunded fuel storage tank which will be located close to the site office. Fuel will be delivered to the quarry by competent oil companies and dispensed into plant and machinery, at a designated refuelling location.

It is proposed that the operating hours at the development will be 07:00-19:00 Monday to Friday and 07:00-16:00 on Saturdays. The development will not operate on Sundays or Public Holiday. The proposed development will provide employment for approximately 30 people directly with further people employed indirectly (e.g., sub-contractors for blasting).

9.5 Predicted Impacts

9.5.1 Construction Phase

Air Quality

Construction works will involve the establishment of the site access road and manufacturing area. There will be some minor construction works involved in setting up the concrete batching plant and associated material processing areas. However, these works will be minimal in nature and will likely have an imperceptible, negative, localised and short-term impact.

Overburden for the proposed extraction area will be stripped in phases and will be undertaken during the normal day to day operations at the site and has been considered within the operational phase assessment detailed in Section 9.5.2 in addition to emissions from the batching plant and material processing.

9.5.2 Operational Phase

Air Quality

The main potential sources of emissions to air are associated with plant and machinery undertaking day to day activities such as extraction, onsite processing and transportation of material, concrete products and dust blow generated during dry windy conditions. Potential impacts associated with day-to-day activities have been separated into dust deposition and vehicle and plant emissions.

Dust

Emissions from the site lead to a worst-case dust deposition level averaged over the full year of 52.2 mg/(m^2*day) at the land ownership boundary of the site (see Table 9-5). Based on a worst case background dust deposition of 39 mg/(m^2*day) in the region of the site, the combined dust deposition level peaks at 91.2 mg/(m^2*day) which is 26% of the TA Luft Limit Value of 350 mg/(m^2*day). However, operational activities from the site contribute a maximum of 15% of the TA-Luft Limit Value. Figure 9.2 shows the geographical variation in annual dust deposition levels in the region of the development.

The dust deposition level decreases with increasing distance from the site. The worst-case dust deposition at the closest sensitive receptor to the site peaks at 16% of the TA Luft limit value, including background concentrations.

The impact of dust deposition is considered imperceptible, negative, localised and long-term.

Table 9-5: Dispersion Modelling Results for Dust Deposition at Boundary

Pollutant / Year	Worst Case Background Level (mg/(m²*day))	Process Contribution (mg/(m²*day))	Predicted Deposition (mg/(m²*day))	Limit Value (mg/(m²*day)) Note 1
Dust Deposition / 2015	39	40.8	79.8	350
Dust Deposition / 2016	39	52.2	91.2	350
Dust Deposition / 2017	39	48.7	87.7	350
Dust Deposition / 2018	39	49.6	88.6	350
Dust Deposition / 2019	39	50.2	89.2	350

Note 1 TA-Luft as interpreted by DEHLG (2004)

PM_{10}

Predicted PM_{10} concentrations are significantly lower than the ambient air quality standards at the worst-case residential receptor due to background concentrations and emissions from the application site (see Table 9-6). For emissions from the application site the predicted 24-hour and annual concentrations (excluding background) at the worst-case receptor peak at 6.82 $\mu g/m^3$ and 2.09 $\mu g/m^3$ respectively. Based on a background annual mean PM_{10} concentration of 10 $\mu g/m^3$ in the region of the application site, the combined annual PM_{10} concentration including the site peaks at 12.09 $\mu g/m^3$ (Table 9-6). This predicted level equates to at most 30% of the annual limit value of 40 $\mu g/m^3$. The predicted 24-hour PM_{10} concentration (including background) peaks at 17.09 $\mu g/m^3$ which is 34% of the 24-hour limit value of 50 $\mu g/m^3$ (measured as a 90.4th%ile). Operational activities from the site contribute a maximum of 5.2% of the PM_{10} annual mean limit value. The impact of PM_{10} is considered imperceptible, localised and long-term.

The geographical variation in the 24-hour mean (90.4th%ile) and annual mean PM_{10} ground level concentrations are illustrated as concentration contours in Figures 9.3 and 9.4. The locations of the maximum concentrations for PM_{10} are close to the boundary of the site with concentrations decreasing with distance from the facility.

Table 9-6: Dispersion Modelling Results for PM_{10}

Pollutant / Year	Background ($\mu g/m^3$)	Averaging Period	Process Contribution PM_{10} ($\mu g/m^3$)	Predicted Emission Concentration PM_{10} ($\mu g/m^3$) Note 2	Standard ($\mu g/m^3$) Note 1
PM_{10} / 2015	15	90.4th%ile of 24-hr means	4.11	16.35	50
	10	Annual Mean	1.35	11.35	40
PM_{10} / 2016	15	90.4th%ile of 24-hr means	4.50	16.51	50
	10	Annual Mean	1.51	11.51	40
PM_{10} / 2017	15	90.4th%ile of 24-hr means	6.82	17.09	50
	10	Annual Mean	2.09	12.09	40
PM_{10} / 2018	15	90.4th%ile of 24-hr means	4.59	16.67	50
	10	Annual Mean	1.67	11.67	40
PM_{10} / 2019	15	90.4th%ile of 24-hr means	3.00	16.18	50
	10	Annual Mean	1.18	11.18	40

Note 1 S.I. 180 of 2011 and EU Directive 2008/50/EC

Note 2 Short-term Environmental Concentrations calculated according to UK DEFRA guidance based on the maximum background 24-hr mean (as a 90.4th%ile) of 15 $\mu g/m^3$ from rural Zone D monitoring stations

$PM_{2.5}$

Predicted $PM_{2.5}$ concentrations at the worst-case receptor are significantly lower than the limit value of 25 $\mu g/m^3$ (see Table 9-7).

The predicted annual concentration (excluding background) at the worst-case receptor peaks at 0.28 $\mu g/m^3$. Based on a background $PM_{2.5}$ concentration of 6.5 $\mu g/m^3$ in the region of the site, the annual $PM_{2.5}$ concentration including the operations peaks at 6.78 $\mu g/m^3$. This peak level equates to 27% of the annual limit value for $PM_{2.5}$. Operational activities from the site contribute a maximum of 1.1% of the $PM_{2.5}$ annual mean limit value. The impact of $PM_{2.5}$ is considered imperceptible, localised and long-term.

The geographical variation in the annual mean $PM_{2.5}$ ground level concentrations is illustrated as concentration contours in Figure 9.5. Concentrations decrease with increasing distance from the site.

Table 9-7: Dis persion Modelling Results for $PM_{2.5}$

Pollutant / Year	Annual Mean Background ($\mu g/m^3$)	Averaging Period	Process Contribution $PM_{2.5}$ ($\mu g/m^3$)	Predicted Emission Concentration $PM_{2.5}$ ($\mu g/m^3$)	Standard ($\mu g/m^3$) Note 1
$PM_{2.5}$ / 2015	6.5	Annual Mean	0.18	6.68	25
$PM_{2.5}$ / 2016	6.5	Annual Mean	0.21	6.71	25
$PM_{2.5}$ / 2017	6.5	Annual Mean	0.28	6.78	25
$PM_{2.5}$ / 2018	6.5	Annual Mean	0.21	6.71	25
$PM_{2.5}$ / 2019	6.5	Annual Mean	0.15	6.65	25

Note 1 S.I. 180 of 2011 and EU Directive 2008/50/EC

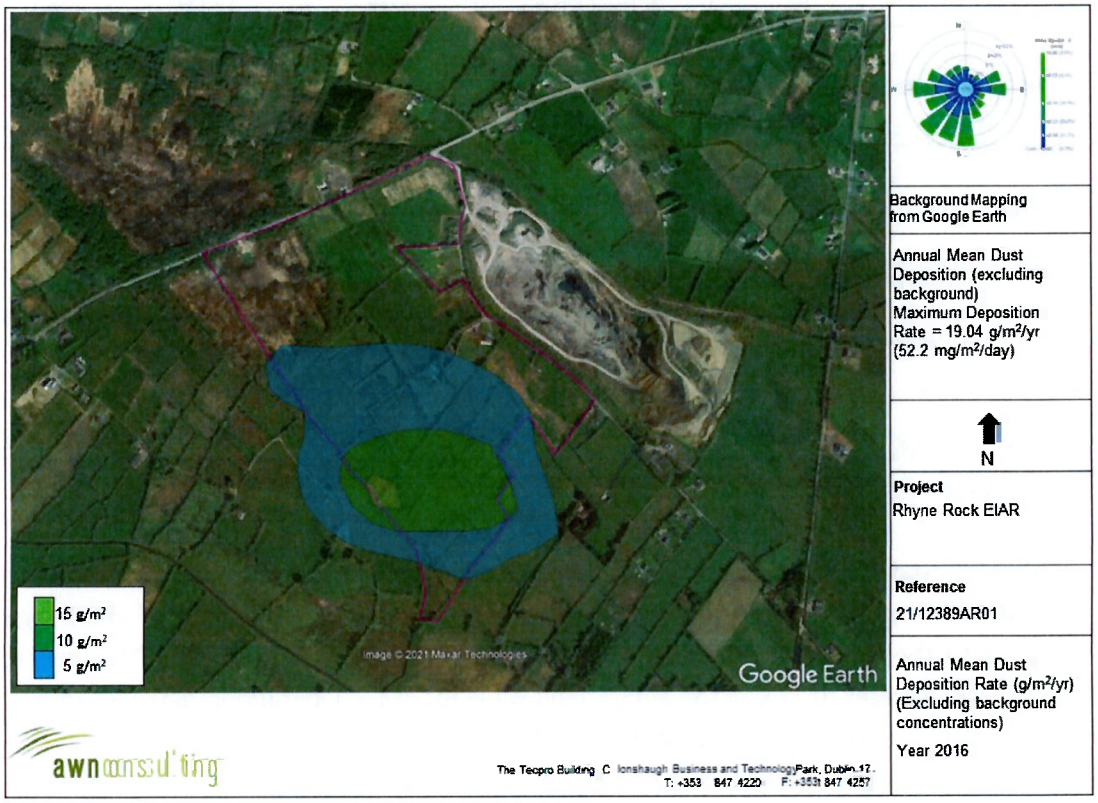

Figure 9.2 Annual Average Dust Deposition ($g/m^2/yr$)

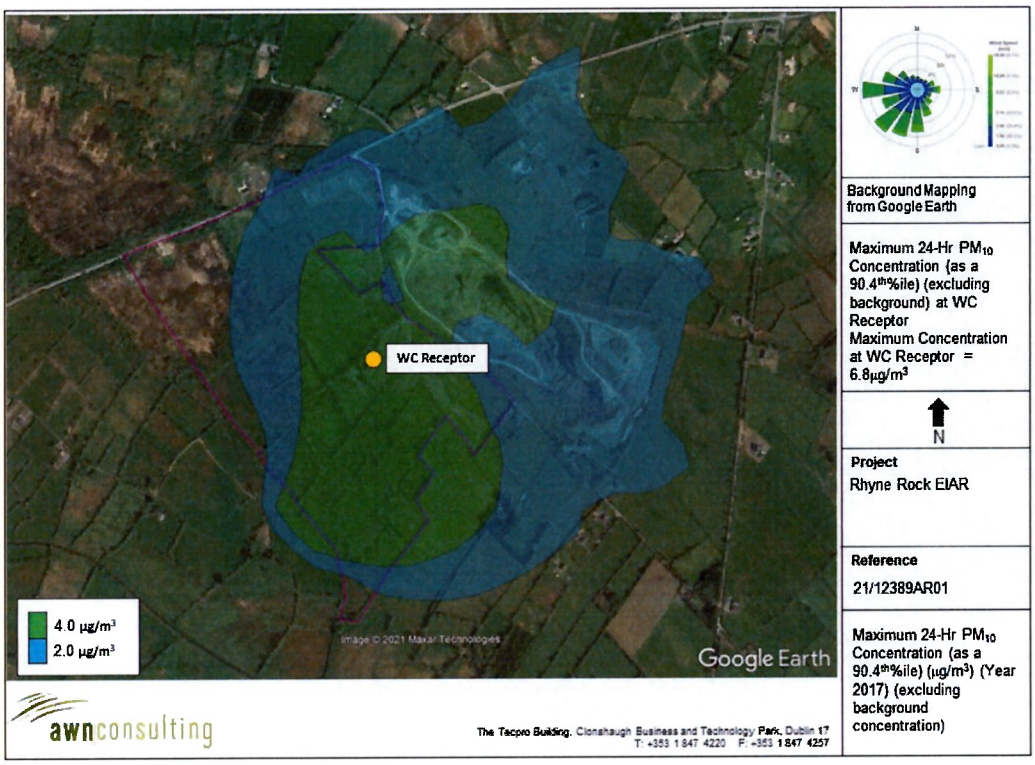

Figure 9.3 90.4th Percentile of 24-Hour Average PM_{10} Concentrations ($\mu g/m^3$)

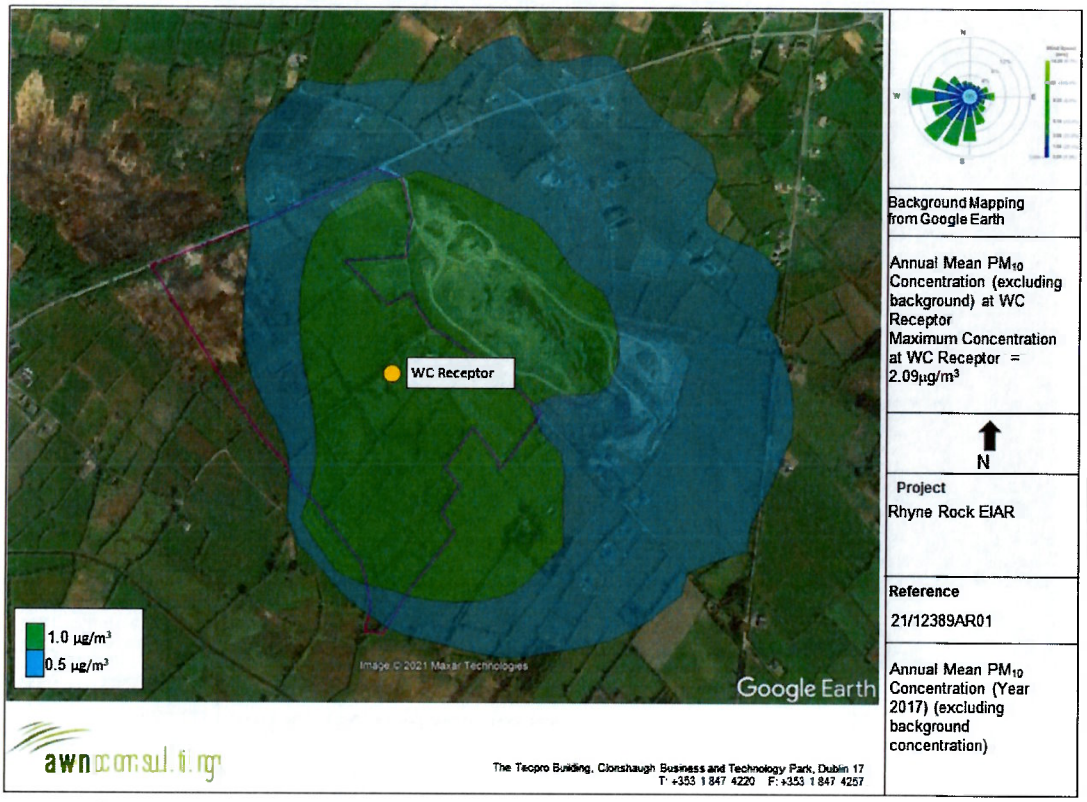

Figure 9.4 Annual Average PM_{10} Concentrations (µg/m^3)

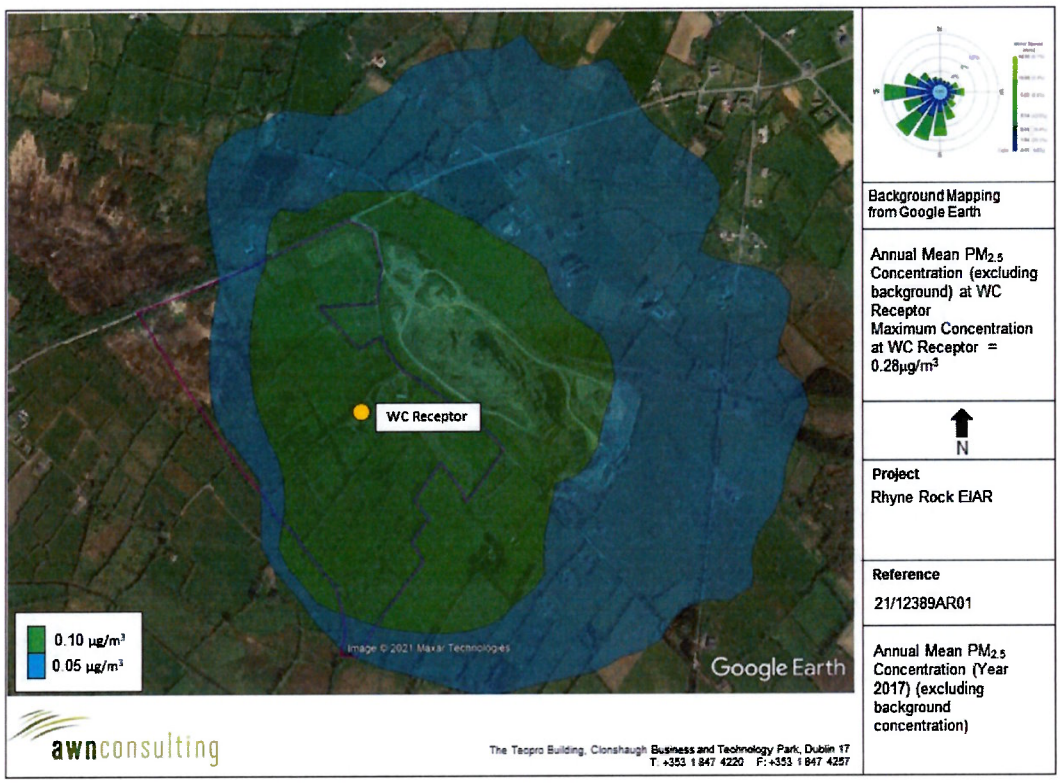

Figure 9.5 Annual Average $PM_{2.5}$ Concentrations (µg/m³)

Road Traffic Emissions

There is the potential for a number of emissions to the atmosphere during the operational phase of the development. In particular, the traffic-related air emissions may generate quantities of air pollutants such as NO_2, PM_{10} and $PM_{2.5}$.

The traffic generated as part of the development was reviewed against the DMRB screening criteria as outlined in Section 9.2.3. It was determined that none of the roads impacted by the development met the screening criteria and therefore impacts from road traffic emissions on local air quality are considered long-term, neutral and imperceptible.

Human Health

Air dispersion modelling of operational activities at the site was undertaken to assess the impact of the development with reference to EU ambient air quality standards which are based on the protection of human health. As demonstrated by the modelling results, emissions of PM_{10} and $PM_{2.5}$ as a result of the development are compliant with all National and EU ambient air quality limit values (see Table 9-1) and, therefore, will not result in a significant impact on human health.

9.5.3 "Do Nothing" Scenario

Under the Do Nothing Scenario the proposed development would not occur and the site would remain a greenfield site. The predicted impacts of dust deposition, PM_{10} and $PM_{2.5}$ emissions as well as traffic emissions would not occur and pollutant concentrations would remain similar to baseline levels. The Do Nothing scenario is considered neutral in terms of air quality and climate.

9.5.4 "Worst Case" Scenario

In the worst-case scenario where mitigation measures fail for the Proposed Development, it is considered that localised nuisances such as PM_{10}, $PM_{2.5}$ and dust may arise on site and local receptors. This is considered highly unlikely and indeterminable.

9.5.5 Cumulative Impacts

Cumulative effects have been assessed for the proposed development. Conservative background concentrations have been included in the modelling study for dust deposition and EPA data for PM_{10} and $PM_{2.5}$. These background concentrations account for non-localised sources of the pollutants of concern.

The existing Rhyne Quarry is within 170m of the proposed extraction area. The presence of the existing quarry has been considered when determining conservative background concentrations of dust, PM_{10} and $PM_{2.5}$ in the region of the proposed development.

9.6 Mitigation Measures

There are a number of mitigation measures proposed to be put in place on site to prevent significant dust emissions from on-site activities. These measures include:

- A wheel wash will be in place on site which trucks must pass through prior to exiting onto the public road.
- A water bowser will be used during dry periods to dampen site roads.
- Speed restrictions will be in place for on-site roads.
- Stockpiles will be dampened during dry periods.

These measures have been incorporated into the modelling assessment to determine the impact of the site on levels of dust deposition and ambient levels of particulate matter (PM_{10} / $PM_{2.5}$). The modelling assessment found that there was an imperceptible impact on the ambient air quality environment as a result of the development and therefore further mitigation is not required. These mitigation measures will be enforced to prevent significant dust emissions from the site.

9.7 Monitoring

It is recommended that dust deposition monitoring be undertaken at the boundary of the site. Monitoring will ensure that the TA Luft guideline limit value of 350 mg/(m^2*day) is complied with at the site boundary. Monitoring can be carried out using the Bergerhoff method as recommended by the Department of Environment, Heritage and Local Government (DHLEG, 2004). If monitoring indicates a potential issue with dust deposition, additional mitigation measures shall be implemented to remediate. Monitoring should be conducted at the western, eastern and northern site boundaries at a minimum as these areas are closest to sensitive receptors.

9.8 Residual Impacts

It is not anticipated that there will be an adverse impact on air quality in the vicinity of the proposed development. Modelled emissions from the site lead to ambient concentrations which are within the relevant ambient air quality standards for dust, PM_{10} and $PM_{2.5}$. Thus, the impact on air quality as a result of the proposed development is not significant and thus no residual impact is anticipated.

9.9 Technical Difficulties

There were no significant difficulties encountered during the compilation of the chapter.

Department of the Environment Heritage and Local Government (DEHLG) (2004) Quarries and Ancillary Activities, Guidelines for Planning Authorities

Environmental Protection Agency (2015) Advice Notes for Preparing Environmental Impact Statements (Draft) on the Information to be Contained in Environmental Impact Assessment Reports (Draft)

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USEPA (2018) User's Guide to the AERMOD Meteorological Pre-processor (AERMET)

USEPA (2019) AERMOD Description of Model Formulation and Evaluation

Appendix 9.1 - Ambient Air Quality Standards

APPENDIX 9.1 – AMBIENT AIR QUALITY STANDARDS

National standards for ambient air pollutants in Ireland have generally ensued from Council Directives enacted in the EU (& previously the EC & EEC). The initial interest in ambient air pollution legislation in the EU dates from the early 1980s and was in response to the most serious pollutant problems at that time. In response to the problem of acid rain, sulphur dioxide, and later nitrogen dioxide, were both the focus of EU legislation. Linked to the acid rain problem was urban smog associated with fuel burning for space heating purposes. Also apparent at this time were the problems caused by leaded petrol and EU legislation was introduced to deal with this problem in the early 1980s.

In recent years the EU has focused on defining a basis strategy across the EU in relation to ambient air quality. In 1996, a Framework Directive, Council Directive 96/62/EC, on ambient air quality assessment and management was enacted. The aims of the Directive are fourfold. Firstly, the Directive's aim is to establish objectives for ambient air quality designed to avoid harmful effects to health. Secondly, the Directive aims to assess ambient air quality on the basis of common methods and criteria throughout the EU. Additionally, it is aimed to make information on air quality available to the public via alert thresholds and fourthly, it aims to maintain air quality where it is good and improve it in other cases.

As part of these measures to improve air quality, the European Commission has adopted proposals for daughter legislation under Directive 96/62/EC. The first of these directives to be enacted, Council Directive 1999/30/EC, has been passed into Irish Law as S.I. No 271 of 2002 (Air Quality Standards Regulations 2002) and has set limit values which came into operation on 17th June 2002. Council Directive 1999/30/EC, as relating to limit values for sulphur dioxide, nitrogen dioxide, lead and particulate matter. The Air Quality Standards Regulations 2002 detail margins of tolerance, which are trigger levels for certain types of action in the period leading to the attainment date. The margin of tolerance varies from 60% for lead, to 30% for 24-hour limit value for PM_{10}, 40% for the hourly and annual limit value for NO_2 and 26% for hourly SO_2 limit values. The margin of tolerance commenced from June 2002. It started to reduce from 1 January 2003, continuing every 12 months thereafter by equal annual percentages to reach 0% by the respective attainment date for each pollutant. A second daughter directive, EU Council Directive 2000/69/EC, limit values for both carbon monoxide and benzene in ambient air is also included in the Air Quality Standards Regulations 2002. This has also been passed into Irish Law under the Air Quality Standards Regulations 2002.

The most recent EU Council Directive on ambient air quality was published on the 11/06/08. Council Directive 2008/50/EC combines the previous Air Quality Framework

Directive and its subsequent daughter directives. This has also been passed into Irish Law under the Air Quality Standards Regulations 2011 (S.I. 180 of 2011) (see Table 9.1). Provisions were also made for the inclusion of new ambient limit values relating to $PM_{2.5}$. The margin of tolerance specific to each pollutant were also slightly adjusted from previous directives. In regards to existing ambient air quality standards, it is not proposed to modify the standards but to strengthen existing provisions to ensure that non-compliances are removed. In addition, new ambient standards for $PM_{2.5}$ are included in Directive 2008/50/EC. The approach for $PM_{2.5}$ is to establish a target value of 25 $\mu g/m^3$, as an annual average (to be attained everywhere by 2010) and a limit value of 25 $\mu g/m^3$, as an annual average (to be attained everywhere by 2012), coupled with a target to reduce human exposure generally to $PM_{2.5}$ between 2010 and 2020. This exposure reduction target will range from 0% (for $PM_{2.5}$ concentrations of less than 8.5 $\mu g/m^3$ to 20% of the average exposure indicator (AEI) for concentrations of between 18 - 22 $\mu g/m^3$. Where the AEI is currently greater than 22 $\mu g/m^3$ all appropriate measures should be employed to reduce this level to 18 $\mu g/m^3$ by 2020. The AEI is based on measurements taken in urban background locations averaged over a three year period from 2008-2010 and again from 2018-2020. Additionally, an exposure concentration obligation of 20 $\mu g/m^3$ has been set which was to be complied with by 2012 again based on the AEI.

Although the EU Air Quality Limit Values are the basis of legislation, other thresholds outlined by the EU Directives are used which are triggers for particular actions. The Alert Threshold is defined in Council Directive 96/62/EC as "a level beyond which there is a risk to human health from brief exposure and at which immediate steps shall be taken as laid down in Directive 96/62/EC". These steps include undertaking to ensure that the necessary steps are taken to inform the public (e.g. by means of radio, television and the press).

The Margin of Tolerance is defined in Council Directive 96/62/EC as a concentration which is higher than the limit value when legislation comes into force. It decreases to meet the limit value by the attainment date. The Upper Assessment Threshold is defined in Council Directive 96/62/EC as a concentration above which high quality measurement is mandatory. Data from measurement may be supplemented by information from other sources, including air quality modelling.

Under the terms of EU Framework Directive on Ambient Air Quality (96/62/EC), geographical areas within member states have been classified in terms of zones. The zones have been defined in order to meet the criteria for air quality monitoring, assessment and management as described in the Framework Directive and Daughter Directives. Zone A is defined as Dublin and its environs, Zone B is defined as Cork City, Zone C is defined as 23

urban areas with a population greater than 15,000 and Zone D is defined as the remainder of the country. The Zones were defined based on among other factors, population and existing ambient air quality.

EU Council Directive 96/62/EC on ambient air quality and assessment has been adopted into Irish Legislation (S.I. No. 33 of 1999). The act has designated the Environmental Protection Agency (EPA) as the competent authority responsible for the implementation of the Directive and for assessing ambient air quality in the State. Other commonly referenced ambient air quality standards include the World Health Organisation. The WHO guidelines differ from air quality standards in that they are primarily set to protect public health from the effects of air pollution. Air quality standards, however, are air quality guidelines recommended by governments, for which additional factors, such as socio-economic factors, may be considered.

Appendix 9.2 – Emission Factors

APPENDIX 9.2 - EMISSION FACTORS

Emission Factors Used In Dust Emission Calculations (USEPA, 1986 & subsequent updates):

Road Haulage (Unpaved)

$E = [281.9 * k * (s/12)^a (W/3)^b ((365-P)/365)$ g/veh km

Where:

s = surface silt content (4.8%)

k = 4.9 (Total Dust), 1.8 (PM_{10}), 0.15 ($PM_{2.5}$)

W = mean vehicle weight (32.5 tonnes)

a = 0.9 ($PM_{10}/PM_{2.5}$), 0.7 (Total Dust)

b = 0.45

P = 214 wet days

Road Haulage (Paved)

$E = [k * (sL)^{0.91} * (W)^{1.02}](1-(P)/4N)$ g/veh km

Where:

sL = surface silt loading (0.6 g/m^2)

k = 24 (Total Dust), 4.6 (PM_{10}), 0.66 ($PM_{2.5}$)

W = mean vehicle weight (32.5 tonnes)

P = 214 wet days

N = 365 days

Material Loading

$E = k(0.0016) * (U/2.2)^{1.3} / (M/2)^{1.4} ((365-P)/365)$ kg/Mg

Where:

k = 0.74 (Total Dust), 0.35 (PM_{10}), 0.053 ($PM_{2.5}$)

M = moisture content (2.1%)

U = mean wind speed (4.4 m/s)

P = 214 wet days

Screening

$E = ((T*K)/(H*3600*A)) * ((365-P)/365)$ g/s/m^2

Where:

T = Annual Tonnage of Material (400,000 T)

K = 12.5 (Total Dust), 4.3 (PM_{10}) , 0.28 ($PM_{2.5}$)

H = Annual Hours of Operation (3588 hours)

A = Area of Excavation

P = 214 Wet Days

Conveyor

$E = ((T*K)/(H*3600*A)) * ((365-P)/365)$ g/s/m^2

Where:

T = Annual Tonnage of Material (400,000 T)

K = 1.5 (Total Dust), 0.55 (PM_{10}) , 0.14 ($PM_{2.5}$)
H = Annual Hours of Operation (3588 hours)
A = Area of Excavation
P = 214 Wet Days

Topsoil Removal

$E = ((T*K)/(H*3600*A))*((365-P)/365)$ g/s/m^2
Where:
T = Annual Tonnage of Material (400,000 T)
K = 29 (Total Dust), 13.7 (PM_{10}) , 2.07 ($PM_{2.5}$)
H = Annual Hours of Operation (3588 hours)
A = Area of Excavation
P = 214 Wet Days

Wind Erosion of Stockpiles

The formulae for calculating wind erosion can be found in section 13.2.5 of AP42 titled "Industrial Wind Erosion". Information on monthly peak wind speeds and the number of gales per month is required in order to calculate the emission rates.

Operation	Total Dust Emission Rate	PM_{10} Emission Rate	$PM_{2.5}$ Emission Rate
Topsoil removal (g/s/m^2)	2.18E-04	1.03E-04	1.55E-05
Screening (g/s/m^2)	4.45E-03	1.53E-03	9.96E-05
Conveyor Transfer (g/s/m^2)	1.01E-03	3.71E-04	9.44E-05
Crushing (g/s/m^2)	9.61E-04	4.27E-04	7.83E-05
Blasting (g/s/m^2)	8.44E-08	4.37E-08	2.53E-09
Material Loading (g/s/m^2)	7.12E-04	3.37E-04	5.10E-05
Paved Roads (g/s) per source every 5 m	7.47E-04	2.49E-05	3.57E-06
Unpaved Roads (g/s) per source every 5 m	7.22E-05	2.46E-05	2.05E-06

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Appendix 10.1 - Noise Monitoring Data & Monitors In-situ.

10.0 NOISE & VIBRATION

10.1 Introduction

This chapter of the EIAR assess the potential noise and vibration impacts associated with the proposed quarry development at Rhyne, Killoe, Co. Longford.

The application site consists of an area of 18.6 hectares (Ha) with the extraction area being approximately 14.2 Ha and the manufacturing area being 2.1 Ha. The application site is close to an existing quarry owned and operated by the applicant Ryne Rock. The existing quarry will close once the proposed development becomes fully operational.

10.2 Statement of Authority

This section of the EIAR has been prepared by Mr. Brendan O'Reilly of Noise and Vibration Consultants Ltd. Brendan has a Master's degree in noise and vibration from Liverpool University and has over 45 years' experience in noise and vibration control (many years' experience in preparation of noise impact statements) and was a member of a number of professional organisations. Brendan was a co-author and project partner (as a senior noise consultant) in 'Environmental Quality Objectives Noise in Quiet Areas' administered by the Environmental Protection Agency on behalf of the Department of the Environment, Heritage and Local Government. Brendan has considerable experience in the assessment of noise impact and have compiled EIA studies ranging from quarries, mines, retail development, wastewater treatment plants, tailing dams, housing developments and wind farms.

10.3 General Methodology

In order to make an assessment of the current/ baseline noise conditions at and around the site boundary and to assess the potential noise emissions from the proposed works, the following relevant guidance and legislation were consulted:

- Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4) (Jan 2016).
- ISO 1996-1-2016: Acoustics: Description and Measurement of Environmental Noise-Basic Quantities and Assessment Procedures.
- Integrated Pollution Control Licensing – Guidance Note for Noise in Relation to Scheduled Activities, EPA 1995.
- ISO 9613-2, First Edition 1996-12-15. Acoustics-Attenuation of sound during propagation outdoors-Part 2: General method of calculations.
- Draft Guidelines for the Treatment of Noise and Vibration in National Road Schemes.
- BS 5228, 2009 Code of Practice for Noise Control on Construction and Open Sites: Part 1: Noise.

- EPA, 2006, Environmental Management Guidelines-Environmental Management in Extractive Industry (Non-Scheduled Minerals).
- EPA, 2003, Environmental Quality Objectives-Noise in Quiet Areas.
- HMSO, Welsh Office, 1988. Calculation of Road Traffic Noise.

10.4 EPA Description of Effects

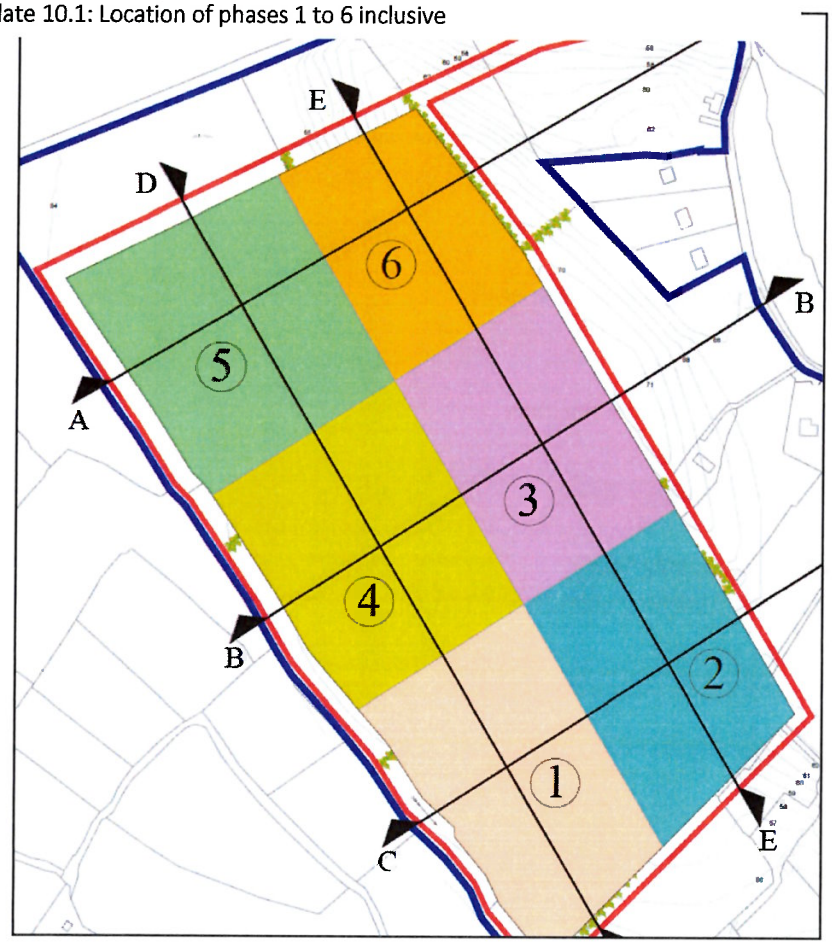
The significance of effects of the proposed development is described in accordance with the EPA guidance document *Guidelines on the information to be contained in the Environmental Impact Assessment Reports (EIAR), EPA May 2022*. The details of the methodology for describing the significance of effects are provided in Table 3.4: Section 3.7.3 of the aforementioned EPA 2022 document.

10.5 Description of Proposed Activity

The application site consists of a greenfield site located in proximity to an existing quarry owned and operated by Rhyne Rock (Plate 10.1.). Should the proposed development site be granted planning permission, operations at the existing quarry will cease once the proposed development site becomes operational.

The application site has an elevation range between 55mOD and 70mOD. The proposed development consists of an extraction area where material will be extracted by blasting down to a level of 20mOD and a manufacturing area where material will be processed into various grades of aggregate and sold to market or used to manufacture ready-mix concrete and concrete products. The extraction of rock will be carried out in 12 phases with the first 6 phases being the removal of the top benches as shown in Plate 10.2 (full details on Figure 3.3). Access to the application site will be via the L5097 Local Road off the R194 Regional Road which connects the towns of Longford and Granard. A haul road will be constructed along the northern and western boundaries which will link the manufacturing area to the L5097 Local Road.

Plate 10.1: Location of phases 1 to 6 inclusive



The proposed manufacturing area will consist of the processing plant, concrete batching plant, block yard, storage sheds, workshop, office buildings, weighbridge, wheel wash, settlement lagoon and all other associated ancillary facilities. The plant and machinery at the existing quarry would be relocated to the proposed development.

Construction works will include development of the batching plant, development of the processing plant, development of a settlement lagoon and removal of overburden in a phased basis which will be used to construct a 5m high acoustic berms surrounding the boundary of the extraction area.

The maximum anticipated annual extraction rate will be 400,000 tonnes with some of this material to being used to manufacture ready-mix concrete at the concrete batching plant.

The blasting frequency (number of blast occurrences) will be at a maximum total of 18 blasts per year (average of 1.5 blasts per month). The plan is to continue with small blasts

as is the case with the existing quarry rather than having a smaller number of larger blasts. The average blast will be less than 25,000 tonnes of rock.

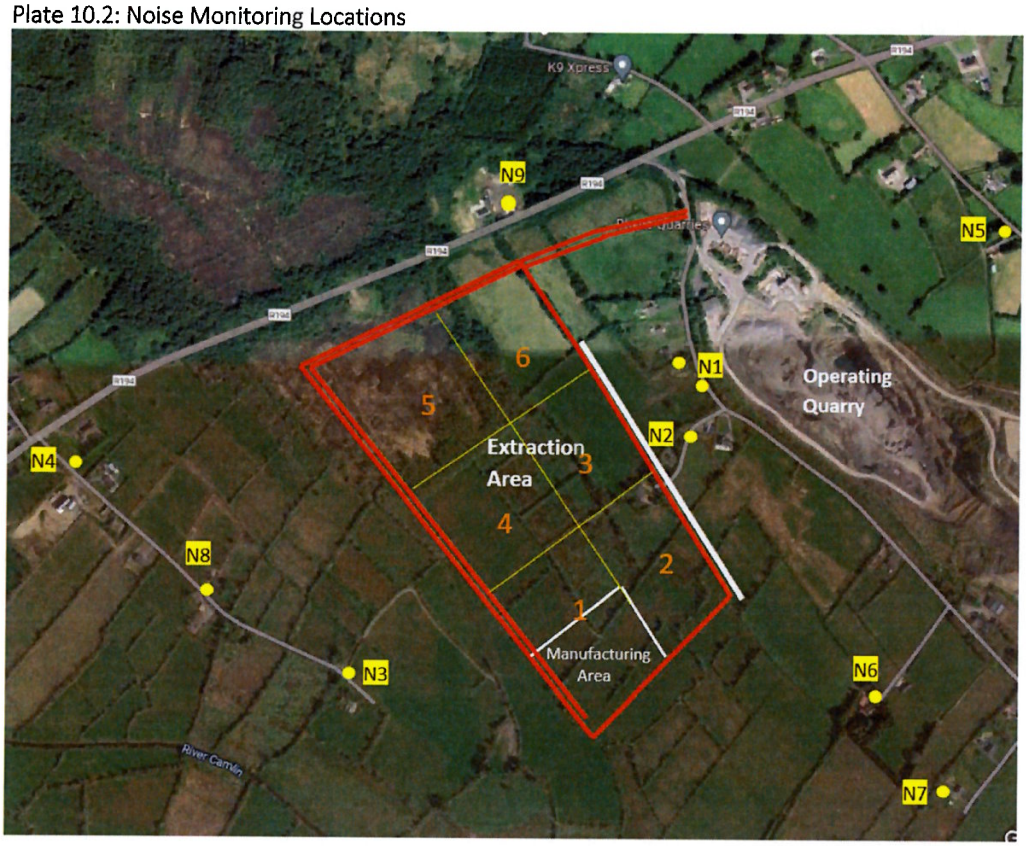
The main noise sources are listed below for the manufacturing and extraction area with location illustrated on Plate 1.

Manufacturing Area
In this area the following plant will operate;
Fixed crushing and washing plant
Concrete batching plant
Mobile concrete block making machine
Forklift for moving blocks
Road trucks including bottle trucks

Extraction Area (on quarry floor)
Mobile crushing & screening plant
Wheel loaders
Excavators
Dump trucks
Hydraulic breaker
Drill rig

Plate 1 shows the locations of baseline noise monitoring location designated as N1 to N5 Locations N6 to N8 incl are used as prediction locations. The phased development is numbered 1 to 6 inclusive. A white line on the map denotes a ridge/hill located NE of the site at an elevation ranging from 15-to 20m+ above the extraction site level.

Plate 10.2: Noise Monitoring Locations



(From Google Map)

10.6 Baseline Noise Monitoring Survey

A baseline noise survey was carried out at some of the nearest receptors to the proposed development. Five noise monitors were used in the survey and were set up to run continuously between 11.15 and 16.00 hrs on 10th October 2022 (monitors in-situ attached in the appendices). A sixth monitor was used to measure the individual quarry plant noise which was operating during the noise survey.

10.6.1 Noise Monitoring Methodology

The following instruments were used;

- Six Larson Davis LxT Sound Expert Precision Integrating Sound Level Analyser/Data logger.
- Wind Shields Type: Double Skinned Wind Screens.
- Calibration Type: Larson Davis Precision Acoustic Calibrator Model CAL250.

All instruments conform to BS EN 61672-1 and BS EN 60942, Class 1 and ISO Type 1.

Weather

The noise survey carried out in near calm conditions with a light west wind speed of 1.5-2.5m/s. Temperature was 10-16°C with no precipitation. Monitoring was carried out in conditions suitable for such a survey (as recommended by EPA Guidance, 2016, NG4) with no noise generated noise emissions from wind effects on vegetation.

Measurement Parameters

L_{Aeq} is the A-weighted equivalent continuous sound level measured during the sample period. It is an average of the fluctuating noise level over the sample period. It can also be described as a notional steady level that has the same sound energy as the real fluctuating noise over a specified time interval- it is a type of average represented by a single number over a specified time interval. L_{Aeq} is often referred to as total noise which is the noise from near and far.

L_{A50} is the noise level equalled or exceeded for 90% of the sample period

L_{A10} is the A-weighted sound level, which is exceeded for 10% of the sample period.

L_{A90} is the A-weighted sound level, which is exceeded for 90% of the sample period and is defined as the background noise level within BS 4142.

Measurement Procedure

Noise monitors were set up to run continuously and concurrently at four receptor locations in the environs surrounding the quarry (N1, N2, N3, N4 and N8). A sixth monitor was used to measure the noise contribution from the individual plant operating in the quarry. It is proposed that the plant operating in the quarry will be the same plant proposed for the new quarry.

Noise monitors were set on 15-minute intervals with microphones at 1.5m above ground level. All the environmental noise analysers had data logging facilities set on real-time, the logged data was later downloaded via a personal computer using software. All noise monitors were calibrated before and after the survey and the maximum drift of calibration was 0.01dB. All monitors were within calibration certification times.

10.6.2 Quarry Operations During Survey

Table 10.1 gives a list of activity / plant and noise levels of individual plant which was operating in the nearby quarry during the monitoring period. The list includes all activity in the quarry during the monitoring period. Table 10.2 gives noise levels of drill rig for shot hole drilling.

Table 10.1: Plant in operation in quarry during the noise survey

Noise Source	Noise level @ 10m Leq dBA	Comments
Batching Plant	79	Readymix truck being loaded in manufacturing area
Forklift grab	84	Move bales of block to storage area on surface
Block Plant	83	Operating in manufacturing area
Primary Terex Jaw Crusher J50/Screener	85	Below surface level
Secondary Terex Cone Crusher/Screener	85.5	On surface in manufacturing area
Washing Plant Screener	80	On surface in manufacturing area
McCloskey S190 tracked Screener	79.5	Below surface
Portable Crusher / screener	83	Below surface
Volvo L150 loading shovel	82.5	Pulling load up ramp
Generator	74.4	In operation below surface
Komatsu 360 Excavator	75.7	Below surface filling primary crusher screener
Caterpillar 329 Excavator	77.0	Below surface
Volvo A35 Dump truck	73	Trucking to surface
Cat 966M Front End Loader	76	Up ramp filling bins
Volvo 150 Front End Loader	75	Filling bins on surface

Table 10.2: Noise sources from plant on-site which was not operational on survey date

Noise Source	Noise level @ 10m Leq dBA	Comments
Tracked drill rig for shot hole drilling +	86	Not operating but only operates for approx. 2.5 days per blast
Excavator with rock breaker	85	Operates at base of quarry with 20+ attenuation by barrier effect

+ Taken from BS 5228-1:2009 C6 page 58.

10.6.3 Results of Noise Survey

A summary of the 15-minute intervals noise levels recorded from the quarry operation is given in Table 10.3. These noise sources ranged from quarry activity road traffic near and far, birds and local domestic activity normal in the everyday environment. Attendance at each noise monitoring location for periods allowed for interpretation to appropriate the noise levels generated by the quarry activity. In far-field situations the LA90 value closely correlate to the noise levels from an activity such as the quarry operation. Table 10.3 gives the mean values over the period. Slightly lower levels were recorded between 13.00 and 13.30 hrs when some of the mobile plant was down. (Appendix I: Complete noise monitoring data).

Table 10.3: Recorded noise levels taken during quarry operations

Location id	Period	Leq dBA	L10 dBA	L50 dBA	L90 dBA	Comments
N1	11.15 to 15.15hrs	47.7	49.3	46.5	44.1	Quarry at 44.1dBA
N2	12.15 to 15.15hrs	46.3	48.0	44.2	41.5	Quarry at 41.5dBA
N3	12.00 to 15.30hrs	43.6	46.1	40.8	37.3	Background (L90) was road traffic with quarry inaudible
N4	11.45 to 15.30hrs	56.7	61.4	45.8	38.5	Total (Leq) and Background was road traffic with quarry inaudible
N5	12.30 to 15.45hrs	48.8	49.5	45.7	42.6	Quarry at 42.6dBA

10.6.4 Analysis of Recorded Noise Data

The mean noise levels from the quarry ranged from 41.5 to 44.1dBA at the nearest receptors (N1, N2 and N5) while at the more distant receptors the levels were predominately from road traffic (N3 and N4).

10.7 Relevant Guidance and Legislation

Operation of Development

The EPA has produced Environmental Management Guidelines- 'Environmental Management in the Extractive Industry (Non-Scheduled Minerals) [2]', 2006. This document references 'A Guidance Note for Noise in Relation to Scheduled Activities (EPA, 1996[1])'. It deals with the approach to be taken in the measurement and control of noise, and provided advice in relation to the setting of emission limits values and compliance monitoring.

In relation to quarry developments and ancillary activities, it is recommended that noise from the activities; it recommended that noise from the activities on site shall not exceed the following noise limits at the nearest noise-sensitive receptor:

Daytime	08.00-20.00 hrs	LAeq (1h) = 55dBA
Night-time	20.00-08.00 hrs	LAeq (1h) = 45dBA

95% of all noise levels shall comply with the specified limits values(s). No noise level shall exceed the limit value by more than 2dBA.

[2] Quarries and Ancillary Activities, Guidelines for Planning Authorities Dept of the Environment, Heritage and Local Government April 2004

[1] Ref. EPA's Guidance Note for Noise In Relation to Scheduled Activities, 1996

Blast Vibration Limits

Blasting shall be designed and operated so that:

'Ground vibration arising from any blasts carried out on site shall not exceed a peak particle velocity of 12mmls in any of the three mutually octagonal planes at the threshold of any house in the vicinity of the site'.

The air overpressure arising from the blasts shall not exceed 125dB (lin) max peak with a 95% confidence limit when measured outside the nearest house to the blast.

Monitoring for ground vibration and air over pressure shall be carried out by the operator during each blast

Operating hours for the proposed development (construction and operation) will be between 0700 hours and 1900 hours, Monday to Friday and between 0700 hours and 1600 hours on Saturdays with no Sunday work.

Construction Activity

There is no published national guidance relating to the maximum permissible noise level that may be generated during the construction phase of a project. However, the National Roads Authority ("NRA") give limit values which are deemed acceptable ("the NRA Guidelines")[1]. Guidance to predict and control noise is also given in BS 5228:2009, *Code of Practice for Noise and Vibration Control on Construction and Open Sites* (two parts) where Part 1 deal with Noise. The NRA guidelines for construction noise which are considered typically acceptable are given in Table 10.4.

Table 10.4: Construction noise levels that are typically acceptable based on the NRA guidelines

Day / Times	Guideline Limits
Monday to Friday	
07:00 – 19:00hrs	70dB LAeq, (1h) and LAmax 80dB
19:00 – 22:00hrs	*60dB LAeq, (1h) and LAmax 65dB*
Saturday	
08:00 – 16:30hrs	65dB LAeq,1h and LAmax75dB
Sunday and Bank Holidays	
08:00 – 16:00hrs	*60dB LAeq,1h and LAmax 65dB*

*Construction outside of these times, other than required by an emergency works, will normally require explicit permission from the relevant Local Authority

Part 1 of BS 5228 provides for control of noise effects from construction activities. The control methods include and are not limited to; the management of the site, supervision,

[1] National Roads Authority, *Guidelines for Noise and Vibration in National Road Schemes.*

maintenance and training, selection of equipment, working methods, hours of operation and screening barriers.

10.8 Impact Assessment

10.8.1 Potential Construction Phased Impacts of Proposed Development

The noise sources associated with the construction phase will relate to removal of overburden, development of acoustic berms, levelling of manufacturing area, development of block yard, development of settlement lagoon. Other lesser noise activity will be development of haul road which is close to the R194 and away for receptors, erection of batching plant and erection of fixed processing plant which generate low level noise levels.

Construction of Berms

Construction of acoustic mounds on the boundary of the site will give rise to the highest noise levels at the nearest receptors. Typical plant to carry out this activity would be two dump trucks working with two excavators with one excavator being used to construct the 5m high berm/barrier. The source noise levels are (75.7+77.0+73.0+73.0) dBA equivalent to 81dBA at 10m.

Table 10.5 gives the distance to the nearest receptors due to construction of the acoustic berms and which phase is nearest to receptor location. The distance refers to the nearest distance from the boundary to each of the nearest receptor. Plate 10.1 shows details of the proposed phased extraction plan for the application site and nearest receptors.

Table 10 .5 Distance to receptors from nearest activity (m)

Receptor id	N1	N2	N3	N4	N5	N6	N7	N8	N9
Construction of berm Distance in meters	108	105	239	282	613	246	418	305	86
Nearest location to phase number	3	3	4	5	3	2	2	5	6

Table 10.6 gives the distance to the nearest receptors due to extraction with acoustic berms in place and which phase is nearest to receptor location.

Table 10.6: Distance to receptors from nearest activity (m)

Receptor id	N1	N2	N3	N4	N5	N6	N7	N8	N9
Extraction Distance in meters	133	155	260	307	638	273	443	330	111
Nearest location to phase number	3	3	4	5	3	2	2	5	6

The difference between noise levels at two far-field locations can be calculated as:

$L_{p2} - L_{p1} = 10 \log (R_2 / R_1)^2 - (A_{atm} + A_{gr} + A_{br} + A_{mis})$

$= 20 \log (R_2 / R_1) - (A_{atm} + A_{gr} + A_{br} + A_{mis})$

Where,

L_{p1} = sound pressure level at location 1

L_{p2} = sound pressure level at location 2

R_1 = distance from source to location 1

R_2 = distance from source to location 2

and where,

A_{atm} = Attenuation due to air absorption

A_{gr} = Attenuation due to ground absorption

A_{br} = Attenuation provided by a berm/barrier

A_{mis} = Attenuation provided by miscellaneous other effects

Attenuation by air absorption, ground absorption and miscellaneous effects is assumed as zero.

From N1 and N2 a natural barrier effect of 20dBA is assumed due to the topography layout with a ridge /hill extending from 15-20m+ above the existing ground level in the extraction area. This hill is located to the NE boundary of the extraction area running in a denoted by white line in Plate 10.2. At all other locations an allowance of 3dBA is assumed for air absorption and ground absorption. It is assumed in the calculations that all plant is operating at nearest location to nearest receptors a scenario that is highly unlikely to occur.

Table 10.7 gives the predicted maximum noise levels for construction of the 5m high berms/barrier on the boundary of the proposed extraction area at sensitive receptors.

Table 10.7: Predicted maximum noise levels for berm/barrier construction

Receptor	Source level at 10m dBA	Distance 20log(R1/R2)	Air attenuation/ Ground absorption/ Barrier effect	Resultant noise level 1hr Leq dBA
N1	81	20log 108/10= -20.7	-20	40.3
N2	81	20log 105/10= -20.4	-20	40.6
N3*	81	20log 239/10= -27.6	-3	50.4
N4	81	20log 282/10= -29.0	-3	49.0
N5	81	20log 613/10= -35.7	-3	42.3
N6*	81	20log 248/10= -27.9	-3	50.2
N7	81	20log 418/10= -32.4	-3	45.6
N8	81	20log 305/10= -29.7	-3	47.3
N9	81	20log 86/10= -20.9	-3	59.8

NB * Denotes derelict buildings

The maximum noise levels from the excavation of overburden in all phases will be in the region of 10dBA+ below the predicted levels in Table 10.7 at the nearest locations to the boundary due to established 5m high berm/barrier. This applies to all 6 phases which are on surface (remaining phases are areas below the surface).

Construction Works in Manufacturing Area

The construction works in this area will include levelling of an area, construction of concrete pad for block yard, erection of batching plant, construction of settlement pond and erection of processing plant. The main noise sources for this area will be from the levelling of the manufacturing area and the plant involved. This plant (two dumper trucks and two excavators) will give maximum noise levels at nearest locations N3 and N6 and receptors represented by N7 of similar levels to those given in Table 10.6.

Construction of Haul Road

It is proposed to construct a haul road along the northern and eastern boundary of the application site from the entrance off the public road to the manufacturing area. Overburden will be removed, and the road will be constructed with aggregate sourced from the existing quarry. The overburden will be used to construct a berm around the boundary of the site. An excavator and dump trucks will be used to undertake this activity which means that the maximum noise levels from this activity at the nearest receptors N4, N8, N1 and N2 are no more than that predicted in Table 10.6.

It is anticipated that construction works associated with the haul road and manufacturing area will be no more than 6 months duration.

Ground Vibration from Construction Activity

Due to distance, there are no ground vibration effects at any receptor from any onsite construction including haulage on the haul road.

10.8.1.1 Assessment

The construction activity associated with the development removal of topsoil / overburden, building of berms/barriers, construction of haul route and construction activity in the manufacturing area are all well within the guidelines values given in Table 10.8.

Table 10.8: Construction Phase Effects

Quality	Significance	Probability	Duration
Negative	Not significant	Likely	Temporary

It is not expected that there will be any cumulative impacts at any receptor during construction phase as plant normally used in the quarry will be utilised.

10.8.2 Potential Operation Phase Impacts of Proposed Development

The operation of the proposed development is being carried out in a phased basis over a 12 phases over a 25 year period. The maximum noise levels will be generated with the phased removal of the surface benches (benches 1 to 6 incl.). The predicted noise levels are based on the nearest activity location to the respective receptor during extraction with acoustic berm in place. The maximum predicted noise levels from extraction activity is given in **Table 10.9**. and the maximum predicted noise level from the manufacturing area is given in **Table 10.10.** As the height of all the main noise sources are within 3m of ground level in the manufacturing area an allowance of 10dBA is assumed due to the 5m high berm/ barrier attenuation effects (Ref: BS 5228-1).

Activity at the base of the surface bench which is more than 15m below the surface will give a reduction of significantly more than 20dBA with levels from these effects in similar quarries measured well in excess of 30dBA. Barrier effects from works at the base of surface is conservatively assumed as 20dBA in the predicted calculations except for locations N1 and N2 where additional barrier effects of 25dBA are attained due to the topography where the SE boundary increases in height ranging from 15 to 20m+.

The activity at the quarry floor will include a generator, front end loader and dumper trucking to surface, primary crushing with screening, rock breaker and excavator feeding the mobile crusher. This activity equates to (86+79.5+83+74.4+75.7+77+76) = 89.9dBA at 10m.

Table 10.9: Predicted maximum noise levels from extraction activity at base of the surface bench

Receptor	Source level at 10m in dBA	Distance 20log(R1/R2)	Barrier effect	Resultant noise level 1hr Leq dBA
N1	89.9	20log 133/10= -20.7	-25	41.8
N2	89.9	20log 130/10= -20.4	-25	42.0
N3*	89.9	20log 264/10= -27.6	-20	40.9
N4	89.9	20log 307/10= -29.0	-20	39.3
N5	89.9	20log 638/10= -35.7	-20	30.8
N6*	89.9	20log 265/10= -27.9	-20	40.8
N7	89.9	20log 443/10= -32.4	-20	36.4
N8	89.9	20log 330/10= -29.7	-20	38.4
N9	89.9	20log 111/10= -20.9	-20	49.0

NB * Denotes derelict buildings

Table 10.10 gives the predicted maximum noise levels noise levels generated by operations being carried out in the manufacturing area. The prediction assumes that all plant fixed and mobile is located at the nearest location to all receptors with distance assumed as being 25m from the site boundary (due to berm/barrier and road). The

predicted noise levels assumes that all plant is operating together. Noise sources includes batching plant, forklift, block plant secondary cone crusher and screener, washing plant, dump truck activity on surface and front end loader filling bins/stockpiles. An allowance of 10dBA has been assumed for barrier attenuation as all main noise sources will be within 3m of ground level and not visible to receptors operating close to boundaries.

A conservative value of 3dBA is assumed for air attenuation and ground absorption while 10dBA attenuation is assumed at N3 to N9 incl. Due to topography barrier effects 25dBA attenuation is assumed for receptors in the area of N1 and N2. The combined effect of all manufacturing activity operating together with shot hole drilling gives (79+84+83+85.5+80+73+75+) equivalent to 90.1dBA at 10m. Typically no more than 50% of plant would be operating together which would result in noise levels being 3dBA below that predicted in **Table 10.10**. All noise levels are given as 1hr Leq dBA.

Table 10.10: Predicted maximum noise levels from the manufacturing area

Receptor	Source level at 10m	Distance 20log(R1/R2)	Barrier effect /air attenuation/ground absorption	Resultant noise level
N1	90.1	20log 270/10=-28.6	-25	36.5
N2	90.1	20log 376/10=-31.5	-25	35.6
N3*	90.1	20log 208/10=-26.4	-13	50.8
N4	90.1	20log 756/10=-37.6	-13	39.5
N5	90.1	20log 779/10=-37.8	-13	39.3
N6*	90.1	20log 328/10=-30.3	-13	46.8
N7	90.1	20log 491/10=-33.8	-13	43.3
N8	90.1	20log 502/10=-34.0	-13	43.1
N9	90.1	20log 572/10=-35.1	-13	42.0

NB * Denotes derelict buildings

Table 10.11 gives the predicted noise levels from drilling activity at locations nearest to receptors and nearest to extraction boundary for all surface phases 1-6incl.

Table 10.11: Predicted noise levels from drilling activity on surface phases

Receptor	Source level at 10m in dBA	Distance 20log(R1/R2)	Barrier effect	Resultant noise level 1hr Leq dBA
N1	86	20log 108/10= -20.7	-25	40.3
N2	86	20log 105/10= -20.4	-25	40.7
N3*	86	20log 239/10= -27.6	-13	45.4
N4	86	20log 282/10= -29.0	-13	44.0
N5	86	20log 613/10= -35.7	-13	45.1
N6*	86	20log 248/10= -27.9	-13	40.5
N7	86	20log 418/10= -32.4	-13	40.6
N8	86	20log 305/10= -29.7	-13	43.3
N9	86	20log 111/10= -20.9	-13	52.1

* Denotes derelict buildings

10.8.2.1 Cumulative Noise Levels

The maximum predicted noise levels (in 1hr Leq dBA) when extraction and manufacturing is operating in tandem the noise levels at all receptors is given in Table 10.12. There is an assumption made that all plant will be working together which is unlikely to occur. With 50% of plant working together the cumulative levels will be reduced at all receptors by 3dBA. The predictions are made as maximum levels with plant operating at the nearest location to all receptors.

Table 10.12: Predicted maximum cumulative noise levels from extraction and manufacturing

Receptor	Extraction noise levels	Manufacturing noise levels	Drilling shot holes noise levels	Resultant cumulative noise level
N1	41.8	33.5	40.3	45.2
N2	42.0	32.6	40.7	45.4
N3*	40.9	50.8	45.4	52.3
N4	39.3	39.5	44.0	46.5
N5	30.8	39.3	45.1	46.3
N6*	40.8	46.8	40.5	48.7
N7	36.4	43.3	40.6	45.8
N8	38.4	43.1	43.3	47.1
N9	49.0	42.0	52.1	54.0

NB * Denotes derelict buildings

10.8.2.2 Road Traffic Noise and Ground Vibration Impacts

The proposed development site is located within proximity of an existing quarry operated by Rhyne Rock. Access to the development is via the L5097 Local Road which the existing quarry gains access off. The proposed development will become operational on closure of the existing quarry. Therefore, there will no increase in traffic on the local road

infrastructure as all quarry related traffic will transfer to the subject development site. Road traffic from the proposed quarry will travel a slightly shorter route on the L5097. The R194 will be the main transport route for the quarry development.

Ground vibration generated by HCV's along all roads will be below the threshold of sensitivity to humans at less than 0.2mm/s peak particle velocity[2] at all houses.

10.8.2.3 Blast Vibration

Ground Vibration

Ground vibration is caused by the imperfect utilisation of the explosive energy released from the fragmentation of rock during blasting operations. The energy that is unused in the fragmentation of rock propagates as an elastic disturbance away from the shot area as seismic waves. These waves, which radiate in a complex manner, diminish in strength with distance from the source. The theory relative to this motion is based on an idealised (sinusoidal) vibratory motion. When these waves come into contact with a free face, physical motion results as the energy induces oscillation in the ground surface. Blasting vibration is a surface wave type, which incorporates components of both body and surface motion.

Ground vibration itself is in-audible, however air vibrations (air overpressure) both audible and sub-audible usually accompany it. The resulting impacts of blasting vibration are often characterised as being impulsive and of short duration, usually less than 1 second with the air overpressure following. It is difficult for the average lay person to differentiate between the various types of vibrations (ground vibration and air overpressure), humans commonly associate the level of vibration with the 'loudness' of a blast.

Ground Vibration Control

Ground vibration from blasting at any receptor point is influenced in the main by:

- the maximum instantaneous charge of explosives usually referred to as MIC.
- the medium between blast source and receptor point and.
- the distance between the receptor point and the blast source.

Ground vibration control is based on reducing and controlling the weight of explosives detonated per delay. In any given situation large amounts of explosives can be detonated using time delay intervals (greater than 8 millie-second) between specific charges within the overall blast. The level of ground vibration is directly related to the maximum charge weight per delay and numerous studies have shown that peak particle velocity (PPV) is directly related to the maximum charge weight per delay. In terms of predicting ground

[2]Wiss, J. F., and Parmelee, R. A.. (1974) Human Perception of Transient Vibrations, *"Journal of Structural Division"*, ASCE, Vol 100, No. S74, PP. 773-787

vibration each quarry location is 'site specific'. Typically a 'scaled distance' regression line can be established using monitored vibration data, MIC and distance. Continuous vibration monitoring will ensure that blast vibration limits are being complied with and it also allows the development and adjustments to the 'scale distance' regression line for the proposed site. As their is an established blasting site nearby resulting in a significant amount of data is available to ensure compliance with ground vibration levels. In practice the distance and MIC to a blast receptor will determine the MIC used for blasting. As blasting operations move in a north to north-east direction blast vibration levels can be reduced by lowering the MIC. Lowering the MIC can be obtained by a number of means including a combination of the following:

- reducing the shot hole diameter
- reducing the bench height, thereby reducing the shot hole
- decking charges-dividing the charge with the shot hole by using a minimum of 1.5m of stemming

The most up to date technology in blasting operation is used at the existing quarry and will continue to be used in the proposed quarry. To this end face profiling will be carried for each blast so that the accurate geometry of the free face can be established, thereby enabling the optimum burden and spacing to be applied for each blast. Monitoring can demonstrate compliance with blast vibration limits is being met.

Variations in the maximum instantaneous charge weights (MIC) and distance to a receptor at any specific site are closely related to variations in vibration magnitude. The distance from a blast to receiver and MIC determines the basis of vibration prediction. Ground vibration monitoring is to be carried out for every blast in the environs surrounding the proposed development to ensure that blast vibration limits are being complied with. This allows the development and adjustments to their 'scale distance' regression line for the site so that the MIC charge can be lowered as a blasting goes closer to a receptor, or structure.

Historical Blast Measurements at nearby site operated by Rhyne Rock

There have been a number of blasts carried out in the nearby Rhyne Rock quarry during the past 2 years on the nearby quarry with measurements taken. Table 10.13 gives ground vibration and air overpressure levels for 2021 and part of 2022. The PPV is denoted by the maximum vector, or the maximum of three orthogonal directions: the horizontal longitudinal (L), horizontal transverse (T) and vertical (V). AOP refers to air overpressure measured in dB(Lin).

Table 10.13: Blast vibration and Air-Overpressure Levels for 2021 and August / September 2022

2021 BLASTING DETAILS

Date	Time	T(mm/sec)	V (mm/sec)	L (mm/sec)	AOP (dB Lin)	Monitoring Location
15th Feb'2021	14.10	3.3	4.3	2.9	124	Caseys
15th Feb'2021*	14.10	4.7	4.7	5.7	119	Caseys
15th Feb'2021	14.17	3.6	5.8	3.4	123	Caseys
15th Feb'2021	14.18	4.2	8.4	3.3	124	Caseys
24th Mar 2021	14.35	2.2	2.7	1.5	116	Corrigans
7th April 2021	14.08	2.9	7.7	3.6	126	Caseys
7th April 2021	14.10	2.7	4.2	4.1	125	Caseys
7th April 2021	14.12	3.2	4.1	4.9	122	Caseys
11th May 2021	15.17	1.9	2.5	1.7	125	Caseys
11th May 2021	15.18	1.5	3.8	2.5	121	Caseys
11th May 2021	15.21	7.2	10.5	4.6	126	Caseys
4th Oct 2021	15.23	0.9	1.1	1.0	116	Thompsons
4th Oct 2021	15.26	1.0	2.2	1.9	116	Thompsons
4th Oct 2021	15.33	0.5	0.8	0.8	126	Thompsons
12th Nov 2022	15.34	1.8	2.9	2.2	126	Thompsons
22nd Dec' 2021	15.22	0.6	0.9	0.5	122	Thompsons
22nd Dec' 2021	15.22	3.8	7.1	5.1	123	Caseys
22nd Dec' 2021	15.23	1.1	1.9	2.2	120	Thompsons
22nd Dec' 2021	15.23	2.3	7.5	2.3	126	Caseys
15th June 2021	15.04	5.7	6.9	7.9	124	Caseys
15th June 2021	15.08	2.5	4.2	5.2	119	Caseys
27th July 2021	13.22	1.1	1.9	1.2	113	Thompsons
27th July 2021	13.23	0.6	0.9	0.5	115	Thompsons
	NB: *Less than 30 seconds between blasts					

2022 RECENT BLASTING DETAILS

Date	Time	T(mm/sec)	V (mm/sec)	L (mm/sec)	AOP (dB Lin)	Location
30th Aug 2022	16.04	1.8	2.9	2.3	122	Thompson
6th Sept 2022	14.22	2.5	3.9	4.2	115	P. Currin

Ground Vibration Criteria, Guidelines/Recommendations/Standards

The measurement of peak particle velocity (PPV) is internationally recognised as the best single descriptor to use when assessing potential ground vibration damage to structures/buildings. More recently velocity-frequency control bounds are used as damage control criteria. There are no Irish standards for ground vibration control, however there are limits recommended in the EPA's Guidance Note on Noise in Relation to Scheduled Activities. These limits are also recommended in the Guidelines for Planning Authorities for *Quarries and Ancillary Activities* issues in April 2004 by the Department of the Environment, Heritage and Local Government. The EPA has also published a document "Environmental Management Guidelines" Environmental Management in the Extractive Industry (Non-Schedule Minerals)-2006. There are many different standards and recommendations being used internationally, some like the German DIN 4150[1] that lacks data for its foundation. However, most of these standards and recommendations are derived from the considerable work carried by the U.S Bureau of Mines (USBM). The

[1] German Standard, DIN 4150; Part 3: 1986, Vibration in buildings; effects on structures

USBM Report of Investigation 8507[2] gives practical safe criteria for blasts that generate low frequency ground vibrations (<40Hz). These are 19 mm/sec for modern houses and 12.7 mm/sec for older houses. Since 1993 British Standards Institute have adopted BS 7385 Part 2: 1993[3], which is based predominately on a literature review of the previous studies already alluded to in this report

Air Blast (Air-Overpressure) Noise

A blast causes a diverging shock-wave front that quickly reduces to the speed of sound, and an air blast is then propagated through the atmosphere as sound waves. Air blast or air overpressure is the term used to describe the low frequency, high energy air vibrations generated by blasting detonation. Air blasts are characterised by containing a larger proportion of its energy in the sub-audible spectrum, below 20 Hz. Because the waves associated with air blasts are essentially outside the audible spectrum (below 20 Hz), a separate unit of measure, pressure is reported.

The pressure is recorded using an air-blast transducer and the linear device must measure accurately in the structurally critical range, 2 to 20 Hz. Air blast (sound waves) can be reported in two distinct units of measurements, pressure (psi) or decibels (dB), normally as dB(Lin), or dB(L).

Sound waves in the form of the sub-audible sound waves (air overpressure/air blast waves), and noise (the audible waves) are sometimes linked inextricable. It is difficult sometimes for humans to differentiate between the characteristics of air blasts and noise.

A wind speed of 9 m/s produces a pressure equal to 133.7 dB (0.014 psi). Although such wind is comparable in amplitude to a strong air-blast, its effects are not as noticeable because of the relatively slow rate of wind change and the corresponding minor or non-existent rattling, compared with the rapid rise time (impulsive) of an air blast transient.

Air blast waves are attenuated over distance in much the same way as sound waves; however there are some differences due to the lower frequency of the sub-audible air blast waves. Lower frequency waves are attenuated at a lower rate by air absorption over distance than the higher frequency audible waves. Air blasts, being very high pulses of energy in the form of low frequency waves can travel great distances. The effects of temperature inversions are negligible close to a blast. The effects of ambient

[2] Siskind, D. E, Stagg, M. S., Kopp, and Dowding, C. H. (1980) *'Structure Response and Damage Produced by Ground Vibration From Surface Mine Blasting'* U .S Bureau of Mines RI 8507

temperature and relative humidity are considered negligible, at less than 1 dB at 1Km[5]. Prediction and control of air blasts can be more difficult than that of ground vibration due to the influences of weather conditions on the air blast propagation.

Control of Air Blasts

The principal factors governing air blasts are:

(a) the type and quantity of explosives
(b) the degree and type of confinement (stemming)
(c) the method of initiation (not-use of exposed detonating Cord etc.)
(d) local geology, topography and distance
(e) atmospheric conditions

Factors (a), (b) and (c) are variables within the control of the quarry operator whereas (d) and (e) are essentially uncontrollable at any particular site. However, by varying the timing of a blast (avoid early morning or late evening), by controlling the degree of confinement and by using non-electric or electronic detonators as the method of initiation (non –use of detonating Cord on surface) the quarry operator, in effect, achieves control over the influence of atmospheric conditions and hence over the blast emissions. It is important to note that atmospheric conditions (including temperature inversions) will have little effects at distances within 300m.

It is proposed to limit the air blast to an air overpressure level of 125 dB (Lin peak) with a 95% confidence limit when measured with instrumentation that has a linear response down to 2 Hz. as is given in the existing permission. This proposed limit is well below the safe level of 133 dB for air blasts given by Siskind *et al.*, 1980[6] and is also within the limit recommended by the EPA.

Flyrock

Flyrock can occur due to incorrect design and poor management of blasting rounds where there is inadequate stemming or inadequate burden (overcharging the holes with explosives). Overcharging can be avoided by following proper management procedures). Considerations for the bench height, bench face profile, face condition, local geology, rock properties, burden and spacing of the drilling pattern and in particular to the first row of boreholes when calculating charge weight per hole will ultimately define the optimum powder and energy factors for a safe and productive blast. The measures taken to control ground vibration and air-overpressure will also control and counteract the possibility of flyrock.

[5] Almone-Martin, C., and Martin, R. S. (2000). *Effects of Temperature and Humidity on Airblast Sound Pressure Levels*. Journal of the International Society of Explosive Engineers

[6] Siskind, D. E., Stachura, V.J., Stagg, M. S., and Kopp, J. W. (1980). *Structural Response and Damage Produced by Air Blast from Surface Mining*, USBM, RI 8485

10.8.2.1 Assessment of Operating Phase Effects

Using the EPA criteria for description of effects, the potential worst-case associated with the operational effects at the nearest noise sensitive receptors are described in **Table 10. 14.**

Table 10.14: Operational Phase Effects

Quality	Significance	Probability	Duration
Negative	Not significant	Likely	Long term effects

10.8.3 Potential Decommissioning Phase Impacts of Proposed Development

Noise effects during decommissioning are likely to be of a similar nature to that during construction. It is likely that the duration of decommissioning will be short term. Any legislation, guidance or best practice relevant at the time of decommissioning would be complied with.

Decommissioning will be carried out in 3 phases with:
Phase 1 being Permanent restoration of side slopes during rock extraction.
Phase II being Final Restoration of Areas and,
Phase II being Final Restoration of Areas

A description of the 3 phases is given in Section 3.3.3 Landscaping, Restoration, Decommissioning & Aftercare of Chapter 3.0 of the EIAR and the Landcape & Restoration Plan attached in Appendix 12.1.

Existing site plant will be used in decommissioning so there will be no increase in intensity of works. Decommissioning is expected to be of no more intensity and off shorter duration than construction so effects will be not significant.

Using the EPA criteria for description of effects, the potential worst-case associated with construction and Phased Decommissioning effects at the nearest noise sensitive receptors are described in Table 10.15.

Table 10.15: Decommissioning Phase Effects

Quality	Significance	Probability	Duration
Negative	Not significant	Likely	Temporary

10.8.3.1 "Do Nothing" Scenario

A 'Do Nothing' scenario would result in the site remaining as agricultural land. Noise and vibration levels would remain unchanged onsite and at nearby sensitive receptors.

10.8.3.2 "Worst Case" Scenario

The worst-case scenario would involve the failure of mitigation measures for the Proposed Development. In this scenario there is the potential for short-term, intermittent noise and vibration related impacts.

10.8.4 Avoidance, Remedial & Mitigation Measures

- Overburden will be used to provide additional berms/barriers. A barrier/ berm of height of 5m will be constructed on the boundary of the site in such a way that as phases are developed a 5m barrier berm will be located between the extraction and nearest receptors.
- The processing plant (crushers/ screeners/ washing plant) will be powered by 3 phase electricity
- All main noise sources (crushing systems, screening, washing and concrete batching plant is to be located on the bottom of quarry which provides very significant acoustic barrier attenuation effect (well over 20dBA measured at a number of points).
- All motors and pulleys will be maintained to a high standard with regular maintenance to avoid any tonal or impulsive components in the emission.
- All mobile plant on site will have well maintained silencers.
- Machinery will be throttled down or turned off when not in use.
- A noise buying standard will be put in place where any replacement of any mobile plant will have noise characteristics considered.

The following controls are already in place at the existing quarry so that ground vibration, air overpressure, noise and flyrock is minimised and kept within the regulatory limits. These will be extended to the application site. Specific mitigations measures are listed that is followed by the experienced Contractors who carry out these duties and are as follows;

- Pre-blasting management procedures, loading Management procedures and blasting management procedures) will be in place at all times.
- Considerable care will be taken to conduct the blast only between 12:00 hrs and 16:00 hrs, Monday to Friday. No blast will be conducted on weekends or bank holidays.
- Prior to drilling of a blast face, profiling or a trigonometric bench height measurement is carried out for all blasts.

- Prior to drilling the blasting pattern, the quarry foreman will mark the position of the boreholes and the blast number on the ground as per the agreed blasting plan approved and signed by the Drilling and Blasting Manager.
- A blasting plan will be issue by the blaster in charge for agreement to the Drilling and Blasting Manager prior the drilling of any blast.
- Only personnel with appropriated Certification in drilling and blasting operate the blasting programs.
- A driller's log will be in place at all times.
- A site specific scale distance regression for the proposed development site should be continuously developed as blasting continues over the life of the quarry.
- Monitoring locations for ground vibration and air overpressure will be agreed prior to blasting. Monitoring data will be used to allow for future adjustments to the maximum instantaneous charge of the blast if required.
- All seismographs should have a certificate of calibration from the manufacturer and all certificates and serial numbers of each seismograph to be used for the monitoring of the blast will be kept on file.
- Advance warning notice of all blasts will be given to residents in the near environs of the quarry at least 24hrs prior to blasting.
- Optimum blast ratio should be maintained and this ensures that the maximum amount of explosive on any one delay, the maximum instantaneous charge (MIC) is optimised so that the ground vibration levels are kept below the regulatory limits.
- Explosive charges should be properly and adequately confined with sufficient amount of quality of stemming using angular chippings and/or a combination of angular chippings and plug.
- The adequate confinement of all charges by means of accurate face survey and the subsequent judicious placement of explosives by certified personnel.
- Overcharging can be avoided by considering depth, burden and spacing when calculating charge weight per hole.
- There will be no exposed detonating cord used in surface.
- The initiation sequence in the blast will be set in a way that it progresses away from the nearest sensitive locations or structure to be protected, where practical.
- An adequate powder factor and energy factor will be chosen for each blast by considering safety, confinement and productivity.
- Borehole deviation studies will be conducted in order to have a better control in potential borehole deviation.
- Only the necessary sub drilling to achieve good breakage will be use (normally 1 to 1.5 m), excessive sub-drilling should be avoided at all times.
- Use of decked charges if required in order to reduce the Maximum Instantaneous Charge (MIC).

- Pre-splitting technique will be use for the final slope stability.

10.9 Unplanned Events

In the event of an emergency such as a fire to plant or equipment, the emergency response plan will be implemented and the relative emergency services will be contacted. An assessment in relation to the cause of the emissions will be undertaken and the activity will not recommence until the problem has been rectified.

10.10 Noise and Vibration Monitoring

To ensure compliance with regulatory limits, monitoring of all blasting events will be carried out at a selection of nearest sensitive dwellings, the location which may vary as the quarry develops. Keeping within the statutory limits of blast vibration or air overpressure will ensure that the likelihood of damage (or superficial damage) to property approaches zero. Noise monitoring could be carried out on an annual basis at locations N2, N4, N7, N8 and N9 as detailed in Plate 10.1. When compliance is met at the nearest noise receptors, then it will be met at distance further away as noise levels decreases with distance from a source.

10.11 Residual Impacts

It is not anticipated that there will be an adverse impact on noise or vibration quality in the vicinity of the application site provided that mitigation measures and best practice is applied. The predicted noise levels from construction and operation of the proposed are within the noise limits at all receptors. Ground vibration and air-overpressure will be kept below the guidelines recommended and below the regulatory limits. As blasting moves closer to receptors MIC's will be reduced thereby controlling the blast vibration levels.

10.12 Technical Difficulties

There were no technical difficulties encountered during the study / assessment.

10.13 Glossary of Technical Terms

Peak Particle Velocity (PPV) – the maximum rate of change of particle displacement, measured in millimetres per second (mm/sec).
Frequency (Hz) – the number of cycles per second of vibration usually expressed in Hertz (Hz)
dB – Decibel, a unit of measure on a logarithmic scale used to quantify pressure fluctuations such as those associated with air overpressure (concussion wave)
dB(A) – Decibel measured within an A weighted frequency curve that differentiates between sounds of different frequency in a similar way to the human ear
Maximum Instantaneous Charge Weight – The maximum amount of explosives detonated at any one precise instance in time

Scaled Distance – The blast/receiver separation distance divided by the square root of the maximum instantaneous charge weight
Blast Ratio – The amount of work per unit of explosive measured in tonnes of rock per kilogram of explosives detonated
Delay Interval – The time between successive detonations of detonators
Sequential Detonation – The method of control of time intervals between explosions of individual charges
Stemming – The term given to the inert material, typically stone chippings that is placed into the top of a borehole which has already been filled with explosives. The length of stemming should equal the distance between the hole and its associated free face.
Burden – The distance measured at right angles between a row of holes and the free face, or between rows of holes.
Shot – is a borehole complete with primed charge and stemming
Bench blasting - method of blasting in quarries and opencast sites by means of steps or benches with holes positioned parallel to the bench face.
Flyrock - The projection of material from the blast site to any area beyond the designated danger zone.
Free face - A rock surface bounded by air.

10.14 Vibration Terminology

Particle Velocity (V) - the particle velocity is defined as the rate of change of amplitude or, for sinusoidal motion this may be mathematically expressed as;

$V=2\pi fa$

Where, 'V' represents PPV (mm/sec.), 'f' is the frequency (Hz) and 'a' is the peak particle displacement or amplitude (mm). Particle velocity as the term suggests is the movement of particles within a body or medium.

Vibration is usually measured in three orthogonal directions: the vertical, horizontal transverse and the horizontal longitudinal (often termed the x, y, z vector components). Vibration waves can be divided into P (primary) waves which are compression wave, S (secondary) waves which are shear waves, Rayleigh waves, Love waves, Stonely waves etc. However, in practice it is very difficult (and not very important) to distinguish between these waves. In most cases the vertical component is the *body wave* while the *surface waves* are the longitudinal and transverse waves.
Peak Vector Sum (PVS) - the peak vector sum is often referred to as the RPPV (resultant peak particle velocity) and can be mathematically expressed as;

$$PVS = \sqrt{X^2 + Y^2 + Z^2}$$

and this is equal to the real time resultant (not the pseudo resultant). You will usually find that in practice the average difference in the peak vector-particle and the PVS is less than 10% at distances in excess of 200 metres[5].

Zero cross frequency (zc) - zero crossing frequency is the frequency at the peak particle velocity of the recorded wave.

10.15 BS 5228-1:2009

BRITISH STANDARD **BS 5228-1:2009**

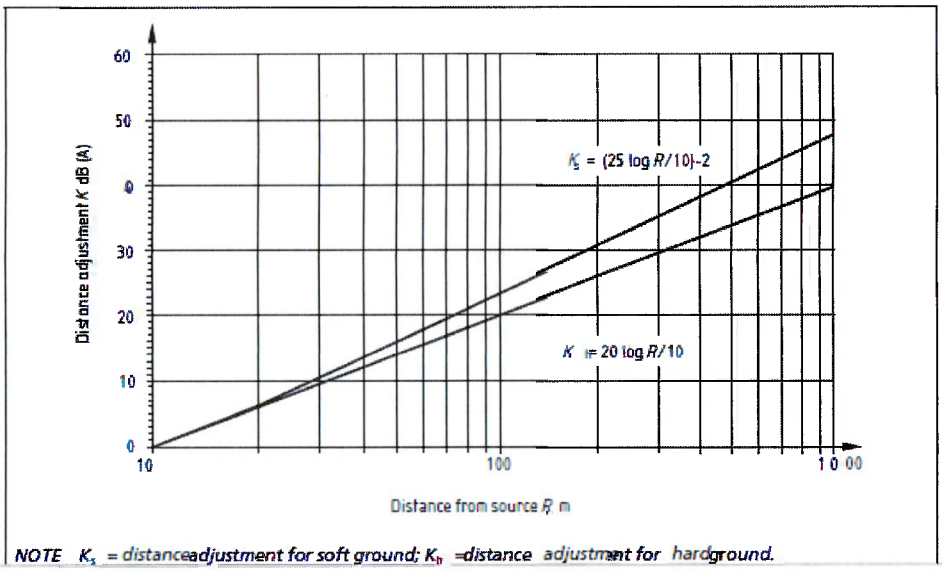
receiving positi onin relation to the source and the barier are required. Calcuàtions may be madein octave ba ndsinstead of 'A" weight ngto provid ea moreaccurate barrier attenuati on; if the octave band soundlevels (see Talles C.1 to C.11) and the posi tions of thesourc es,receiver and barrier are known .The barrier attenuatio ncan becalculated fromFigure F.3. The final results of this analysis then needs to be logaritlmically summed and weighted to provide an"A" weig htedlevel.

In the absence of spectral data, as a working appr oximaton, if there is a barrier or other topographi feature between the source andthe receiving position,assume an approximate attenuation of5 dB whenthe top of tle plant is just visible to the receiver over the noise barrier, an dof 10 dB when then oise screen completely hides the sources from the receive. High topographica lfeatures and specificallydesigned and posi tioned noise barriers could provide greater attenuatiòn. Subtract the atte nuatior from thevalue of L_{Aeq} cdculated at thepoint of interest. Where the point of interest is 1 mfro m tle façade ofa building, make an al lowarce for reflection by adding 3 dB to the calculated (free feld) levels.

d) *Stage 4.* R epeatstages 1 to 3 for eachactivity.

e) *Stage 5* Estim ate the percentage of the assessment period for which each activity takes place. Then use one of the methods outlinedin F.2.6 to pred ct theassessment period L_{Aeq} from the individual activity L_{Aeq} values obtained in stage 3, wh ch might be ona shorter timebase.

Figure F.2 **Distance adjustment *K* for activity L_{Aeq} method**



NOTE K_s = distanceadjustment for soft ground; K_h =distance adjustment for hardground.

10.16 References

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[4] Dowding, Charles, H. (1996). *Construction Vibrations*, 610 pages, Prentice Hall.

[5] O'Reilly, B., (2000), Noise and Vibration Monitoring Around an Active Base Metal Mine, M. Phil Thesis, Liverpool University, U.K.

[6] BS 5228-1:2009: Code of Practice for noise and vibration and open sites- Part 1: Noise

Appendix 10.1 - Noise Monitoring Data & Monitors In-situ

Appendix I: Noise data and photo of monitors in-situ

N1										
Date	Time	Duration	LAeq	LAFmin	LAFmax	LAF5	LAF10	LAF33	LAF50	LAF90
2022-10-10	11:15:00	00:15:00.0	49.7	41.4	73.5	53.0	51.5	47.6	46.4	43.9
2022-10-10	11:30:00	00:15:00.0	50.5	41.5	81.3	52.3	50.2	47.5	46.6	44.2
2022-10-10	11:45:00	00:15:00.0	46.6	41.2	61.6	48.6	47.8	46.5	45.9	44.2
2022-10-10	12:00:00	00:15:00.0	46.5	40.6	53.9	48.9	48.3	46.9	46.1	44.2
2022-10-10	12:15:00	00:15:00.0	47.1	41.3	62.2	50.0	49.0	47.0	46.1	43.8
2022-10-10	12:30:00	00:15:00.0	48.7	42.2	65.0	51.9	50.3	48.3	47.4	45.2
2022-10-10	12:45:00	00:15:00.0	47.6	40.9	58.4	50.6	49.7	47.8	47.0	44.6
2022-10-10	13:00:00	00:15:00.0	44.9	38.3	61.8	49.1	47.3	44.2	43.1	40.7
2022-10-10	13:15:00	00:15:00.0	46.5	38.3	64.2	51.0	49.8	46.5	44.6	40.5
2022-10-10	13:30:00	00:15:00.0	48.3	41.4	54.4	51.5	50.8	48.1	47.4	45.5
2022-10-10	13:45:00	00:15:00.0	47.8	42.3	59.7	50.1	49.4	48.0	47.4	45.6
2022-10-10	14:00:00	00:15:00.0	47.5	41.6	59.2	50.1	49.2	47.7	47.0	44.9
2022-10-10	14:15:00	00:15:00.0	46.4	40.5	62.0	48.8	47.9	46.4	45.7	43.8
2022-10-10	14:30:00	00:15:00.0	47.1	41.3	55.1	49.8	49.0	47.3	46.6	44.7
2022-10-10	14:45:00	00:15:00.0	47.4	41.9	65.3	50.1	49.1	47.1	46.2	44.3
2022-10-10	15:00:00	00:15:00.0	47.1	40.5	61.3	49.7	48.9	47.2	46.4	44.0
2022-10-10	15:15:00	00:15:00.0	46.9	39.9	69.8	49.8	48.4	46.3	45.5	42.8
		Mean	47.7	41.2	62.8	50.3	49.3	47.3	46.5	44.4

N2									
Date	Time	Duration	LAeq	LAFmin	LAF5	LAF10	LAF33	LAF50	LAF90
2022-10-10	12:15:00	00:15:00.0	48.3	38.1	50.7	48.6	46.0	44.8	41.4
2022-10-10	12:30:00	00:15:00.0	47.5	40.5	51.4	50.3	47.4	46.0	43.6
2022-10-10	12:45:00	00:15:00.0	46.7	38.9	50.8	49.4	46.6	45.4	42.4
2022-10-10	13:00:00	00:15:00.0	44.5	33.8	48.6	46.4	42.9	41.6	37.6
2022-10-10	13:15:00	00:15:00.0	44.4	33.7	48.4	46.7	43.3	41.8	38.3
2022-10-10	13:30:00	00:15:00.0	44.8	37.9	48.6	46.9	44.5	43.4	40.9
2022-10-10	13:45:00	00:15:00.0	44.4	39.2	47.3	46.4	44.7	43.7	41.2
2022-10-10	14:00:00	00:15:00.0	44.9	39.0	48.2	47.2	44.9	44.0	41.6
2022-10-10	14:15:00	00:15:00.0	43.1	37.7	45.9	45.1	43.2	42.5	40.3
2022-10-10	14:30:00	00:15:00.0	43.2	37.9	45.8	45.1	43.5	42.7	40.7
2022-10-10	14:45:00	00:15:00.0	47.3	38.9	51.2	48.6	45.0	43.9	40.9
2022-10-10	15:00:00	00:15:00.0	45.4	38.2	48.7	47.2	45.1	44.2	41.2
2022-10-10	15:15:00	00:15:00.0	53.3	38.6	58.0	53.4	47.1	45.4	41.9
		Mean	46.3	38.6	49.7	48.0	45.3	44.2	41.5

N3										
Date	Time	Duration	LAeq	LAFmin	LAFmax	LAF5	LAF10	LAF33	LAF50	LAF90
2022-10-10	12:00:00	00:15:00.0	48.5	36.3	67.5	53.2	49.2	45.2	43.4	39.5
2022-10-10	12:15:00	00:15:00.0	46.1	34.9	59.1	51.3	49.7	45.6	43.6	39.5
2022-10-10	12:30:00	00:15:00.0	45.9	36.5	57.2	50.0	48.6	46.1	44.9	41.4
2022-10-10	12:45:00	00:15:00.0	40.2	33.0	52.3	43.6	42.6	40.3	39.4	36.5
2022-10-10	1300.·00	00:15:00.0	44.9	27.6	64.9	507	43.0	38.8	37.6	33.0
20 2210-10	13:15:00	00:15:00.0	45.0	303	56.0	51.4	49.7	43.4	40.3	34.8
2022-10-10	13:30:00	00:15:00.0	39.7	33.1	48.1	43.8	42.4	39.8	38.5	35.6
2022-10-10	13:45:00	00:15:00.0	40.5	31.8	52.8	44.7	42.9	40.3	38.9	35.6
2022-10-10	14:00:00	00:15:00.0	43.2	33.4	54.1	47.4	46.2	43.1	41.6	37.0
2022-10-10	14:15:00	00:15:00.0	42.7	34.1	53.7	47.2	46.0	42.3	41.0	37.4
2022-10-10	14:30:00	00:15:00.0	45.8	31.8	61.2	51.2	49.2	44.0	41.9	37.1
2022-10-10	14:45:00	00:15:00.0	42.2	34.3	53.5	46.2	45.0	42.0	40.6	37.5
2022-10-10	15:00:00	00:15:00.0	39.7	33.0	52.4	43.2	42.0	39.5	38.4	35.8
2022-10-10	15:15:00	00:15:00.0	40.4	33.4	48.3	44.1	43.1	40.6	39.5	36.3
2022-10-10	15:30:00	00:15:00.0	52.0	33.2	68.9	60.4	52.8	40.4	38.9	35.6
		Mean	43.6	33.7	56.1	48.2	46.1	42.2	40.8	37.3

N4										
Date	Time	Duration	LAeq	LAFmin	LAFmax	LAF5	LAF10	LAF33	LAF50	LAF90
2022-10-10	11:45:00	00:15:00.0	55.2	32.5	71.1	62.2	58.8	49.6	46.0	39.4
2022-10-10	12:00:00	00:15:00.0	56.2	32.8	73.6	63.5	60.6	49.5	45.2	36.6
2022-10-10	12:15:00	00:15:00.0	56.3	33.5	72.3	63.6	61.0	50.0	45.1	38.6
2022-10-10	12:30:00	00:15:00.0	57.3	34.2	73.9	64.5	61.3	51.1	47.7	42.1
2022-10-10	12:45:00	00:15:00.0	576	31.7	74.5	64.7	61.7	52.1	46.6	36.3
2022-10-10	13:00:00	00:15:00.0	55.9	29.7	76.5	63.4	60.6	47.2	41.8	33.3
2022-10-10	13:15:00	00:15:00.0	55.6	31.2	70.1	62.9	60.5	49.5	45.4	36.4
2022-10-10	13:30:00	00:15:00.0	56.3	33.4	73.6	63.7	61.0	48.7	43.7	37.6
2022-10-10	13:45:00	00:15:00.0	57.0	31.6	74.9	64.2	61.3	49.1	44.6	36.3
2022-10-10	14:00:00	00:15:00.0	57.0	35.7	74.0	64.5	61.4	50.3	46.6	41.0
2022-10-10	14:15:00	00:15:00.0	56.9	32.1	75.1	63.9	61.6	49.6	45.0	36.9
2022-10-10	14:30:00	00:15:00.0	55.7	33.5	72.4	63.4	60.5	49.0	45.0	38.3
2022-10-10	14:45:00	00:15:00.0	57.3	30.6	73.0	64.3	62.1	52.3	47.7	39.6
2022-10-10	15:00:00	00:15:00.0	56.1	33.6	69.4	63.8	61.4	50.3	45.0	38.0
2022-10-10	15:15:00	00:15:00.0	58.1	34.0	73.9	64.9	62.7	53.0	47.0	39.5
2022-10-10	15:30:00	00:15:00.0	55.7	32.8	69.4	63.3	61.0	50.1	45.8	39.4
		Mean	56.7	33.0	73.1	64.0	61.4	50.4	45.8	38.5

N5										
Date	Time	Duration	LAeq	LAFmin	LAFmax	LAF5.00	LAF10	LAF33	LAF50	LAF90
2022-10-10	12:30:00	00:15:00.0	49.4	42.0	78.5	51.0	50.0	48.2	47.2	45.0
2022-10-10	12:45:00	00:15:00.0	48.7	38.7	72.8	50.0	48.8	46.7	45.8	42.3
2022-10-10	13:00:00	00:15:00.0	42.3	33.6	53.7	46.7	45.4	42.4	40.9	36.4
2022-10-10	13:15:00	00:15:00.0	45.4	33.1	69.9	46.6	45.3	42.8	41.4	37.6
2022-10-10	13:30:00	00:15:00.0	46.9	37.2	70.7	47.8	47.0	45.2	44.1	40.5
2022-10-10	13:45:00	00:15:00.0	53.1	40.4	83.6	53.1	49.8	46.8	45.8	43.3
2022-10-10	14:00:00	00:15:00.0	50.7	41.1	75.1	52.7	50.7	47.6	46.6	44.6
2022-10-10	14:15:00	00:15:00.0	52.5	40.4	77.5	56.3	52.6	47.7	46.0	43.4
2022-10-10	14:30:00	00:15:00.0	48.5	39.1	68.5	51.0	49.1	46.6	45.6	43.0
2022-10-10	14:45:00	00:15:00.0	48.5	41.5	72.3	49.3	48.4	46.6	45.9	43.8
2022-10-10	15:00:00	00:15:00.0	45.4	37.4	58.6	48.4	47.5	45.7	44.8	42.4
2022-10-10	15:15:00	00:15:00.0	46.1	37.0	54.5	49.3	48.4	46.8	45.8	41.4
2022-10-10	15:30:00	00:15:00.0	46.8	38.1	64.7	49.4	48.5	46.5	45.6	42.6
2022-10-10	15:45:00	00:15:00.0	48.7	38.0	63.8	53.9	53.0	48.5	45.1	39.4
		Mean	48.8	39.2	70.1	51.0	49.5	46.9	45.7	42.6

Location N1

Location N4

Location N3

Location N2

Location N5

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11.0 TRAFFIC

11.1 Introduction

The objective of this Chapter is to assess the potential impacts and effects associated with the traffic from the proposed quarry development at the application site located at Rhyne Rock Quarry, Co. Longford (hereafter referred to as the Project). This assessment will consider the impacts and effects associated with the operation and decommissioning phases on the existing and future traffic and transport infrastructure at local and regional levels.

The proposed quarry consists of an area of 18.6 Ha. adjacent to the west of the existing quarry. The access to the proposed quarry shall be via the newly proposed T-Junction west of the existing quarry and onto the L5097. The envisaged opening year for the quarry is 2024.

11.2 Methodologies

The construction phase of the proposed development will be relatively minor associated with the relocation of plant from the existing quarry to the proposed development Therefore a haul route assessments and a Construction Traffic Management Plan (CTMP) have therefore not been prepared. Therefore, there are no impacts to assess or mitigation measures to be provided.

The Operation Phase at the quarry is accessed via the newly proposed access on L5097 located to the east of the project. The impacts are assessed with mitigation measures proposed to manage the operational phase impacts associated with the quarry.

Traffic flows associated with the Decommissioning Phase of the Project are not significant and therefore no mitigation is proposed as traffic generation associated with this phase is deemed to be low and of short duration in comparison to the Operational Phase of the Project.

This Chapter considers and assesses the effects of the existing quarry on local traffic, transport networks and sensitive receptors anticipated to occur during operation.

11.3 Existing Environment and Permission

The existing development is located in Killoe, Co. Longford which is a rural area located approximately 8.1km northwest of Longford town centre. The quarry is accessed via the R194 from the existing access onto the L5097. The R194 links the quarry to Sligo/Mullingar via the N4 and Cavan/Athlone via the N55.

11.3.1 Proposed Operational Works

The application site is 18.6 hectares in area. Day to day activities that will take place at the quarry are discussed in detail in Section 3.0 of the EIAR.

Due to the various processes undertaken, the following plant and equipment is typical of that which will operate at the proposed development. Most of the plant and equipment detailed below operate at the existing quarry operated by the applicant except for the mobile crane which will be used for the erection and decommissioning of the plant and infrastructure at the quarry.

Mobile Crushing & Screening Plant	Fixed Crushing, Screening & Washing Plant
Wheel loaders	Concrete Batching Plant
Excavators	Mobile Concrete Block Making Machine
Dump Trucks	Forklift / Concrete Block Handler
Drilling Rig	Road Trucks
Hydraulic Impact Breaker	Concrete Bottle Trucks
Tractor & Bowser	Block Carrier Trucks
Mobile Crane	

It is noted that not all plant and machinery operate at the one time particularly in relation to plant associated with the extraction and processing of material such as crushing and screening units, drilling rigs, excavators and dump trucks etc.

Products that will be produced at the quarry will consist of graded aggregate, ready-mix concrete and concrete products. Aggregate trucks, concrete bottle trucks and concrete block trucks fitted with a grab will be used to transport products from the application site to the required destination. Each load is weighed prior to exiting the site and a weighbridge docket is printed out to accompany the load to the destination. All vehicles exit the quarry via the proposed eastern access point and onto the L5097.

11.3.2 Proposed Decommissioning Works

Decommission works shall involve landscaping and restoration which will include the removal of all plant and machinery, landscaping and restoration of areas on completion of extraction.

11.4 Methodology

11.4.1 Study Area

This section provides an overview of the location and environmental setting of the proposed quarry, describing key features of the natural and built environment which fall within, or in proximity to the quarry.

The study area comprises of 1 no. proposed site access and the existing haul roads (L5097 and R194) during operation. The quarry is situated in a rural area with one off houses and farmsteads located along roads in the vicinity of the quarry. Land-use in the vicinity of the application area and existing quarry consists mainly of agricultural land with livestock farming being the predominant sector practiced.

The closest urban centre is Longford town centre located approximately 8.1km to the southwest of the application area.

11.4.2 Relevant Guidelines, Policy and Legislation

The following guidance documents have been utilised in the assessment of the potential traffic and transport related impacts on the regional and local road network:

- Guidelines on the Information to be contained in Environmental Impact Assessment Reports, by the Environmental Impact Agency, Draft August 2017;
- Traffic and Transport Assessment Guidelines, by Traffic Infrastructure Ireland (formerly the National Roads Authority (NRA)), May 2014;
- Transport Infrastructure Ireland Publications (Standards and Technical) documents; and
- Guidelines for the Environmental Assessment of Road Traffic, by the Institute of Environmental Management and Assessment, 1994.

A summary of the relevant traffic and transport related policy context in relation to the quarry is outlined below.

11.4.2.1 Longford Development Plan 2021-2027

In accordance with the Longford Development Plan 2021-2027 (as varied), the following objective are applicable to quarries:

> DMS16.175 -- *Require that all extract industry development complies with the requirements of Section 261 and Section 261A of the Planning and Development Act, 2000 (as amended), the Quarries and Ancillary Activities Guidelines 2004 or any updates thereof EPA Guidelines for*

11.4.3 Data Collection Methods

In order to assess the traffic and transportation impacts associated with the Project, the following approach was adopted:

- Scoping of the Project and assessment requirements, with Local Authorities in respect of the proposed development;
- Desktop assessment in the vicinity of the quarry;
- Determination of existing road characteristics, traffic levels and collision statistics (Baseline Conditions); and
- Determination of the impacts of the continuation of use of the existing quarry (Predicted Impacts).
- Assessment of Environmental Impacts as outlined in Preparation of this Environmental Impact Assessment Report Traffic Chapter.

The assessments and reports outlined above should be read in conjunction with this Chapter. Summaries of the key findings of these assessments are presented throughout this Chapter.

11.4.3.1 Traffic Counts

In order to determine the magnitude of the existing traffic flows, the results of a manual classified junction turning counts was used. The traffic surveys were carried out by Traffinomics Limited. The junction count was undertaken on Tuesday 23rd November 2021 between the hours 07:00 and 19:00.

The count information was obtained on the following locations:

- Site 1: R194/L5097; and
- Site 2: L5097/Quarry Access

This survey distinguished between light good vehicles and heavy good vehicles. The traffic count data is included in Appendix 11.1 of this report. The results of this survey indicated that the peak traffic levels through the junction occurred between the hours of 08:30 and 09:30 and between 16:30 and 17:30.

11.4.3.2 Consultation / Scoping

In order to ensure the scope of this report was to the satisfaction of Longford County Council, a scoping document was issued on the 09th of November 2021 to Longford County Council Roads Department (Appendix 11.2).

11.5 Baseline Environment

11.5.1 Description of Existing Environment

The existing quarry impacts are in the administrative area of Longford County Council. The zone of influence of the quarry in relation to traffic and transport includes the proposed quarry access on the L5097 and the R194/L5097 T-Junction.

11.5.1.1 Description of Existing Junction

The site lies on the south of the R194 local road. The quarry is accessed via the R194 from the L5097 as seen in Plate 11.1.

Plate 11-1: Site Access (Google Maps)

11.5.1.2 Existing Road Network

The posted speed limit along this section of the R194 is 80km/h. The R194 has an approximate carriageway width of 6.0m, with no hard strip and no verge in the vicinity of the quarry entrance. There is no lighting along this section of road.

11.5.1.3 Existing Haul Routes

The site is accessed via the R194. The road infrastructure in the vicinity of the quarry consists of a series of regional and local roads which connects villages and towns in the region. The national road network is approx. 6.7km to N4, 15.2km to N55, 10.4km to N5 and 9.1km to N63.

11.6 Appraisal Method for Assessment of Impacts

11.6.1 Assessment of Environmental Impacts

At the time of writing this report, draft Environmental Protection Agency (EPA) Guidelines[1] are available detailing the information to be contained in Environmental Impact Assessment Reports. Under previous legislation relating to Environmental Impact Assessments, Traffic formed part of the assessments associated with 'Material Assets'.

In accordance with Directive 2011/92/EU, Material Assets included architectural and archaeological heritage, while Directive 2014/52/EU included these heritage aspects, as components of cultural heritage. It is noted in the EPA Guidelines, that the meaning of Material Assets is less clear than other prescribed requirements such as Noise and Air.

The EPA guidelines provide a qualitative approach outlining traffic related impacts. However, no thresholds for traffic related impacts area available. In order to meet the requirements of the EPA guidelines for the assessment of Traffic related traffic, it was necessary to refer to the TII Traffic and Transportation Assessment Guidelines 2014 TII Publications (Standards) PE-PDV-02045. These TII Guidelines outlines the thresholds under which the preparation of a TTA is recommended.

11.6.2 Significance Criteria

The TII Traffic and Transportation Assessment Guidelines 2014, Table 2.1 *Traffic Management Guidelines Thresholds for Transport Assessments*[2] outlines the thresholds

[1] Guidelines on the Information to be contained in Environmental Impact Assessment Reports – Environmental Protecting Agency – Draft – August 2017

[2] National Roads Authority (Now Transport Infrastructure Ireland) Traffic and Transportation Assessment Guidelines, 2014 – Table 2.1 Traffic Management Guidelines Thresholds for Transport Assessments.

under which the preparation of a Traffic and Transportation Assessment is recommended. These include:

- *Traffic to and from the development exceeds 10% of the traffic flow on the adjoining road; and*
- *Traffic to and from the development exceeds 5% of the traffic flow on the adjoining road where congestion exists, or the location is sensitive.*

11.6.3 Significance of Effects

In addition to these thresholds and criteria, the EPA's Draft Guidelines on the Information to be contained in Environmental Impact Assessment Reports, August 2017 (hereafter referred to as the Draft EPA Guidelines), also includes a methodology for the description of effects. This is detailed in Table 11.1.

Table 11-1: EPA Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (Draft) - August 2017 – Table 3.3 Description of Effects

Description of Effects	
Quality of Effects	**Positive Effects** A change which improves the quality of the environment.
	Neutral Effects No effects or effects that are imperceptible, within normal bounds of variation or within the margin of forecasting error.
	Negative/adverse Effects A change which reduces the quality of the environment.
Significance of Effects	**Imperceptible** An effect capable of measurement but without significant consequences.
	Not significant An effect which causes noticeable changes in the character of the environment but without significant consequences.
	Slight Effects An effect which causes noticeable changes in the character of the environment without affecting its sensitivities.
	Moderate Effects An effect that alters the character of the environment in a manner that is consistent with existing and emerging baseline trends.
	Significant Effects An effect which, by its character, magnitude, duration or intensity alters a sensitive aspect of the environment.
	Very Significant An effect which, by its character, magnitude, duration or intensity significantly alters most of a sensitive aspect of the environment.
	Profound Effects An effect which obliterates sensitive characteristics.
Extent and Context of Effects	**Extent** Describe the size of the area, the number of sites, and the proportion of a population affected by an effect.
	Context

Description of Effects	
	Descri'bewhether the extent, duration, or frequency willco nformor contrast with established (baseline) conditions.
Probability of Effects	**Likely Effects** The effects that can reasonably be expected to occur because of the planned project if all miti gaton measures are properly implemented.
	Unlikely Effects The effects that can reasonably be expected not to occur because of the planned project if all miti gaton measures are properly implemented.
Duration andFrequency of Effects	**Momentary Effects** Effects lasting from seconds to minutes.
	B riefEffects Effects lasting less than a day.
	Temporary Effects Effects lasting less than a year.
	Short-term Effects Effects lasti ngone to seven years.
	Medium-term Effects Effects lasting seven to fifteen years
	Long-term Effects Effects lasting fifteen to sixty years.
	Permanent Effects Effects lasting over sixty years.
	Reversible Effects Effects that can be undone, for example through remediation or restoration.
	Frequency of Effects Describe how often the effect will occur.
Types of Effects	**Indirect Effects** Impacts on the environment, which are not a direct result of the project, often produced away from the project site or because of a complex pathway.
	Cumulative Effects The addition of many minor or significant effects, including effects of other projects, to create larger, more s'ignifcant effects.
	'Do-Nothing Effects' The environment as it would be in the future should the subject project not be carried out.
	`Worst case' Effects Theeffects arising from a project in the case where mitigation measures substantially fail.
	hdeterminable Effects When the full consequences of a change in the environment cannot be described.
	Irreversible Effects When the character, distinctiveness, diversity or reproductive capacity of an environment is permanentlylost.
	Residual Effects

Description of Effects	
	The degree of environmental change that will occur after the proposed mitigation measures have taken effect.
	Synergistic Effects Where the resultant effect is of greater significance than the sum of its constituents.

The existing site accesses associated with the quarry has been analysed using the following Transport Research Laboratory (TRL) software:

- PICADY, a widely acceptable tool used for the analysis of priority junctions.

The key parameters examined in the results of the analysis are:

- The Ratio of Flow to Capacity Value (RFC) - The desirable RFC Values for junctions assessed using PICADY is less than 0.85. Values over 1.00 indicate that the approach arm is over capacity;
- Maximum queue length on any approach to the junctions; and
- Average delay for each vehicle passing through the junction during the modelled period.

Therefore, in utilising the criteria derived for assessing the significance of traffic flow shown in Table 11.2, the significance effect was determined for junctions above the desirable RFC.

11.6.4 Description of Receiving Environment

The following sections detail the existing environment with respect to the quarry site access junction and related haul routes.

11.6.4.1 Site Access Location

Access to the Project is via the no. 1 proposed quarry entrance/exit onto the L5097.

In accordance with Longford Development Plan 2021-2027, a 'y'-distance of 160m is required for the visibility splay at the junction as per *Table 10.1 Sightline Requirements* onto Regional and Local Roads.

11.6.4.2 Proposed Haul Routes

There is no Construction Phase associated with this project and hence no construction haul route just the movement of plant from the existing quarry to the proposed development which is a very short section of road.

The Operational Phase haul routes are currently being utilised as part of the normal operations of the quarry. As this application is to facilitate the relocation of the current

quarry operations there will be no intensification of activities and hence no increases in traffic on the currently utilised haul routes.

The Decommission Phase will result in traffic generations along similar routes to the Operation Phase haul routes. The volume of traffic anticipated during the decommission phase will be of a shorter duration than the operational phase with a reduction in traffic. Short term peaks may be encountered during the decommissioning in excess of the current operational traffic.

11.7 Predicted Impact of the Project

The following section outlines the Traffic and Transportation Assessment undertaken in accordance with the TII Traffic and Transportation Assessment Guidelines – August 2014 publication (PE-PDV-02045).

11.7.1 Assessment Periods

11.7.1.1 Assessment Year

TII Traffic and Transportation Assessment Guidelines sets out the required assessment years and time periods to be assessed. In accordance with this guideline document, the following sections detail those proposed in this assessment.

11.7.1.2 Construction Phase

The assessment years assessed typically include for the construction phase and operational phase. For this Project, the construction phase involves the movement of plant from the existing quarry to the proposed development which is a very short section of road, hence no Construction Phase has been assessed.

11.7.1.3 Operational Phase

For this application, the Operational Phases as per TII Traffic and Transportation Assessment Guidelines (PE-PAV-02045) are:

- Operational Phase
  - 2024 – Envisaged Year of Opening;
  - 2029 – Year of Opening plus 5 years;
  - 2039 – Year of Opening plus 15 years.

11.7.1.4 Decommission Phase

The Decommission Phase for this development is not envisaged within the opening year plus 15 years and hence has not been assessed. In addition, the predicted traffic for the

decommission phase are anticipated to be of short duration within only occasional peaks in excess of current operations.

11.7.2 Traffic Growth

In order to undertake a robust and comparable traffic assessment, it is necessary for baseline traffic data to be factored based on nationally adopted growth rates detailed in the TII PAG Unit 5.3 Travel Demand Projections. A high growth factoring of the traffic data from the year the traffic counts were undertaken, to the assessment years for the Project.

Table 12-2 shows the associated high sensitivity growth rates, from the TII PAG Unit 5.3 utilised in the traffic assessment. These factors have been applied to the seasonally adjusted baseline traffic flows on the existing road network.

Table 12-2: Growth Rates - TII Project Appraisal Guidelines, October 2021

County	2016-2030		2030-2040	
	LV	HV	LV	HV
Longford	1.017	1.035	1.007	1.016

11.7.3 Do Nothing Scenario

It shall be noted that the Do-Nothing scenario is equivalent to the baseline environment. The assessment of the existing environment/Do Nothing Scenario, would be a scenario with the existing quarry utilising their reserve of material available. (i.e. if the extension was not to proceed the quarry would continue to extract the available reserve of material). The site access would therefore remain operational.

11.7.3.1 Baseline Traffic

Traffic count data have been utilised in accordance with the Transport Infrastructure Irelands (TII) Project Appraisal Guidelines (PAG) - Unit 16 in order to estimate the Annual Average Daily Traffic (AADT)[3] two-way traffic flow on the associated road network. This method is an industry standard as it takes account of seasonal variations that is typically experienced during national public holidays and tourist seasons. In turn, this allows for an informed and representative basis for comparison of project related impacts.

11.7.4 Construction Phase Assessment

None envisaged. No construction phase is associated with this development.

[3] Annual Average Daily Traffic (AADT) is defined as the total two-way traffic volume passing a point or segment of a road for one full calendar year, divided by the number of days in a year (365).

11.7.5 Operational Phase Assessment

11.7.5.1 Operational Phase Traffic Generation

The Operational Phase has the largest impact. The traffic associated with the Operational Phase is based on:

- Cars for the staff numbers at the existing quarry from traffic count data;
- Light Vehicles (LV) for staff and material collections from traffic count data; and
- Client data and traffic count data for Heavy Goods Vehicles (HGV).

A summary of the predicted peak activity at the quarry is provided below in Table 11-3 .

Table 11-3: Peak Traffic volumes at the Quarry Access on L5097

Quarry Traffic at Site Entrance – Peak Activity 2021 Traffic Count				
	AM Peak		PM Peak	
Time	08:30-09:30		16:30-17:30	
	Arrivals	Departures	Arrivals	Departures
LGV	30	0	0	30
HGV	6	6	6	6

The following assumptions have been made in the development of the Operational Phase Generated traffic:

- All operational staff will arrive in the AM peak (08:30-09:30) and depart in the PM peak (16:30-17:30);
- All HGV will arrive empty and depart full
- Assumed that operational staff will travel to work in their own vehicle (single occupancy); and
- Assume HGV operations within an 12-hour period per weekday and 9 hour on Saturday.

11.7.5.2 Summary of Operational Phase Assessment Results

The JUNCTION 10 (PICADY) assessment of the quarry access and junction onto R194 are shown below in Table 11-4 and Table 11-5. A complete set of outputs from JUNCTION 9 are included in Appendix 11.3.

Table 11-4: Junction 1: Existing T-Junction R194

	AM			PM		
	Queue (PCU)	Delay (s)	RFC	Queue (PCU)	Delay (s)	RFC
	2022					
Stream B-AC	0.1	10.24	0.04	0.1	10.24	0.04
Stream C-AB	0.0	11.19	0.01	0.0	11.19	0.01
	2024 - No Dev					
Stream B-AC	0.1	10.57	0.05	0.1	10.56	0.05
Stream C-AB	0.0	11.17	0.01	0.0	11.19	0.01
	2024 - With Dev					
Stream B-AC	0.1	10.66	0.05	0.2	15.23	0.11
Stream C-AB	0.1	7.35	0.05	0.0	11.19	0.01
	2029 - No Dev					
Stream B-AC	0.1	10.98	0.05	0.1	10.96	0.05
Stream C-AB	0.0	11.05	0.01	0.0	11.06	0.01
	2029 - With Dev					
Stream B-AC	0.1	11.09	0.05	0.2	15.49	0.12
Stream C-AB	0.1	7.47	0.05	0.0	11.06	0.01
	2039 - No Dev					
Stream B-AC	0.1	11.45	0.06	0.1	11.49	0.06
Stream C-AB	0.0	10.93	0.01	0.0	10.94	0.01
	2039 - With Dev					
Stream B-AC	0.1	11.57	0.06	0.3	15.82	0.13
Stream C-AB	0.1	7.60	0.05	0.0	10.94	0.01

The summary of performance analysis indicates that proposed Junction 1 will be operating with negligible queues and delays during the peak hours, during the Operational Phase.

Table 11-5: Junction 2: Proposed access on the L5097

	AM			PM		
	Queue (PCU)	Delay (s)	RFC	Queue (PCU)	Delay (s)	RFC
	2022					
Stream B-AC	0.1	11.34	0.04	0	9.01	0.05
Stream C-AB	0	7.3	0	0	6.09	0
	2024 - No Dev					
Stream B-AC	0.1	11.52	0.05	0	9.06	0.05
Stream C-AB	0	7.28	0	0	6.09	0

	2024 - With Dev					
Stream B-AC	0.1	11.66	0.05	0.1	8.65	0.07
Stream C-AB	0	5.87	0.03	0	6.13	0
	2029 - No Dev					
StreamB-AC	0.1	10.21	0.05	0.1	9.27	0.05
Stream C-AB	0	7.22	0.01	0	6.06	0
	2029 - With Dev					
StreamB-AC	0.1	11.96	0.06	0.1	8.84	0.08
Stream C-AB	0.1	5.84	0.04	0	6.1	0
	2039 - No Dev					
Stream B-AC	0.1	12.23	0.06	0.1	9.47	0.06
Steam C-AB	0	7.11	0.01	0	6.05	0
	2039 - With Dev					
Stream B-AC	0.1	12.38	0.06	**0.1**	**9.09**	**0.08**
Stream C-AB	0.1	5.81	0.04	**0**	**6.09**	**0**

The summary of performance analysis indicates that proposed Junction 2 wil lbe operating with negligible queues and delays during the peak hours, during the Operational Phase.

11.7.5.3 Summary of Threshold Assessment

The quarry accesses are expected to operate well within capacity; therefore, the Project will have an imperceptible effect on the road network during operations. Decommissioning Phase Assessment

11.7.5.4 Decommissioning Phase Traffic Generation

The traffic associated with the Decommissioning Phase of the Project is expected to be less than the Operational Phase and of shorter duration.

11.7.5.5 Summary of Decommissioning Phase Assessment Results

As the date of the Decommissioning Phase is not currently known and the traffic associated with the works is anticipated to be less than those expected for the Operational Phase. It is assumed that the site access and link capacity will operate well below capacity as per the Operational Phase allowing for growth in baseflow traffic for the year of the decommissioning.

11.7.5.6 Summary of Threshold Assessment

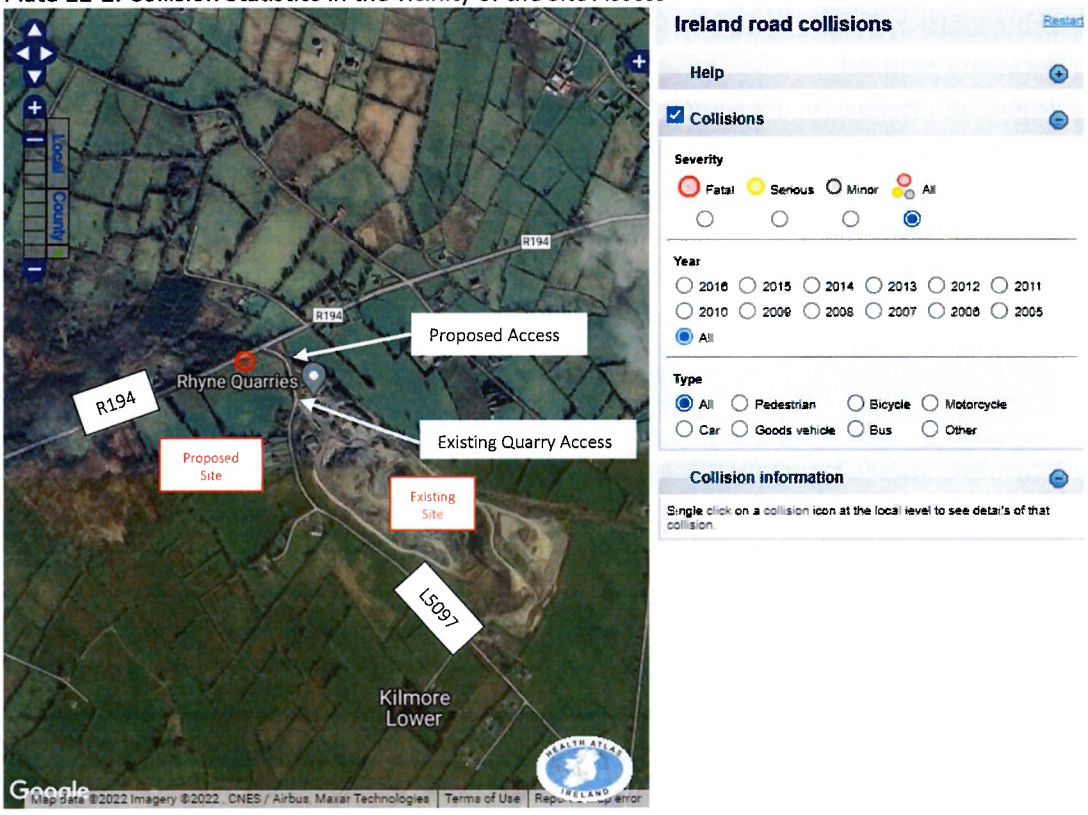
During decommissioning it is anticipated that the quarry accesses will operate well within their capacities and therefore the Project will have an imperceptible effect on the road network during the Decommissioning Phase.

11.7.6 Environmental Impacts

11.7.6.1 Road Collision Statistics

An investigation of road collision data from the Road Safety Authority website (source: http://www.rsa.ie/RSA/Road-Safety/Our-Research/Ireland-Road-Collisions/) (see Plate 11.7) indicates that there was one fatal collision recorded between 2005 and 2016 located on the R194 close to the junction with the local road L5097.

Plate 11-2: Collision Statistics in the vicinity of the Site Access



Note - the RSA database is not a comprehensive record of collisions and should be reviewed in conjunction with the Local Authority / Gardaí records for the site.

11.7.6.2 Unplanned Events

In order to address unforeseen events, the following incidents have been considered:

- Incident along the Haul Roads;
- Incident at the existing site access; and
- Incident within the quarry.

The unplanned events that potentially could occur include road collisions, flooding and/or an oil spillage along a Haul Road. In such an event, competent personnel such as the Local Authorities, An Garda Siochána and other emergency services would be involved, setting up designated diversion routes to mitigate the unplanned event.

In the event of an incident occurring along any of the Haul Roads, the emergency diversion routes provided by An Garda Siochána will be utilised.

An incident at the site access is similar to the occurrence of an incident along the Haul Roads. An Garda Siochána emergency diversion routes will be utilised and the facility operators will also contact the HGV drivers to inform them of the significance of the incident and the necessary protocol.
Where an incident occurs within the quarry, existing emergency protocols in place at the quarry will be enacted and onsite personnel will respond in accordance with these protocols.

In order to estimate the likelihood of the above-mentioned incidents, a Safety Risk Assessment has been prepared, see Table 12-5.

Table 11-6: U nplanned Events – Risk Assessment

Risk Assessment			
Hazards and Risks	**Personnel at risk from the significant hazards**	**Risk Control**	**Responsible persons**
Road Collison	• Public • Drivers of vehicles travelling to/from quarry • Vulnerable Road Users (Pedestrians and Cyclist)	• Maintain hedgerow to maintain optimum visibility • Maintain road signage and add signage where necessary • Maintain road surfacing and improve where necessary • Maintain lighting along road and improve where necessary	Local Authority and Applicant
Pavement Deterioration, e.g. potholes	• Public • Drivers of vehicles travelling to/from quarry • Vulnerable Road Users	• Maintain road pavement and improve where necessary	Local Authority and Applicant

Road Flooding	• Public • Drivers of vehicles travelling to/from quarry • Vulnerable Road Users	• Maintain road drainage and improve where necessary	Local Authority and Applicant
Snow / front on road	• Public • Drivers of vehicles travelling to/from quarry • Vulnerable Road Users	• Maintain a stock of salt and chips and apply prior to snow/frost fall • Apply temporary signage where need to notify public of risk and /or road closures	Local Authority
Injury within the site (i.e. slips / trips or falls)	• Employees of the Quarry • Drivers of HGVs for deliveries	• Adequate training provided to personnel • Walkways to be maintained and kept clear	Applicant
Collision within the site (i.e. vehicle or personnel struck by vehicle)	• Employees of the Quarry • Drivers of HGVs for deliveries	• Personnel use internal walkways • Personnel wear high-vis • Supervision of HGVs to enforce safety procedures	Applicant

11.7.6.3 Fear, Intimidation and Pedestrian Amenity

Traffic volume, composition and speeds, in combination with lack of pedestrian footways and crossings, contribute to the level of general unpleasantness, fear, intimidation and delay experienced by pedestrians and other vulnerable road users.

11.8 Mitigation Measures

11.8.1 Construction Phase

Not applicable as no construction phase envisaged.

11.8.2 Operational Phase

The following mitigation measures have been and will be implemented to minimise the impacts of the quarry:

- Sufficient car parking spaces are provided within the quarry for current staff levels. The existing working quarry and proposed quarry development shall result in an increase in staff levels and as such this ensures that parking associated with the quarry does not occur along the public road network;
- Sufficient space has been provided between the L5097 carriageway edge and the gates at the existing access to accommodate 1 HGV clear of by-passing traffic on the mainline;

- Pedestrian facilities are provided where required within the proposed quarry to facilitate safe pedestrian movements in accordance with the Quarry Health and Safety Plan;
- Maintenance of existing visibility splays shall be undertaken in accordance with the Longford Development Plan at the quarry access;
- The quarry products are currently loaded onto open back trucks using wheel loaders, these trucks shall be covered where required to reduce dust impacts; and
- An existing wheelwash is located within the quarry.

11.8.3 Decommissioning Phase

The following mitigation measures will be implemented at Decommissioning Phase to minimise the impacts of the Project:

- A detailed Traffic Management Plan shall be prepared in advance of the decommissioning works;
- Sufficient car parking spaces shall be provided within the quarry for staff associated with the decommissioning works;
- Materials and plant shall be sourced locally to reduce the impact on the road network and environmental impacts; and
- Transport of materials and plant to the quarry during this phase shall utilise the national and regional road networks, which have a greater traffic capacity in comparison to the local road network.

11.9 Residual Impacts

The mitigation measures outlined in Section 11.7 will minimise any residual impacts. Operational traffic associated with the quarry was assessed at the site accesses onto the L5097 and onto the R194. Traffic arriving and departing for the quarry will have a high content of HGV movement. The assessments indicate that the site accesses are expected to operate well within capacity in all the assessment years including the continuation of the quarry traffic and therefore will have an imperceptible effect on the existing site access and a not significant impact on the road network.

The Decommissioning Phase traffic will be temporary in nature, with traffic volumes lower than the current operations at the Quarry. The preparation of the Traffic Management Plan will minimise traffic impacts during this phase.

11.10 Conclusion

The quarry accesses will operate below the desired 0.85 RFC up to and including the design year of 2039, with the inclusion of quarry-generated traffic.

Sufficient car parking spaces are provided within the quarry for current staff levels. The existing working quarry and proposed quarry shall not result in an increase in staff levels and as such this ensures that parking associated with the quarry does not occur along the public road network.

11.11 Difficulties Encountered in Compiling Information

At the time of the preparation of this report, the date for decommissioning the quarry is not known. It is envisaged that the extraction will continue at the existing quarry beyond the date of the final assessment year of 2039 under new / subsequent application and beyond the year of 2050.

The TII PAG Unit 5.3 currently does not project this far into the future. For this reason, the assessment of the Decommission Phase has been compared to the Operational Phase throughout this report.

11.12 Cumulative Impacts and Impact Inter-relations

During the preparation of the traffic and transport impact assessment, interaction and consultations have taken place with several other disciplines in order to ensure that the cumulative impacts of the Project have been considered. Therefore, it has been assumed that any increase in traffic over the time period considered in this traffic assessment will be accounted for in the baseflow central / medium growth factors.

Appendix 11.1 Traffic Count Data

Traffic Calculations for Killoe Quarry

Site 1 - R194/L5097

AM Peak (08:30 - 09:30)

Seasonally Adjusted 2021

Route	A	HGV	B	HGV	C	HGV
A	0	0	1	1	209	5
B	2	3	0	0	10	2
C	86	8	0	3	0	0

2024 ***Year of Opening***

	Longford	LGV	HGV
	2016 - 2030 Index	1.0167	1.0347
	Years	2	2
High Growth Factor		1.0337	1.0708

Route	A	HGV	B	HGV	C	HGV
A	0	0	1	1	216	8
B	2	4	0	0	10	2
C	89	8	0	4	0	0

2029 ***(5 Years after Opening)***

	Longford	LGV	HGV
	2016-2030 Index	1.0167	1.0347
	Years	7	7
High Growth Factor		1.1229	1.2697

Route	A	HGV	B	HGV	C	HGV
A	0	0	1	1	234	10
B	2	4	0	0	11	3
C	96	10	0	4	0	0

2039 ***(15 Years after Opening)***

	Longford	LGV	HGV
	2016-2030 Index	1.0167	1.0347
	Years	9	9
High Growth Factor		1.1607	1.3593
	Longford	LGV	HGV
	2030-2040 Index	1.0072	1.0161
	Years	9	9
High Growth Factor		1.0667	1.1546
Combined Factors		1.2381	1.5694

Route	A	HGV	B	HGV	C	HGV
A	0	0	1	2	258	12
B	3	5	0	0	12	3
C	106	12	0	5	0	0

AM PEAK GENERATED TRAFFIC

Site 1 - R194/L 5097

WITH DEVELOPMENT

Generated Traffic

Route	A	HGV	B	HGV	C	HGV
A	0	0	12	0	0	0
B	0	0	0	0	0	0
C	0	0	18	0	0	0

Year of Opening

Route	A	HGV	B	HGV	C	HGV
A	0	0	13	1	216	8
B	2	4	0	0	10	2
C	89	8	18	4	0	0

(5 Years after Opening)

Route	A	HGV	B	HGV	C	HGV
A	0	0	13	1	234	10
B	2	4	0	0	11	3
C	96	10	18	4	0	0

(15 Years after Opening)

Route	A	HGV	B	HGV	C	HGV
A	0	0	13	2	258	12
B	3	5	0	0	12	3
C	106	12	18	5	0	0

Traffic Calculations for Killoe Quarry

Site 1 - R194/L5097
PM Peak (16:30 - 17:30)

Seasonally Adjusted 2021

Route	A	HGV	B	HGV	C	HGV
A	0	0	1	1	209	8
B	2	9	0	0	10	2
C	85	8	0	3	0	0

2024 ***Year of Opening***

	Longford	LGV	HGV
2016 - 2030 index		1.0152	1.0340
Years		2	2
High Growth Factor		1.0306	1.0692

Route	A	HGV	B	HGV	C	HGV
A	0	0	1	1	216	8
B	2	4	0	0	10	2
C	88	8	0	4	0	0

2029 ***(5 Years after Opening)***

	Longford	LGV	HGV
2016-2030 index		1.0152	1.0340
Years		7	7
High Growth Factor		1.1114	1.2637

Route	A	HGV	B	HGV	C	HGV
A	0	0	1	1	232	10
B	2	4	0	0	11	3
C	96	10	0	4	0	0

2039 ***(15 Years after Opening)***

	Longford	LGV	HGV
2016-2030 index		1.0152	1.0340
Years		9	9
High Growth Factor		1.1454	1.3511
	Longford	LGV	HGV
2030-2040 index		1.0073	1.0152
Years		9	9
High Growth Factor		1.0677	1.1454
Combined Factors		1.2229	1.5475

Route	A	HGV	B	HGV	C	HGV
A	0	0	1	2	266	12
B	3	6	0	0	12	3
C	106	12	0	6	0	0

AM PEAK GENERATED TRAFFIC

Site 1 - R194/L5097
WITH DEVELOPMENT

Generated Traffic

Route	A	HGV	B	HGV	C	HGV
A	0	0	0	0	0	0
B	0	9	0	0	0	21
C	0	0	0	0	0	0

Year of Opening

Route	A	HGV	B	HGV	C	HGV
A	0	0	1	1	216	8
B	2	13	0	0	10	23
C	88	8	0	4	0	0

(5 Years after Opening)

Route	A	HGV	B	HGV	C	HGV
A	0	0	1	1	232	10
B	2	14	0	0	11	23
C	96	10	0	4	0	0

(15 Years after Opening)

Route	A	HGV	B	HGV	C	HCV
A	0	0	1	2	266	12
B	3	14	0	0	12	24
C	106	12	0	6	0	0

Traffic Calculations for Killoe Quarry

Site 2 - L5097/Proposed Quarry Access

AM Peak (16:30 - 17:30)

Seasonally Adjusted 2021

Route	A	HGV	B	HGV	C	HGV
A	0	0	0	1	29	2
B	40	5	0	0	5	1
C	506	2	4	4	0	0

2024 ***Year of Opening***

	Longford	LGV	HGV
2016 - 2030 index		1.0152	1.0340
Years		2	2
High Growth Factor		1.0308	1.0692

Route	A	HGV	B	HGV	C	HGV
A	0	0	0	8	22	2
B	40	5	0	0	5	8
C	543	2	4	4	0	0

2029 ***(5 Years after Opening)***

	Longford	LGV	HGV
2016-2030 index		1.0152	1.0340
Years		7	7
High Growth Factor		1.1114	1.2637

Route	A	HGV	B	HGV	C	HGV
A	0	0	0	8	83	40
B	44	1	0	0	5	8
C	515	40	4	4	0	0

2039 ***(15 Years after Opening)***

	Longford	LGV	HGV
2016-2030 index		1.0152	1.0340
Years		9	9
High Growth Factor		1.1454	1.3511
	Longford	LGV	HGV
2030-2040 index		1.0073	1.0152
Years		9	9
High Growth Factor		1.0677	1.1454
Combined Factors		1.2229	1.5475

Route	A	HGV	B	HGV	C	HGV
A	0	0	0	3	403	45
B	45	1	0	0	1	3
C	533	45	4	5	0	0

AM PEAK GENERATED TRAFFIC

Site 2 - L5097/Proposed Quarry Access

WITH DEVELOPMENT

Generated Traffic

Route	A	HGV	B	HGV	C	HGV
A	0	0	42	0	0	0
B	0	0	0	0	0	0
C	0	0	45	0	0	0

Year of Opening

Route	A	HGV	B	HGV	C	HGV
A	0	0	42	8	22	2
B	40	5	0	0	5	8
C	543	2	41	4	0	0

(5 Years after Opening)

Route	A	HGV	B	HGV	C	HGV
A	0	0	42	8	83	40
B	44	1	0	0	5	8
C	515	40	41	4	0	0

(15 Years after Opening)

Route	A	HGV	B	HGV	C	HGV
A	0	0	42	3	403	45
B	45	1	0	0	1	3
C	533	45	41	5	0	0

Traffic Calculations for Killoe Quarry

Site 2 - L5097/Quarry Access

AM Peak (16:30 - 17:30)

Seasonally Adjusted 2021

Route	A	HGV	B	HGV	C	HGV
A	0	0	0	0	221	8
B	11	0	0	0	7	0
C	110	7	1	0	0	0

2024 ***Year of Opening***

	Longford	LGV	HGV
2016 - 2030 index		1.0152	1.0340
Years		2	2
High Growth Factor		1.0306	1.0692

Route	A	HGV	B	HGV	C	HGV
A	0	0	0	0	227	8
B	11	0	0	0	7	0
C	113	7	1	0	0	0

2029 ***(5 Years after Opening)***

	Longford	LGV	HGV
2016-2030 index		1.0152	1.0340
Years		7	7
High Growth Factor		1.1114	1.2637

Route	A	HGV	B	HGV	C	HGV
A	0	0	0	0	234	11
B	12	0	0	0	7	0
C	122	8	1	0	0	0

2039 ***(15 Years after Opening)***

	Longford	LGV	HGV
2016-2030 index		1.0152	1.0340
Years		9	9
High Growth Factor		1.1454	1.3511
	Longford	LGV	HGV
2030-2040 index		1.0073	1.0152
Years		9	9
High Growth Factor		1.0677	1.1454
Combined Factors		1.2229	1.5475

Route	A	HGV	B	HGV	C	HGV
A	0	0	7	2	258	14
B	13	0	0	0	8	0
C	134	10	1	0	0	0

AM PEAK GENERATED TRAFFIC

Site 2 - L5097/Quarry Access

WITH DEVELOPMENT

Generated Traffic

Route	A	HGV	B	HGV	C	HGV
A	0	0	26	0	0	0
B	0	0	0	0	11	0
C	0	0	0	0	0	0

Year of Opening

Route	A	HGV	B	HGV	C	HGV
A	0	0	31	1	217	9
B	11	0	0	0	18	0
C	113	7	1	0	0	0

(5 Years after Opening)

Route	A	HGV	B	HGV	C	HGV
A	0	0	32	1	234	11
B	12	0	0	0	19	0
C	122	8	1	0	0	0

(15 Years after Opening)

Route	A	HGV	B	HGV	C	HGV
A	0	0	32	2	258	14
B	13	0	0	0	19	0
C	134	10	1	0	0	0

Appendix 11.2 Scoping Document

TOBIN
CONSULTING ENGINEERS

SCOPING STUDY FOR: Proposed Quarry, Killoe, Co. Longford

CLIENT: Earth Science Partnership Ltd. Westport, Co Mayo

LOCAL AUTHORITY: Longford County Council

SCOPING FORM SENT TO: David Coppinger, Longford County Council

SENT BY: Maria Rooney **DATE:** 09.11.2021

Ref	Item	Requirements
1	Location, size, operating hours, and nature of proposed description of proposal	Proposed quarry at Killoe, Co. Longford
2	Is the development in line with National, County and Local Area Plan policy?	Yes
3	Description of existing uses of land	Greenfield Site
4	Does the development involve the relocation of an existing use?	No
5	Is a new or modified highway access likely?	No
6	What existing / proposed provisions are there for Pedestrians, Cyclists, Public Transport, Disabled access, set down, loading areas? (Rational for no. of provisions)	TBC. Pedestrian access routes provided in the development
7	What background data / information available? (i.e. staffing number, weighbridge data etc)	N/A
8	Are traffic surveys of the existing conditions available or required?	TMU N04 110.0 W-N04 Between Dublin Road and Granard Road Roundabouts, Longford Bypass, Co. Longford
9	What will be the area of impact of the proposal, i.e. which adjacent local regional and National Road routes and junctions will be affected and require capacity calculations?	Existing site entrance on to Unknown Local Road and Existing T-Junction on the R194
10	Are trip distribution and assignment models to be used? or Existing trip distribution?	Match existing distributions
11	Are additional traffic scenarios to be assessed? (e.g. rat running, stress tests etc)	No
12	What will be the trip generation for the proposals? (e.g. pro rata, TRICS, other)	Weighbridge Data from existing quarry
13	Are further traffic generation surveys required? (i.e. if traffic surveys to develop pro rata rates etc)	No
14	What seasonal adjustment is to be undertaken?	TII Live Traffic Counters
15	Link based Growth Rates? (Low Sensitivity, Central, High Sensitivity)	TII Project Appraisal Guidelines for National Roads Unit 5.3 - Travel Demand Projections – High Growth Rate
16	When are the critical time periods for assessment? (i.e. AM, PM and Noon peak hours)	AM, and PM Peaks
17	When will the site become fully operational?	2024
18	What are the assessment years?	

Ref	Item	Requirements
	(Base, opening & future (+5 years & +15 years of operation or any additional)	2024, 2029 (+5years), 2039 (+15 years)
19	Are there significant phases to the project?	No.
20	Will the site attract traffic from the other adjacent sites? (Pass-by Traffic)	No
21	Are there any significant committed developments? (Granted Planning within the past 5 years and not commenced)	TBC
22	Details of any adjacent highway improvement proposals?	TBC
23	What capacity tests / traffic modelling software is to be used? (i.e. JUNCTION 9: PICADY/ ARCADY & OSCADY PRO)	PICADY
24	Will adjacent links become overloaded or significantly impacted? (Design Standards: Urban – UK DMRB TA 79/99 or Rural – TII DN-GEO-03031 (formerly TD9/12) Table 6/1 or alternative Rural to RT 180 when single carriageway width is less than 6.0m)	TBC
25	What are the sightlines / visibility splays requirements? Are they available? (DMURS, TII DN0-GEO-0343, Development Plan etc)	160m as outlined in Longford Development Plan 2021-2027 for 80km/h speed limit.
26	Are there ways to reduce car dependency? Is a workplace travel plan / statement required? (formerly mobility management plans)	TBC
27	What are the targets for mode share and how are they achieved?	TBC
28	What level of car parking provision is proposed? To what standard? (included disabled parking provisions)	TBC - in accordance with Longford County Development Plan.
29	Are special provisions required for cyclists? To what standard?	TBC - in accordance with Longford County Development Plan.
30	Are special provisions required for pedestrians or disabled facilities? To what standard?	TBC - in accordance with Longford County Development Plan.
31	Proposals (if necessary) for public transport facilities?	TBC
32	Will the proposals have an impact on road safety?	TBC
33	Is a Road Safety Impact Assessment or Road Safety Audit required?	No
34	What Stage RSA?	N/A
35	Are there any other special circumstances relevant to this proposal?	None

Appendix 11.3 Junction 9 (Picardy) Results

Junctions 10

PICADY 10 - Priority Intersection Module

Version: 10.0.3.1598
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The users of this computer program for the solution of an engineering problem are in no way relieved of their responsibility for the correctness of the solution

Filename: Junction 1.j10
Path: J:\Projects\11193 - EIAR Traffic Chapter Existing quarry at Killoe, Longford\05-Design\01-Calculations
Report generation date: 12/04/2022 14:24:14

»2022, AM
»2022, PM
»2024 - No Dev, AM
»2024 - No Dev, PM
»2024 - With Dev, AM
»2024 - With Dev, PM
»2029 - No Dev, AM
»2029 - No Dev, PM
»2029 - With Dev, AM
»2029 - With Dev , PM
»2039 - No Dev, AM
»2039 - No Dev, PM
»2039 - With Dev, AM
»2039 - With Dev, PM

Summary ofjunction pe rformance

	AM			PM		
	Queue (PCU)	Delay (s)	RFC	Queue (PCU)	Delay (s)	RFC
	2022					
Stream B-AC	0.1	10.24	0.04	01	1024	0.04
Stream C-AB	0.0	1 1.19	0.01	0.0	11.19	0.01
	2024 - No Dev					
Stream B-AC	0.1	10.57	0.05	0.1	10.56	0.05
Stream C-AB	0.0	11.17	0.01	0.0	1119	0. 0
	2024 - With Dev					
Stream B-AC	0.1	10.66	0.05	02	15.23	0.11
Stream C-AB	0.1	7.35	0.05	0.0	11.19	0. 0
	2029 - No Dev					
Stream B-AC	0.1	10.98	0.05	0.1	10.96	0.05
Stream C-AB	0.0	11.05	0.01	0.0	11 06	0.01
	2029 - With Dev					
Stream B-AC	0.1	1 1.09	0.05	0.2	15 49	0.12
StreamC-AB	0.1	7.47	0.05	0.0	11.06	0.0
	2039 - No Dev					
StreamB-AC	0.1	11.45	0.06	01	11.49	0. 06
Stream C-AB	0.0	10.93	0.01	0.0	1094	001
	2039 - With Dev					
Stream B-AC	0.1	1 1.57	0.06	0.3	15.82	0.13
Stream C-AB	0.1	7 .60	0.05	0.0	1094	0.0

Values shown are thehighest valus encountered over all time segments.Delay is the maximum valuso faverage delay per arriving vehicle.

File summary

File Description

Title	
Location	
Site number	
Date	08/04/2022
Version	
Status	(newfile)
Identifier	
Client	
Jobnumber	
Enumerator	TOBIN\Lana.Salameh
Description	

Units

Distance units	Speed units	Traffic unitsinput	Traffic unitsresults	Flow units	Average delay units	Total delayunits	Rate of delay units
m	kph	PCU	PCU	perHour	s	-Min	perMin

Analysis Options

Calculate Queue Percentiles	Calculate residual capacity	RFC Threshold	Average Delay threshold (s)	Queue threshold (PCU)
		0.85	36.00	20.00

Demand Set Summary

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D1	2022	AM	ONE HOUR	08:30	10:00	15
D2	2022	PM	ONE HOUR	16:30	18:00	15
D3	2024 - No Dev	AM	ONE HOUR	08:30	10:00	15
D4	2024 - No Dev	PM	ONE HOUR	16:30	18:00	15
D5	2024 - With Dev	AM	ONE HOUR	08:30	10:00	15
D6	2024 - With Dev	PM	ONE HOUR	16:30	18:00	15
D7	2029 - No Dev	AM	ONE HOUR	08:30	10:00	15
D8	2029 - No Dev	PM	ONE HOUR	16:30	18:00	15
D9	2029 - With Dev	AM	ONE HOUR	08:30	10:00	15
D10	2029 - With Dev	PM	ONE HOUR	16:30	18:00	15
D11	2039 - No Dev	AM	ONE HOUR	08:30	10:00	15
D12	2039 - No Dev	PM	ONE HOUR	16:30	18:00	15
D13	2039 - With Dev	AM	ONE HOUR	08:30	10:00	15
D14	2039 - With Dev	PM	ONE HOUR	16:30	18:00	15

Analysis Set Details

ID	Network flow scaling factor (%)
A1	100.000

2022, AM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Arm A Direction	Arm B Direction	Arm C Direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	untitled	T-Junction	Two-way	Two-way	Two-way		0.64	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	0.64	A

Arms

Arms

Arm	Name	Description	Arm type
A	untitled		Major
B	untitled		Minor
C	untitled		Major

Major Arm Geometry

Arm	Width of carriageway (m)	Has kerbed central reserve	Has right-turn storage	Visibility for right turn (m)	Blocks?	Blocking queue (PCU)
C	6.00			0.0	✓	0.00

Geometries for Arm C are measured opposite Arm B. Geometries for Arm A (if relevant) are measured opposite Arm D.

Minor Arm Geometry

Arm	Minor arm type	Lane width (m)	Visibility to left (m)	Visibility to right (m)
B	One lane	2.20	0	0

Slope / Intercept / Capacity

Priority Intersection Slopes and Intercepts

Stream	Intercept (PCU/hr)	Slope for A-B	Slope for A-C	Slope for C-A	Slope for C-B
B-A	440	0.080	0.202	0.127	0.289
B-C	574	0.088	0.222	-	-
C-B	574	0.222	0.222	-	-

The slopes and intercepts shown above include custom intercept adjustments only.

Streams may be combined, in which case capacity will be adjusted.

Values are shown for the first time segment only; they may differ for subsequent time segments.

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D1	2022	AM	ONEHOUR	0830	10:00	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		✓	218	100.000
B		✓	17	100.000
C		✓	96	100.000

Origin-Destination Data

Demand (PCU/hr)

		To		
		A	B	C
From	A	0	2	216
	B	5	0	12
	C	93	3	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	0	50	4
	B	60	0	18
	C	8	100	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
B-AC	0.04	10.24	0.1	B
C-AB	0.01	11.19	0.0	B
C-A				
A-B				
A-C				

Main Results for each time segment

08:30 - 08:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	13	487	0.026	13	0.0	9.705	A
C-AB	3	587	0.004	3	0.0	11.190	B
C-A	70			70			
A-B	2			2			
A-C	163			163			

08:45- 0900

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	15	479	0.032	15	0.0	9.923	A
C-AB	3	589	0.005	3	0.0	11.036	B
C-A	83			83			
A-B	2			2			
A-C	194			194			

09:00 - 09:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue(PCU)	Delay (s)	Unsignalised level of service
B-AC	19	468	0 040	19	01	10.233	B
C-AB	4	593	0.007	4	0.0	10.747	B
C-A	102			102			
A-B	2			2			
A-C	238			238			

0915 - 09:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	19	468	0.040	19	01	10.235	B
C-AB	4	593	0.007	4	0.0	10.639	B
C-A	102			102			
A-B	2			2			
A-C	238			238			

09:30 - 09 :45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	15	479	0.032	15	0.0	9.924	A
C-AB	3	589	0.005	3	0.0	10.803	B
C-A	83			83			
A-B	2			2			
A-C	94			194			

09:4 5 -10:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	13	487	0.026	13	0.0	9.712	A
C-AB	3	587	0.004	3	0.0	11 071	B
C-A	70			70			
A-B	2			2			
A-C	163			163			

2022, PM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Arm A Direction	Arm B Direction	Arm C Direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	untitled	T-Junction	Two-way	Two-way	Two-way		0.64	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	0.64	A

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D2	2022	PM	ONE HOUR	16:30	18:00	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		✓	218	100.000
B		✓	17	100.000
C		✓	96	100.000

Origin-Destination Data

Demand (PCU/hr)

		To		
		A	B	C
From	A	0	2	216
	B	5	0	12
	C	93	3	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	0	50	4
	B	60	0	18
	C	8	100	0

Results

Results Summary for whole modelled peri od

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
B-AC	0.04	10.24	0. 1	B
C-AB	0.01	11.19	0.0	B
C-A				
A-B				
A-C				

Main Results foreach time segment

16 :30- 16:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	13	487	0.026	13	0.0	9.705	A
C-AB	3	587	0.004	3	0.0	11. 90	B
C-A	70			70			
A-B	2			2			
A-C	163			163			

16:45 - 1 7:00

Stream	TotalDemand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	15	479	0.032	15	0.0	9.923	A
C-AB	3	589	0.005	3	0.0	11.036	B
C-A	83			83			
A-B	2			2			
A-C	194			194			

17:00 - 17:15

Stream	TotalDemand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised levelof service
B-AC	19	468	0.040	19	0.1	10.233	B
C-AB	4	593	0.007	4	0.0	10.747	B
C-A	102			102			
A-B	2			2			
A-C	238			238			

17:15 - 17:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	19	468	0.040	19	0. 1	1 0235	B
C-AB	4	593	0.007	4	0.0	10.639	B
C-A	102			102			
A-B	2			2			
A-C	238			238			

17:30 - 17:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	15	479	0.032	15	0.0	9.924	A
C-AB	3	589	0.005	3	0.0	10.803	B
C-A	83			83			
A-B	2			2			
A-C	194			194			

17:45 - 18:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	13	487	0.026	13	0.0	9.712	A
C-AB	3	587	0.004	3	0.0	11.071	B
C-A	70			70			
A-B	2			2			
A-C	163			163			

2024 - No Dev, AM

Data Errors and Wa nings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Arm A Direction	Arm B Direction	Arm C Direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	untitled	T-Junction	Two-way	Two-way	Two-way		0.73	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	0.73	A

Traffic Demand

Demand Set Deta ils

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D3	2024 - No Dev	AM	ONE HOUR	08:30	10:00	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	ScalingFactor (%)
A		✓	226	100.000
B		✓	9	100.000
C		✓	101	1 00.000

Origin-Destination Data

Demand (PCU/hr)

		To		
		A	B	C
From	A	0	2	224
	B	6	0	13
	C	97	4	0

Vehicle Mix

Heavy VehiclePercentages

		To		
		A	B	C
From	A	0	51	4
	B	61	0	19
	C	9	00	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
B-AC	0.05	10.57	0.1	B
C-AB	0.01	11.17	0.0	B
C-A				
A-B				
A-C				

Main Results for each time segment

08:30 - 08:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	14	482	0.030	14	0.0	9.976	A
C-AB	3	587	0.006	3	0.0	11.169	B
C-A	73			73			
A-B	2			2			
A-C	169			169			

08:45 - 09:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	17	474	0.036	17	0.0	10.220	B
C-AB	4	590	0.007	4	0.0	11.015	B
C-A	87			87			
A-B	2			2			
A-C	201			201			

09:00 - 09:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	21	463	0.045	21	0.1	10.566	B
C-AB	5	595	0.009	5	0.0	10.723	B
C-A	106			106			
A-B	2			2			
A-C	247			247			

09:15 - 09:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	21	463	0.045	21	0.1	10.568	B
C-AB	5	595	0.009	5	0.0	10.611	B
C-A	106			106			
A-B	2			2			
A-C	247			247			

09:30 - 09:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	17	474	0.036	7	00	10.224	B
C-AB	4	590	0.007	4	0.0	10.778	B
C-A	87			87			
A-B	2			2			
A-C	201			201			

09:45 - 10:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Th roughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level oservice
B-AC	14	482	0.030	14	0.0	9.986	A
C-AB	3	587	0.006	3	0.0	11 048	B
C-A	73			73			
A-B	2			2			
A-C	169			169			

2024 - No Dev, PM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Arm A Direction	Arm B Direction	Arm C Direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	untitled	T-Junction	Two-way	Two-way	Two-way		0.74	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	0.74	A

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D4	2024 - No Dev	PM	ONE HOUR	16:30	18:00	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		✓	225	100.000
B		✓	19	100.000
C		✓	100	100.000

Origin-Destination Data

Demand (PCU/hr)

		To		
		A	B	C
From	A	0	2	223
	B	6	0	13
	C	96	4	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	0	51	4
	B	81	0	19
	C	9	100	0

Results

Results Summary for whde modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PIU)	Max LOS
B-AC	0.05	10.56	0.1	B
C-AB	0.01	11.19	0.0	B
C-A				
A-B				
A-C				

Main Results for each time segment

16:30 - 16: 6

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	14	482	0.030	14	0.0	9.972	A
C-AB	3	587	0.006	3	0.0	1 1.186	B
C-A	72			72			
A-B	2			2			
A-C	168			168			

16:45 -17:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Th roughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	17	474	0036	17	0.0	10. 214	B
C-AB	4	590	0.007	4	0.0	11 034	B
C-A	86			86			
A-B	2			2			
A-C	200			200			

17 :00- 17:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	21	463	0.045	21	0.1	10.559	B
C-AB	5	594	0.009	5	00	10.745	B
C-A	105			105			
A-B	2			2			
A-C	246			246			

17:15 - 17:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue(PCU)	Delay (s)	Unsignalised level of service
B-AC	21	463	0.045	21	0. 1	10.56 1	B
C-AB	5	594	0.009	5	0.0	1 0.636	B
C-A	105			105			
A-B	2			2			
A-C	246			246			

17:30 - 17:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	17	474	0.036	17	0.0	10.218	B
C-AB	4	590	0.007	4	0.0	10.796	B
C-A	86			86			
A-B	2			2			
A-C	200			200			

17:45 - 18:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	14	482	0.030	14	0.0	9.979	A
C-AB	3	587	0.006	3	0.0	11.064	B
C-A	72			72			
A-B	2			2			
A-C	168			168			

2024 - With Dev, AM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Arm A Direction	Arm B Direction	Arm C Direction	Use circulatinglanes	Junction Delay (s)	Junction LOS
1	untitled	T-Junction	Two-way	Two-way	Two-way		1.05	A

Junction Network

Drivingside	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	1.05	A

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Timesegment length (min)
D5	2024 - With Dev	AM	ONE HOUR	08:30	10:00	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linkedarm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		✓	238	100.000
B		✓	19	100.000
C		✓	119	100.000

Origin-Destination Data

Demand(PCU/hr)

		To		
		A	B	C
From	A	0	14	224
	B	8	0	13
	C	97	22	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	0	8	4
	B	61	0	19
	C	9	18	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
B-AC	0.05	10.66	0.1	B
C-AB	0.05	7.35	0.1	A
C-A				
A-B				
A-C				

Main Results for each time segment

08:30 - 08:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	14	479	0.030	14	0.0	10.033	B
C-AB	19	585	0.032	19	0.0	7.308	A
C-A	71			71			
A-B	11			11			
A-C	169			169			

08:45 - 09:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	17	471	0.036	17	0.0	10.292	B
C-AB	23	588	0.040	23	0.1	7.327	A
C-A	84			84			
A-B	13			13			
A-C	201			201			

09:00 - 09:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	21	459	0.046	21	0.1	10.661	B
C-AB	30	592	0.050	30	0.1	7.346	A
C-A	101			101			
A-B	15			15			
A-C	247			247			

09:15 - 09:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	21	459	0.046	21	0.1	10.664	B
C-AB	30	592	0.050	30	0.1	7.344	A
C-A	101			101			
A-B	15			15			
A-C	247			247			

09:30- 09:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	17	471	0.036	17	0.0	10.296	B
C-AB	23	588	0.040	23	0.1	7.316	A
C-A	84			84			
A-B	13			13			
A-C	201			201			

09:45 - 10:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	14	479	0.030	14	0.0	10.043	B
C-AB	19	586	0.032	19	0.0	7.309	A
C-A	71			71			
A-B	11			11			
A-C	169			169			

2024 - With Dev, PM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Arm A Direction	Arm B Direction	Arm C Direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	untitled	T-Junction	Two-way	Two-way	Two-way		2.10	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	2.10	A

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D6	2024 - With Dev	PM	ONE HOUR	16:30	18:00	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		✓	225	100.000
B		✓	48	100.000
C		✓	100	100.000

Origin-Destination Data

Demand (PCU/hr)

		To		
		A	B	C
From	A	0	2	223
	B	15	0	33
	C	96	4	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	0	51	4
	B	85	0	69
	C	9	100	0

Results

Results Summa ryfor whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
B-AC	0.11	15.23	0.2	C
C-AB	0.01	1119	0.0	B
C-A				
A-B				
A-C				

Mán Results for each time segment

16:30 - 16:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	36	483	0.075	36	0.1	1 3989	B
C-AB	3	587	0.006	3	0.0	1 1.186	B
C-A	72			72			
A-B	2			2			
A-C	168			168			

16:45- 17:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level oservice
B-AC	43	475	0.091	43	0.2	14 482	B
C-AB	4	590	0.007	4	0.0	11.034	B
C-A	86			86			
A-B	2			2			
A-C	200			200			

17:00 - 17:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Th roughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	53	463	0.114	53	0.2	15. 212	C
C-AB	5	594	0.009	5	0.0	10.745	B
C-A	105			105			
A-B	2			2			
A-C	246			246			

17:1 5- 17:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	53	463	0.114	53	0.2	15.227	C
C-AB	5	594	0.009	5	0.0	1 0.634	B
C-A	105			105			
A-B	2			2			
A-C	246			246			

17:30 - 17:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	43	475	0.091	43	0.2	14.506	B
C-AB	4	590	0.007	4	0.0	10.798	B
C-A	86			86			
A-B	2			2			
A-C	200			200			

17:45 - 18:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	36	483	0.075	36	0.1	14.011	B
C-AB	3	587	0.006	3	0.0	11.064	B
C-A	72			72			
A-B	2			2			
A-C	168			168			

2029 - No Dev, AM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Arm A Direction	Arm B Direction	Arm C Direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	untitled	T-Junction	Two-way	Two-way	Two-way		0.75	A

Junction Network

Drivingside	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	0.75	A

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D7	2029- No Dev	AM	ONE HOUR	08:30	9:00	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		✓	247	100.000
B		✓	21	100.000
C		✓	110	100.000

Origin-Destination Data

Demand (PCU/hr)

		To		
		A	B	C
From	A	0	3	244
	B	7	0	14
	C	106	4	0

Vehicle Mix

Heavy Vehicle Percentage s

		To		
		A	B	C
From	A	0	53	4
	B	83	0	20
	C	9	100	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
B-AC	0.05	10.98	0.1	B
C-AB	0.01	11.05	0.0	B
C-A				
A-B				
A-C				

Main Results for each time segment

08:30 - 08:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	16	475	0.033	16	0.0	10.300	B
C-AB	3	589	0.006	3	0.0	11.050	B
C-A	79			79			
A-B	2			2			
A-C	184			184			

08:45 - 09:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	19	467	0.040	19	0.1	10.578	B
C-AB	4	592	0.007	4	0.0	10.882	B
C-A	95			95			
A-B	3			3			
A-C	219			219			

09:00 - 09:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	23	454	0.051	23	0.1	10.981	B
C-AB	5	597	0.009	5	0.0	10.569	B
C-A	116			116			
A-B	3			3			
A-C	269			269			

09:15 - 09:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	23	454	0.051	23	0.1	10.983	B
C-AB	5	597	0.009	5	0.0	10.453	B
C-A	116			116			
A-B	3			3			
A-C	269			269			

09:30 - 09:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	19	467	0.040	19	0.1	10.582	B
C-AB	4	592	0.007	4	0.0	10.629	B
C-A	95			95			
A-B	3			3			
A-C	219			219			

09:45 - 10:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	16	475	0.033	16	0.0	10.307	B
C-AB	3	589	0.006	4	0.0	10.919	B
C-A	79			79			
A-B	2			2			
A-C	184			184			

2029 - No Dev, PM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Arm A Direction	Arm B Direction	Arm C Direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	untitled	T-Junction	Two-way	Two-way	Two-way		0.76	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	0.76	A

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D8	2029 - No Dev	PM	ONE HOUR	16:30	18:00	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		✓	244	100.000
B		✓	21	100.000
C		✓	109	100.000

Origin-Destination Data

Demand (PCU/hr)

		To		
		A	B	C
From	A	0	3	241
	B	7	0	14
	C	105	4	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	0	53	4
	B	63	0	20
	C	9	100	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
B-AC	0.05	10.98	0.1	B
C-AB	0 .01	11.06	0.0	B
C-A				
A-B				
A-C				

Main Results for each timesegment

16:30 - 16:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	16	478	0.033	16	00	1 0.288	B
C-AB	3	589	0.006	3	0.0	11.061	B
C-A	79			79			
A-B	2			2			
A-C	181			181			

1 6:45- 17:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	19	467	0040	19	0. 1	10.562	B
C-AB	4	592	0.007	4	0. 0	10.895	B
C-A	94			94			
A-B	3			3			
A-C	217			217			

1 7:00- 17:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	23	455	0.051	23	0.1	10.961	B
C-AB	5	597	0.009	5	0.0	10.584	B
C-A	115			115			
A-B	3			3			
A-C	265			265			

17:15 - 17:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Th roughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	23	455	0.051	23	0.1	10.963	B
C-AB	5	597	0.009	5	0.0	10.469	B
C-A	115			115			
A-B	3			3			
A-C	265			265			

17:30 - 17:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	19	467	0.040	19	0.1	10.565	B
C-AB	4	592	0.007	4	0.0	10.645	B
C-A	94			94			
A-B	3			3			
A-C	217			217			

17:45 - 18:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	16	476	0.033	16	0.0	10.293	B
C-AB	3	589	0.006	3	0.0	10.931	B
C-A	79			79			
A-B	2			2			
A-C	181			181			

2029 - With Dev, AM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Arm A Direction	Arm B Direction	Arm C Direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	untitled	T -Junction	Two-way	Two-way	Two-way		1.06	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	1.06	A

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D9	2029 - With Dev	AM	ONE HOUR	0830	10:00	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		✓	259	100.000
B		✓	21	80.000
C		✓	128	100.000

Origin-Destination Data

Demand (PCU/hr)

		To		
		A	B	C
From	A	0	15	244
	B	7	0	14
	C	106	22	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	0	0	4
	B	63	0	20
	C	9	19	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
B-AC	0.05	11.09	0.1	B
C-AB	0.05	7.47	0.1	A
C-A				
A-B				
A-C				

Main Results for each time segment

08:30 - 08:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	16	473	0.033	16	0.0	10.361	B
C-AB	19	587	0.033	19	0.1	7.449	A
C-A	77			77			
A-B	11			11			
A-C	184			184			

08:45 - 09:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	19	463	0.041	19	0.1	10.656	B
C-AB	24	590	0.040	24	0.1	7.462	A
C-A	91			91			
A-B	13			13			
A-C	219			219			

09:00 - 09:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	23	450	0.051	23	0.1	11.086	B
C-AB	30	594	0.051	30	0.1	7.473	A
C-A	111			111			
A-B	17			17			
A-C	269			269			

09:15 - 09:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	23	450	0.051	23	0.1	11.089	B
C-AB	30	594	0.051	30	0.1	7.461	A
C-A	111			111			
A-B	17			17			
A-C	269			269			

09:30 - 09:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	19	483	0 .04	19	0.1	10.659	B
C-AB	24	590	0.040	24	0.1	7 .443	A
C-A	91			91			
A-B	13			13			
A-C	219			219			

09:45- 10:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay s)	Unsignalised level of service
B-AC	16	473	0.033	16	0.0	10.369	B
C-AB	19	587	0.033	19	01	7.443	A
C-A	77			77			
A-B	11			11			
A-C	184			184			

2029 - With Dev , PM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Arm A Direction	Arm B Direction	Arm C Direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	untitled	T-Junction	Two-way	Two-way	Two-way		2.05	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	2.05	A

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D10	2029 - With Dev	PM	ONE HOUR	16:30	18:00	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		✓	244	100.000
B		✓	50	100.000
C		✓	109	100.000

Origin-Destination Data

Demand (PCU/hr)

		To		
		A	B	C
From	A	0	3	241
	B	16	0	34
	C	105	4	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	0	53	4
	B	85	0	68
	C	9	100	0

Results

Results Summary for whde modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
B-AC	012	15.49	0.2	C
C-AB	0.01	11.08	0.0	B
C-A				
A-B				
A-C				

Mán Results for each time segment

16:30- 1 6:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	38	478	0.079	37	0!	14.10	B
C-AB	3	589	0.006	3	0.0	1 1.061	B
C-A	79			79			
A-B	2			2			
A-C	1 8			181			

16:45 -17:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	45	469	0.096	45	0.2	14.672	B
C-AB	4	592	0.007	4	0.0	10.895	B
C-A	94			94			
A-B	3			3			
A-C	217			217			

17:00 -17:1 5

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised levelof service
B-AC	55	457	0 120	55	0.2	15.476	C
C-AB	5	597	0.009	5	0.0	10584	B
C-A	115			115			
A-B	3			3			
A-C	265			265			

17:15 - 17:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	55	457	0.120	55	0.2	15.493	C
C-AB	5	597	0.009	5	0.0	10.467	B
C-A	115			115			
A-B	3			3			
A-C	265			265			

17:30 - 17:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	45	469	0.096	45	0.2	14.698	B
C-AB	4	592	0.007	4	0.0	10.643	B
C-A	94			94			
A-B	3			3			
A-C	217			217			

17:45 - 18:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	38	478	0.079	38	0.2	14.159	B
C-AB	3	589	0.006	3	0.0	10.933	B
C-A	79			79			
A-B	2			2			
A-C	181			181			

2039 - No Dev, AM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Arm A Direction	Arm B Direction	Arm C Direction	Use circulatinglanes	Junction Delay (s)	Junction LOS
1	untitled	T -Junction	Two-way	Two-way	Two-way		0.81	A

Junction Network

Driving side	Lighting	Network delay (s)	NetworkLOS
Left	Normal/unknown	0.81	A

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finishtime (HH:mm)	Time segment length (min)
D11	2039 -No Dev	AM	ONE HOUR	08:30	10:00	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	AverageDemand (PCU/hr)	ScalingFactor (%)
A		✓	273	100.000
B		✓	24	100.000
C		✓	123	100.000

Origin-Destination Data

Demand (PCU/hr)

		To		
		A	B	C
From	A	0	3	270
	B	8	0	16
	C	118	5	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	0	56	4
	B	66	0	22
	C	10	100	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
B-AC	0.06	11.45	0.1	B
C-AB	0.01	10.93	0.0	B
C-A				
A-B				
A-C				

Main Results for each time segment

08:30 - 08:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	18	471	0.038	18	0.1	10.638	B
C-AB	4	591	0.006	4	0.0	10.929	B
C-A	88			88			
A-B	2			2			
A-C	203			203			

08:45 - 09:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	22	461	0.047	22	0.1	10.968	B
C-AB	5	595	0.009	5	0.0	10.750	B
C-A	105			105			
A-B	3			3			
A-C	243			243			

09:00 - 09:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	26	447	0.059	26	0.1	11.450	B
C-AB	7	600	0.012	7	0.0	10.417	B
C-A	128			128			
A-B	3			3			
A-C	297			297			

09:15 - 09:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	26	447	0.059	26	0.1	11.452	B
C-AB	7	600	0.012	7	0.0	10.294	B
C-A	128			128			
A-B	3			3			
A-C	297			297			

09:30 - 09:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	22	461	0.047	22	0.1	10.973	B
C-AB	5	595	0.009	6	0.0	10.483	B
C-A	105			105			
A-B	3			3			
A-C	243			243			

09:45 - 10:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue(PCU)	Delay (s)	Unsignalised level of service
B-AC	18	471	0.038	18	0.1	10.651	B
C-AB	4	591	0.008	4	0.0	10.790	B
C-A	88			88			
A-B	2			2			
A-C	203			203			

2039 - No Dev, PM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Arm A Direction	Arm B Direction	Arm C Direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	untitled	T-Junction	Two-way	Two-way	Two-way		0.80	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	0.80	A

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D12	2039 - No Dev	PM	ONE HOUR	16:30	18:00	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		✓	270	100.000
B		✓	23	100.000
C		✓	122	100.000

Origin-Destination Data

Demand (PCU/hr)

		To		
		A	B	C
From	A	0	3	267
	B	8	0	15
	C	117	5	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	0	56	4
	B	65	0	22
	C	10	100	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
B-AC	0.06	1 1.49	01	B
C-AB	0.01	10.94	0 0	B
C-A				
A-B				
A-C				

Main Results for each time segment

16:30 - 6 :45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Un signalised level oservice
B-AC	17	469	0.037	17	0.1	10.687	B
C-AB	4	591	0.007	4	0.0	10940	B
C-A	87			87			
A-B	2			2			
A-C	201			20			

16:45- 17:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Th roughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level oservice
B-AC	21	459	0.045	21	0.1	11.013	B
C-AB	5	595	0. 009	5	0. 0	10.762	B
C-A	104			104			
A-B	3			3			
A-C	240			240			

1 7:00 -17:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised levelof service
B-AC	25	446	0.057	25	0.1	11490	B
C-AB	7	600	0. 012	7	0.0	10.431	B
C-A	127			127,			
A-B	3			3			
A-C	294			294			

17.·15- 17:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	25	446	0057	25	0. 1	11.492	B
C-AB	7	600	0.012	7	0.0	10.30	B
C-A	127			127			
A-B	3			3			
A-C	294			294			

17:30 - 17:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	21	459	0.045	21	0.1	11.021	B
C-AB	5	595	0.009	5	0.0	10.498	B
C-A	104			104			
A-B	3			3			
A-C	240			240			

17:45 - 18:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	17	469	0.037	17	0.1	10.700	B
C-AB	4	591	0.008	4	0.0	10.802	B
C-A	87			87			
A-B	2			2			
A-C	201			201			

2039 - With Dev, AM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junctiontype	Arm A Direction	Arm B Direction	Arm C Direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	untitled	T -Junction	Two-way	Two-way	Two-way		1.10	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	1.10	A

Traffic Demand

Demand Set Deta ils

ID	Scenario name	Time Period name	Traffic profiletype	Start time (HH:mm)	Finish time (HH:mm)	Time segment length(min)
D13	2039 With Dev	AM	ONE HOUR	08:30	1000	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand(PCU/hr)	Scaling Factor (%)
A		✓	285	100.000
B		✓	24	100.000
C		✓	141	100.000

Origin-Destination Data

Demand (PCU/hr)

		To		
		A	B	C
From	A	0	15	270
	B	8	0	16
	C	118	23	0

Vehicle Mix

Heavy Vehicle Perce ntages

		To		
		A	B	C
From	A	0	11	4
	B	88	0	22
	C	10	22	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
B-AC	0.06	11.57	0.1	B
C-AB	0.05	7.60	0.1	A
C-A				
A-B				
A-C				

Main Results for each time segment

08:30 - 08:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	18	468	0.039	18	0.1	10.702	B
C-AB	20	589	0.035	20	0.1	7.593	A
C-A	86			86			
A-B	11			11			
A-C	203			203			

08:45 - 09:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	22	457	0.047	22	0.1	11.051	B
C-AB	25	593	0.043	25	0.1	7.601	A
C-A	102			102			
A-B	13			13			
A-C	243			243			

09:00 - 09:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	26	443	0.060	26	0.1	11.563	B
C-AB	32	598	0.054	32	0.1	7.604	A
C-A	123			123			
A-B	17			17			
A-C	297			297			

09:15 - 09:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	26	443	0.060	26	0.1	11.566	B
C-AB	32	598	0.054	32	0.1	7.589	A
C-A	123			123			
A-B	17			17			
A-C	297			297			

09:30- 09:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	22	457	0.047	22	0 1	11.060	B
C-AB	25	593	0.043	25	0.1	7.578	A
C-A	102			102			
A-B	3			13			
A-C	243			243			

09:45 - 10:00

Stream	TotalDemand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	18	468	0.039	18	0. 1	1 0.714	B
C-AB	20	589	0.035	20	01	7.585	A
C-A	86			86			
A-B	11			11			
A-C	203			203			

2039 - With Dev, PM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Arm A Direction	Arm B Direction	Arm C Direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	untitled	T-Junction	Two-way	Two-way	Two-way		2.04	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	2.04	A

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D14	2039 - With Dev	PM	ONE HOUR	16:30	18:00	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		✓	270	100.000
B		✓	53	100.000
C		✓	122	100.000

Origin-Destination Data

Demand (PCU/hr)

		To		
		A	B	C
From	A	0	3	267
	B	17	0	36
	C	117	5	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	0	56	4
	B	84	0	67
	C	10	100	0

Results

ResultsS umnary for whole model ledperiod

Stream	Max RFC	MaxDelay (s)	Max Queue(PCU)	Max LOS
B-AC	0.13	15.82	0.3	C
C-AB	001	10.94	00	B
C-A				
A-B				
A-C				

Main Results for each time segment

16:30- 16:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	40	473	0.084	39	0.2	14.283	B
C-AB	4	591	0.007	4	0.0	10.940	B
C-A	87			87			
A-B	2			2			
A-C	201			201			

16:45 - 17:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	48	463	0.103	47	0.2	14.898	B
C-AB	5	595	0.009	5	0.0	10.762	B
C-A	104			104			
A-B	3			3			
A-C	240			240			

17:00 - 1 715

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	58	450	0.130	58	0.3	15.805	C
C-AB	7	600	0. 012	7	0.0	10. 431	B
C-A	127			127			
A-B	3			3			
A-C	294			294			

17: 15- 17:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	58	450	0.130	58	0.3	15.824	C
C-AB	7	600	0.012	7	0.0	10.3 0	B
C-A	127			127			
A-B	3			3			
A-C	294			294			

17:30 - 17:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	48	463	0.103	48	0.2	14.922	B
C-AB	5	595	0.009	5	0.0	10.496	B
C-A	104			104			
A-B	3			3			
A-C	240			240			

17:45 - 18:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	40	473	0.084	40	0.2	14.313	B
C-AB	4	591	0.008	4	0.0	10.802	B
C-A	87			87			
A-B	2			2			
A-C	201			201			

Junctions 10

PICADY 10 - Priority Intersection Module

Version: 10.0.3.1598
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Filename: Junction 2.j10
Path: J:\Projects\11193 - EIAR Traffic Chapter Existing quarry at Killoe, Longford\05-Design\01-Calculations
Report generation date:12/04/2022 14:25:46

- 2022 , AM
- 2022, PM
- 2024 - No Dev, AM
- 2024- No Dev, P M
- 2024 - With Dev, AM
- 2024 – With Dev, PM
- 2029 -No Dev, AM
- 2029 - No Dev, PM
- 2029- With Dev, AM
- 2029- With Dev, PM
- 2039- No Dev, AM
- 2039 - No Dev, PM
- 2 039- With Dev, AM
- 2 039 - With Dev, PM

Summary of junction performance

	AM			PM		
	Queue (Veh)	Delay (s)	RFC	Queue (Veh)	Delay (s)	RFC
	2022					
Stream B-AC	0.0	11.34	0.04	0.0	9.01	0.05
Stream C-AB	0.0	7.30	0.00	0.0	6.09	0.00
	2024 - No Dev					
Stream B-AC	0.1	11.52	0.05	0.0	9.08	0.05
Stream C-AB	0.0	7.28	0.00	0.0	6.08	0.00
	2024 - With Dev					
Stream B-AC	0.1	11.66	0.05	0.1	8.65	0.07
Stream C-AB	0.0	5.87	0.03	0.0	6.13	0.00
	2029 - No Dev					
Stream B-AC	0.1	10.21	0.05	0.1	9.27	0.05
Stream C-AB	0.0	7.22	0.01	0.0	6.06	0.00
	2029 - With Dev					
Stream B-AC	0.1	11.96	0.06	0.1	8.84	0.08
Stream C-AB	0.0	5.84	0.04	0.0	6.11	0.00
	2039 - No Dev					
Stream B-AC	0.1	12.23	0.06	0.1	9.47	0.06
Stream C-AB	0.0	7.11	0.01	0.0	6.05	0.00
	2039 - With Dev					
Stream B-AC	0.1	12.38	0.06	0.1	9.09	0.08
Stream C-AB	0.1	5.81	0.04	0.0	6.09	0.00

Values shown are the highest values encountered over all time segments. Delay is the maximum value of average delay per arriving vehicle.

File summary

File Description

Title	
Location	
Site number	
Date	06/04/2022
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Enumerator	TOBIN\Lana.Salameh
Description	

Units

Distance units	Speed units	Traffic units input	Traffic units results	Flow units	Average delay units	Total delay units	Rate of delay units
m	kph	Veh	Veh	perHour	s	-Min	perMin

Analysis Options

Calculate Queue Percentiles	Calculate residual capacity	RFC Threshold	Average Delay threshold (s)	Queue threshold (PCU)
		0.85	36.00	20.00

Demand Set Summary

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D1	2022	AM	ONE HOUR	08:30	10:00	15
D2	2022	PM	ONE HOUR	16:30	18:00	15
D3	2024 - No Dev	AM	ONE HOUR	08:30	10:00	15
D4	2024 - No Dev	PM	ONE HOUR	16:30	18:00	15
D5	2024 - WithDev	AM	ONE HOUR	08:30	10:00	15
D6	2024 - With Dev	PM	ONE HOUR	16:30	18:00	15
D7	2029 -No Dev	AM	ONE HOUR	08:30	10:00	15
D8	2029 - No Dev	PM	ONE HOUR	16:30	18:00	15
D9	2029 - With Dev	AM	ONE HOUR	08:30	10:00	15
D10	2029 - WithDev	PM	ONE HOUR	16:30	18:00	15
D11	2039 - No Dev	AM	ONE HOUR	08:30	10:00	15
D12	2039 - No Dev	PM	O NEHOUR	16:30	18:00	15
D13	2039- WithDev	AM	ONE HOUR	08:30	10:00	15
D14	2039 - With Dev	PM	ONE HOUR	16:30	18:00	15

Analysis Set Details

ID	Network flow scaling factor (%)
A1	100.000

2022, AM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Arm A Direction	Arm B Direction	Arm C Direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	untitled	T-Junction	Two-way	Two-way	Two-way		0.64	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	0.64	A

Arms

Arms

Arm	Name	Description	Arm type
A	untitled		Major
B	untitled		Minor
C	untitled		Major

Major Arm Geometry

Arm	Width of carriageway (m)	Has kerbed central reserve	Has right-turn storage	Visibility for right turn (m)	Blocks?	Blocking queue (PCU)
C	6.00			0.0	✓	0.00

Geometries for Arm C are measured opposite Arm B. Geometries for Arm A (if relevant) are measured opposite Arm D.

Minor Arm Geometry

Arm	Minor arm type	Lane width (m)	Visibility to left (m)	Visibility to right (m)
B	One lane	2.20	0	0

Slope / Intercept / Capacity

Priority Intersection Slopes and Intercepts

Stream	Intercept (Veh/hr)	Slope for A-B	Slope for A-C	Slope for C-A	Slope for C-B
B-A	440	0.080	0.202	0.127	0.289
B-C	574	0.088	0.222	-	-
C-B	574	0.222	0.222	-	-

The slopes and intercepts shown above include custom intercept adjustments only.

Streams may be combined, in which case capacity will be adjusted.

Values are shown for the first time segment only; they may differ for subsequent time segments.

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D1	2022	AM	ONE HOUR	08:30	10:00	15

Vehicle mix source	PCUFactor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand(Veh/hr)	Scaling Factor(%)
A		✓	88	100.000
B		✓	13	100.000
C		✓	209	100.000

Origin-Destination Data

Demand (Veh/hr)

		To		
		A	B	C
From	A	0	2	86
	B	10	0	3
	C	208	1	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	0	100	8
	B	18	0	60
	C	4	50	0

Results

Results Summaryfor whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (Veh)	Max LOS
B-AC	0.04	11.34	0	B
C-AB	0.00	7 .30	0.0	A
C-A				
A-B				
A-C				

Ma inResults for each timesegment

08:30- 08:45

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-AC	10	344	0.029	10	0.0	10.773	B
C-AB	1	495	0.003	1	0.0	7.298	A
C-A	156			156			
A-B	1			1			
A-C	65			65			

08:45 - 09:00

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-AC	12	339	0.035	12	0.0	11.007	B
C-AB	2	517	0.004	2	0.0	7.038	A
C-A	186			186			
A-B	1			1			
A-C	77			77			

09:00 - 09:15

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-AC	15	332	0.044	15	0.0	11.336	B
C-AB	3	547	0.005	3	0.0	6.661	A
C-A	228			228			
A-B	2			2			
A-C	95			95			

09:15 - 09:30

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-AC	15	332	0.044	15	0.0	11.338	B
C-AB	3	548	0.005	3	0.0	6.605	A
C-A	228			228			
A-B	2			2			
A-C	95			95			

09:30 - 09:45

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-AC	12	339	0.035	12	0.0	11.009	B
C-AB	2	517	0.004	2	0.0	6.909	A
C-A	186			186			
A-B	1			1			
A-C	77			77			

09:45 - 10:00

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-AC	10	344	0.029	10	0.0	10.784	B
C-AB	1	495	0.003	1	0.0	7.229	A
C-A	156			156			
A-B	1			1			
A-C	65			65			

2022, PM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Arm A Direction	Arm B Direction	Arm C Direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	untitled	T-Junction	Two-way	Two-way	Two-way		0.47	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/ unknown	047	A

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D2	2022	PM	ONE HOUR	16:30	18:00	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A		✓	218	100.000
B		✓	18	100000
C		✓	110	100.000

Origin-Destination Data

Demand (Veh/hr)

		To		
		A	B	C
From	A	0	6	2 12
	B	11	0	7
	C	109	1	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	0	17	4
	B	0	0	0
	C	6	0	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (Veh)	Max LOS
B-AC	0.05	9.01	0.0	A
C-AB	0.00	8.09	0.0	A
C-A				
A-B				
A-C				

Main Results for each time segment

16:30 - 16:45

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-AC	14	440	0.031	13	0.0	8.444	A
C-AB	0.87	592	0.001	0.87	0.0	8.085	A
C-A	82			82			
A-B	5			5			
A-C	159			159			

16:45 - 17:00

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-AC	16	431	0.038	16	0.0	8.676	A
C-AB	1	596	0.002	1	0.0	8.043	A
C-A	98			98			
A-B	5			5			
A-C	190			190			

17:00 - 17:15

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-AC	20	419	0.047	20	0.0	9.011	A
C-AB	1	602	0.002	1	0.0	5.987	A
C-A	120			120			
A-B	7			7			
A-C	233			233			

17:15 - 17:30

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-AC	20	419	0.047	20	0.0	9.013	A
C-AB	1	602	0.002	1	0.0	5.994	A
C-A	120			120			
A-B	7			7			
A-C	233			233			

17:30 - 17:45

Stream	Total Demand (Veh/hr)	Capacity(Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-AC	16	431	0.038	16	0.0	8.678	A
C-AB	1	596	0.002	1	0.0	6.054	A
C-A	98			98			
A-B	5			5			
A-C	190			190			

17:45 - 18:00

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay(s)	Unsignalised level of service
B-AC	14	440	0.031	14	0.0	8.451	A
C-AB	0.88	592	0.001	0.88	0.0	6.093	A
C-A	82			82			
A-B	5			5			
A-C	159			159			

2024 - No Dev, AM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Arm A Direction	Arm B Direction	Arm C Direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	untitled	T-Junction	Two-way	Two-way	Two-way		0.70	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	0.70	A

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D3	2024 - No Dev	AM	ONE HOUR	08:30	10:00	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A		✓	90	100.000
B		✓	15	100.000
C		✓	216	100.000

Origin-Destination Data

Demand (Veh/hr)

		To		
		A	B	C
From	A	0	2	88
	B	11	0	4
	C	214	1	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	0	100	9
	B	19	0	61
	C	4	51	0

AN COIMISIÚN PLEANÁLA
21 AUG 2025
LTR DATED ____ FROM DX
LDG-
ACP- 323358-25

Results

Results Summary for whole modeled period

Stream	Max RFC	Max Delay (s)	Max Queue (Veh)	Max LOS
B-AC	0.05	1 1.52	0.1	B
C-AB	0.00	7.28	0.0	A
C-A				
A-B				
A-C				

Main Results for each time segment

08:30- 08:45

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level oservice
B-AC	11	341	0.032	1	0.0	10.9*3	B
C-AB	1	498	0.003	1	0.0	7.278	A
C-A	161			161			
A-B	2			2			
A-C	66			66			

08:45- 09:00

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level oservice
B-AC	13	336	0.039	13	0.0	11.167	B
C-AB	2	519	0.004	2	0.0	7 .011	A
C-A	192			192			
A-B	2			2			
A-C	79			79			

09:00 - 09:1 5

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-AC	16	329	0.049	16	0.1	11 .59	B
C-AB	3	551	0.005	3	0.0	6.625	A
C-A	235			235			
A-B	2			2			
A-C	97			97			

09:15 - 09:30

Stream	Total Demand (Veh/hr)	Capacity(Veh/hr)	RFC	Throughpt (Veh/hr)	Endqueue (Veh)	Delay (s)	Unsignalised level of service
B-AC	16	329	0.049	16	0. 1	1 1522	B
C-AB	3	551	0.005	3	0 .0	6.569	A
C-A	235			235			
A-B	2			2			
A-C	97			97			

09:30 - 09:45

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-AC	13	338	0.039	13	0.0	11.172	B
C-AB	2	519	0.004	2	0.0	6.878	A
C-A	192			192			
A-B	2			2			
A-C	79			79			

09:45 - 10:00

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-AC	11	341	0.032	11	0.0	10.927	B
C-AB	1	496	0.003	1	0.0	7.210	A
C-A	161			161			
A-B	2			2			
A-C	66			66			

2024 - No Dev, PM

DataErrors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Arm A Direction	Arm B Direction	Arm C Direction	Useci rculatinglanes	Junction Delay (s)	Junction LO S
1	untitled	T-Junction	Two-way	Two-way	Two-way		0.46	A

Junction Network

Driving side	Lighting	Network delay (s)	NetworkLOS
Left	Normal/unknown	0.46	A

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D4	2024 - No Dev	PM	ONE HOUR	8:30	18:00	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A		✓	224	100.000
B		✓	18	100.000
C		✓	114	100.000

Origin-Destination Data

Demand (Veh/hr)

		To		
		A	B	C
From	A	0	6	218
	B	11	0	7
	C	113	1	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	0	17	4
	B	0	0	0
	C	6	0	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (Veh)	Max LOS
B-AC	0.05	9.06	0.0	A
C-AB	0.00	6.08	0.0	A
C-A				
A-B				
A-C				

Main Results for each time segment

16:30 - 16:45

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-AC	14	438	0.031	13	0.0	8.471	A
C-AB	0.88	593	0.001	0.87	0.0	6.077	A
C-A	85			85			
A-B	5			5			
A-C	184			184			

16:45 - 17:00

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-AC	16	429	0.038	16	0.0	8.711	A
C-AB	1	597	0.002	1	0.0	6.032	A
C-A	102			102			
A-B	5			5			
A-C	196			196			

17:00 - 17:15

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-AC	20	417	0.048	20	0.0	9.058	A
C-AB	1	603	0.002	1	0.0	5.974	A
C-A	124			124			
A-B	7			7			
A-C	240			240			

17:15 - 17:30

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-AC	20	417	0.048	20	0.0	9.060	A
C-AB	1	603	0.002	1	0.0	5.979	A
C-A	124			124			
A-B	7			7			
A-C	240			240			

17:30 - 17:45

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-AC	16	429	0.038	16	0.0	8.113	A
C-AB	1	597	0.002	1	0.0	6.044	A
C-A	102			102			
A-B	5			5			
A-C	196			196			

17:45 - 18:00

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-AC	14	438	0.031	14	0.0	8.479	A
C-AB	0.88	593	0.001	0.88	0.0	6.083	A
C-A	85			85			
A-B	5			5			
A-C	164			164			

2024 - With Dev, AM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Arm A Direction	Arm B Direction	Arm C Direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	untitled	T-Junction	Two-way	Two-way	Two-way		0.91	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	0.91	A

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D5	2024 - With Dev	AM	ONE HOUR	08:30	10:00	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A		✓	107	100.000
B		✓	15	100.000
C		✓	227	100.000

Origin-Destination Data

Demand (Veh/hr)

		To		
		A	B	C
From	A	0	19	88
	B	11	0	4
	C	214	13	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	0	16	9
	B	19	0	61
	C	4	8	0

Results

Results Su mmaryfor w hde modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (Veh)	Max LOS
B-AC	0.05	11.66	0.1	B
C-AB	0.03	5 .87	0.0	A
C-A				
A-B				
A-C				

Main Results for each time segment

08:30 - 08:45

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Endqueue (Veh)	Delay (s)	Unsignalised level of service
B-AC	11	338	0.033	11	0.0	1 1.001	B
C-AB	13	627	0.021	13	0.0	5.866	A
C-A	1 58			158			
A-B	14			14			
A-C	66			66			

08:45- 09:00

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-AC	13	332	0.040	13	0.0	11.272	B
C-AB	17	648	0.026	7	0.0	5.726	A
C-A	88			188			
A-B	17			17			
A-C	79			79			

09:00 - 09:15

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-AC	16	325	0.050	16	0.1	11.660	B
C-AB	22	672	0 033	22	0.0	5.543	A
C-A	228			228			
A-B	21			21			
A-C	97			97			

09:15 - 09:30

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-AC	16	325	0 .050	16	0. 1	1 1662	B
C-AB	22	672	0 .033	22	0.0	5.541	A
C-A	228			228			
A-B	21			21			
A-C	97			97			

09:30 - 09:45

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-AC	13	332	0.040	13	0.0	11.279	B
C-AB	17	646	0.026	17	0.0	5.719	A
C-A	188			188			
A-B	17			17			
A-C	79			79			

09:45 - 10:00

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-AC	11	338	0.033	11	0.0	11.012	B
C-AB	13	627	0.021	13	0.0	5.861	A
C-A	158			158			
A-B	14			14			
A-C	66			66			

2024 - With Dev, PM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Arm A Direction	Arm B Direction	Arm C Direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	untitled	T-Junction	Two-way	Two-way	Two-way		0.63	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	0.63	A

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D6	2024 With Dev	PM	ONE HOUR	1630	18:00	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A		✓	250	100.000
B		✓	29	100.000
C		✓	114	100.000

Origin-Destination Data

Demand (Veh/hr)

		To		
		A	B	C
From	A	0	32	218
	B	11	0	18
	C	113	1	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	0	4	4
	B	0	0	0
	C	6	0	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (Veh)	Max LOS
B-AC	0.07	8.65	0.1	A
C-AB	0.00	6.13	0.0	A
C-A				
A-B				
A-C				

Main Results for each time segment

16:30 - 16:45

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-AC	22	489	0.047	22	0.0	8.044	A
C-AB	0.88	589	0.001	0.87	0.0	6.120	A
C-A	85			85			
A-B	24			24			
A-C	164			164			

16:45 - 17:00

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-AC	26	460	0.057	26	0.1	8.291	A
C-AB	1	592	0.002	1	0.0	6.082	A
C-A	102			102			
A-B	29			29			
A-C	196			196			

17:00 - 17:15

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-AC	32	448	0.071	32	0.1	8.653	A
C-AB	1	597	0.002	1	0.0	6.033	A
C-A	124			124			
A-B	35			35			
A-C	240			240			

17:15 - 17:30

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-AC	32	448	0.071	32	0.1	8.655	A
C-AB	1	597	0.002	1	0.0	6.041	A
C-A	124			124			
A-B	35			35			
A-C	240			240			

1 7:30- 17:45

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-AC	26	460	0.057	26	0	8.295	A
C-AB	1	592	0.002	1	0	6.094	A
C-A	102			102			
A-B	29			29			
A-C	196			196			

17:45 - 18:00

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-AC	22	469	0.047	22	0.0	8.053	A
C-AB	0.68	589	0.002	0.68	0	6.128	A
C-A	85			85			
A-B	24			24			
A-C	164			164			

2029 - No Dev, AM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Arm A Direction	Arm B Direction	Arm C Direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	untitled	T-Junction	Two-way	Two-way	Two-way		0.66	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	0.66	A

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D7	2029 - No Dev	AM	ONE HOUR	08:30	10:00	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A		✓	98	100.000
B		✓	18	100.000
C		✓	234	100.000

Origin-Destination Data

Demand (Veh/hr)

		To		
		A	B	C
From	A	0	2	96
	B	12	0	7
	C	232	2	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	0	100	9
	B	20	0	3
	C	4	53	0

Results

Results Summa ryfor whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (Veh)	Max LOS
B-AC	0.05	10.21	0.1	B
C-AB	0.01	7.22	0.0	A
C-A				
A-B				
A-C				

Main Results fo r eachtime segment

08:30 - 08:45

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-AC	14	388	0.036	14	0.0	9.627	A
C-AB	2	501	0.005	2	0.0	7.216	A
C-A	174			174			
A-B	2			2			
A-C	73			73			

08:45 - 09:00

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-AC	17	381	0.044	17	0.0	9.855	A
C-AB	3	526	0.006	3	0.0	6935	A
C-A	207			207			
A-B	2			2			
A-C	87			87			

09:00 - 09:15

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-AC	20	373	0.055	20	0.1	10.208	B
C-AB	4	560	0.007	4	0.0	6.529	A
C-A	253			253			
A-B	2			2			
A-C	106			106			

09:15 - 09:30

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-AC	20	373	0.055	20	0.1	10.210	B
C-AB	4	561	0.007	4	0.0	6.468	A
C-A	253			253			
A-B	2			2			
A-C	106			106			

09:30 - 09:45

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-AC	17	381	0.044	17	0.0	9.870	A
C-AB	3	526	0.006	3	0.0	6.795	A
C-A	207			207			
A-B	2			2			
A-C	87			87			

09:45 - 10:00

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-AC	14	388	0.036	14	0.0	9.632	A
C-AB	2	502	0.005	2	0.0	7.140	A
C-A	174			174			
A-B	2			2			
A-C	73			73			

2029 - No Dev, PM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Arm A Direction	Arm B Direction	Arm C Direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	untitled	T-Junction	Two-way	Two-way	Two-way		0.46	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	0.46	A

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D8	2029 - No Dev	PM	ONE HOUR	6:30	18:00	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A		✓	239	100.000
B		✓	19	100.000
C		✓	124	100.000

Origin-Destination Data

Demand (Veh/hr)

		To		
		A	B	C
From	A	0	6	233
	B	12	0	7
	C	123	1	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	0	19	5
	B	0	0	0
	C	6	0	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (Veh)	Max LOS
B-AC	0.05	9.27	0.1	A
C-AB	0.00	6.06	0.0	A
C-A				
A-B				
A-C				

Main Results for each time segment

16:30 - 16:45

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-AC	14	432	0.033	14	0.0	8.613	A
C-AB	0.89	595	0.002	0.89	0.0	6.056	A
C-A	92			92			
A-B	4			4			
A-C	176			176			

16:45 - 17:00

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-AC	17	422	0.040	17	0.0	8.881	A
C-AB	1	600	0.002	1	0.0	6.007	A
C-A	110			110			
A-B	5			5			
A-C	210			210			

17:00 - 17:15

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-AC	21	409	0.051	21	0.1	9.270	A
C-AB	1	607	0.002	1	0.0	5.942	A
C-A	135			135			
A-B	6			6			
A-C	257			257			

17:15 - 17:30

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-AC	21	409	0.051	21	0.1	9.272	A
C-AB	1	607	0.002	1	0.0	5.951	A
C-A	135			135			
A-B	6			6			
A-C	257			257			

17:30 - 17:45

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignal sed level of service
B-AC	17	422	0. 040	17	0.0	8.883	A
C-AB	1	600	0.002	1	0.0	6.020	A
C-A	110			110			
A-B	5			5			
A-C	210			210			

17:45 - 18:00

Stream	TotalDemand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-AC	14	432	0033	14	0.0	8.621	A
C-AB	0. 89	595	0.002	0.89	0.0	6.063	A
C-A	92			92			
A-B	4			4			
A-C	176			176			

2029 - With Dev, AM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Arm A Direction	Arm B Direction	Arm C Direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	untitled	T-Junction	Two-way	Two-way	Two-way		0.94	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	0.94	A

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D9	2029 - With Dev	AM	ONE HOUR	08:30	10:00	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A		✓	115	100.000
B		✓	16	100.000
C		✓	245	100.000

Origin-Destination Data

Demand (Veh/hr)

		To		
		A	B	C
From	A	0	18	96
	B	12	0	4
	C	232	14	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	0	19	9
	B	20	0	63
	C	4	9	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (Veh)	Max LOS
B-AC	0.06	11 .96	01	B
C-AB	0.04	5.84	0.0	A
C-A				
A-B				
A-C				

Main Resultsfor each time segment

08:30 - 0845

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-AC	12	333	0036	12	0.0	11.37	B
C-AB	14	630	0.023	14	0.0	5.842	A
C-A	170			170			
A-B	14			14			
A-C	73			73			

08:45 -09:00

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-AC	14	327	0.044	14	0.0	11.518	B
C-AB	18	651	0.028	18	0.0	5.693	A
C-A	202			202			
A-B	17			17			
A-C	87			87			

09:00 - 09:15

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-AC	18	319	0.055	18	0.1	11 .953	B
C-AB	24	680	0.036	24	0.0	5.497	A
C-A	246			246			
A-B	20			20			
A-C	106			106			

09:1 5- 09:30

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-AC	18	319	0.055	18	0.1	11 .955	B
C-AB	24	680	0036	24	0.0	5.493	A
C-A	246			246			
A-B	20			20			
A-C	106			106			

09:30 - 09:45

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-AC	14	327	0.044	14	0.0	11.526	B
C-AB	18	651	0.028	18	0.0	5.680	A
C-A	202			202			
A-B	17			17			
A-C	87			87			

09:45 - 10:00

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-AC	12	333	0.036	12	0.0	11.229	B
C-AB	14	631	0.023	14	0.0	5.838	A
C-A	170			170			
A-B	14			14			
A-C	73			73			

2029 - With Dev, PM

Data Erors and Warnings

No errorsor warnings

Junction Network

Junctions

Junction	Name	Junction type	Arm A Direction	Arm B Direction	Arm CDirection	Use circulating lanes	JunctionDelay (s)	Junction LOS
1	untitled	T-Junction	Two-way	Two-way	Two-way		0.64	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	0.64	A

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D10	2029 - With Dev	PM	ONE HOUR	16:30	18: 00	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A		✓	265	100.000
B		✓	31	100.000
C		✓	124	100.000

Origin-Destination Data

De mand (Veh/hr)

		To		
		A	B	C
From	A	0	32	233
	B	12	0	19
	C	123	1	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	0	4	5
	B	0	0	0
	C	6	0	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (Veh)	Max LOS
B-AC	0.08	8.84	0.1	A
C-AB	0.00	6.11	0.0	A
C-A				
A-B				
A-C				

Main Results for each time segment

16:30 - 16:45

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-AC	23	464	0.050	23	0.1	8.156	A
C-AB	0.89	591	0.002	0.89	0.0	6.099	A
C-A	92			92			
A-B	24			24			
A-C	176			176			

16:45 - 17:00

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-AC	28	455	0.061	28	0.1	8.430	A
C-AB	1	595	0.002	1	0.0	6.056	A
C-A	110			110			
A-B	29			29			
A-C	210			210			

17:00 - 17:15

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-AC	34	442	0.077	34	0.1	8.834	A
C-AB	1	601	0.002	1	0.0	6.000	A
C-A	135			135			
A-B	35			35			
A-C	257			257			

17:15 - 17:30

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-AC	34	442	0.077	34	0.1	8.835	A
C-AB	1	601	0.002	1	0.0	6.006	A
C-A	135			135			
A-B	35			35			
A-C	257			257			

17:30 - 17:45

Stream	TotalDemand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-AC	28	455	0. 061	28	0.1	8.436	A
C-AB	1	595	0.002	1	0.0	6.069	A
C-A	1 10			110			
A-B	29			29			
A-C	210			210			

17:45 - 1 8:00

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level oservice
B-AC	23	464	0.050	23	01	8. 166	A
C-AB	0.89	591	0.002	0 .89	0.0	6.107	A
C-A	92			92			
A-B	24			24			
A-C	176			176			

2039 - No Dev, AM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Arm A Direction	Arm B Direction	Arm C Direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	untitled	T-Junction	Two-way	Two-way	Two-way		0.76	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	0.76	A

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D11	2039 - No Dev	AM	ONE HOUR	08:30	10:00	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A		✓	109	100.000
B		✓	17	100.000
C		✓	259	100.000

Origin-Destination Data

Demand (Veh/hr)

		To		
		A	B	C
From	A	0	3	106
	B	12	0	5
	C	257	2	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	0	100	10
	B	22	0	65
	C	4	56	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (Veh)	Max LOS
B-AC	0.06	12.23	01	B
C-AB	0.01	7. 11	0.0	A
C-A				
A-B				
A-C				

Main Results for each time segment

08:30 - 08:45

Stream	Total Demand (Veh/hr)	Capacity(Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay(s)	Unsignalised level oservice
B-AC	13	327	0. 039	13	0.0	1 1.442	B
C-AB	2	508	0.005	2	0.0	7.111	A
C-A	192			192			
A-B	2			2			
A-C	80			80			

08:45 - 09:00

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-AC	15	321.	0.048	15	0.0	1 1.762	B
C-AB	3	536	0.006	3	0.0	6.807	A
C-A	229			229			
A-B	2			2			
A-C	96			96			

09:00- 09:15

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue(Veh)	Delay (s)	Unsignalised level of service
B-AC	19	313	0.060	19	0.1	12.224	B
C-AB	4	575	0.007	4	0.0	6.373	A
C-A	281			281			
A-B	3			3			
A-C	117			17			

09:15 - 09:30

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-AC	19	313	0.060	19	0. 1	12.228	B
C-AB	4	575	0.007	4	0.0	6 .309	A
C-A	28			281			
A-B	3			3			
A-C	117			117			

09:30 - 09:45

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-AC	15	321	0.048	15	0.1	11.771	B
C-AB	3	537	0.006	3	0.0	6.655	A
C-A	229			229			
A-B	2			2			
A-C	98			98			

09:45 - 10:00

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-AC	13	327	0.039	13	0.0	11.458	B
C-AB	2	509	0.005	2	0.0	7.028	A
C-A	192			192			
A-B	2			2			
A-C	80			80			

2039 - No Dev, PM

DataErrors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Arm A Direction	Arm B Direction	Arm C Direction	Use circulating lanes	JunctionDelay (s)	Junction LOS
1	untitled	T-Junction	Two-way	Two-way	Two-way		0.46	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	0.46	A

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profiletype	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D12	2039 - No Dev	PM	ONE HOUR	6:30	18:00	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A		✓	265	100.000
B		✓	21	100.000
C		✓	136	100.000

Origin-Destination Data

Demand(Veh/hr)

		To		
		A	B	C
From	A	0	7	258
	B	13	0	8
	C	135	1	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	0	20	5
	B	0	0	0
	C	7	0	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (Veh)	Max LOS
B-AC	0.06	9.47	0.1	A
C-AB	0.00	6.05	0.0	A
C-A				
A-B				
A-C				

Main Results for each time segment

16:30 - 16:45

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-AC	16	428	0.037	16	0.0	8.720	A
C-AB	0.91	597	0.002	0.90	0.0	6.040	A
C-A	101			101			
A-B	5			5			
A-C	194			194			

16:45 - 17:00

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-AC	19	418	0.045	19	0.0	9.024	A
C-AB	1	602	0.002	1	0.0	5.986	A
C-A	121			121			
A-B	6			6			
A-C	232			232			

17:00 - 17:15

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-AC	23	403	0.057	23	0.1	9.472	A
C-AB	1	609	0.002	1	0.0	5.914	A
C-A	148			148			
A-B	7			7			
A-C	284			284			

17:15 - 17:30

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-AC	23	403	0.057	23	0.1	9.474	A
C-AB	1	609	0.002	1	0.0	5.922	A
C-A	148			148			
A-B	7			7			
A-C	284			284			

1 7:30- 17:45

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-AC	19	418	0.045	19	0.0	9.026	A
C-AB	1	602	0.002	1	0.0	6.004	A
C-A	121			121			
A-B	6			6			
A-C	232			232			

17:45- 1 800

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Th roughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-AC	16	428	0.037	16	0.0	8.728	A
C-AB	0.91	597	0.002	0.91	0.0	6.048	A
C-A	101			101			
A-B	5			5			
A-C	194			194			

2039 - With Dev, AM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Arm A Direction	Arm B Direction	Arm C Direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	untitled	T-Junction	Two-way	Two-way	Two-way		0.94	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	0.94	A

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D13	2039 - With Dev	AM	ONE HOUR	08:30	10:00	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A		✓	125	100.000
B		✓	17	100.000
C		✓	270	100.000

Origin-Destination Data

Demand (Veh/hr)

		To		
		A	B	C
From	A	0	19	106
	B	12	0	5
	C	257	14	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	0	22	10
	B	22	0	65
	C	4	11	0

Results

ResultsSummary for who lemodelled period

Stream	Max RFC	MaxDelay (s)	Max Queue(Veh)	Max LOS
B-AC	0.06	12.38	0.1	B
C-AB	0.04	5.81	0.1	A
C-A				
A-B				
A-C				

Main Results for each time segment

08:30 - 08:45

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level oservice
B-AC	13	325	0.040	13	0.0	11.530	B
C-AB	15	634	0.023	15	0.0	5. 83	A
C-A	189			189			
A-B	14			14			
A-C	80			80			

08:45 - 09:00

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-AC	15	318	0.048	15	0 1	11 .875	B
C-AB	19	657	0.029	19	0.0	5.846	A
C-A	224			224			
A-B	17			17			
A-C	98			98			

09:00- 09:15

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-AC	19	310	0.061	19	0. 1	12 .371	B
C-AB	25	690	0.037	25	0.1	5.427	A
C-A	272			272			
A-B	21			21			
A-C	117			17			

09:15 - 09:30

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised levelof service
B-AC	19	310	0.061	19	0.1	12.377	B
C-AB	25	690	0.037	25	0. 1	5. 421	A
C-A	272			272			
A-B	21			21			
A-C	117			117			

09:30 - 09:45

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-AC	15	318	0.048	15	0.1	11.882	B
C-AB	19	657	0.029	19	0.0	5.627	A
C-A	224			224			
A-B	17			17			
A-C	96			96			

09:45 - 10:00

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-AC	13	325	0.040	13	0.0	11.545	B
C-AB	15	634	0.023	15	0.0	5.803	A
C-A	189			189			
A-B	14			14			
A-C	80			80			

2039 - With Dev, PM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Arm A Direction	Arm B Direction	Arm C Direction	Use circulatinglanes	Junction Delay (s)	Junction LOS
1	untitled	T -Junction	Two-way	Two-way	Two-way		0.62	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	0.62	A

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Trafficprofile type	Start time (HH:mm)	Finish time (HH:mm)	Timesegment length (min)
D14	2039- With Dev	PM	ONE HOUR	16: 30	18:00	15

Vehicle mix source	PCUFactor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linkedarm	Use O-D data	Average Demand (Veh/hr)	ScalingFactor (%)
A		✓	290	100.000
B		✓	32	100.000
C		✓	136	100.000

Origin-Destination Data

Demand (Veh/hr)

		To		
		A	B	C
From	A	0	32	258
	B	13	0	19
	C	135	1	0

Vehicle Mix

HeavyVehicle Percentages

		To		
		A	B	C
From	A	0	5	5
	B	0	0	0
	C	7	0	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (Veh)	Max LOS
B-AC	0.08	9.09	0.1	A
C-AB	0.00	6.09	0.0	A
C-A				
A-B				
A-C				

Main Results for each time segment

16:30 - 16:45

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-AC	24	456	0.053	24	0.1	8.318	A
C-AB	0.91	593	0.002	0.90	0.0	6.082	A
C-A	101			101			
A-B	24			24			
A-C	194			194			

16:45 - 17:00

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-AC	29	446	0.065	29	0.1	8.629	A
C-AB	1	597	0.002	1	0.0	6.034	A
C-A	121			121			
A-B	29			29			
A-C	232			232			

17:00 - 17:15

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-AC	35	431	0.082	35	0.1	9.088	A
C-AB	1	603	0.002	1	0.0	5.971	A
C-A	148			148			
A-B	36			36			
A-C	284			284			

17:15 - 17:30

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-AC	35	431	0.082	35	0.1	9.092	A
C-AB	1	603	0.002	1	0.0	5.979	A
C-A	148			148			
A-B	36			36			
A-C	284			284			

17:30 - 17:45

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-AC	29	448	0.065	29	0.1	8.636	A
C-AB	1	597	0.002	1	0.0	6.053	A
C-A	121			121			
A-B	29			29			
A-C	232			232			

17:45 - 18:00

Stream	Total Demand (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-AC	24	456	0.053	24	0.1	8.328	A
C-AB	0.91	593	0.002	0.91	0.0	6.090	A
C-A	101			101			
A-B	24			24			
A-C	194			194			

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Appendix 12.1 Landscape & Restoration Plan.

12.0 LANDSCAPE & VISUAL

12.1 Introduction

This section of the EIAR assesses the landscape & visual impact of the proposed development on the surrounding landscape in the vicinity of the application site and proposes a restoration plan for the development once quarrying activities have ceased. This section also outlines the methodologies used to assess the landscape and visual impacts and proposes mitigation measures where required.

A Landscape and Visual Impact Assessment combines the magnitude of change with the sensitivity of the landscape to the existing development, which provides a measure of the significance of the impact. The acceptability of an existing development is determined by the extent to which the long-term landscape and visual effects are significant. Understanding the character quality and value of the landscape determines the sensitivity of that landscape to accommodate change through development.

Landscape and visual effects are independent but related issues; landscape effects are changes in the landscape, its character and quality, while visual effects relate to the appearance of these changes and the resulting effect on visual amenity. The two principal factors determining the visual impact of a development are the sensitivity of the location or receptor and the scale or magnitude of the development.

12.2 Methodology

A detailed landscaping assessment was undertaken to assess the impact of the existing development on the surrounding landscape. This involved undertaking a visual impact assessment of the area and a desk-based study to gather information on the existing landscape, visual resource, planning context and landscape designations. Information has been gathered from the following sources:

- Ordnance Survey Ireland) 1:2,500 maps and 1:50,000 maps.
- Aerial photography.
- Longford County Development Plan 2021 – 2027.
- Landscape Character Assessment County Longford (Annex 4 - Longford County Development Plan)

The following methodologies for the assessment of landscape character and landscape and visual impact have also been used in the preparation of this report:

- Guidelines on the information to be contained in Environmental Impact Assessment Reports (EIAR) (EPA, May 2022).
- Environmental Impact Assessment of Projects Guidance on the Preparation of the Environmental Impact Assessment Report (Directive 2011/92/EU as amended by 2014/52/EU) (European Union, 2017).
- Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment (DHP&LG), August 2018).
- 'Guidelines for Landscape and Visual Impact Assessment', (GLVIA) by the Landscape Institute with the Institute of Environmental Management and Assessment (Second Edition, 2002).
- The Landscape Institute with the Institute of Environmental Management and Assessment, 2013, Guidelines for Landscape and Visual Assessment, (Third Edition).

As mentioned above, field observations were also undertaken to assess the landscape character and structure of the application site, the existing quarry located to the east and the surrounding land. A visual impact assessment of the application site was undertaken from land under the control of the applicant and from publicly accessible viewpoints around the application site.

12.2.1 Landscape Assessment Criteria

12.2.1.1 Landscape Effects

Landscape effects describe the impact on the fabric or structure of a landscape or landscape character. The assessment of landscape effects firstly requires the identification of the components of the landscape. The landscape components are also described as landscape receptors and comprise the following: Individual landscape elements or features; Specific aesthetic or perceptual aspects; and landscape character, or the distinct, recognisable and consistent pattern of elements (natural and man-made) in the landscape that makes one landscape different from another. The assessment will identify the interaction between these components and the Proposed Development during Construction and Operational Phases. The condition of the landscape and any evidence of current pressures causing change in the landscape will also be documented and described.

Landscape Value

Landscape value is frequently addressed by reference to international, national, regional and local designations, determined by statutory and planning agencies. However, the absence of such a designation does not necessarily imply a lack of quality or value. Factors such as accessibility and local scarcity can render areas of nationally unremarkable quality, highly valuable as a local resource. The quality and condition are also considered in the

determination of the value of a landscape. Landscape Value is classified using the following criteria:

Table 12.1: Landscape Value

Sensitivity	Description
High	A landscape of particularly distinctive character, susceptible to relatively small changes.
Medium	A landscape of moderately valued characteristics reasonably tolerant to change.
Low	A relatively unimportant landscape, the nature of which is potentially tolerant to substantial change.

The landscape of the site of the Proposed Development is considered to have a Low Landscape Value as parts of the landscape are not unspoilt and have degrading elements such as man-made structures and infrastructure present.

Landscape Susceptibility

Landscape susceptibility relates to the ability of a particular landscape to accommodate the Proposed Development. Landscape susceptibility is appraised through consideration of the baseline characteristics of the landscape and in particular the scale or complexity of a given landscape. Table 12.1 is used to classify landscape susceptibility.

Table 12.2: Landscape Susceptibility

Sensitivity	Description
High	Small Scale intimate or complex landscape considered to be intolerant of even minor change.
Medium	Medium scale, more open or less complex landscape considered tolerant to some degree of change.
Low	Large scale, simple landscape considered tolerant of a large degree of change.

The landscape of the site of the Proposed Development is considered to have a Medium Landscape Susceptibility.

Landscape Sensitivity

Landscape sensitivity to change is determined by employing professional judgment to combine and analyse the identified landscape value, quality and susceptibility and is defined with reference to the scale outlined in Table 12-3:

Table 12.3: Landscape Sensitivity

Class	Criteria
High	Landscape characteristics or features with little or no capacity to absorb change without fundamentally altering their present character. Landscape designated for its international or national landscape value or with highly valued features. Outstanding example in the area of well cared for landscape or set of features that combine to give a particularly distinctive sense of place. Few detracting or incongruous elements.
High-Medium	Landscape characteristics or features with a low capacity to absorb change without fundamentally altering their present character. Landscape designated for regional or county-wide landscape value where the characteristics or qualities that provided the basis for their designation are apparent. Good example in the area of reasonably well cared for landscape with notable landscape features.
Medium	Landscape characteristics or features with moderate capacity to absorb change without fundamentally altering their present character. Landscape designated for its local landscape value or a regional designated landscape where the characteristics and qualities that led to the designation of the area are less apparent or are partially eroded or an undesignated landscape which may be valued locally for example an important open space. An example of a landscape or a set of features which is neutral or mixed character.
Medium Low	Landscape characteristics or features which are reasonably tolerant of change without detriment to their present character. No landscape designation present or of medium to low local value, or an example of a common or un-stimulating landscape or set of features and conditions.
Low	Landscape characteristics or features which are tolerant of change without detriment to their present character. No designation present or of low local value. An example of monotonous unattractive visually conflicting or degraded landscape or set of features.

The landscape of the site of the Proposed Development is considered to have a Medium Landscape Sensitivity.

Magnitude of Landscape Change

The magnitude of a predicted landscape impact is a product of the scale, extent or degree of change that is likely to be experienced as a result of the development. The magnitude takes into account whether there is a direct physical impact resulting from the loss of landscape components and/ or a change that extends beyond the proposal site boundary that may have an effect on the landscape character of the area.

Table 12.4: Magnitude of Landscape Change

Magnitude of Impact	Description
Very High	Highly noticeable change, affecting most key characteristics and dominating the experience of the landscape; and
High	Notable change in landscape characteristics over an extensive area and/or permanent long-term change.
Medium	Moderate changes in a localised area and/or medium-term change.
Low	Small change in any components and/or short-term/temporary change.
Negligible	Landscape characteristics or features with a low capacity to absorb change without fundamentally altering their present character.
None	Landscape characteristics or features with little or no capacity to absorb change without fundamentally altering their present character.

It is considered that the Proposed Development changes to Landscape Characteristics are Medium to High.

Note that potential beneficial landscape impacts are not accounted for in the tables and matrix above. This is on the basis that quarrying activities are very unlikely to generate beneficial landscape impacts. In the rare instance that this might occur, perhaps by facilitating the rehabilitation of a degraded landscape, the benefits will be discussed in the assessment and the significance of the impact would default to the lowest end of the range (Negligible or None).

12.2.2 Visual Impact Assessment Criteria

Visual effects are determined by the extent of visibility and the nature of the visibility (i.e., how a development is seen within the landscape); for example, whether it appears integrated and balanced within the visual composition of a view or whether it creates a focal point. Negative visual effects may occur through the intrusion of new elements into established views, which are out of keeping with the existing structure, scale and composition of the view.

Visual effects may also be beneficial, where an attractive focus is created in a previous unremarkable view, or the influence of previously detracting features is reduced. The

significance of effects will vary, depending on the nature and degree of change experienced and the perceived value and composition of the existing view.

Receptors

For there to be a visual impact, there is the need for a viewer. Views experienced from locations such as settlements, recognised routes and popular vantage points used by the public have been included in the assessment. Receptors are the viewers at these locations. The degree to which receptors, i.e., people, will be affected by changes as a result of the Proposed Development depends on a number of factors.

Value of the View

Value of the view is an appraisal of the value attached to views and is often informed by the appearance on Ordnance Survey of tourist maps and in guidebooks, literature or art. Value can also be indicated by the provision of parking or services and signage and interpretation. The nature and composition of the view is also an indicator. The value of the view is determined with reference to the definitions outlined in Table 12.4

Table 12.5: Value of View

Magnitude of Impact	Description
High	Nationally recognised view of the landscape, with no detracting elements.
Medium	Regionally or locally recognised view, or unrecognised but pleasing and well composed view with few detracting elements.
Low	Views from viewpoints which may have value to local people

Visual Susceptibility

The susceptibility of visual receptors to changes in views and visual amenity is a function of:

- The occupation or activity of people experiencing the view at a particular location; and
- The extent to which their attention or interest may therefore be focused on the views and visual amenity they experience at particular locations.

For example, residents in their home, walkers whose interest is likely to be focused on the landscape or a particular view, or visitors at an attraction where views are an important part of the experience often indicate a higher level of susceptibility. Whereas receptors occupied in outdoor sport, where views are not important, or at their place of work, are often considered less susceptible to change. Visual susceptibility is determined with reference to the three-point scale and criteria outlined in Table 12.4.

Table 12.6: Visual Susceptibility

Magnitude of Impact	Description
High	Receptors for which the view is of primary importance and are likely to notice even minor change.
Medium	Receptors for which the view is important but not the primary focus and are tolerant of some change.
Low	Typical or poorly composed view often with numerous detracting elements.

Sensitivity of Visual Receptors

Unlike landscape sensitivity, the sensitivity of visual receptors has an anthropocentric basis. It balances the visual susceptibility of the viewer against the value of the view on offer. The susceptibility of a viewer to changes in a particular view relates to the occupation or activity they are engaged in at that location and whether views of the surrounding landscape are an important aspect of that occupation or activity i.e. hill walkers versus commuters. By comparison, the value of the view relates to the visual setting of the viewer and whether this is recognised through county designations and guidebooks or is likely to just have local value.

Table 12.7: Visual Receptor Sensitivity

Sensitivity	Description
High	Users of an outdoor recreation feature which focuses on the landscape; valued views enjoyed by the community; tourist visitors to scenic viewpoint; occupiers of residential properties with a high level of visual amenity.
Medium/High	Users of outdoor recreational facilities, in locally designated landscapes or on local recreational routes that are well publicised in guidebooks. Road and rail users in nationally designated landscapes or on recognised scenic routes, likely to be travelling to enjoy the view.
Medium	Users of outdoor sport or recreation which does not offer or focus attention on landscape; occupiers of residential properties with a medium level of visual amenity.
Low/Medium	People engaged in active outdoor sports or recreation and less likely to focus on the view. Primary transport road network and rail users likely to be travelling to work with oblique views of the Development or users of minor road network.
Low	Regular commuters, people at place of work; occupiers of residential properties with a low level of visual amenity.

Visual Impact Magnitude

The magnitude of visual effects is determined on the basis of two factors; the visual presence of the development and its effect on visual amenity. Visual presence is something of a quantitative measure relating to how noticeable or visually dominant the proposal is within a particular view.

This is based on a number of aspects beyond simply scale in relation to distance. Some of these include the extent of the view as well as its complexity and the degree of movement experienced i.e. within a busy street scene. The backdrop against which the development is presented and its relationship with other focal points or prominent features within the view is also considered. Visual presence is essentially a measure of the relative visual dominance of the proposal within the available vista.

Table 12.8: Magnitude of Visual Impact

Criteria	Description
High	Total loss or alteration to key elements/features/characteristics of the existing landscape or view and/or introduction of elements considered totally uncharacteristic when set within the attributes of the receiving landscape or view.
Medium	Partial loss or alteration to key elements/features/characteristics of the existing landscape or view and/or introduction of elements that may be prominent but not necessarily substantially uncharacteristic when set within the attributes of the receiving landscape/view.
Low	Minor loss or alteration to key elements/features/characteristics of the existing landscape or view and/or introduction of elements that may not be uncharacteristic when set within the attributes of the receiving landscape/view.
Negligible	Very minor loss or alteration to key elements/features/characteristics of the existing landscape or view and/or introduction of elements that are not uncharacteristic when set within the attributes of the receiving landscape/view.
No Change	No change in the existing view.

Visual Impact Significance

The significance of effects is assessed by considering the sensitivity of the receptor and the predicted magnitude of effect in relation to the baseline conditions. In order to provide a level of consistency and transparency to the assessment and allow comparisons to be made between the various landscape and visual receptors subject to assessment, the assessment of significance is informed by pre-defined criteria as outlined in the Table 12.8. When assessing significance, individual effects may fall across several different categories of significance and professional judgement is therefore used to determine which category of significance best fits the overall effect on a landscape or visual receptor.

Table 12.9: Categories of Significance of Landscape and Visual Effects

Criteria	Description
Profound Impact	An impact which obliterates sensitive characteristics
Significant Impact	An impact which, by its character, magnitude, duration or intensity alters a sensitive aspect of the environment
Moderate Impact	An impact that alters the character of the environment in a manner that is consistent with the existing and emerging trends
Minor Impact	An impact which causes noticeable changes in the character of the environment without affecting its sensitivities
Imperceptible Impact	An impact capable of measurement but without noticeable consequences

12.3 Existing Environment

The application site consists of greenfield paddocks separated by hedgerows, an area of peatland to the northwest which was historically subject to peat extraction and an area of planted mixed woodland located on the eastern boundary.

The majority of the application site is located on the western side of north south ridge which has a peak level of 71mOD. The main surface water course in the area is the River Camlin which flows in a south easterly direction joining the River Shannon at the Cloondara village. The River Camlin is located 360m to the south of the application site at its closest point.

A number of tributaries flow into the River Camlin along its course including the Rhine Stream which flows in an easterly direction along the northern boundary of the existing quarry. The Rhine Stream is located approximately 50m to the east of the point where the haul road joins the L5097 Local Road.

Land-use in the vicinity of the application site include agriculture consisting of livestock farming. Historical peat extraction and commercial forestry is also evident from aerial photography. There are number residences in the immediate vicinity of the development comprising of isolated farm dwellings and ribbon development. An operational quarry is located to the north east of the application site which is operated by Rhyne Rock.

12.3.1 Landscape Policy Context and Designations

12.3.1.1 Longford County Development Plan 2021 – 2027

Through the Landscape Assessment, it is the policy of the Council to identify, protect and enhance landscapes and landscape features of special environmental, historic or cultural interest. This includes gardens, parks, demesnes, historic designed landscapes, views and

prospects, places and features of natural beauty and / or cultural value. Consideration will also be given to the making of Tree Preservation Orders in respect of trees or groups of trees of particular landscape value. In addition to the material contained within the Landscape Character Assessment, the Council's policy and objectives are as follows:-

It is the County Policy Objective to:

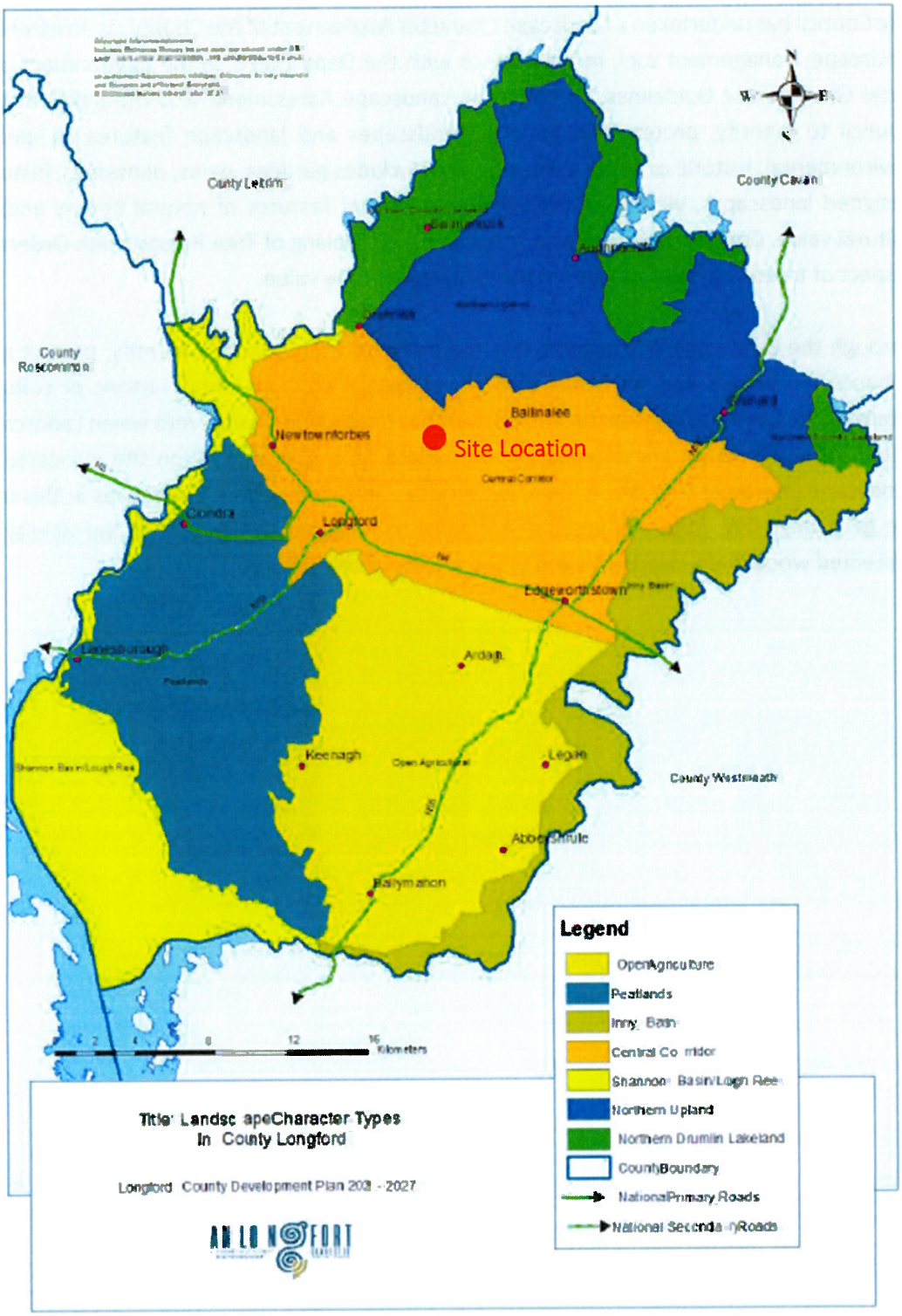
- CPO14.1 Support and implement objectives contained in any Regional Landscape Character Assessment.
- CPO14.2 Review in the context of a regional approach to landscape assessment, the County Landscape Character Assessment following publication of statutory guidelines for Planning Authorities on local Landscape Character Assessments, as outlined in the National Landscape Strategy 2015-2025.
- CPO14.3 Protect the landscapes and natural environments of the County by ensuring that any new developments do not detrimentally impact on the character, integrity, distinctiveness or scenic value of their area. Any development which could unduly impact upon such landscapes will not be permitted.
- CPO14.4 Ensure the preservation of the uniqueness of a landscape character type by having regard to the character, value and sensitivity of a landscape in new development proposals. Any new development should respect and reinforce the distinctiveness and sense of place of the landscape character types, including the retention of important features or characteristics, taking into account the various elements which contribute to their distinctiveness.
- CPO14.5 Conserve and enhance the high nature conservation value of the Landscape Character Areas in order to create/protect ecologically resilient and varied landscapes.
- CPO14.6 Discourage proposals necessitating the removal of an extensive number of trees, hedgerows and historic walls or other distinctive boundary treatments and consider the making of Tree Preservation Orders in respect of trees or groups of trees of particular landscape value.
- CPO14.7 Require landscape and visual impact assessments prepared by suitably qualified professionals to be submitted with planning applications for development which may have significant impact on landscape character areas of medium or high sensitivity.
- CPO14.8 Preserve views and prospects as illustrated on the accompanying map as part of Appendix 9: Landscape Character and as listed in Tables 14.2 and 14.3 in the CDP.

12.3.1.2 Landscape Character Assessment County Longford

The Council has undertaken a Landscape Character Assessment of the County, as an essential landscape management tool, in accordance with the Department of the Environment and Local Government Guidelines. Through the Landscape Assessment, it is the policy of the Council to identify, protect and enhance landscapes and landscape features of special environmental, historic or cultural interest. This includes gardens, parks, demesnes, historic designed landscapes, views and prospects, places and features of natural beauty and/or cultural value. Consideration will also be given to the making of Tree Preservation Orders in respect of trees or groups of trees of particular landscape value.

Through the Landscape Assessment, it is the policy of the Council to identify, protect and enhance landscapes and landscape features of special environmental, historic or cultural interest. The Landscape Character Assessment has divided the County into seven Landscape Character Areas which are detailed below in Plate 12.1. The application site is located in Landscape Character Unit No. 4 'Central Corridor'. Sensitivity of the landscapes in this unit are generally LOW. Potential areas of MEDIUM to HIGH sensitivity exist in the vicinity of protected woodlands, riverbanks and in the vicinity of the Aquifer.

Plate 12.1: Landscape Character Areas of County Longford



Landscape Unit 4 – Central Corridor

This area consists of the centre of the County and includes the settlements of Newtownforbes, Longford Town and Edgeworthstown extending in a northerly direction towards Drumlish in the west and Granard in the east. The southern boundary is mainly formed by the N4 National route from Longford to Mullingar. As with the rest of the County, the main landcover constituent in this unit consists of agricultural pastures. The urban fabric of Longford Town, Edgeworthstown and Newtownforbes also cover extensive areas. Deciduous and mixed forestry are present in pockets throughout the centre of the unit, notably at Carrickglass and Farraghroe. The land in this unit is relatively flat and low-lying, rarely breaking the 100-metre contour line, meaning that trees, field boundaries, buildings and other features generally restrict views over any significant distance. This is contrasted with areas of distinct demesne type landscapes such as at Moatfarrell/Corbeagh. Drainage is toward the Shannon via a complex network of Rivers and Streams accessing the Camlin River, which is subject to seasonal flooding.

The urban network is strongest in this area of the County, with a defined hierarchical system dominated by the settlements of Longford, Edgeworthstown and Newtownforbes, which lie along the main transport routes. Edgeworthstown and Longford exhibit a certain amount of commuter traffic to the Dublin area, but not yet to an economically significant degree. Significant pressure exists for "one-off" housing development along the R198 regional route from Longford to Arva and there is an established ribbon development pattern in place in the Clonbalt/Cloonrollagh/Creenagh area. This pattern is repeated at Kilnashee and Cloonagh further north along this route on the approach to Drumlish.

The road network is at its most dense at this point given the relatively favourable flat topography of the area. All four national routes (N4 – Dublin/Sligo N5-Longford/Castlebar, N55 Athlone/Cavan, N63-Longford/Roscommon) traverse this Landscape Unit. The Dublin/Sligo Rail line traverses the County through the Central Corridor. Almost one-third of the planning applications for large-scale communications infrastructure in the County have been made in this area.

Agriculture in this area is well developed in comparison to much of the County, with a wide range of agricultural activity, from large-scale dairying activity to smaller scale extensive uses, particularly to the west of the area. The main industrial centre of the County is centred at Longford Town, with major installations at Lisnamuck/Templemichael, Townsparks, Ballymacormack and the Athlone Road. Edgeworthstown has two large factories, C&D Pet Foods and Paul & Vincent.

A wide range of architectural and cultural heritage is present in this area, with the important occupied demesnes of Castleforbes and Carrickglass. Former settlements have left their mark on the landscape at Farraghroe, Corbeagh and Moatfarrell. A wide range of recreational facilities are available at Longford Town, including leisure centres and swimming pools. The Mall sports complex and walkway through Longford is an important and widely used amenity, augmented by Sli na Sláinte (around Longford bypass). The Camlin River is part of the Midland Fisheries Group of Shannon Regional Fisheries Board managed waters and requires a fishing permit. There are also a number of GAA and soccer pitches within the Unit and a golf course in Longford Town.

The sensitivity of the landscapes in this unit is generally LOW. Potential areas of MEDIUM to HIGH sensitivity exist in the vicinity of protected woodlands, riverbanks and in the vicinity of the Aquifer.

Threats

- Pollution of Groundwater sources in the vicinity of the aquifer to the north of Longford Town;
- Loss/fragmentation of important agricultural land/tree stands and woodlands;
- Continued ribbon development in pressure areas.

Opportunities

- High capacity for absorption of additional development;
- Existing strong urban network upon which settlement strategy can be based.

Landscape Unit 4 – Central Corridor – County Policy Objectives

It is the County Policy Objective to:

- CPO14.24 Restrict development in pressure areas
- CPO14.25 Relax restrictions in areas of high capacity
- CPO14.26 Install Groundwater protection scheme around potential groundwater supplies
- CPO14.27 Identify and protect important areas of agricultural land from further fragmentation
- CPO14.28 Encourage use of existing large-scale communications infrastructure for future proposed developments

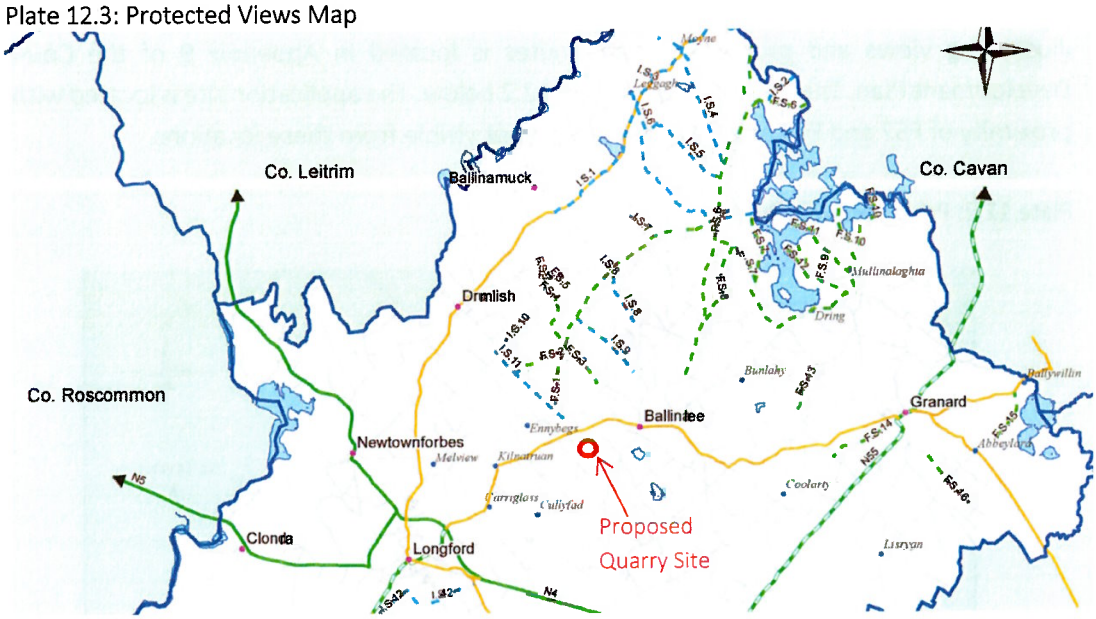
12.3.1.3 Views and Prospects, Scenic Routes

The landscape of the County has many vantage points which offer attractive views from hilltops and upland areas, along river valleys and the boglands. These scenic views are of an amenity and tourism value and contribute to our quality of life. There are two distinct types

of views identified Full (uninterrupted) and intermittent (broken or sporadic). A map illustrating views and propects, scenic routes is located in Appendix 9 of the County Development Plan. This is illustrated in Plate 12.2 below. The application site is located within proximity of FS2 and FS3 and IS11, however is not visible from these locations.

Plate 12.2: Protected View Map

Plate 12.3: Protected Views Map



12.4 Impact Assessment

12.4.1 Potential Landscape Impact

Landscape effects – Degree of change to physical characteristics or elements of the landscape, which together form the character of that landscape, e.g., landform, vegetation, boundaries, buildings etc.

Construction Phase

The Construction Phase of the Proposed Development will be short in duration and will include the construction of a haul road and quarry infrastructure which will be located in the southern corner of the development. As part of the Construction Phase, the site's landscape will undergo some changes:

- A general site clearance to remove overburden and vegetation to construct the haul road and infrastructure.
- The use of construction machinery, cranes, excavators, dump trucks etc. operating on the site.
- Change in colour and form of topography due to the excavation, removal and storage of soils.

It is concluded that the proposed development will, therefore, have a minor to moderate, neutral to negative, short-term impact on the landscape character of the site during the construction phase mainly due to the removal of existing vegetation.

Operational Phase

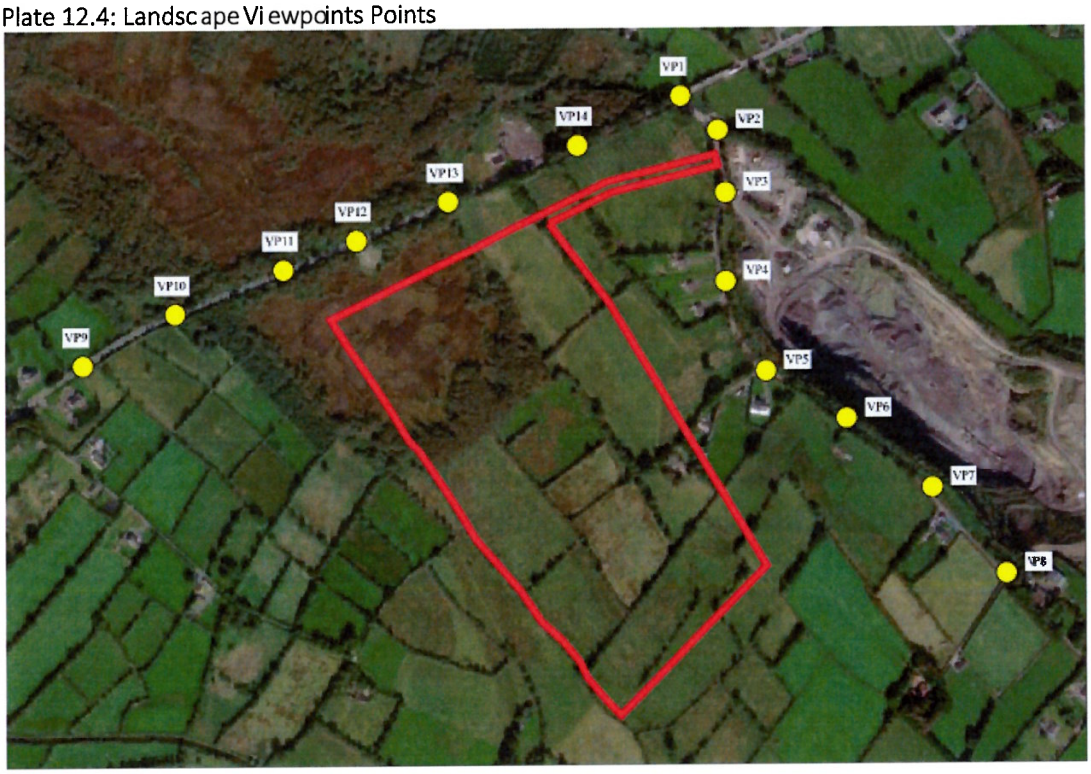
The operational phase of the Proposed Development will cause some negative landscape impact in the long term within the site due to the removal of the available resource. Once the quarrying is complete the applicant will vegetate areas around the open lagoon. The Site land use will become largely a scrubland and water deposit.

It is concluded that the proposed development and the implementation of the proposed mitigation measures will result in a negative, moderate, permanent effect on landscape.

12.4.2 Potential Visual Impact

The visibility of the application site was initially assessed by a desktop study of OS maps in order to identify potential viewpoints. This was followed up by a field survey where viewpoints were generally chosen to give a representative sample of views of the development within the landscape to illustrate the impact on local residential properties and on protected views, where relevant. 14 No. vantage points were chosen which are depicted below and illustrated on Plate 12.4 below. Each viewpoint is detailed below and a description is provide for each one.

Plate 12.4: Landscape Viewpoints Points



Viewpoint 1 – North East of the Application Site Along Local Road L5097

Viewpoint 1 shows a view of the application site from a position to the northeast along the L5097 local road. The viewpoint shows the location of the entrance to the existing quarry and where the haul road from the application site will join the L5097.

VP Value	Low
VP Susceptibility	Medium
VP Sensitivity	Low/Medium
Magnitude of Visual Change	Low
Duration of Effects	Medium/Long Term
Quality of Effects	Negative
Significance of Landscape & Visual Effects	Minor
Conclusion of Visual Impact of Proposed Development	The haul road and entrance will be partially visible at this location. However, the natural topography and proposed berms will screen the manufacturing area and extraction area from this location.

Viewpoint 2 - North East of the Application Site Along Local Road L5097

Viewpoint 2 shows a view of the application site from a position to the north east of the application site. Similar to Viewpoint 1, the haul road and entrance will be visible at this location.

VP Value	Low
VP Susceptibility	Medium
VP Sensitivity	Low/Medium
Magnitude of Visual Change	Low
Duration of Effects	Medium/Long Term
Quality of Effects	Negative
Significance of Landscape & Visual Effects	Minor
Conclusion of Visual Impact of Proposed Development	The haul road and entrance will be visible at this location. However, the natural topography and proposed berms will screen the manufacturing area and extraction area from this location.

Viewpoint 3 – North East of the Application Site Along Local Road L5097

Viewpoint 3 shows a view of the application site from a position to the north east of the application site. Similar to Viewpoint 1 and 2, the haul road and entrance will be visible at this location. The natural topography and proposed berms will screen the manufacturing area and extraction area from this location.

VP Value	Low
VP Susceptibility	Medium
VP Sensitivity	Low/Medium
Magnitude of Visual Change	Low
Duration of Effects	Medium/Long Term
Quality of Effects	Negative
Significance of Landscape & Visual Effects	Minor
Conclusion of Visual Impact of Proposed Development	The haul road and entrance will be visible at this location. However, the natural topography and proposed berms will screen the manufacturing area and extraction area from this location.

Viewpoint 4 – East of the Application Site Along Local Road L5097

Viewpoint 4 is at a location to the east of the application site. There are three dwellings located between the local road and the application site. A mature hedgerow has established on the rear boundary of the dwellings. The existing vegetation and natural topography aid in screening the application site from this location. The planted berm to be constructed along the eastern boundary will also aid in screening the application site when the planted vegetation has matured.

VP Value	Medium
VP Susceptibility	Medium
VP Sensitivity	Medium
Magnitude of Visual Change	Low
Duration of Effects	Medium/Long Term
Quality of Effects	Negative
Significance of Landscape & Visual Effects	Minor
Conclusion of Visual Impact of Proposed Development	Similar to Viewpoint 3, The highest level of the application site is 71mOD which is located along the north eastern boundary of the application site. Therefore, only the planted berm will be visible from the rear of the houses. The existing vegetation growing along the boundary of the dwellings will also provide visual screening.

Viewpoint 5 – East of the Application Site Along Local Road L5097

Viewpoint 5 is at a location to the east of the application site further along Local Road L5097.

VP Value	Low
VP Susceptibility	Medium
VP Sensitivity	Low/Medium
Magnitude of Visual Change	Low
Duration of Effects	Medium/Long Term
Quality of Effects	Negative
Significance of Landscape & Visual Effects	Minor
Conclusion of Visual Impact of Proposed Development	The highest level of the application site is 71mOD which is located along the north eastern boundary of the application site. Similar to Viewpoint 4, existing vegetation growing along field boundaries and the natural topography aids in screening the application site. The planted berm to be constructed along the eastern boundary will also aid in screening the application site when the planted vegetation has matured.

Viewpoint 6 – South of the Application Site Along Local Road L5097

Viewpoint 6 is at a location to the east of the application site further along Local Road L5097.

VP Value	Low
VP Susceptibility	Low
VP Sensitivity	Low
Magnitude of Visual Change	No Change
Duration of Effects	Medium/Long Term
Quality of Effects	Neutral
Significance of Landscape & Visual Effects	Imperceptible
Conclusion of Visual Impact of Proposed Development	The existing vegetation growing along field boundaries aids in screening the application site. The planted berm to be constructed along the eastern boundary will also aid in screening the application site when the planted vegetation has matured.

Viewpoint 7 – South of the Application Site Along Local Road L5097

Viewpoint 7 was taken at a location to the south east of the application site.

VP Value	Low
VP Susceptibility	Low
VP Sensitivity	Low
Magnitude of Visual Change	No Change
Duration of Effects	Medium/Long Term
Quality of Effects	Neutral
Significance of Landscape & Visual Effects	Imperceptible
Conclusion of Visual Impact of Proposed Development	The vegetation growing along field boundaries and the natural topography aids in screening the application site at this location.

Viewpoint 8: South East of Application Site Along Local Road L5097

Viewpoint 8 was taken at a location to the south east of the application site.

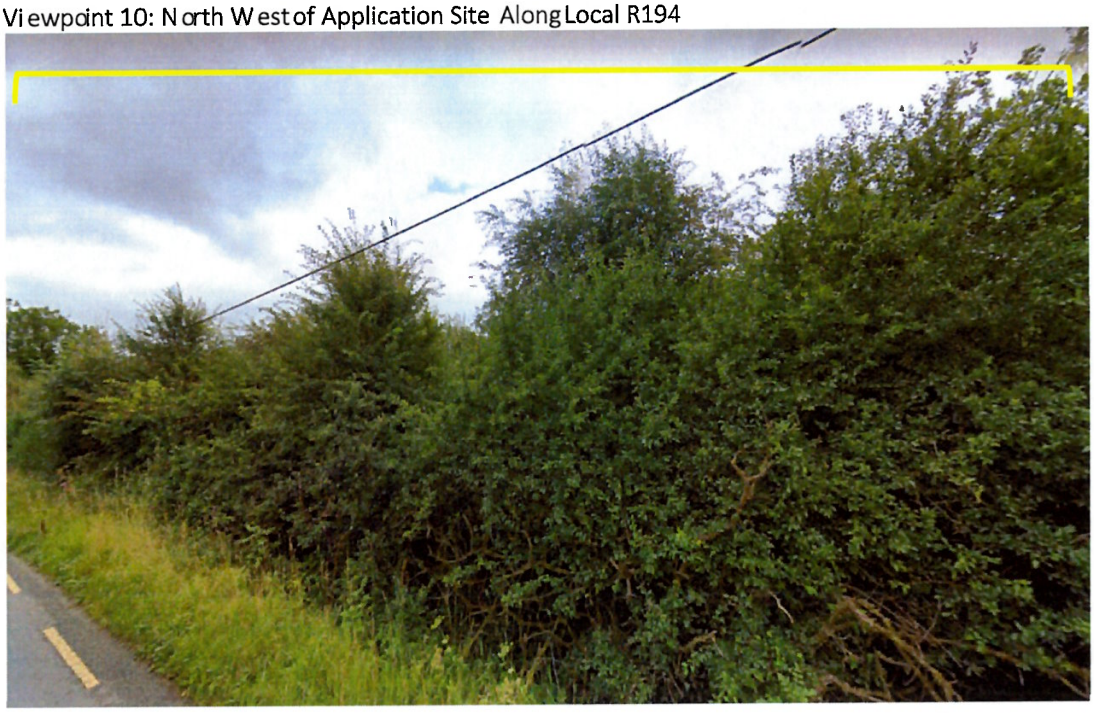
VP Value	Low
VP Susceptibility	Low
VP Sensitivity	Low
Magnitude of Visual Change	No Change
Duration of Effects	Medium/Long Term
Quality of Effects	Neutral
Significance of Landscape & Visual Effects	Imperceptible
Conclusion of Visual Impact of Proposed Development	The vegetation growing along field boundaries and the natural topography aids in screening the application site at this location.

Viewpoint 9: North West of Application Site Along Local R194

Viewpoint 9 is from a location to the north west of the application site along the R194.

VP Value	Low
VP Susceptibility	Low
VP Sensitivity	Low
Magnitude of Visual Change	No Change
Duration of Effects	Medium/Long Term
Quality of Effects	Neutral
Significance of Landscape & Visual Effects	Imperceptible
Conclusion of Visual Impact of Proposed Development	The application site is not visible due to the vegetation growing along field boundaries.

Viewpoint 10: North West of Application Site Along Local R194



Viewpoint 10 is from a location to the north west of the application site along the R194.

VP Value	Low
VP Susceptibility	Low
VP Sensitivity	Low
Magnitude of Visual Change	No Change
Duration of Effects	Medium/Long Term
Quality of Effects	Neutral
Significance of Landscape & Visual Effects	Imperceptible
Conclusion of Visual Impact of Proposed Development	The application site is not visible due to the vegetation growing along field boundaries.

Viewpoint 11: North of Application Site Along R194

Viewpoint 11 is from a location to the north west of the application site along the R194.

VP Value	Low
VP Susceptibility	Low
VP Sensitivity	Low
Magnitude of Visual Change	No Change
Duration of Effects	Medium/Long Term
Quality of Effects	Neutral
Significance of Landscape & Visual Effects	Imperceptible
Conclusion of Visual Impact of Proposed Development	The application site is not visible due to the vegetation growing along field boundaries.

Viewpoint 12: North of Application Site Along R194

Viewpoint 12 is from a location to the north of the application site along the R194.

VP Value	Medium
VP Susceptibility	Medium
VP Sensitivity	Medium
Magnitude of Visual Change	Medium
Duration of Effects	Medium/Long Term
Quality of Effects	Negative
Significance of Landscape & Visual Effects	Slight
Conclusion of Visual Impact of Proposed Development	The application site boundary is approximately 75m from the viewpoint location and the boundary is visible due to the gap in the hedgerows along the R194. Vegetation which is visible at a distance from this location will be removed to facilitate the proposed development. It is proposed to construct a berm along the boundary of the application site which will screen the site from this location. Once the side slopes of the berm have vegetated, they will screen the application site.

Viewpoint 13: North of Application Site Along R194

Viewpoint 13 is from a location to the north of the application site along the R194.

VP Value	Medium
VP Susceptibility	Medium
VP Sensitivity	Medium
Magnitude of Visual Change	Medium
Duration of Effects	Medium/Long Term
Quality of Effects	Negative
Significance of Landscape & Visual Effects	Slight
Conclusion of Visual Impact of Proposed Development	Similar to Viewpoint 12, the application site boundary is approximately 75m from the viewpoint location. It is proposed to construct a berm along the boundary of the application site which will screen the site from this location. Once the side slopes of the berm have vegetated, they will screen the application site.

Viewpoint 14:North East of Application Site

Viewpoint 14 is from a location to the north east of the application site along the R194.

VP Description	Medium
VP Value	Medium
VP Susceptibility	Medium
VP Sensitivity	Medium
Magnitude of Visual Change	Medium/Long Term
Duration of Effects	Negative
Quality of Effects	Slight
Significance of Landscape & Visual Effects	Medium
Conclusion of Visual Impact of Proposed Development	The application site is visible due to the gap in the hedgerows. The application site boundary is at a similar distance from the R194 as shown in Viewpoint 12 and 13. It is proposed to construct a berm along the northern boundary of the application site which will screen the site from this location.

12.4.3 Restoration/Aftercare Plan

The following matters were taken into consideration as part of the landscape and restoration plan:

- Habitat type and species local to the site.
- Planning requirements and applicable legislation.
- Interaction with the surrounding environment.
- Health & safety considerations.
- Resources available.
- Nature and extent of aggregates extraction.
- Availability of suitable restoration materials.

When quarrying activity has ceased at the site, all fixed and mobile plant, equipment and buildings, fuel tanks, toilets and plant machinery will be removed from the site. Most of the plant and equipment that will be on site will not pose any environmental concern in the event of decommissioning. In the event of decommissioning, all machinery removed from the quarry will be reused at a different location or if not required at another location, plant will be dismantled and the metal recycled at an appropriate facility.

All stockpiles, plant equipment and unused structures will be removed from the site and an inspection will be undertaken to ensure that all plant and equipment has been decommissioned and removed.

The existing perimeter vegetation will be retained. Landscape work and planting as part of the restoration process will serve to reduce the long-term visual impact of the development. As part of the quarry works measures will be put in place to reduce loss of biodiversity and enhance the conservation value of the area and reduce environmental impacts of quarrying activity on the surrounding area. These include:

- Provision of berms which will be planted and allowed to develop with the natural seed bank in the soil to create ecosystems and to provide corridors of natural habitat which connect existing natural areas around the quarry.
- The use of native species will support a wider range of insects and animals and will contribute more to the ecology of the region than non-native ornamental vegetation.
- Using plants adapted to or tolerant of the existing site conditions will reduce the need for expensive remedial measures (such as replacing failed plants).
- All planting of trees and shrubs will take place during the dormant seasons. Bare-rooted plants transplant most successfully during their dormant season, this is usually

between November and March/April. Avoiding times when the ground is actually frozen, this will mean either autumn or spring planting.

- Planting areas will be suitably fenced to exclude farm stock, rabbits, sheep and other browsing animals. It may be more economical to protect each tree individually rather than fence the whole area.

12.4.4 Potential Cumulative Effects

The application site is located adjacent to an existing operational quarry which is owned by the applicant. Due to the proximity of the site to this existing quarry there is the potential for cumulative impacts to arise. The existing quarry will cease operation once the application site becomes operational. A restoration plan will be implemented at the existing quarry to offset the impact associated with extraction of material to date. Therefore, no cumulative effects are anticipated from the proposed development.

12.4.5 Transboundary Effects

No transboundary effects are envisaged as a result of the proposed development.

12.4.6 'Do Nothing' Scenario

A do-nothing scenario would result in the site remaining as is with no development taking place. The application site would continue to be used for agricultural purposes and the existing site would continue to be present in the landscape.

12.5 Avoidance, Remedial & Mitigation Measures

Landscape and visual effects have been avoided and reduced by a number of measures. The quarry area will be surrounded by a planted berm which will be constructed with overburden removed from the site. The proposed planting as it matures will maintain this visual neutrality. A restoration plan will be implemented during the operational phase with final restoration undertake on completion of extraction which will inevitably consist of forming a man made lake which will be vegetated above the water level. The landscape and restoration plan is attached as an appendix to this section.

12.5.1 'Worst Case' Scenario

The worst-case effects arise when the mitigation measures as proposed substantially fail which include trees and shrubs which will be planted. If this were to happened grass species which will have stablished will still remain in place such on side slopes of berms and areas of ground which have vegetated.

12.5.2 Residual Impacts

No significance negative residual impacts in the context of landscape and visual impact are anticipated regarding this proposed development.

12.6 Monitoring

12.6.1 Construction Phase

The removal of vegetation as part of the should be supervised periodically by an appropriately qualified Ecologists.

12.6.2 Operational Phase

The mitigation measures for medium to long term, neutral landscape effects are detailed in the Restoration Plan. The restoration of the quarry should be supervised periodically by an appropriately qualified Ecologists. Any removal of vegetation as part this phase should be supervised periodically by an appropriately qualified Ecologists.

12.7 After Use

The greatest potential for biodiversity in relation to site is after the operation has ceased. Once quarrying has ceased and all stockpiled, plant and machinery has been removed the groundwater levels will recover over time up to a level of 41-45mOd. This will fluctuate with the water table over the seasons.

The Quarry will be flooded on a permanent basis from 20.0mOd (quarry floor) up to the top water table of the surrounding area. With time, nature reclaims a quarry and, left alone, the quarry landscape can revert to a rich zone of biodiversity with little intervention from human hands. The aim of any natural restoration plan is to restore ecological balance and to produce self-sustaining plant and wildlife communities and habitats.

12.8 Technical Difficulties

No technical difficulties were encountered.

12.9 References

Longford County Development Plan 2021-2027

Landscape Character Assessment County Longford

'Guidelines for Landscape and Visual Impact Assessment', (GLVIA) by the Landscape Institute with the Institute of Environmental Management and Assessment (Second Edition, 2002).

The Landscape Institute with the Institute of Environmental Management and Assessment, 2013, Guidelines for Landscape and Visual Assessment, (Third Edition).

Appendix 12.1 - Landscape & Restoration Plan

Landscape & Restoration Plan

For
Proposed Quarry at
Rhine, Killoe,
Co. Longford.

Prepared For:

Rhyne Rock Ltd.

Prepared By
Earth Science Partnership Ire Ltd
May 2024

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1.0 Introduction

This Landscape and Restoration Plan has been prepared on behalf of Rhyne Rock Ltd. to accompany a planning application for a proposed quarry development to be located at a greenfield site at Rhine, Killoe, Co. Longford.

This report addresses the landscaping and restoration of the application site during the operational phase and the final restoration of the pit on completion of extraction of the available resource. The final restoration layout and sections are detailed on Figures attached in the Figures section.

This document identifies a general strategy and objectives of the proposed landscape and restoration plan. The Plan forms an important link between the predicted impacts of the operations on the site and also the need to plan for long-term land and site management. Restoration of a quarry site provides an opportunity for enhancement of local biodiversity with the phased re-colonisation and naturalisation of disused areas within the site, and ultimately the entire site.

Conversely, through management of biodiversity during excavation and subsequent rehabilitation, extraction sites can have a positive impact on biodiversity through the creation of new habitats and colonisation by new species of flora and fauna which can enhance and protect biodiversity during operation and post-closure. Mitigation measures are suggested to reduce potential impacts on wildlife and fauna in the surrounding environment.

The following matters were taken into consideration as part of the landscape and restoration plan:

- Habitat type and species local to the site.
- Planning requirements and applicable legislation.
- Interaction with the surrounding environment.
- Health & safety considerations.
- Resources available.
- Nature and extent of aggregates extraction.
- Availability of suitable restoration materials.

The proposed phased approach to landscaping and restoring the quarry over its operational years will reduce the cost associated with the final restoration of the quarry on completion of extraction. By the end of the working life of the quarry, areas that have been landscaped

will be well established, and have blended with the surrounding countryside. The restoration of the quarry will be undertaken in tandem with the phased extraction plan.

2.0 The Site

The application site is located at Rhine, Killoe, Co. Longford. As detailed in Plate 1, the closest urban centres are the villages of Aghaboy and Ballinalee located 1.4km to the north west and 3.5km to the east respectively. Longford town is located 7km to the south west.

Plate 1: Site Location Map

2.1 Application Site

The application site consists of a greenfield site located in proximity to an existing quarry owned and operated by Rhyne Rock (Plate 2). The reserve of material at the existing quarry is nearly exhausted therefore the applicant is applying for planning permission for the proposed development to authorise a reserve of material which will meet the demand for material over a long-term period. Should the proposed development site be granted planning permission, operations at the existing quarry will cease once the proposed development site becomes fully operational. The existing quarry would then be restored in line with a restoration plan agreed with Longford County Council.

Plate 2: Application Site and Existing Quarry

The application site consists of greenfield paddocks separated by hedgerows, an area of peatland to the northwest which was historically subject to peat extraction and an area of planted mixed woodland located on the eastern boundary.

The majority of the application site is located on the western side of a north south ridge which has a peak level of 71mOD. The extraction/manufacturing area of the application site varies from a level of approximately 55mOD along the western boundary to approximately 70mOD along the eastern boundary.

The main surface water course in the area is the River Camlin which flows in a south easterly direction joining the River Shannon at the Cloondara village. The River Camlin is located 360m to the southeast of the application site at its closest point. A number of tributaries flow into the River Camlin along its course including the Rhine Stream which flows in an easterly direction along the northern boundary of the existing quarry. The Rhine Stream is located approximately 50m to the east of the point where the haul road joins the L5097 Local Road.

Land-use in the vicinity of the application site include agriculture consisting of livestock farming. Historical peat extraction and commercial forestry is also evident from aerial

photography. There are number residences in the immediate vicinity of the development comprising of isolated farm dwellings and ribbon development. An operational quarry is located to the north east of the application site which is operated by Rhyne Rock.

3.0 The Proposed Development

The proposed development consists of an extraction area where material will be extracted by blasting means down to a level of 20.0mOD and a manufacturing area with a floor level of 54.0mOD, where material will be processed into various grades of aggregate and sold to market or used to manufacture ready-mix concrete. Access to the application site will be via the L5097 Local Road off the R198 Regional Road which connects the towns of Longford and Granard. A haul road will be constructed along the northern and western boundaries which will link the manufacturing area to the L5097 Local Road.

The proposed manufacturing area (54mOD) will consist of the processing plant, concrete batching plant, block yard, storage sheds, workshop, office buildings, weighbridge, wheelwash, settlement lagoon and all other associated ancillary facilities. The plant and machinery at the existing quarry would be relocated to the proposed development.

4.0 Landscaping Measures

A number of landscaping proposals are proposed as part of the initial phases of the proposed development in order to provide visual screening of the proposed development and to improve traffic site lines which include the following:

4.1 Removal of Existing Hedgerows

The existing hedgerows along field boundaries will be removed when necessary as part of the phased extraction plan which will be undertaken outside the bird breeding season. Where possible trees will be relocated from internal boundaries to external boundaries. The removal of existing hedgerows will be offset by the planting of hedgerows around the boundary of the site. There will also be a requirement to remove hedgerows at the junction of the haul road and the L5097 Local Road to improve site lines. Security fencing/stock proof post and wire fencing will be erected around the boundary of the site.

4.2 Berm Construction

Berms will be constructed around the boundary of the site using overburden removed from the site. A suitable growth medium such as topsoil will be placed on the berms which will allow vegetation to establish. Berms will be planted with native trees and shrubs to provide screening. Trees will be planted on the proposed berms to offset the impact associated with the removal of vegetation.

The tree species mix will include a range of species with the potential to cope with the planting environment and to build in long-term resilience to pests and diseases. Tree species to be considered include both native and some non-native species, including the following: Silver Birch (*Betula pendula*), Common Alder (*Alnus glutinosa*), Italian Alder (*Alnus cordata*), Aspen (*Populus tremula*), Holly (*Ilex aquifolium*), Hazel (*Corylus avellana*), Field Maple (*Acer campestre*), Hornbeam (*Carpinus betulus*), Sycamore (*Acer pseudoplatanus*), Wild Cherry (*Prunus avium*), Bird Cherry (*Prunus padus*), Scots Pine (*Pinus sylvestris*), Common Oak (*Quercus robur*), Sessile Oak (*Quercus petraea*).

The planting of new Ash (*Fraxinus excelsior*) trees is not advised on account of the prevalence of Ash Dieback disease.

The trees will be planted as young bare-rooted whips at around 1m-1.5m spacing. The trees will be planted in a mixed species layout, with some small clusters of individual species (Oak and Pine) spread throughout. Alder and Birch will be the dominant species within the mix, together forming around 30% of the total number of trees. Aftercare will be undertaken where practicable, with weed control (spot treatment with approved herbicide) likely to be the principal operation for the first few years of establishment.

Any areas of high tree mortality will be replaced with fresh planting following a review of the likely cause of the failures. The plantations will be inspected and reviewed every 6 months for the first 5 years, then annually thereafter. The plantations are likely to require some thinning work in the future, however, this is not envisaged to be necessary for a significant time and be dictated by the development of the new plantation woodland.

5.0 Decommissioning

When quarrying activity has ceased at the site, plant, equipment and buildings, fuel tanks, toilets and plant machinery will be removed from the site. The majority of plant and equipment on site will not pose any environmental concern during the decommissioning phase. Machinery removed from site will be reused at a different location or if not required at another location plant will be dismantled and the metal sold as scrap. Some plant such as excavators and dump trucks will be required to carry out the final restoration of the site. After stockpiles, plant equipment and unused structures are removed from the site an inspection will be undertaken to ensure that all plant and equipment has been decommissioned and removed. Existing boundary fencing will be left in place.

6.0 Restoration Measures

A restoration plan for the quarry is also proposed to supplement the landscaping measures to encourage habitat development and increase biodiversity of the area. This report outlines

the work to be carried out in a phased programme. Restoration may be undertaken during the working life of the quarry such as the restoration of quarry faces which have been worked to their extremities.

6.1 Phase I – Permanent Restoration of Side Slopes

Quarry faces which have been worked to the extremities of the boundary will be restored to a permanent restoration where possible. This will have been undertaken during the working life of the quarry. Some of the faces will be covered with overburden to stimulate the growth of vegetation. The finished profile of the sides of the quarry will promote the re-colonisation and naturalisation of the worked areas.

6.2 Phase II - Grading of Overburden on Exposed Surfaces

Overburden will be applied to exposed surfaces such as the manufacturing area and gravel areas. It is proposed to apply a species rich grass seed and leave to colonise naturally. Other areas such as rock surfaces exposed by excavation that are undergoing low levels of disturbance have the potential to be valuable habitats for species. Areas of bare ground also provide an opportunity for the establishment of species, some of which may be locally or regionally important. This can also be of benefit as a food resource for invertebrates.

6.3 Phase III – Restoration of Quarry Void

Due to low permeability of the underlying geology it is envisaged that the void area will fill with water over time up to the existing ground water level which is between 41 and 45mOD. The water level will fluctuate seasonally in response to precipitation levels. This new water body will be allowed to evolve with the minimum amount of intervention and will consist of approximately 12 hectares in area This will create a new biological ecosystem which will develop over many years.

7.0 Mitigation Measures & Monitoring

Implementing a landscape and restoration plan on a phased basis provides for mitigation to reduce the impact associated with the extraction stages of the development. This will serve to reduce the overall impact of the project, namely:

- Visual Impact
- Biodiversity & Ecological (flora & fauna) impact

Landscape work and planting as part of the overall process will serve to reduce the long-term visual impact of the development. The landscaping measures have been designed to conceal the pit as much as possible screening it from outside views. These measures consist of the following:

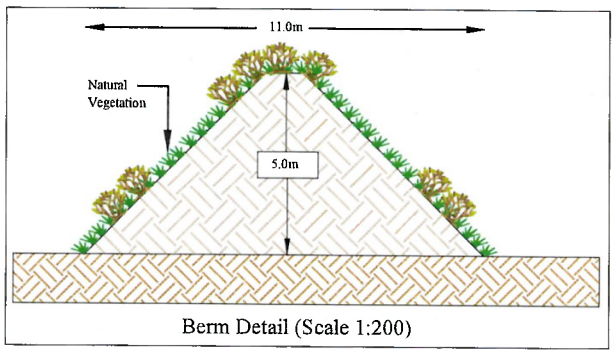
- Provision of a berm along the boundary which will be planted with native trees and shrubs.
- It is recommended that hedgerows and tree lines along the site perimeter be retained where possible with further landscaping of areas.
- The use of native species will support a wider range of insects and animals and will contribute more to the ecology of the region than non-native ornamental vegetation.
- Provision of perimeter fencing around the site where required to prevent unauthorised access.
- All planting of trees and shrubs will take place during the dormant seasons. Bare-rooted plants transplant most successfully during their dormant season, this is usually between November and March/April. Avoiding times when the ground is actually frozen, this will mean either autumn or spring planting.
- Regular Inspections post-planting will provide an assessment of the success of the planting regime. Where necessary i.e. where planting fails, additional supplemental planting can take place.

8.0 After Use

The greatest potential for biodiversity in relation to extractive sites is after the operation has ceased and the site has been restored. The aim of any restoration plan is to restore ecological balance and to produce self-sustaining plant and wildlife communities and habitats. As much of the quarry void will fill with water, this will create new aquatic habitat which will aid in diversification of the local ecology.

Figures

AN COIMISIÚN PLEANÁLA
21 AUG 2025
LTR DATED ____ FROM ____
LDG-____
ACP-323358-24



Berm Detail (Scale 1:200)

Ballinalee

R198 Road

L5097 Road

Access Road

Longford

Haul Road

Haul Road

Planted Berm Surround

Extraction Level FFL 20.0m OD

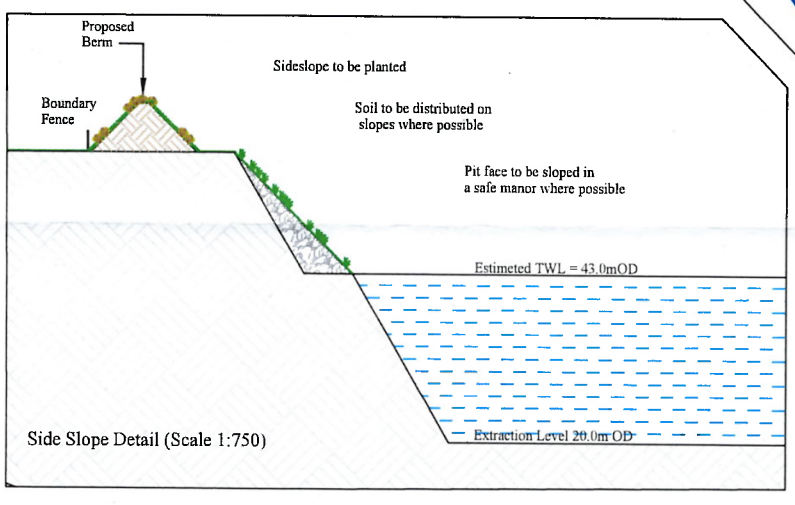
Estimated TWL 43.0m OD

Ramp

Manufacturing Area

FFL 54.0

Restored to Hardstand Area



Side Slope Detail (Scale 1:750)

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Legend

Ownership/Consent Boundary

Application Area

Area = 18.6Ha

Vegetated Side Slopes

Water

Haul Road / Manufacturing Area

Planted Berms

N

OS Sheet Ref. No. LD 009

ITM Coordinates E 619157, N 779736

All Levels Relative to Ordnance Datum

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Client: Blessington Stone & Concrete Plant Hire Limited, trading as Rhyne Rock

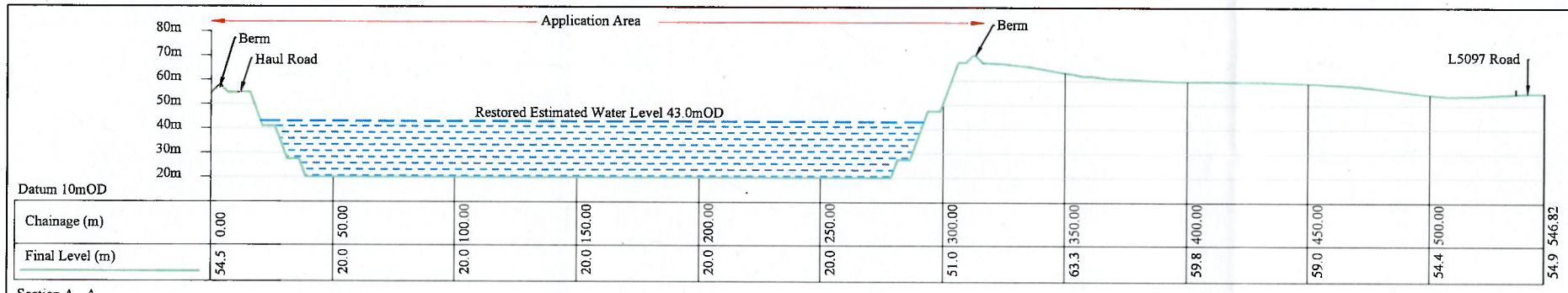
Project: Landscape & Restoration Plan to Accompany a Planning Application for a Quarry Located at Rhine, Killoe, Co. Longford.

Title: Restored Site Layout Map

Drawn By: P. O' Donnell

Scale: 1:2,500 @ A3	Date: May 2024
Job No: EI 161	Rev: 0

L&R Figure 1



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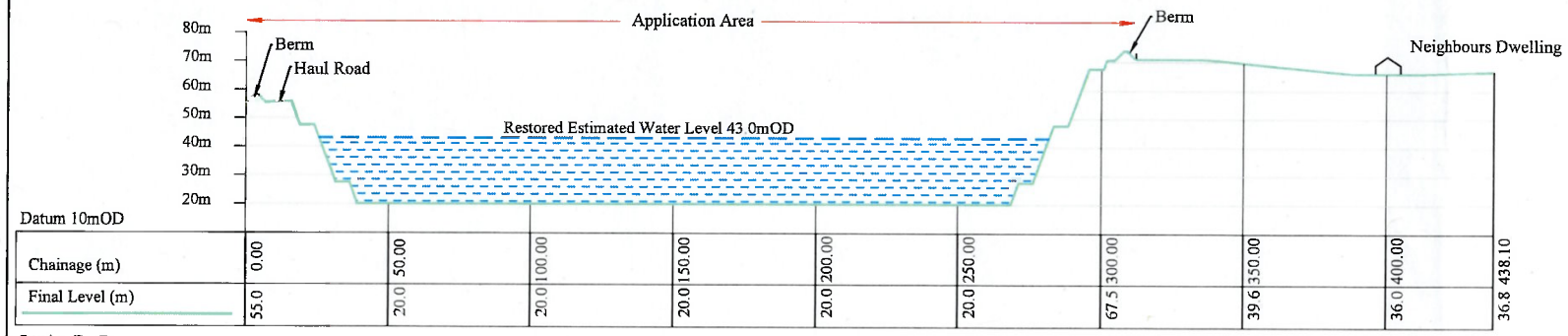
Final Level (m)	54.5	20.0	20.0	20.0	20.0	20.0	51.0	63.3	59.8	59.0	54.4	54.9

Section A - A



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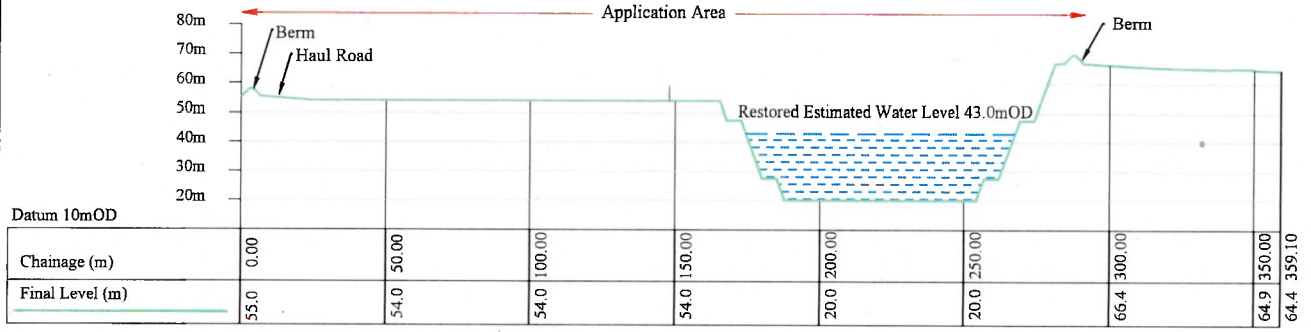
Section B - B



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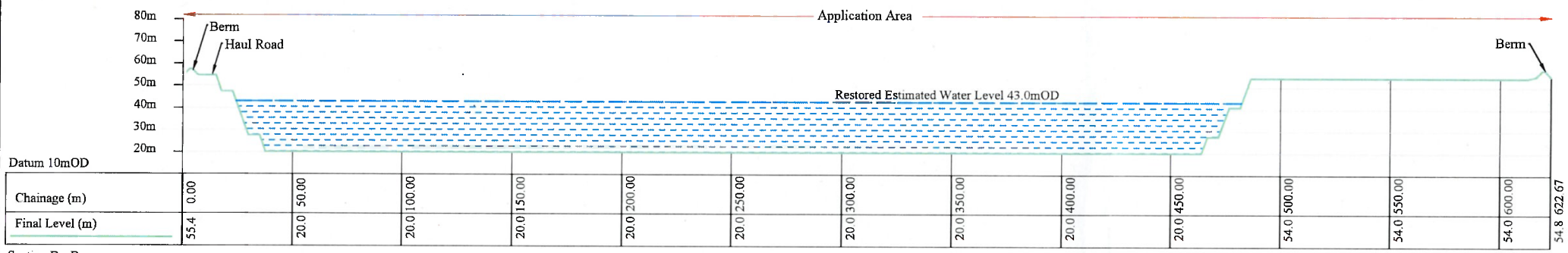
Section C - C



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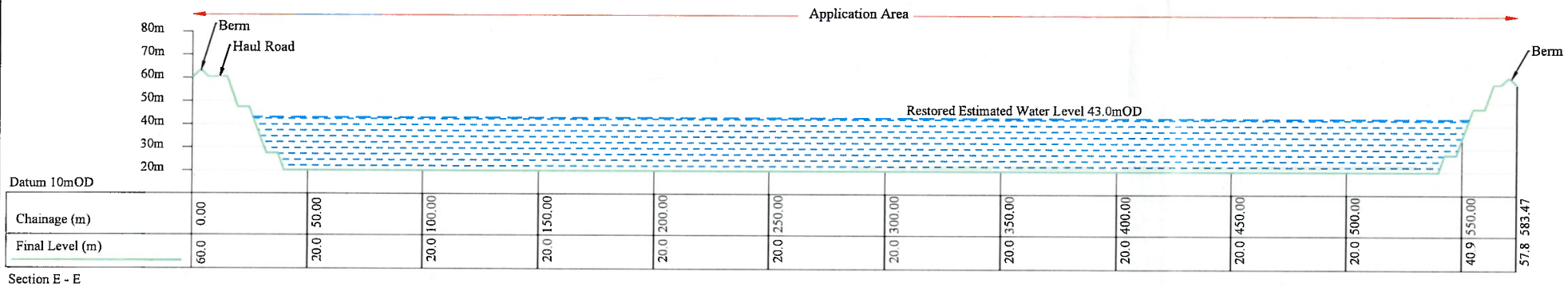
Section D - D



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Section E - E

Legend

Ownership/Consent Boundary

Application Area

Area = 18.6 Ha

Final Level

OS Sheet Ref. No. LD 009

ITM Coordinates E 619157, N 779736

All Levels Relative to Ordnance Datum

Vegetated Side Slopes

Water

Haul Road / Manufacturing Area

Planted Berms

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Client: Blessington Stone & Concrete Plant Hire Limited, trading as Rhyne Rock

Project: Landscape & Restoration Plan to Accompany a Planning Application for a Quarry Located at Rhine, Killoe, Co. Longford.

Title: Final Sections

Drawn By: P. O' Donnell

Scale: 1:2,500 @ A3 | Date: May 2024

Job No: EI 161 | Rev: 0

L&R Figure 2

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13.0 MATERIAL ASSETS

13.1 Introduction

This section of the EIAR addresses the impacts of the development on the material assets located in the vicinity of the quarry. Material assets are defined in the EPA *'Advice notes on current practice (in the preparation of Environmental Impact Statements)'* (2003) as *'resources that are valued and that are intrinsic to specific places, they may be either human or natural origin and the value may arise for either economic or cultural reasons'*.

The developments utilisation of the area's material assets, or proximity to these material assets, can lead directly and indirectly to potential environmental impacts. The objective of the assessment is to ensure that these assets are used in a sustainable manner with respect to the development and propose measures where necessary to ensure that they are used in a sustainable manner.

13.2 Methodology

The information for the assessment of the impacts of the application site was obtained from:

- Draft Revised Guidelines on the Information to be contained In Environmental Impact Statements (EPA, September 2015)
- Guidelines on the information to be contained in Environmental Impact Assessment Reports (EIAR) (EPA, May 2022)
- Longford County Council Development Plan (2021 – 2027).
- Site visits
- Aerial photography
- Historical Mapping
- Geological Survey of Ireland Mapping
- General Soil Map of Ireland (Teagasc Classification) sourced from Geological Survey of Ireland.

The EPA Guidelines on the information to be contained in Environmental Impact Statements (March 2002) states that the material assets should be assessed under the headings of:

- Archaeological Heritage
- Folklore/Tradition/History
- Architecture/Settlements
- Monuments/Features
- Designed Landscape
- Natural Resources of Economic Value
- Buildings & Structures
- Infrastructure.

The Draft Revised Guidelines on the Information to be contained in Environmental Impact Statements (2015) and Draft Advice Notes for Preparing Environmental Impact Statements (2015) state that the following material assets should be assed in relation to quarries:

- Build Services
- Roads & Traffic
- Effects of vibration on surface structure
- Road damage due to transport and machinery use
- Loss of, or damage to water supplies
- Effects potential for groundwater development in the area, in the future, especially downgradient of the site
- Impacts on geological heritage

The EPA guidelines on the Information to be contained in an Environmental Impact Assessment Report (May 2022) state the Built Services (electricity, telecommunications, gas, water supply infrastructure and sewage), Roads & Traffic (construction & operational phases & unplanned events i.e. accidents) and Waste Management (construction & operational phases) should be assessed as part of this section of the EIAR.

Information on the transport infrastructure, public utilities and material assets of natural origin was obtained from Longford County Council, Discovery Series mapping and aerial photography. The material assets, which have been identified as being within and adjacent to the proposed site and which may be directly affected by the proposed development are addressed below in terms of the receiving environment, impacts and mitigation measures.

13.3 Existing Environment

The application site consists of greenfield paddocks separated by hedgerows, an area of peatland to the northwest which was historically subject to peat extraction and areas of planted woodland.

The majority of the application site is located on the western side of a north south ridge which has a peak level of 71mOD. The extraction/manufacturing area of the application site varies from a level of 55mOD along the western boundary to 70mOD along the eastern boundary.

The main surface water course in the area is the River Camlin which flows in a south easterly direction joining the River Shannon at the Cloondara village. The River Camlin is located 360mto the southeast of the application site at its closest point. A number of tributaries flow

into the River Camlin along its course including the Rhine Stream which flows in an easterly direction along the northern boundary of the existing quarry. The Rhine Stream is located approximately 50m to the east of the point where the haul road joins the L5097 Local Road.

Land-use in the vicinity of the application site include agriculture consisting of livestock farming. Historical peat extraction and commercial forestry is also evident from aerial photography. There are number residences in the immediate vicinity of the development comprising of isolated farm dwellings and ribbon development. An operational quarry is located to the north east of the application site which is operated by Rhyne Rock.

The closest licensed waste facility is Mulleady's Limited (Drumlish) which is located 6km to the northwest of the application site. The closest IPPC licenced facility is Mr Padraig Kiernan (Ballinalee Pig Farm) located 2.3km south east of the application site.

As per the EIAR Guidelines (EPA, 2022), this Chapter address built services, roads & traffic and waste management in terms of material assets relative to the proposed development.

13.3.1 Built Services

The study area is serviced by telecommunications, electricity and water which are discussed under each heading. There is no mains gas network located in the immediate study area.

Electricity - The electricity connection to the existing quarry is a 200KVa – 240v – 3 Phase over-head line which enters the existing quarry from the north near the entrance to the quarry. This connection at the existing quarry will be diverted to the proposed quarry manufacturing area via the proposed access road and will provide the principal energy supply. No overhead lines traverse the application site. An existing overhead ESB line runs along the western side of the L5097 road which services dwellings houses located along the L5097 to the east of the application site. Electricity will be required to power plant and facilities at the proposed development such as the administrative facilities, processing plant and the concrete batching plant.

Telecommunications - An overhead telecommunications line services the existing quarry and dwellings houses to the east of the application site along the L5097 road. A connection will be obtained from this line to serve the administrative infrastructure located at the application site.

Water Supply Infrastructure - A water connection will be obtained from an existing Irish Water main that runs along the L5097 road. This connection will provide a potable water

supply to the office and canteen. Production water for dust suppression, concrete production, aggregate washing etc. will be sourced from the quarry sump which will be located on the lowest level of the quarry floor. This water will consist of run-off water from quarry areas which will be directed to the sump.

Excess water collected in the quarry sump will be discharge periodically from the proposed quarry. The discharge from the quarry will be to a drainage ditch running alongside the south-western perimeter of the proposed quarry and will ultimately flow to the Camlin River. The discharge of water from the site will be subject to a trade effluent discharge licence.

Sewerage – A wastewater treatment system will be installed at the application site which will treat effluent toilet and welfare facilities at the proposed development. The facility to be installed will be specified based on the results of a site suitability assessment.

13.3.2 Roads & Traffic

Access to the application site will be via a new proposed gated entrance off the L5097 Local Road. The L5097 connects to the R194 Regional Road approximately 120m north west of the proposed new quarry entrance. The R194 is the main Longford to Granard road and links the quarry to Sligo/Mullingar via the N4 and Cavan/Athlone via the N55.

The road infrastructure in the vicinity of the quarry consists of a series of regional and local roads which connects villages and towns in the region. The national road network is approx. 6.7km to N4, 15.2km to N55, 10.4km to N5 and 9.1km to N63.

A haul road will be constructed from the proposed quarry entrance to the manufacturing and extraction areas to allow access from the public road to these areas. Road surfacing in the area consists of a tar & chip as standard on local and regional roads.

13.3.3 Waste Management

Waste generated at the application site will consist of the following:

General/Domestic Waste – This will be collected in bins provided by a permitted waste collector operating in the area. Domestic waste will be segregated into general, recyclable and food waste and will be presented for collection as per the waste collector's schedule.

Garage Waste – This consists of scrap metal, waste oils and filters, batteries, oily rags etc. associated with the servicing of plant and machinery. These waste types will be stored in designated receptables awaiting collection by appropriately licenced contractors for disposal or recovery at an authorised facility.

Extractive Waste – This waste consists of the overburden removed to extract the underlying resource. This material will be used to construct berms around the boundary of the site and retained for restoring the site on cessation of the works. Berms will be vegetated to maintain the shape and to act as both visual and aural barriers. These will be left in place for the lifetime of the project. There is little or no waste produced from the crushing and screening of material as all material has a use or commercial value from a capping fill material to a processed aggregate. Any potential silt/soil material that may no be of use as a product will be used for restoration.

13.3.4 Sensitive Receptors

Settlement in the area mainly consists of ribbon developments located along minor roads in the vicinity of the application site. There are 34 dwelling houses located within a 500m radius of the application site boundary with a further 68 located between 500m and 1km of the site (Plate 13.1). The potential impacts on residences associated with quarries are in relation to landscape, noise, vibration, dust and traffic as a result of the day to day activities which have been assessed in the relative chapters of the EIAR.

Plate 13-1: Dwelling House Locations

The majority of the land in the vicinity of the application site is used for agricultural purposes. A mixture of pasture types is found in the surrounding land which range from improved grasslands to peatland.

Seven Natura 2000 sites which were identified during the desk study as being located within 15km. The closest sites are Lough Forbes Complex SAC and Ballykenny-Fisherstown Bog SPA which are located 8.9km to the west. The quarry is not located in the vicinity of any scenic views. The closest protected view is located approximately 1km to the north east. The application site is not visible from this section of road.

13.4 Impact Assessment

Potential impacts in relation to material assets identified above are assessed under each heading detailed below.

13.4.1 Built Services

Construction Phase Impacts

The proposed development will require a connection to the existing services available in the area to include water, electricity and telecommunications which will require laying underground ducts or over headlines which will not require significant infrastructure work. These works will lead to a direct, neutral, imperceptible, temporary effect on built services.

Operational Phase Impacts

Electricity will be the main energy requirement to power plant and administrative infrastructure operating in the manufacturing area. In terms of energy usage, the closure of the existing quarry and the diversion of the power supply to the proposed development will mean that there will be no significant net increase in power consumption associated with the proposed development. In terms of water usage, the proposed development will not be a significant user of treated water as production water will consist of surface water run-off collected in the quarry sump. The operational phase of the proposed development will lead to a direct, neutral, imperceptible, long term effect on built services.

Decommissioning Phase Impacts

Once the quarry has ceased extraction and production, final restoration will be undertaken which will involve removal of plant and infrastructure and carrying out final restoration works which take approximately 18 months. All plant will be moved to a different location or will be recycled where not fit for further use. The decommissioning phase will lead to a direct, neutral, imperceptible, permanent effect on built services.

13.4.2 Roads & Traffic

Construction Phase Impacts

The construction phase of the proposed development will consist of the installation of the haul road and erection of the plant and structures in the manufacturing area. Traffic levels associated with the phase will be limited and will mainly involve movement of plant from the existing quarry to the proposed development. Aggregate required for the haul road will also be sourced from the existing quarry therefore only a short section of the L5097 (approximately 50m) will utilized during the construction phase. These works will lead to a direct, neutral, imperceptible, temporary effect on roads and traffic.

Operational Phase Impacts

The development will generate a number of traffic movements associated with the delivery of raw materials, employee related traffic and the transport of material to market which is anticipated to be in the region of 73 truckloads per day. All the quarry traffic will exit onto the L5097 for approximately 50 meters before meeting the R194 which will be the main transport route for products from the quarry. There will be no net increase on traffic on the L5097 and R194 from the proposed development as quarry related traffic will be transferred from the existing quarry to the proposed development.

A junction(PICADY) assessment of the quarry access and junction onto R194 was undertaken for the proposed development. The summary of performance analysis indicates that proposed Junctions will be operating with negligible queues and delays during the peak hours, during the operational phase. It is likely that the applicant will be required to pay a contribution towards the upkeep of road infrastructure in the area which will go towards resurfacing roads in the vicinity.

The operational phase of the proposed development will lead to a direct, neutral, no significant, long-term effect on roads and traffic.

Decommissioning Phase Impacts

Traffic associated with the decommissioning phase will be limited and will be associated with the movement of plant and machinery off site to alternative locations. The decommissioning phase will lead to a direct, neutral, imperceptible, temporary effect on roads and traffic.

13.4.3 Waste

Construction Phase Impacts

Waste generated during the construction phase will be minimal and will be segregated appropriately and sent to authorised waste facilities. These works will lead to a direct, neutral, imperceptible, temporary effect during this phase.

Operational Phase Impacts

All extracted material produced at the quarry will have a value as saleable product or use in landscaping and restoration of the quarry. Waste produced during the operational phase will comprise general/domestic waste and garage waste which will be segregated and stored appropriately awaiting collection by authorised waste collectors. It is considered therefore that the impact of waste generation during this stage will be direct, neutral, slight, long term effect.

Decommissioning Phase Impacts

Plant and infrastructure which at the end of the life of the quarry development has no further use will be reused where possible or recycled in the case where the plant has no further use. The decommissioning phase will lead to a direct, neutral, imperceptible, temporary effect in terms of waste generation.

13.4.4 Sensitive Receptors

Construction Phase Impacts

Works associated with the construction phase will generate noise and dust emissions associated with the operation of plant and equipment. However, these works will be minimal in nature and will likely have imperceptible dust emissions. In terms of noise levels, the noise and vibration chapter calculated anticipated noise levels at nearest dwelling during this phase of the development and it is envisaged that construction phase will lead to a direct, negative, not significant, likely, temporary effect.

Operational Phase Impacts

Like the construction phase, the operational phase of the development will generate noise and dust emissions. The impact of dust, PM_{10} and $PM_{2.5}$ levels is assessed as imperceptible, negative, localised and long-term during the operational phase. Noise and vibration levels associated with the operational phase of the proposed development were assessed as direct, negative, not significant, likely, long term during this phase.

Decommissioning Phase Impacts

Landscaping and ongoing restoration will be undertaken dung the operational life of the quarry meaning that only minor restoration works will be required, noise associated with the removal of plant and infrastructure will lead to a direct negative, not significant, likely, temporary effect.

13.4.5 Unplanned Events

The EPA Guidelines on Information to be Contained in EIARs suggested that Unplanned Events [i.e. Accidents] is assessed under the Material Assets Chapter. According to the guidelines, *"unplanned events can include spill from traffic accidents, floods or landslides affecting the site, fire, collapse or equipment failure on the site."*

Flooding - Extreme rainfall events are becoming frequent and can potentially lead to flooding of low-lying areas. Should an extreme rainfall occur, the quarry floor will be allowed to flood to attenuate the water in order to not exceed the maximum volume of water which can be discharged off site. The water will be attenuated until the storm subsides and will be discharged at the normal rate. The quarry will act as a buffer against potential risk of flooding during extreme rainfall events – this is a beneficial impact from the proposed development.

Accidental Spillages or Emissions - There is the potential for accidental spillages from plant and machinery operating at the application site to occur with the degree of impact depending on the nature of the emission.

Plant and machinery will be serviced regularly to reduce the likelihood of accidental emissions occurring. Procedures will be put in place for dispensing fuel and servicing plant and machinery at the quarry. All repairs are carried out at a workshop located within the manufacturing area where possible. Fuel should be stored in double skinned bunded fuel tanks with protective railing surrounds. A stock of spill kits and booms will be stored at the quarry.

Quarry Face and Stockpile Slippages – Quarry benches formed as a result of extraction of material will be designed in line with The Safety, Health and Welfare at Work (Quarries) Regulations, 2008. All stockpiles will also be in compliance with these regulations. Geotechnical assessments will be undertaken of the quarry where required.

Fire – There is the potential for plant and machinery to catch fire where faults go unchecked, or servicing and repairs aren't carried out as required. Likewise, welding and cutting operations during maintenance can be a source of fires. Plant and machinery will be service

regularly and daily checks of operating machinery will be undertaken. Fire extinguishers and blankets will be located on plant and machinery.

Storm Events - Extreme windy conditions could potentially lead to damage to buildings and infrastructure if not structurally sound. The infrastructure proposed will be limited and will be structurally safe with no loose items located on infrastructure or stored in areas around the pit that could be carried by winds.

In light of these factors, it is considered that no material assets identified in this Chapter are particularly vulnerable to unplanned or unforeseen events and were they to occur, would be unlikely to cause significant, sudden environmental effects in respect of existing built services and infrastructure or the management of wastes.

13.4.6 Indirect Effects

No indirect effects are envisaged.

13.4.7 Cumulative/Synergistic Impacts

The proposed development must also be considered in association with other developments located within or close to the application site. The existing operational quarry will be closed and a restoration plan implemented once the application site becomes operational. The proposed restoration plan will be agreed with Longford Co. Co. and designed with a view to increasing biodiversity of the site. There will be no net increase in traffic on the public roads as the traffic associated with the existing quarry will shift to the proposed development. There are no other developments in the near vicinity of the application site which in combination with the application site would lead to a cumulative impact.

13.4.8 'Do Nothing' Effect

If the proposed development does not go ahead, the site will remain as a greenfield site and subject to existing land use which is predominantly agriculture.

13.4.1 'Worst Case' Effect

It is expected that in the absence of mitigation measures (primarily noise, dust and visual) that there will be slight to moderate negative effects with respect to local amenity and residential receptors because of the development of the quarry.

13.4.2 Transboundary Effects

No transboundary effects are envisaged as a result of the proposed development.

13.5 Mitigation Measures

Mitigation measures are proposed in the various chapters of the EIAR 6.0 Land, Soils & Geology, 7.0 Water, 9.0 Air Quality, 10.0 Noise & Vibration and 11.0 Traffic to reduce or offset the impacts identified in relation to the various stages of the proposed development. No additional mitigation measures are proposed in this chapter.

13.6 Residual Impacts

Once the identified mitigation measures, appropriate design standards and operational infrastructure management plans are adhered to, it is considered that any impacts on the Material Assets surrounding the proposed development will be Not Significant.

13.7 Monitoring

An environmental monitoring programme will be developed and implemented for the proposed development. The monitoring programme will verify that implemented controls prevent and minimise emissions from the proposed development. Monitoring will also assess the effects of the quarrying activities on the environment so that operational changes and improvements can be made where appropriate. The monitoring programme and sampling frequency will be agreed with Longford County Council.

13.8 Technical Difficulties

No technical difficulties were encountered during the compilation of this chapter.

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14.0 ARCHAEOLOGY & CULTURAL HERITAGE

14.1 Introduction

This Chapter of the Environmental Impact Assessment Report (EIAR) prepared on behalf of Earth Science Partnership addresses the impacts on the archaeological, architectural and cultural heritage of the application site and the surrounding area of a proposal to develop a rock quarry in the townland of Rhine, Killoe, Co. Longford. The proposed development will consist of an extraction area of approximately 14.2 ha, and a manufacturing area of approximately 2.1 ha within an overall application area of 18.6 hectares with an access road and landscaping areas.

Overburden will be removed in phases prior to extraction of underlying material and will be used in the construction of berms around the perimeter of the site and for restoration of the quarry once work has ceased.

Material will be extracted down to a level of 20mOD. Extraction of material will mainly be carried out by blasting means. Occasionally, rock breaking may be required on site. It is proposed that material will be extracted at a maximum rate of 400,000 tonnes/annum. Once extracted, material will be loaded onto dump trucks using an excavator. Material will be transported along internal haul roads to the proposed manufacturing area where it will be processed into various grades of aggregate using crushing and screening plant. Material may also be used in the manufacturing of ready-mix concrete at the proposed concrete batching plant.

Products will be transported off site to market via a proposed road which will connect the site to the L5097 and onto the R194 regional road. It is proposed that the development will generate an Annual Average Daily Traffic (AADT) of 73 loads/day.

14.2 Methodology

This study which complies with the requirements of Directive EIA 2014/52/EU is an assessment of the known or potential cultural heritage resource within a specified area and includes the information that may reasonably be required for reaching a reasoned conclusion on the significant effects of the project on the environment, taking into account current knowledge and methods of assessment. It consists of a collation of existing written and graphic information in order to identify the likely context, character, significance and sensitivity of the known or potential cultural heritage, archaeological and structural resource using an appropriate methodology (EPA 2002, 2003 and 2022).

The study involved detailed investigation of the cultural heritage including the archaeological, architectural and historical background of the proposed development site and the surrounding area up to 1km from the development. The study area is indicated on Fig 14.1. This area was examined using information from:

- The Record of Monuments and Places (RMP) County Longford;
- The Sites and Monuments Record (SMR);
- The Longford County Development Plan 2021-27 including the Record of Protected Structures;
- The National Inventory of Architectural Heritage (NIAH);
- Aerial photographs;
- Excavation reports;
- Cartographic and
- Documentary sources.

An impact assessment and mitigation strategy has been prepared. The assessment has been undertaken to assess the significant effects, if any, on the archaeology, cultural heritage and architecture which can reasonably be expected to occur because of the proposal to quarry in the application area, while a mitigation strategy has been designed to remedy any significant adverse effects on cultural heritage.

The assessment was prepared by Dr. Charles Mount who has more than thirty years of cultural heritage assessment experience. He holds B.A., M.A. and Ph.D. degrees in archaeology as well as a professional diploma in EIA and SEA Management and is a member of the Institute of Archaeologists of Ireland and the Discovery Programme.

14.3 Existing Environment

14.3.1 The Landscape

The application area is located in northern part of Co. Longford c. 3km to the south-west of the town of Ballinalee and just to the south of the R194 road. It is located in low-lying sloping and level ground. The land-use is pasture, cut-away bog and woodland and the local soils are fine loamy drift with siliceous stones overlying drift with siliceous stones and peat (http://gis.teagasc.ie/soils/map.php).

14.3.2 Archaeological and historical development of the study area

The following is a brief summary of the archaeological and historical development of the study area and the main types of sites and monuments that are known from the surrounding landscape. The information is drawn from the assessment. It is intended to indicate the types

of sites and monuments known to be present in the study area as well as the pattern of landholding and to place this material in its cultural heritage context. The application area is situated in the townland of Rhine, the civil parish of Killoe and the barony of Longford. Note the spellings of place names varied throughout history, the historical spellings are used here.

14.3.3 Prehistoric Period

There are no prehistoric sites or monuments from the study area and the nature of prehistoric activity is unknown.

14.3.4 Early Medieval Period

In the Early Medieval period the study area was part of the territory that came to be known as Muintir Angaile (Annaly) which in historic times was ruled by the Uí Fhergail of Conmaicne (MacCotter 2008, 221-2). Classically settlement at this period is indicated by the presence of enclosed farmsteads known as ringforts when they are enclosed by an earthen bank and cashels when they are enclosed by a stone wall. There is one ringfort known from the study area in Aghaboy townland (LF009-017----). A large enclosure in Aghaboy townland (RMP LF009-019001-) could also be the remains of a ringfort.

14.3.5 The later medieval period

Following the arrival of the Normans in Ireland in the twelfth century the Annals of the Four Master (AFM) record that in the year 1172 the son of Annadh O'Rourke and the English invaded and plundered the Annaly and Muintir Magilligan on a number of occasions and killed Donnell O'Farrell chief of Annaly. In the year 1176 the King of Conmacne submitted to King Henry II and was recognized as Lord of Anghaile (Annaly). During the Anglo-Norman period the O'Farrell's continued to rule over of Annaly, apart from Granard which was granted to the Norman baron Richard de Tuite. The Annals of the Four Masters record that in the year 1182 Auliffe O'Farrell became Lord, replacing Hugh O'Farrell; in 1196 Hugh O'Farrell, Lord of Muintir-Annaly, was killed; in 1207 Auliffe O'Farrell, Chief of Annaly died; in 1209 Donough O'Farrell, Lord of Annaly, died; in 1232 Hugh O'Farrell, Chief of Annaly, was killed. In 1262 the Annals record a civil war commenced between Gilla-na-naev O'Farrell, Lord of Annaly; and the son of Murrough Carragh O'Farrell, who was supported by the English of Meath. Eventually Gilla-na-naev won and died in 1274. In 1282 his son Cathal and was followed by his brother Geoffrey. In 1316 Geoffrey O'Farrell, Lord of Annaly, fought with Felim O'Conor at the battle of Athenry, he survived the battle and died in 1318 (AFM).

The process of Norman sub-infeudation is normally associated with the construction of timber castles, known as Motte and Baileys. These earthwork fortifications were used to

house and defend the Norman lords and their retinues while they organized their new fiefs. However, there are no mottes in the study area and the closest example is 4.5km to the south at Newtownbond (RMP LF014-043----). In Ireland the manor houses of local lords were sometimes enclosed by rectangular moats and are referred to as moated sites. They are a useful indicator of Anglo-Norman settlement. There are no moated sites in the study area and the closest example is 2km to the south at Killyfad (RMP LF014-008----).

14.3.6 The Post-Medieval Period

The fifteenth century was characterised by the general decline of Anglo-Norman power in Ireland. During this period Tower House castles were constructed by a lord or landholder and were often partially or completely enclosed by a bawn. There are no Tower Houses in the study area and the closest example is at Knockahaw (RMP LF014-140----) 6m to the south-west. The Calendar of the Carew Manuscripts (Brewer and Bullen 1867-73, Vol 4, p. 406) records that in February 1571 an indenture of surrender and regrant was agreed between Sir Henry Sydney (Lord Deputy of Ireland) and Faghne O'Ferrall and amongst others Donnell O' Farroll, of the Reen (Rhine). The Down Survey and Civil Survey record that in 1641 Rhine was held by Murrogh Farrell but by 1670 had come to Nathan Philpot (http://downsurvey.tcd.ie/). Griffiths Valuation of 1848-64 records that in the mid-nineteenth century the pastureland of the application area was held by Captain William Bond, of Newtownbond House, and the bog was leased by Captain Bond from Richard D. Boyer (http://griffiths.askaboutireland.ie/).

14.4 Buildings

14.4.1 Designated structures

The Longford County Development Plan 2021-27 was examined as part of the baseline study for this section of the EIAR. The review established that there are no structures listed in the Record of Protected Structures situated within the application area. There are also no structures listed in the study area.

14.4.2 Non-designated structures

The National Inventory of Architectural Heritage (NIAH) which is maintained by the Dept of Housing, Local Government and Heritage was examined as part of the baseline study for this section of the EIAR on the 21st of September 2021. The review established that there are no additional structures listed in the NIAH situated within the application area. There are four structures listed in the NIAH that are located in the study area (see below and Fig. 14.1). These structures are all located more than 0.8km from the application area and are all considered to be too far distant to be directly or indirectly impacted by the proposal.

No.	13400904
Structure type	St. Mary's Roman Catholic Church
Townland	Enybegs
Designation	None
Data source	National Inventory of Architectural Heritage
Perceived Significance:	Regional
Type of impact:	None
Significance & quality of impact	None
Description	Detached Roman Catholic church/chapel on cruciform-plan, built c. 1828 and altered c. 1900 and c. 1957. Comprises a two-bay nave to the north, single-bay transepts to the east and west having modern flat-roofed brick entrance porches to the north elevations, a single-bay chancel (c. 1900) to the south having a lean-to sacristy attached to the east side. Belfry/belltower on rectangular-plan attached to the north end of the west elevation of nave having open belfry with fluted posts (on circular profile) supporting flat-roof over having cross final. Pitched slate roofs with terracotta ridge cresting, raised verges to gable ends having kneeler stone detail and with cast-iron rainwater goods. Cross finals to gable apex over north end of nave and to transept gable apexes. Ruled-and-lined smooth rendered walls over projecting plinth. Cut stone date plaque to entrance gable (dated 1828) and to belfry (dated 1957). Clasping buttresses to east and west sides of nave, to corners of entrance gable and to transepts. Round-headed window openings with hood mouldings, stained glass windows and painted stone sills. No window opening to chancel gable. Square-headed door opening to the centre of the entrance gable (north) with moulded surround and double-leaf timber battened door. Square-headed door openings with timber and glazed doors to porches. Interior has timber altar furniture and open timber hammer beam roof. Set back from road, adjacent to Enybegs Community Centre, and to the west of Ballinalee.
Mitigation proposal	No mitigation required
Illustration	-

No.	13400903
Structure type	Post Box
Townland	Enybegs
Designation	None
Data source	National Inventory of Architectural Heritage
Perceived Significance:	Regional
Type of impact:	None
Significance & quality of impact	None
Description	Cast-iron post box (lamp box), erected c. 1950, with 'P&T' emblem/cipher to top and foundry mark to base reading 'Lion Foundry and Co Ltd., Kirkintilloch. Secured to timber post, adjacent to roadside. Located to the north (across road) of Enybegs/Enybegs Roman Catholic church (13400904), and to the west of Ballinalee.
Mitigation proposal	No mitigation required
Illustration	-

No.	13400907
Structure type	Bridge
Townland	Aghaboy
Designation	None
Data source	National Inventory of Architectural Heritage
Perceived Significance:	Regional
Type of impact:	None
Significance & quality of impact	None
Description	Single-arch road bridge over tributary of the Camlin River, built c. 1860. Constructed of coursed rock-faced limestone with rounded dressed limestone coping over parapet walls. Segmental-headed arch with rock-faced limestone voussoirs. Rock-faced string course at road level. Terminating piers to either side of arch having rock-faced coping over with stepped dressed edges. Located to the west/southwest of Ballinalee.
Mitigation proposal	No mitigation required
Illustration	-

No.	13400908
Structure type	Aghaga Bridge
Townland	Killeter
Designation	None
Data source	National Inventory of Architectural Heritage
Perceived Significance:	Regional
Type of impact:	None
Significance & quality of impact	None
Description	Single-arch road bridge over the Camlin River, built c. 1860. Constructed of coursed rock-faced limestone with rounded dressed limestone coping over parapet walls. Terminating piers to either side of arch having splayed bases and with dressed limestone coping over. Dressed limestone string courses to base of piers. Segmental-headed arch with rock-faced limestone voussoirs. Squared coursed dressed limestone to barrel and abutments. Bridge largely overgrown with ivy. Located to the west of Ballinalee, pump house and flight of steps adjacent to the southwest. Rubble stone wing walls to either side (north and south); portion of northwest wing wall rebuilt.
Mitigation proposal	No mitigation required
Illustration	-

14.4.3 Field Inspection of Structures

On the 30th of September 2021 fieldwork was carried out to identify any additional non-designated structures of heritage interest in the vicinity of the application area. This involved assessing all upstanding structures that are marked on the 1913 edition of the six-inch Ordnance Survey mapping within 300m of the application area (see Fig. 14.1). There are five upstanding structures located within this area (see below).

No.	1
Structure type	Cottage
Townland	Killeter
Designation	None
Data source	1913 edition 6 inch Ordnance Survey map
Perceived Significance:	No special architectural or heritage interest.
Type of impact:	None
Significance & quality of impact	None
Description	Ruined stone cottage with corrugated roof and one surviving window opening. No heritage interest.
Mitigation proposal	No mitigation required
Illustration	Plate 14.1

No.	2
Structure type	House
Townland	Killeter
Designation	None
Data source	1913 edition 6 inch Ordnance Survey map
Perceived Significance:	No special architectural or heritage interest.
Type of impact:	None
Significance & quality of impact	None
Description	Structure located up private lane on private land and not accessible.
Mitigation proposal	No mitigation required
Illustration	-

No.	3
Structure type	House
Townland	Rhine
Designation	None
Data source	1913 edition 6 inch Ordnance Survey map
Perceived Significance:	No special architectural or heritage interest.
Type of impact:	None
Significance & quality of impact	None
Description	Ruined stone cottage with corrugated roof . No heritage interest.
Mitigation proposal	No mitigation required
Illustration	Plate 14.2

No.	4
Structure type	House
Townland	Rhine
Designation	None
Data source	1913 edition 6 inch Ordnance Survey map
Perceived Significance:	No special architectural or heritage interest.
Type of impact:	None
Significance & quality of impact	None
Description	Three bay cottage with slate roof and two chimneys. No heritage interest.
Mitigation proposal	No mitigation required
Illustration	Plate 14.3

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No.	5
Structure type	House
Townland	Rhine
Designation	None
Data source	1913 edition 6 inch Ordnance Survey map
Perceived Significance:	No special architectural or heritage interest.
Type of impact:	None
Significance & quality of impact	None
Description	Structure located up private lane on private land and not accessible.
Mitigation proposal	No mitigation required
Illustration	-

14.5 Archaeological Assessment

14.5.1 Recorded Monuments

A review of the Record of Monuments and Places for Co. Longford indicated that there are no Recorded Monuments located within the application area (see Fig. 14.1 and Appendix 14.1). The closest Recorded Monument externally to the application area LF009-017---- is a Ringfort in Aghaboy townland that is described in the Record of Monuments as:

> *LF009-017---- Aghaboy Ringfort – rath*
> *Scheduled for inclusion in the next revision of the RMP: Yes*
> *In level pasture. A raised circular area (diam. 42.5m) enclosed by a very wide bank of earth and stone (Wth c. 9m; H 0.5-0.9m) and a wide external fosse (Wth 3-6m; D 0.4-1.5m). A report in 1990 (SMR file) recorded two more banks and a second fosse, all of which have since been levelled. It suggested that the original entrance may have been at E.*

This monument is located approximately 0.486km north of the proposed application site (see Fig. 14.1). It is considered too far distant to be directly or indirectly impacted by the proposal.

The remaining Recorded Monuments in the study area are more distant from the application area than LF009-017---- and are considered too far distant to be directly or indirectly impacted by the proposed development.

14.5.2 Undesignated monuments

A review of the Sites and Monuments Record which is maintained by the Dept. of Housing, Local Government and Heritage on the 20th of September 2021 indicated that there are no SMRs located in the application area or the study area.

14.5.3 Cartographic Sources

The Ordnance Survey 1st and 3rd edition six-inch and 1st edition 25 inch maps of the area were examined. On the Ordnance Survey 1st edition map approximately 8.9 Ha of the application area was indicated as peatland. There are also two lime kilns indicated that are no longer visible at ground level (see Fig. 14.2). This analysis did not indicate the presence of any additional cultural heritage material.

14.5.4 Place Name Evidence

The place names were extracted from the cartography in order to facilitate the search for structures and monuments and small finds, to help identify any unrecorded monuments or structures, to search for any published papers and documents related to the study area and to assist in the study of the historical development of the area. The English translations of the townland names of the study presented below are based on the Placenames Database of Ireland. The placenames refer mainly to topographical features and land cover. The analysis did not indicate any additional cultural heritage material in the application area.

Aghaboy	yellow field
Clontumpher	meadow of the lawn
Cloonee	meadow
Drumhaughly	Shaughlin's ridge or long hill
Enybegs	little marsh
Esker south	low ridge
Killeter	central wood
Kilnacarrow	wood of the weir
Mucknagh	pig's marsh
Rhine	a land division

14.5.5 Aerial Photographs

Examination of the Ordnance Survey 1995, 2000 and 2005 imagery as well as Google Earth imagery from 2009, 2014, 2018, 2019 and 2021 and Bing Maps imagery did not indicate any additional cultural heritage or archaeological sites in the application area or vicinity (see Plate 14.1).

14.5.6 Other sources

Examination of archaeological corpus works on prehistoric artefacts (Harbison 1969, Eogan 1965, 1983, 2000) and pottery (O' Ríordáin and Waddell 1993) and Iron Age material (Raftery 1984) does not indicate any additional material.

14.5.7 Archaeological excavations

Examinations of the Excavations Bulletin www.excavations.ie indicated that there have been no licensed archaeological investigations carried out in the application area. There has been one investigation carried out in the study area that identified nothing of archaeological significance (see below).

Rhine 03E1799 No archaeological significance
Monitoring was required for the extension to a quarry at Rhine, Killoe. An area of land was stripped and a possible monument was uncovered, but, upon investigation, the feature was found to be the result of field clearance. Soil-stripping will continue in 2004.

14.5.8 Field Inspection

A field inspection was carried out on the 30th of September 2021. This involved an inspection of all the lands of the application area (see Plate 14.4).

Field 1
The site access runs through the northern part of a six-sided field of north-east sloping rough pasture enclosed by mature hedgerow with trees. There is no visible indication of any cultural heritage material at ground level (Plate 14.5).

Field 2
The site access runs through northern part of narrow rectangular-shaped field of north-east sloping pasture enclosed by mature hedgerow with trees. There is no visible indication of any cultural heritage material at ground level (Plate 14.6).

Field 3
This is a trapezoidal-shaped field of north-west sloping pasture enclosed by mature hedgerow with trees. There is no visible indication of any cultural heritage material at ground level (Plate 14.7).

Field 4
This is the western part of a rectangular-shaped field of west sloping pasture enclosed by stone walls and mature hedgerow with trees. There is no indication of the lime kiln marked on the OS 1st edition map. There is no visible indication of any cultural heritage material at ground level (Plate 14.8).

Field 5

This is a trapezoidal-shaped field of low-lying level pasture enclosed by ditches and mature hedgerow with trees. Mostly overgrown with rushes. There is no visible indication of any cultural heritage material at ground level (Plate 14.9).

Field 6

This is a rectangular-shaped field of low-lying level pasture enclosed by ditches and mature hedgerow with trees. Mostly overgrown with rushes. There is no visible indication of any cultural heritage material at ground level (Plate 14.10)

Field 7

This is a rectangular-shaped field of low-lying pasture sloping slightly to the west and enclosed by ditches and mature hedgerow with trees. Mostly overgrown with rushes. There is no visible indication of any cultural heritage material at ground level (Plate 14.11).

Field 8

This is the western part of a long and narrow-shaped strip field of west sloping pasture enclosed by ditches and mature hedgerow with trees. Partly overgrown with rushes. There is no visible indication of any cultural heritage material at ground level (Plate 14.12).

Field 9

This is the northern edge of a long and narrow-shaped strip field of west sloping pasture enclosed by ditches and mature hedgerow with trees. Partly overgrown with rushes. There is no visible indication of any cultural heritage material at ground level (Plate 14.13).

Field 10

This is a rectangular-shaped field of west sloping pasture enclosed by ditches and mature hedgerow with trees and a farmyard in the north-east corner. There is no indication of the lime kiln marked on the OS 1st edition map. There is no visible indication of any cultural heritage material at ground level (Plate 14.14).

Field 11

This is a rectangular-shaped field of low-lying level pasture enclosed by ditches and mature hedgerow with trees. Partly overgrown with rushes. There is no visible indication of any cultural heritage material at ground level (Plate 14.15)

Field 12
This is a rectilinear-shaped field of low-lying level pasture enclosed by ditches and mature hedgerow with trees. Partly overgrown with rushes. There is no visible indication of any cultural heritage material at ground level.

Field 13
This is the south-east part of a large trapezoidal -shaped area of cut-away bog enclosed on all sides by woodland which is densest at south. There is no visible indication of any cultural heritage material at ground level (Plate 14.16).

14.6 Impact of the Development

14.6.1 Direct Impacts

There are no direct impacts on any significant known items of archaeology, cultural heritage or buildings of heritage interest in the application area or vicinity during all phases of the proposed development (Construction, Operational, Decommissioning).

14.6.2 Indirect Impacts

There are no indirect impacts on any significant known items of archaeology, cultural heritage or buildings of heritage interest in the application area or vicinity.

14.6.3 Do-nothing Impacts

If the proposed development were not to proceed there would be no negative impact on the cultural heritage.

14.6.4 Cumulative Impacts

No significant cultural or archaeological heritage has been identified in the application site and therefore there will be no cumulative impacts on the archaeological, architectural or cultural heritage resource.

14.6.5 Residual Impacts

No significant cultural or archaeological heritage has been identified in the application site and will be no residual impacts on the archaeological, architectural or cultural heritage resource after the completion of the project.

14.6.6 Worst case impact

In the worst-case scenario, the proposal might disturb previously unknown subsurface deposits or artefacts without preservation by record taking place in areas 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12 and 13.

14.6.7 Unplanned Events

No unplanned events associated with the proposal that have the potential to impact archaeological, architectural or cultural heritage have been identified.

14.7 Proposed mitigation measures

Due to the possibility of the survival of previously unknown subsurface archaeological deposits or finds within the application area topsoil-stripping in areas 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12 and 13 should be monitored by a qualified archaeologist.

14.8 Conclusions and Recommendations

There are no significant known items of cultural heritage, monuments or buildings of heritage interest known from the application area. There are no direct impacts on any significant known items of archaeology, cultural heritage or buildings of heritage interest in the application area or vicinity. Due to the possibility of the survival of previously unknown subsurface archaeological deposits or finds within the application area topsoil-stripping in in areas in areas 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12 and 13 should be monitored by a qualified archaeologist.

14.9 References

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Figures

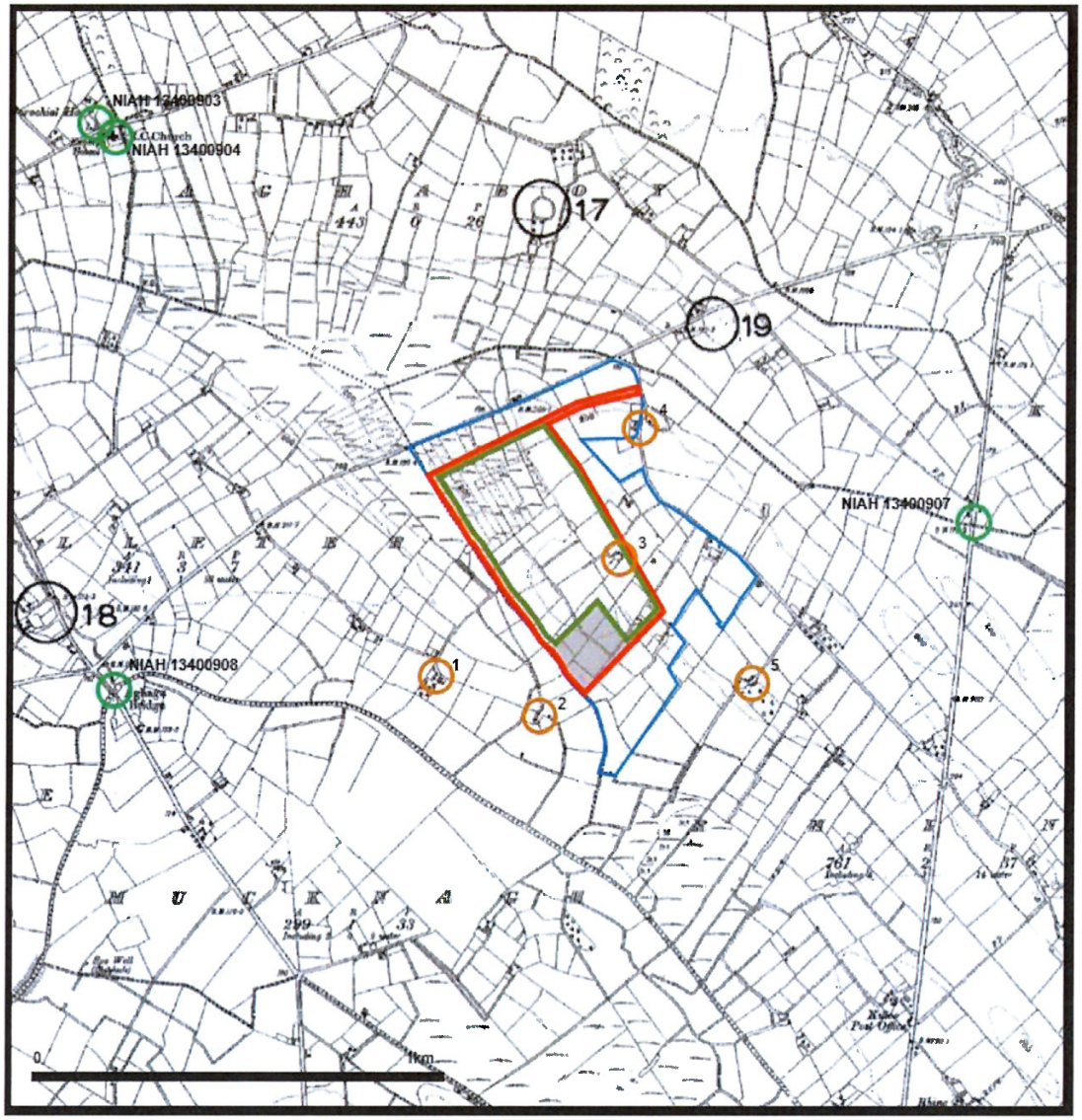

Fig. 14.1. The assessment study area superimposed on the Record of Monuments for Co. Longford. The application area is outlined with the red line, the extraction area with the green line, the manufacturing area is indicated in grey, and the land interest with the blue line. Recorded Monuments are indicated with black circles, NIAHs with green circles and structures within 300m of the application area with brown circles.

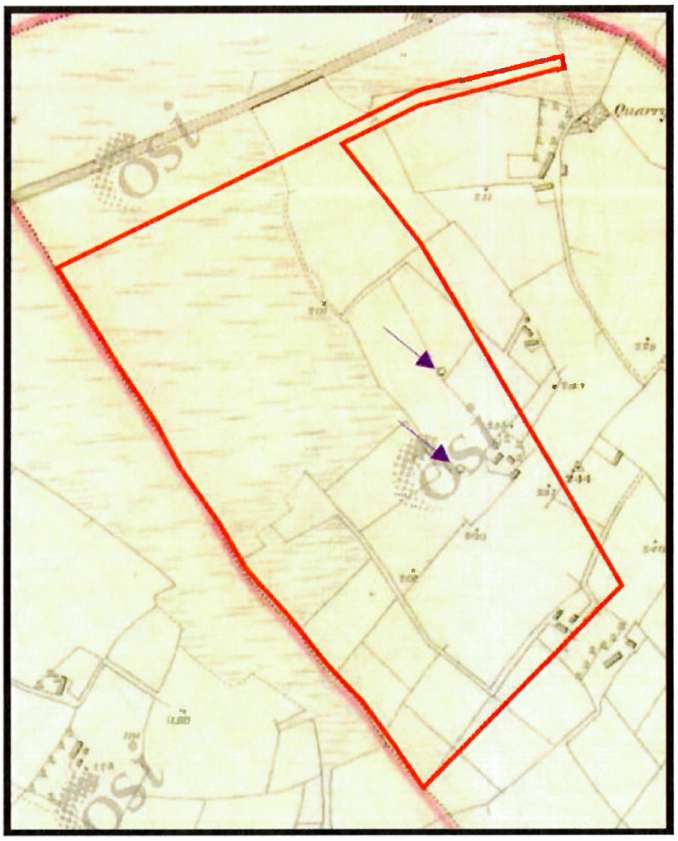

Fig. 14.2. The application area superimposed on the OS 1st edition map. There are two lime kilns indicated with arrows.

Plates

Plate 14.1 View of Structure 1 looking south.

Plate 14.2 View of Structure 3 looking south.

Plate 14.3 View of Structure 4 looking west.

Plate 14.4 Aerial view of the application area, outlined in red, from Google Earth, taken in in 2021.

Plate 14.5 Panoramic view of Field 1 looking north-east.

Plate 14.6 View of Field 2 looking north.

Plate 14.7 Panoramic view of Field 3 looking north.

Plate 14.8 Panoramic view of western part of Field 4 looking south-west.

Plate 14.9 Panoramic view of Field 5 looking north-west.

Plate 14.10 Panoramic view of Field 6 looking north-west.

Plate 14.11 Panoramic view of Field 7 looking north-west.

Plate 14.12 Panoramic view of Field 8 looking north-east.

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Plate 14.13 View of Field 9 looking north-east.

Plate 14.14 Panoramic view of Field 10 looking north.

Plate 14.15 Panoramic view of Field 11 looking south-west.

Plate 14.16 Panoramic view of Field 13 looking south.

Appendix 14.1 Recorded Monuments in the study area

LF009-017---- Aghaboy Ringfort – rath
Scheduled for inclusion in the next revision of the RMP: Yes
In level pasture. A raised circular area (diam. 42.5m) enclosed by a very wide bank of earth and stone (Wth c. 9m; H 0.5-0.9m) and a wide external fosse (Wth 3-6m; D 0.4-1.5m). A report in 1990 (SMR file) recorded two more banks and a second fosse, all of which have since been levelled. It suggested that the original entrance may have been at E.

LF009-018---- Killeter House - 17th century
Scheduled for inclusion in the next revision of the RMP: No
A small rectangular house with two tall chimney stacks and annotated 'Culleghtee' [Killeter] is depicted to the N of the fording point of the Camlin River on the Down Survey (1655-6) map of Longford barony (NLI, MS 719). On the Down Survey (1655-6) map of Killoe parish (ibid.) this building is depicted as a ruinous tower house. The terrier of this map records that there stood in 'Colloghter [Killeter] towneland a Stone House out of Repaire' and that Garrett Farrell was the owner or chief tenant of these lands. The precise location of this house has not been identified. Aghaga Bridge now stands at the fording point marked on the Down Survey barony map.

LF009-019001- Aghaboy Enclosure
Scheduled for inclusion in the next revision of the RMP: Yes
In level pasture. A large oval area (84m NW–SE; 75.5 NE–SW) enclosed at NW and from N–E–SSE by a much-denuded bank of earth and stone (Wth 3.2-7m; H 0.3-1m). From S–W–WNW the bank has been modified and incorporated into a field boundary. At its external base at E is a shallow fosse (Wth 4.3m; D 0.2m). The original entrance is not recognisable. Within the SE quadrant of the interior are the remains of a rectangular house site (LF009-019002-).

LF009-019002- Aghaboy House - indeterminate date
Scheduled for inclusion in the next revision of the RMP: Yes
Within the SE quadrant of the interior of an enclosure (LF009-019001-) are the remains of a rectangular house site (ext. dims. 15.5m E-W; 5.5m N-S) defined by the grassed-over foundation courses of stone walls (H 0.2-0.3m; wall T 2m).

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Tables

Table 15.1: Interactions 15-3

15.0 INTERACTIONS/INTER-RELATIONSHIPS

15.1 Introduction

This section addresses the cumulative impacts, indirect impacts and main interactions between different aspects of the environment that may be impacted on as a result of the proposed development. Only topics that could be logically linked to the development have been examined in detail. Accordingly, when a topic is not mentioned, it is concluded that no potential for conflict exists.

15.2 Interactions

Inter-relationships relate to the interactions between impacts within a project and the interactions between impacts identified under one topic with impacts identified under another topic. Each of the various environmental and related topics have been discussed separately in the preceding sections of the EIAR and the major interactions between the recorded environmental impacts are assessed within the individual chapters of the EIAR. In examining the interactions of the potential impacts for this development one must investigate the combined physical, environmental, visual and socio-economic impact of the development on the receiving environment. Table 15.1 illustrates the interaction of impacts assessed for this project.

Table 15.1: Interactions

	Pop. & Human Health			Biodiversity			Land, Soils & Geology			Water			Climate			Air			Noise			Traffic			Landscape			Material Assets			Cultural Heritage		
	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D
Pop. & Human Health																																	
Biodiversity																																	
Land, Soils & Geology				✓	✓	✓																											
Water	✓	✓	✓	✓	✓	✓	✓	✓	✓																								
Climate	✓	✓	✓																														
Air	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓																		
Noise	✓	✓	✓	✓	✓	✓																											
Traffic	✓	✓	✓													✓	✓	✓	✓	✓	✓												
Landscape	✓	✓	✓	✓	✓	✓	✓	✓	✓																								
Material Assets	✓	✓	✓																						✓	✓	✓						
Cultural Heritage																																	

Weak Interaction = ✓ Some Interaction = ✓ Strong Interaction = ✓

C = Construction Phase

O = Operational Phase

D = Decommissioning Phase

15.3 Interactions with Population & Human Health

15.3.1 Population & Human Health and Water

Contaminants or leakages from plant and vehicles during the various phases can potentially leak into surface water and groundwater which could impact on water quality. Procedures will be in place for dispensing fuel, servicing plant and equipment and for dealing with accidental spillages should they arise which will ensure that potential leaks etc. are retained at the source. All hydrocarbon storage areas will be appropriately bunded to retain leaks or spills.

Surface water run-off will be collected in the sump located on the quarry floor and will be used for production and dust suppression. Excess water not required for production will be discharged off-site to an adjoining ditch which will ultimately discharge into the Camlin River. Prior to discharging off-site water will pass through a settlement pond and hydrocarbon interceptor which will remove any suspended solids or hydrocarbons that could potentially be present. The applicant proposes to apply for a discharge licence which will set limits on the quality and quantity of water which can be discharged from the quarry to protect the water quality of the receiving water course.

The proposed mitigation measures will ensure that no likely significant adverse impacts occur with regards to the water environment and as such there will be no significant impacts on Population and Human Health and Water which has been fully assessed in Chapter 7 of this EIAR

15.3.2 Population & Human Health and Climate

Plant associated with the operation of the development will result in emissions to air associated with the day-to-day operations undertaken at the quarry which are difficult to eliminate. The proposed development if granted planning permission will result in the closure of the existing quarry and the transfer of operations to the proposed development. Therefore, there will be no ne increase in emissions as it is not proposed to increase traffic and production levels above that associated with the existing quarry. The proposed mitigation measures will ensure that no likely significant adverse impacts occur with regards to climate and as such there will be no significant impacts on population and human health.

15.3.3 Population & Human Health and Air

The primary interaction between air quality and humans will be from particulate matter, dust released as a result of excavation of material, rock extraction, processing, production and transporting aggregate which can generate elevated dust level if not managed correctly. Dust can be transported by air around and outside the application site causing a nuisance to neighbouring lands etc. The manufacturing area has been located as far from houses as possible to reduce any potential impact from dust.

Air dispersion modelling of operational activities at the site was undertaken to assess the impact of the development with reference to EU ambient air quality standards which are based on the protection of human health. As demonstrated by the modelling results, emissions of PM_{10} and $PM_{2.5}$ as a result of the development are compliant with all National and EU ambient air quality limit values and, therefore, will not result in a significant impact on human health. Dust deposition monitoring will be undertaken to ensure that levels are within the recommended guideline values.

15.3.4 Population & Human Health and Noise & Vibration

Activities being undertaken at the application site will generate noise and vibration associated with the activities undertaken during the various phases of the proposed development which have been modelled as part of the assessment undertaken in the Chapter 10.0 Noise & Vibration. These include noise levels associated with berm construction, works in the manufacturing area, extraction of rock, manufacturing of products, road traffic noise and blast vibration at nearest sensitive receptors.

As demonstrated by the modelling results, noise and vibration levels associated with the proposed development are all well within the guidelines values recommended in the EPA Management Guidelines - 'Environmental Management in the Extractive Industry (Non-Scheduled Minerals), 2006 and 'A Guidance Note for Noise in Relation to Scheduled Activities (EPA, 1996)' therefore, will not result in a significant impact on human health.

A series of mitigation and management measures have been proposed to ensure that levels remain below the recommended guideline level. Noise monitoring will also be conducted on a regular basis to ensure noise levels generated from the development will be below the recommended guideline value.

15.3.5 Population & Human Health and Traffic

The transport of quarry products to market will generate traffic movements to and from the proposed development which will become operational on closure of the existing quarry.

Therefore, there will no increase in traffic on the local road infrastructure as all quarry related traffic will transfer to the subject development site. Road traffic from the proposed quarry will travel a slightly shorter route on the L5097. The R194 will be the main transport route for the quarry development. Ground vibration generated by HCV's along all roads will be below the threshold of sensitivity to humans at less than 0.2mm/s peak particle velocity at all houses.

15.3.6 Population & Human Health and Landscape

The proposed development will alter the visual appearance of the site which is predominantly a greenfield site. Berms which will be constructed at the initial stages of the proposed development will be vegetated to reduce the visual impact of the application site. Once extraction of the available resource has been completed, the restoration plan will be put in place. It is not considered that the proposed development by virtue of its visual appearance and in the context of the rural nature and low population density of the surrounding landscape, will cause any significant impacts and as such there will be no significant impact on population and human health.

15.3.7 Population & Human Health and Material Assets

The existing quarry has a connection to an Irish Water main, ESB and telecommunications overhead lines which will be diverted to the proposed development. There will be no extra demand in terms of services which could result in water shortages or power outages etc. for residences in the area.

There will be no net increase in traffic volumes on the local road infrastructure with the proposed development accessing the same section of the L5097 which connects to the R194 Regional Road approximately 120m north west of the proposed new quarry entrance. Quarry traffic will transfer to the proposed development on closure of the existing quarry.

Waste generation will be minimal as all extracted material will have a use be it as a saleable product or used for landscaping and restoration purposes. All other waste will be recycled or disposed of appropriately. The overall impact on Material Assets will not be significant and subsequently there will be no significant impact on population and human health.

15.4 Interactions with Biodiversity

15.4.1 Biodiversity and Land, Soils & Geology

Commencing overburden and rock extraction within the proposed application area will lead to land-take and loss of the underlying resource and change of land-use from is

predominantly agricultural land to quarrying. Agricultural land is the dominant land use in the area therefore will not result in a significant loss in the current land use to the area.

The proposed development will result in the irreversible loss of habitats existing within that area. Wet grassland and improved agricultural grassland are the dominant habitats within the application area, which are evaluated as being of local importance (higher value) and local importance (lower value) respectively.

The permanent loss of this habitat at a landscape level is not considered to be significant due to the availability of significant amounts of alternative wet grassland habitat of similar or better quality in the surrounding environment. As such, the loss of this area of wet grassland habitat is evaluated as slight in the long-term.

Similarly, the loss of c. 4ha of mixed broadleaved woodland/scrub habitat and c. 1,900m of hedgerow and treeline habitat will be permanent and irreversible. These habitats are also of use to breeding birds, in addition to foraging and commuting bats and non-volant mammals.

The proposed landscape and restoration plan will aid in establishing new habitats to replace the existing habitats lost as a result of the proposed development which will include the establishment of a quarry lake and vegetation on the side slopes and berms surrounding he site.

15.4.2 Biodiversity and Water

Accidental spillage during refuelling of machinery with petroleum hydrocarbons is a significant pollution risk to groundwater, surface water and associated ecosystems, and to terrestrial ecology.

Hydrocarbon has a high toxicity to humans and all flora and fauna, including fish, and is persistent in the environment. It is also a nutrient supply for adapted micro-organisms, which can rapidly deplete dissolved oxygen in waters, resulting in death of aquatic organisms. The potential effects on the surface water aquatic environment, in particular, are significant. As the quarry operate below the water table in a locally important aquifer, groundwater is being abstracted and discharged into the surface water. For this reason, it is mainly with surface water that this potential risk is deemed as significant. An assessment of the potential impact of the proposed development on the hydrological and hydrogeological environment is described in Chapter 7.0 Water.

When the extraction is complete all plant and material will be removed from the area and the quarry void will be allowed to fill with water up to the present water table level. This will create a long-term open water area which will create its own biodiversity sphere.

A series of mitigation measures are proposed in the Biodiversity and Water Chapters in order to safeguard the water environment which will indirectly prevent deterioration of the habitats and associated flora and fauna. No significant residual impacts on the aquatic environment are anticipated.

15.4.3 Biodiversity and Air Quality

Activities at the application site have the potential to create dust which can impact on flora and fauna. Proposed mitigation measures and management activities such as dust suppression will reduce dust generated at the application site to ensure dust levels are below the recommended guideline value of 350mg/m^2/day. Dust deposition monitoring will be undertaken on a regular basis to ensure that dust deposition levels are kept within recommended levels. It is not considered that the interaction between Air Quality and Climate and Biodiversity will be significant due to the implementation of the proposed mitigation measures.

15.4.4 Biodiversity and Noise & Vibration

Day to day activities that will be undertaken at the proposed development such as extraction, processing, manufacturing and traffic movements will lead to lead to noise emissions from the application site. Noise levels at quarry sites may affect some birds and mammals particularly those sensitive to noise. There is potential for interactions between noise and sensitive fauna, e.g., birds, that occur in adjacent habitats from increased noise levels during the various phases of the development. However, as described, noise related impacts are not deemed to be significant. Also, noise and vibration emissions from the existing quarrying activity in the area would lead to fauna becoming acclimatised to quarry related activity. Noise related impacts are not deemed to be significant.

15.4.5 Biodiversity and Landscape

A landscape and restoration plan is proposed which includes the construction of berms around the boundary of the quarry and planting these with native trees and shrubs. Berms will also be allowed to regenerate naturally using the available seed bank in the soil which will be native to the area. In time mature trees and shrubs will establish which offset the impact of vegetation removal to facilitate the development.

At the end of the life of the quarry, the restoration plan proposes to allow the quarry void to fill with ground water up to a level of the existing water table. Spreading a layer of overburden and topsoil on areas which are above the water table and returning these areas to grassland areas. This will add to the biodiversity of the area as a whole. No significant residual impacts on the biodiversity and landscape are anticipated.

15.5 Interactions with Land, Soils & Geology

15.5.1 Land, Soils & Geology and Water

The removal of overburden and bedrock can increase the risk of contamination of groundwater, in the event of accidental spillages occurring. Fuel will be stored in bunded areas which will be capable of storing 110% the capacity of the contents of the tank and only small volumes of fuel/oils will be present on-site. With the implementation of standard mitigation and monitoring measures outlined in the respective Chapters, significant negative effects are not predicted.

15.5.2 Land, Soils & Geology and Air Quality

Overburden removal and berm construction, extraction and movement of material can give rise to windblown dust. Overburden removal and berm construction will be undertaken during periods of dry weather with some moisture and little or no wind to prevent dust blow. Dust suppression will be undertaken at areas where excavation works, and vehicle movements is being undertaken to dampen down areas of potential dust blow. With the implementation of mitigation and monitoring measures outlined in the respective Chapters, no significant negative effects are predicted.

15.5.3 Land, Soils & Geology and Landscape.

Aggregate extraction at the application site will occur beneath the existing ground level therefore the potential impacts are limited and relate to exposed areas such as quarry faces, stockpiles and un-vegetated areas. The impact on the landscape will be mitigated in the longer term by the proposed landscape and restoration plan which include the construction of planted berms around the boundary of the application site which will be vegetated with shrubs and trees and will undergo national regeneration. Also, the formation of a quarry lake post extraction of material will create a new habitat. No significant residual impacts on Land, Soils and Geology and landscape are anticipated.

15.6 Interaction with Air Quality

15.6.1 Air Quality and Water

Dust generated from activities undertaken at the application site including excavation and loading of material, processing of material and traffic movements has the potential to contaminate surface water if proposed management procedures are not in place. Basic mitigation measures are proposed such as dust suppression which will be undertaken to ensure that dust is not carried by wind to water courses outside the application site. No significant residual impacts on Air Quality and Water are anticipated.

15.6.2 Air Quality and Climate

Plant and machinery operating at the quarry will result in emissions to air and climate which is difficult to mitigate against as the production of quarry materials and delivery of product to market requires the use of energy such as electricity and diesel. Energy conservation measures and good management practices will serve to reduce emissions in so far as is possible. Sustainable renewable energy sources will be considered where relevant during the life of the proposed development such as electric powered vehicles and solar energy to power plant and infrastructure. No significant residual impacts on Air Quality are anticipated as a result of the proposed development.

15.6.3 Air Quality and Traffic

Traffic-related air emissions may generate quantities of air pollutants such as NO_2, PM_{10} and $PM_{2.5}$. Chapter 9.0 (Air Quality) assessed the impacts from road traffic associated with the proposed development on local air quality which were assessed as long-term, neutral and imperceptible. There will be no net increase in quarry traffic as traffic from the existing quarry will transfer to the proposed development. Mitigation measures such as dust suppression on haul roads be will effectively mitigate against windblown dust particles and emissions from vehicles. No significant residual impacts on Air Quality are anticipated as a result of traffic from the proposed development.

15.7 Interaction with Noise & Vibration

15.7.1 Noise & Vibration and Traffic

Traffic associated with the existing development generates noise and a minor source of vibration and this will be the case with the proposed development. The proposed development site is located within proximity of an existing quarry operated by Rhyne Rock and it is proposed that quarry traffic from the existing operational quarry will transfer to the proposed development on closure of the existing quarry. Road traffic from the proposed quarry will travel a slightly shorter route on the L5097. The R194 will be the main transport

route for the quarry development. As there will be no increase in traffic on the local road infrastructure there will be no increase in noise associated with the proposed development. No significant residual impacts on Noise & Vibration levels are anticipated as a result of traffic from the proposed development.

15.8 Interaction with Landscape

15.8.1 Landscape and Material Assets

The application site is not located in the vicinity of any scenic routes or sensitive receptors as detailed in the County Development Plan. The proposed mitigation measures which include the construction of berms will aid in screening the application site from these routes.

15.9 'Do Nothing' Scenario

If the proposed development does not proceed, the application site will continue to be utilised for agricultural purposes.

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16.0 MITIGATION & MONITORING SUMMARY

This section of the EIAR provides a summary of the mitigation measures proposed in order to avoid, reduce or remedy the potential impacts identified and a summary of monitoring proposed to ensure that mitigation measures are effective.

16.1 Population & Human Health

Mitigation Measures

Construction & Decommissioning Phase

- During the Construction Phase, a number of mitigation measures will be implemented to
- protect human health.
- Activity is expected to take place between 07:00 and 19:00, Monday to Friday.
- There will be no unnecessary revving of vehicles during arrival or departures to and from the site to ensure that construction related traffic does not give rise to unnecessary noise nuisances.
- All vehicles will be switched off when not in use on-site. There will be no unnecessary idling of vehicles or machinery on-site. This will reduce or eliminate any potential noise impacts.
- A speed limit of 15km per will be put in place on-site for the Construction Phase of the Proposed Development. This will ensure that traffic will not give rise to dust in periods of prolonged dry weather.
- In periods of prolonged dry weather, the entrance roadway and areas where material is being excavated will be dampened down with water to prevent dust if considered necessary.
- No other specific mitigation measures are required during the Construction and
- Decommissioning Phases of the Proposed Development in relation to population and human health, given the lack of direct effects resulting from the Proposed Development. However, where required, mitigation measures in relation to air emissions (dust), noise, traffic, waste etc. are identified in their respective Chapters in this EIA Report.

Operational Phase

- Mitigation measures are included in various sections of the EIAR to protect human health.
- The proposed development will be developed in a manner such that the effect on human
- beings is minimised. Mitigation measures for Air, Noise & Vibration, Water, Landscape & Restoration and Material Assets included in the representative sections of the EIAR will ensure that the proposed development's effect on the receiving environment is minimised.

- The proposed development will ensure that a reserve of material will be available for future extraction which will secure employment and supply of building materials for the construction industry.

Monitoring

Environmental monitoring will be carried out in accordance with those specified in each relevant section together with the requirements of the conditions attached to the grant of planning permission and discharge licence to ensure that levels are within recommended guideline values.

16.2 Biodiversity

Mitigation Measures for the Protection of Bats

Mitigation measures have been devised and included herein in order minimise the potential effects on all identified ecological receptors at risk as a result of the proposed quarry development. The bat mitigation measures described below take into consideration Marnell et al. (2022) as well as best practice guidelines from Collins (2016) and BCT (2018). The measures described are those considered to be practical and effective based on past experience of the principal bat specialist, for the proposed development site. Measures are also reflective to published scientific research, where available and applicable to Irish bat populations. As stated by Marnell et al. (2022), "Any mitigation intended to ensure that there is no impact or minimal impact on the bats must be clearly described in detail, giving examples of how it worked in other places".

Scrub Removal

The following measures will be strictly adhered to in relation to scrub removal:

- It is recommended that, where possible, minimum scrub removal is undertaken within the proposed development site.
- To retain some foraging habitat along the western boundary of the proposed development site a berm shall be constructed along this boundary and planted as directed by the ecologist.
- It is recommended that replacement vegetation is planted using native shrub species. This is required to be planted within 2 years of clearance.

Tree Protection

The following measures will be strictly adhered to in relation to tree protection:

- The two trees identified as PBRs are located along one treeline within the proposed development site. As this treeline is proposed to be removed, both trees will require additional surveying to ensure that there are no bats present.
- Tree removal will only be undertaken in the months of September, October and November during mild weather conditions (8C air temperature during the daytime).
- Surveying will entail a dusk/dawn survey directly prior to tree removal.

- Felling will be undertaken under supervision and the tree will be left on the ground for 24 hrs (to allow any residing bats to leave unharmed from ivy growth).
- As part of planting, 6 trees of at least 15-20 year growth (native tree species e.g. oak) will be planted post clearance and within 2 years of clearance.
- Such new planting will be protected from operations of proposed development.

Outdoor Lighting

Bats are light sensitive bats species, hence their nocturnal activities. Luminaire design is extremely important to achieve an appropriate lighting regime. Luminaires come in a myriad of different styles, applications and specifications which a lighting professional can help to select. The following will be considered when choosing luminaires. This BCT (2018) guidelines provided a list of recommendations in relation to luminaire design, which was based on the extensive research completed at the time on the potential impact of lighting on bats, and therefore provides best practice mitigation measures. These recommendations have been updated with the new BCT (2023) guidelines. The following measures will be strictly adhered to in relation to outdoor lighting:

- The presence of light sensitive bat species such as brown long-eared bats and Natterer's bat means that outdoor lighting will not be erected in vicinity of treeline boundaries.
- All luminaires will lack UV elements when manufactured. Metal halide, compact fluorescent sources will not be used.
- LED luminaires will be used where possible due to their sharp-cut-off, lower intensity, good colour rendition and dimming capability.
- A warm white light source (2700 Kelvin or lower) will be adopted to reduce blue light component.
- Light sources will feature peak wavelengths higher than 550nm to avoid the component of light most disturbing to bats. DEFINITION: Red Light refers to the light sources in the red spectrum and mainly consist of long wavelength light above 600nm with an RA value of 60 (for good colour recognition). This wavelength of light is considered to the have the least impact on bats.
- Column heights will be carefully considered to minimise light spill and glare visibility. This will be balanced with the potential for increased numbers of columns and upward light reflectance as with bollards.
- Only luminaires with a negligible or zero Upward Light Ration, and with good optical control, will be considered.
- Luminaires will always be mounted horizontally, with no light output above 90o and/or no upward tilt.
- Where appropriate, external security light will be set on motion sensors and set to as short a possible a timer as the risk assessment will allow (e.g. 1-2 minute timer).
- Use of a Central Management System (CMS) with additional web-enables devices to light on demand.

- Only if all other options have been explored, accessories such as baffles, hoods or louvres can be used to reduce light spill and direct it only to where it is needed.
- Security lighting will be minimal and used activation mode and will put on a setting of 2 minutes.
- Any external lighting for the proposed development will strictly follow the above guidelines and these will be strictly implemented during construction and operation phase of the proposed development.

Landscaping

The following measures will be strictly adhered to in relation to landscaping:

- It is recommended that planting of a new hedgerow and treeline is undertaken along the boundary of the proposed development site.
- As per EIAR Chapter 12.0 – Landscape and the proposed Restoration Plan, it is estimated that a total of 2,370.92m will be planted which will replace the estimated 1,999.75m proposed to be removed.
- This planting is required to be undertaken within 2 years of clearance.
- The planting mix will be of the following tree and shrub species (all native plant species – no non- native planting is permitted):
  - Hawthorn
  - Blackthorn
  - Holly
  - Mountain ash
  - Crab apple
  - Alder
  - Hazel
  - Birch
- As hawthorn and blackthorn are planted in 1-2 foot whips, it is recommended that the planting regime is as follows:
  - For each 1 meter of planting, the planting mix will be 5 hawthorn whips and 2 black thorn whips to create a double hedgerow with one holly plant within the mix.
  - One small tree species will be planted within the hedge planting at every 2m of new hedgerow.
  - This new hedgerow/treeline will be planted along the entire length of the boundary.
  - No lighting is permitted along the hedgerow and treelines to ensure that they remain in darkness for bat usage.

Bat Box Scheme

The following measures will be strictly adhered to in relation to the implementation of a bat box scheme:

- Bat boxes scheme will be sited carefully by a bat specialist.

- Some general points in relation to selecting suitable trees for bat boxes that will be followed include:
  - Straight limb trees (or telegraph pole) with no crowding branches or other obstructions for at least 1 metre above and below position of bat box.
  - Diameter of tree will be wide and strong enough to hold the required number of boxes.
  - Locate bat boxes in areas where bats are known to forage or adjacent to suitable foraging areas. Locations will be sheltered from prevailing winds.
  - Bat boxes will be erected at a height of 4-5 metres to reduce the potential of vandalism and predation of roosting bats.
  - Locations for bat boxes will be selected to ensure that the lighting plan for the proposed site does not impact on the bat boxes. Therefore, the bat boxes are to be erected mature trees or in the barn away from outdoor lighting.
- It is recommended that 8 summer bat boxes (suitable for trees) are erected as part of a bat box scheme. This will entail the following bat box types: 1FF and 2FI.
- These bat box designs are suitable for the bat species recorded.
- They will be located away from quarry works and in existing bat habitat.
- If mature trees are not available, then telegraph poles will be erected (1 per two bat boxes).

Mitigation Measures for the Protection of Non-Volant Mammals

The following mitigation measure will ensure that the proposed removal of vegetation to facilitate the development of the quarry will not result in significant adverse effects on breeding mammals, particularly badgers.

Pre-construction Surveys

- As mammal species can breed at various times of the year, prior to the removal of vegetation such as hedgerows, treelines or scrub, a breeding mammal survey will be undertaken by suitably qualified and experienced ecologist to determine the presence or absence of any active mammal breeding sites, such as badger setts and fox dens.
- In the case of badgers, a survey of setts within 50m of the application site is required no more than 10-12 months in advance of construction.
- This will ensure that there will be sufficient time to comply with all licensing requirements and that the necessary actions are undertaken to protect the badger populations prior to the commencement of construction.
- The survey will be supplemented by a further inspection of the development area immediately prior to site clearance to ensure that no new setts were established in the intervening period and that setts previously identified continue to be used by badgers.

- The additional survey information will allow specialists to modify, where appropriate, the extent and location of badger-resistant fencing.
- Badger surveys are significantly constrained by vegetational cover and season and are best conducted from November to April.
- All areas must be systematically searched for setts and both sides of hedgerows and boundaries checked.
- Badger territorial activity is high from mid-January to March and surveys at this time are most efficient in identification of badger paths, latrines and feeding signs.

Exclusion of Badgers from the Proposed Development Site

- Exclusion of badgers from any currently active sett will only be carried out during the period of July to November (inclusive) in order to avoid the badger breeding season.
- Closure of any active sett during this period (i.e. a potential breeding sett) would result in the exclusion of adult badgers, while, if present, dependent young are likely to remain below ground.
- Knowledge of alternative setts within the particular social group's territory is required to ensure that excluded badgers are able to relocate to a suitable alternative refuge.
- The objective is to allow the badgers to remain within their territory, even though a portion of their current territory may be lost as a result of a particular development.
- Exclusion of badgers from disused or currently inactive setts, may be entertained during any season.
- Confirming that a sett is inactive during the breeding season (i.e. as described above, with no possibility of cubs below ground) will usually require a brief period of sett monitoring (e.g. five or more days of checking activity either with sticks or with sand pads on the spoil heaps to identify footprints).
- In circumstances where there are difficulties in identifying alternative setts available to the affected badger group, specialist studies (e.g. bait-marking) may have to be undertaken to ascertain the group's territory and to locate alternative setts.
- Where no alternative setts are available within the territory of the animals, an artificial sett will need to be constructed within the affected group's territory. While individual situations may require different approaches, exclusion will generally follow the steps outlined in the next section.

Badger Evacuation Procedures

- Prior to any work commencing in the vicinity of a badger sett that will be affected by the proposed quarry development, it must be ensured that badgers are excluded and evacuated from the sett.

- Badgers will not necessarily make regular use of all of the setts in their territory; some setts may be used only intermittently. Nevertheless, all setts will be considered as resting places under the Wildlife (Amendment) Act, 2000.
- The methodology by which a licensed operative evacuates a sett depends largely on the number of sett entrances, the observed activity at the sett, terrain and topography, likelihood of interference by people and livestock, and other considerations. Therefore, it will be determined on a case-by-case basis.
- The activity status of a sett is adjudged by field signs at and around the sett e.g. evidence of paths, rooting, bedding etc. will suggest recent or intermittent use.
- The procedures below are usually sufficient to ensure that badgers are not present within a sett prior to its destruction.

Disused and Inactive Setts

- In the instance of disused setts or setts verified as inactive, and to prevent their reoccupation, the entrances may be lightly blocked with vegetation and a light application of soil (soft blocking).
- The purpose of soft-blocking is to confirm that an apparently inactive sett is not occupied by badgers.
- If all entrances remain undisturbed for approximately five days, the sett should be destroyed immediately using a mechanical digger, under the supervision of the licensee.
- Should there be any delay in sett destruction, the soft blocked entrances should be hard-blocked and the sett destroyed as soon as possible, again under the supervision of the licensee.
- Hard-blocking is best achieved using buried fencing materials and compacted soil with further fencing materials laid across and firmly fixed to blocked entrances and surrounds.

Active Setts

- Where field signs or monitoring reveal any suggestion of current or recent badger activity at any of the sett entrances, the sett requires thorough evacuation procedures.
- Inactive entrances may be soft and then hard-blocked, as described for inactive setts, but any active entrances should have one-way gates installed (plus proofing around sides of gates as illustrated) to allow badgers to exit but not to return.
- The gates should be tied open for three days prior to being set to exclude.
- Sticks should be placed at arm's length within the gated tunnels to establish if badgers remain within the sett.
- Gates should be left installed, with regular inspections, over a minimum period of 21 days (including period with gates tied open) before the sett is deemed inactive.
- Any activity at all will require the procedures to be repeated or additional measures taken.

- Gates might be interfered with by other mammals or members of the public - hence the importance of regular exclusion monitoring visits.
- Sett destruction should commence immediately following the 21-day exclusion period, provided that all badgers have been excluded.
- Badgers will often attempt to re-enter setts after a period, and if gates are left in place for any long period, they may attempt to dig around them or even create new entrances and tunnels into the sett system.
- Where an extensive sett is involved, an alternative method of evacuating badgers is to erect electric fencing around the sett (ensuring all entrances are included) with one-way badger-gates installed within the electric fence at points where the fence crosses badger paths leading to and from the sett.
- The exclusion should again take place over a minimum period of 21 days before sett destruction.
- This monitoring period would be contingent upon no badger activity being observed within the fenced area.
- Fencing may not be practical in many situations due to the topography or the terrain – and can be difficult to install effectively.
- If no activity is observed, then the sett may be destroyed, under supervision by the licensed wildlife expert.

Badger Sett Destruction

- The destruction of a successfully evacuated badger sett may only be conducted under the supervision of qualified and experienced personnel under licence from the NPWS.
- The possibility of badgers remaining within a sett must always be considered.
- Suitable equipment should be available on hand to deal with badgers within the sett or any badgers injured during sett destruction.
- Destruction is usually undertaken with a tracked 12-25 tonne digger, commencing at c. 25m from the outer sett entrances and working towards the centre of the sett, cutting c. 0.5m slices in a trench to a depth of 2m.
- Exposed tunnels may be checked for recent badger activity, with full attention paid to safety requirements in so doing.
- The sett should be destroyed from several directions, in the above manner, until only the central core of the sett remains.
- Once it is ensured that no badgers remain, the core may then also be destroyed and the entire area backfilled and made safe.
- Sett excavation should, preferably, be concluded within one working day, as badgers may re-enter exposed tunnels and entrances.
- A report detailing evacuation procedures, sett excavation and destruction, and any other relevant issues should be submitted to the NPWS, in fulfilment of usual wildlife licence conditions.

Artificial Setts

- Where survey indicates that suitable alternative natural setts are not present, a badger expert may recommend the construction of an artificial sett to replace a breeding sett that will be affected by the road scheme.
- Artificial setts should be constructed several months in advance of the closure of a breeding sett.
- In this interval, the affected badgers should be encouraged to utilise the artificial sett by means of attractive food baits (peanuts etc.) and materials from the breeding sett added (such as bedding and spoil).
- The construction of an effective artificial sett is an exercise best conducted by experienced personnel.
- The sett should be constructed as close as reasonably possible to the natural main sett, and within the group's territory, but, obviously, away from the proposed quarry site.
- The constructed tunnel and chamber system should be located in well-drained soils and be landscaped and planted to ensure cover and lack of disturbance.
- Correct location of an artificial sett is necessary to ensure its successful occupation by the affected badgers.
- Suitably designed and well-situated, artificial setts are usually successfully occupied by the badgers being re-located.
- Translocation of badgers from an affected site to a distant locality is rarely considered feasible or practical.

Migation Measures for the Protection of Birds

The following mitigation measure will ensure that the proposed removal of vegetation to facilitate the development of the quarry will not result in significant adverse effects on breeding birds:

- No removal of vegetation such as hedgerows, treelines or scrub should be undertaken within the application area during the bird breeding season 1st March to 31st August.

- A detailed bird survey will be undertaken each spring for the first five years of the proposed development to record and monitor bird activity and to inform the quarry of any mitigating measures, if required, to protect the bird population.

Mitigation Measures for the Protection of Water Quality

Protection Against the Release of Suspended Solids

The key mitigation measure during the construction phase is the avoidance of sensitive aquatic areas where possible. The following proposed mitigations measures will be strictly adhered to in relation to the release of suspended solids into surface watercourses:

- Avoid physical damage to watercourses, and associated release of sediment.

- Avoid the entry of suspended sediment from earthworks into watercourses.
- It is proposed to create a buffer zone around the drainage ditch so as to ensure that adequate space is maintained for the proposed drainage mitigation measures to be properly installed and operate effectively before this area be stripped off.
- Provision of interceptor drains, diversion drains and silt traps where necessary – these will be maintained for the duration of the excavation work on an ad hoc basis;
- Temporary sumps/attenuation lagoons, prior to discharge into the settlement ponds at the bottom of the excavation;
- Use of outfall controls such as buffered outfalls, vegetation filters, silt bags, sedimats etc.
- The land in the proposed quarry will only be stripped as required in order to limit the length of time the soil is exposed to erosion thereby restricting the generation of silt in surface runoff.
- Where possible the land will be stripped in dry weather to reduce nutrient loss, sustain soil condition and reduce the generation of silt-laden runoff.
- All bare/disturbed surfaces shall be reinstated, and soil mounds shall be revegetated as rapidly as possible in order to reduce erosion and restrict silt generation in water.
- The slope of the soil storage mounds shall be minimised, their general shape will be in a manner as to avoid any potential for water ponding.
- As the pit is being worked, land shall be restored in order to reduce any potential for surface runoff.
- Replacement of topsoil and restoration of the site will reduce the vulnerability of groundwater beneath the site on closure.

Protection Against the Release of Hydrocarbons

- The following mitigation measures shall be strictly adhered to in relation to the storage and use of hydrocarbons during the proposed works:
- Storage of fuels, lubricants and hydraulic fluids shall occur only at the dedicated area within the proposed quarry yard, thereby ensuring that the area in which fuels, lubricants and hydraulic fluids are stored will be properly secured against unauthorised access or vandalism and protected against accidental spillage.
- In the unlikely event of a spillage of fuels, lubricants or hydraulic oils, it will be immediately contained, and the contaminated soil removed from the site and disposed of appropriately.
- All waste oils and hydraulic fluids will be collected in leak-proof containers and removed from the site for disposal or recycling.
- As a minimum, simple spill protection equipment that will be held locally and will include specialist absorbent mats / pillows and granules for containment /

cleanup of oil. Adequate quantities will be held in stock and be available for immediate use.

- Appropriate spill control equipment, such as oil soakage pads, will be available on site to deal with any accidental spillage and emergency response procedures will be put in place.
- Designated contractors' personnel will be trained and certified in oil spill control and clean up procedures, and in the proper and safe disposal of any waste generated through such an event.

Monitoring

It is recommended that the proposed vegetation clearance works are monitored closely, particularly in relation to bat and bird species by a qualified ecologist to ensure that the mitigation measures proposed are strictly implemented and that the conservation interests within the receiving environment are effectively protected. Ongoing monitoring of water quality will also be undertaken during the operation of the quarry. Reports on the findings will be submitted to the competent authority (Longford County Council).

16.3 Land, Soils & Geology

Mitigation Measures

The following mitigation measures are proposed as part of the construction and operational phase in relation to Land, Soils & Geology:

Operation of Plant & Machinery

- All plant and machinery will be inspected daily and will be serviced regularly.
- Only designated trained operators will be authorised to refuel plant on site;
- Procedures and contingency plans will be set up to deal with emergency accidents or spills;
- An emergency spill kit with oil boom, absorbers etc. will be kept on-site for use in the event of an accidental spill.

Change in Land-Use

Site earthworks and aggregate extraction will result in a direct impact on the local geological environment, albeit this is an acceptable and unavoidable part of the proposed quarry development. These impacts will be localised (i.e. only at the point of extraction) and will be mostly mitigated through the adoption of a suitable landscape and restoration plan which will be undertaken during the operational phase and on completion of extraction.

The overburden and bedrock which will be removed are not notable from a geological heritage point of view and are widely abundant in the area. The stripped topsoil will be

used for berm construction and restoration on completion of extraction which will result in the creation of new habitats.

Contamination of Soil, Subsoils and Bedrock from Oil / Fuel Spills and Leaks

- All plant and machinery will be inspected daily and will be serviced regularly.
- Only designated trained operators will be authorised to refuel plant on site;
- Procedures and contingency plans will be set up to deal with emergency accidents or spills;
- An emergency spill kit with oil boom, absorbers etc. will be kept on-site for use in the event of an accidental spill.

Stability of Quarry Faces

Rock will be extracted in benches in line with Guidelines to the Safety, Health and Welfare at Work (Quarries) Regulations 2008 (S.I. No. 28 of 2008). A buffer will be left around the external boundary of the application site which will ensure the stability of the external quarry faces. Geotechnical assessments will be undertaken as required in line with Guidelines to the Safety, Health and Welfare at Work (Quarries) Regulations 2008 (S.I. No. 28 of 2008).

Monitoring

An inspection of the geological environment will be undertaken by a competent Geologist and Geotechnical Engineer on a regular basis as required by relevant guidance and legislation introduced or amended.

16.4 Water

Mitigation Measures

Taking the impact assessment process into account, the mitigation process is approached in the following manner:

- Proposed Mitigation Measures: Control measures that will be put in place to prevent or reduce all identified significant adverse impacts. In relation to quarrying activities developments, these measures are generally provided in four types: (1) Avoidance, (2) Design, (3) Prevention and (4) Management.
- Post-mitigation Residual Impact: Impact descriptors which describe the magnitude, likelihood, duration and direct or indirect nature of the potential impacts after mitigation is put in place.
- Significance of Effects: Describes the likely significant post-mitigation effects of the identified potential impact source on the receiving environment.

Felling of Trees

The felling of the woodland area should be undertaken following the best practices available as follows:

Mitigation by Avoidance

There is a requirement in the Forest Service Code of Practice and in the FSC Certification Standard for the installation of buffer zones adjacent to aquatic zones at planting stage.

Mitigation by Design

Best practice methods related to water incorporated into the forestry management and mitigation measures have been derived from the Forestry Commission, Coillte and Forest Service guidelines presented herein.

Best practice methods for protection of water quality include the following:

- Machine combinations will be chosen that are most suitable for ground conditions at the time of felling and which will minimise soils disturbance.
- Checking and maintenance of roads and culverts will be ongoing through any felling operation. No tracking of vehicles through watercourses will occur, as vehicles will use road infrastructure and existing watercourse crossing points.
- Where possible, existing drains will not be disturbed during felling works.
- Ditches which drain from the area to be felled towards existing surface watercourses will be blocked, and temporary silt traps will be constructed. No direct discharge of such ditches to watercourses will occur.

Drains and sediment traps will be installed during ground preparation. Collector drains will be excavated at an acute angle to the contour (~0.3% - 3.0% gradient), to minimise flow velocities.

Main drains to take the discharge from collector drains will include water drops and rock armour, as required, where there are steep gradients, and should avoid being placed at right angles to the contour.

- Sediment traps will be sited in drains downstream of felling areas. Machine access will be maintained to enable the accumulated sediment to be excavated. Sediment will be carefully disposed of in the peat disposal areas. Where possible, all new silt traps will be constructed on even ground and not on sloping ground.
- In areas particularly sensitive to erosion, it may be necessary to install double or triple sediment traps. This measure will be reviewed on site during construction.
- All drainage channels will taper out before entering the aquatic buffer zone. This ensures that discharged water gently fans out over the buffer zone before entering the aquatic zone, with sediment filtered out from the flow by ground vegetation

within the zone. On erodible soils, silt traps will be installed at the end of the drainage channels to the outside of the buffer zone.

- Drains and silt traps will be maintained throughout all felling works, thereby ensuring that they are clear of sediment build-up and are not severely eroded. Correct drain alignment, spacing and depth will ensure that erosion and sediment build-up are minimised and controlled.
- Brash mats will be used to support vehicles on soft ground, reducing peat and mineral soils erosion and avoiding the formation of rutted areas in which surface water ponding can occur. Brash mat renewal will take place when they become heavily used and worn. Provision will be made for brash mats along all off-road routes to protect the soil from compaction and rutting. Where there is risk of severe erosion occurring, extraction will be suspended during periods of high rainfall.
- Timber will be stacked in dry areas and outside the 50m watercourse buffer zones. Straw bales and check dams to be emplaced on the down gradient side of timber storage/processing sites.
- Works will be carried out during periods of no, or low rainfall, in order to minimise entrainment of exposed sediment in surface water run-off.
- Checking and maintenance of roads and culverts will be ongoing through the felling operation.
- Maintenance of machinery will not occur within 100 m of a watercourse.
- A dedicated refuelling area within the construction compounds will be used during the felling works.
- Branches, logs or debris will not be allowed to build up in aquatic zones. All such material will be removed when harvesting operations have been completed, but care will be taken to avoid removing natural debris deflectors.

Silt Traps

Silt traps will be strategically placed down-gradient within the local drains. The main purpose of the silt traps and drain blocking is to slow water flow, increase residence time, and allow settling of silt in a controlled manner. As mineral subsoils are present, additional mitigation by way of use of specialist treatment systems such as Siltbuster systems with two stage chemical dosing to aid settlement may be employed at short notice, if required.

Drain Inspection and Maintenance

The following activities will be carried out during inspection pre-felling and afterwards:

- Communication with tree felling operatives in advance to determine whether any areas have been reported where there is unusual water logging or bogging of machines.

- Inspection of all areas reported as having unusual ground conditions.
- Inspection of main drainage ditches and outfalls. During pre-felling inspection, the main drainage ditches shall be identified. Ideally, the pre-felling inspection shall be carried out during rainfall.
- Following tree felling, all main drains will be inspected to ensure that they are functioning.
- Extraction tracks near drains need to be broken up and diversion channels created to ensure that water in the tracks spreads out over the adjoining ground.
- Culverts on drains exiting the site will be unblocked.
- All accumulated silt will be removed from drains and culverts, and silt traps, and this removed material will be deposited away from any surface water features (i.e. River, streams, etc.) to ensure that it will not be carried back into the trap or surface water features during subsequent rainfall.

Surface Water Quality Monitoring

Sampling will be completed before, during (if the felling operation is conducted over a protracted time) and after the felling activity. The 'before' sampling will be conducted within four weeks of the felling activity, preferably in medium to high water flow conditions. The "during" sampling will be undertaken once a week or after rainfall events. The 'after' sampling will comprise as many samplings as necessary to demonstrate that water quality has returned to pre-activity status, i.e. where an impact has been shown.

The surface water quality monitoring proposals for tree felling will be submitted with the felling license should this latter be required. The criteria for the selection of water sampling points will include the following:

- Avoid man-made ditches and drains or watercourses that do not have year-round flows, i.e. avoid ephemeral ditches, drains or watercourses.
- Select sampling points upstream and downstream of the forestry activities.
- It is advantageous if the upstream location is outside/above the forest in order to evaluate the impact of land-uses other than forestry.
- Where possible, three downstream locations should be selected: one immediately below the forestry activity, the second at exit from the woodland, and the third some distance from the second (this allows demonstration of no impact through dilution effect or contamination by other land-uses where impact increases at third downstream location relative to second downstream location).

Earthworks (Removal of Vegetation Cover, Excavations and Stockpiling)

The key mitigation measure during the construction phase is the avoidance of sensitive aquatic areas where possible. The proposed mitigations measures will:

- Avoid physical damage to watercourses, and associated release of sediment.
- Avoid the entry of suspended sediment from earthworks into watercourses.

Mitigation by Avoidance

As can be seen in Figure 7.3 and Figure 7.13, all of the proposed area for extraction is drained by a drainage ditch running alongside the South-Western boundary of the planning area. It is proposed to create a buffer zone around the drainage ditch so as to ensure that adequate room is maintained for the proposed drainage mitigation measures to be properly installed and operate effectively before this area be stripped off.

Mitigation by Design

Where necessary, the following controls will be put in place:

- Provision of interceptor drains, diversion drains and silt traps where necessary – these will be maintained for the duration of the excavation work on an ad hoc basis;
- Small working areas;
- Temporary sumps/attenuation lagoons, prior to discharge into the settlement ponds at the bottom of the excavation;
- Use of outfall controls such as buffered outfalls, vegetation filters, silt bags, sedimats etc.

Management of runoff from subsoil storage areas

- The land in the proposed quarry will only be stripped as required in order to limit the length of time the soil is exposed to erosion thereby restricting the generation of silt in surface runoff.
- Where possible the land will be stripped in dry weather to reduce nutrient loss, sustain soil condition and reduce the generation of silt-laden runoff.
- All bare/disturbed surfaces shall be reinstated, and soil mounds shall be re-vegetated as rapidly as possible in order to reduce erosion and restrict silt generation in water.
- The slope of the soil storage mounds shall be minimised, their general shape should be in a manner as to avoid any potential for water ponding.
- As the pit is being worked, land shall be restored in order to reduce any potential for surface runoff.
- Replacement of topsoil and restoration of the site will reduce the vulnerability of groundwater beneath the site on closure.

Morphological and Surface Water Quantity

Mitigation by Design

As indicated, the loss of c. 18.05 Ha from the overall catchment area of the Camlin River cannot be mitigated. However, it should be noted that most of the surface water runoff generated within the quarry is ultimately discharged back to the Camlin River. Appendix

7-5 provides a greenfield runoff rate for the site of 0.056m³/s, which shall serve as the basis for the maximum allowable discharge from the site.

As a result, the direct impact on the flow of the Camlin River will be negligible.

The effect of the quarry during a heavy/extreme rainfall event will be to act as a buffer and flatten out flood peaks over several days and therefore reduce the potential for flooding resulting from such events. This is a beneficial impact of the development.

Surface Water Quality

Mitigation by Design

Management of inflows and subsequent treatment prior to discharge into the drainage network will be undertaken as follows:

- Appropriate interceptor drainage to prevent upslope surface runoff from entering excavations will be put in place.
- If required, pumping of excavation inflows from a sump will prevent build-up of water in the excavation.
- The pumped water volumes will be discharged via volume and sediment attenuation sumps within the quarry.
- There will be no direct discharge to surface watercourses, and therefore no risk of hydraulic loading or contamination will occur.

Mitigation by Management

The proposed drainage management measures and pollution prevent measures will ensure that the excavation of the proposed area will be operated without impacting on downstream surface waters.

- The excavation area will not create significant groundwater management issues as it is anticipated that groundwater inflow will be small.
- Any ponding water that could be generated within the excavation and/or the haulage road should be mitigated by the scrapping off the silts that create the ponding conditions in the first place. These silts can be stockpiled and reused as part of the restoration plan.
- To remain efficient, any settlement lagoons will be maintained on an ad hoc basis as is currently the case in the existing quarry.
- Non continuous monitoring shall be implemented to satisfy the conditions of any discharge licence that would be required. It is recommended that the parameters to be monitored be as follows:
    - pH,
    - Turbidity,
    - Temperature,
    - Dissolved oxygen,
    - BOD_5,
    - COD,

- Total Suspended Solids,
- Ammonia and un-ionised ammonia,
- Nitrates.
- Orthophosphates.

The frequency of monitoring shall be as per discharge licence requirements.

Downstream Salmonid Fish

This section describes how surface water runoff will be managed at the site in order to avoid significant impacts on downstream surface waters, thereby protecting downstream salmonid fish in the River Trough and River Blackwater.

Mitigation by Management

While settlement pond(s) form an important element of the drainage proposals for the site, run off from the proposed site will be continually checked along the drainage infrastructure areas to ensure that they are in good working order at all times.

If issues are noted during these inspections, they will be fixed. If necessary, additional measures will be used to prevent any risk of failure in the settling capacity of the final settlement pond, i.e. prior to discharge. Such measures will include additional silt bags, silt fences or sedimats to increase treatment capacity. Appendix 7.6 shows that when the quarry is fully developed, the settlement pond should cover a minimum area of c. 310m^2, which would be easily accommodated in the lower bench.

In the event that a local failure occurs, the problem will be identified and remedied immediately.

Provision for additional pumping equipment, sediments, silt bags and silt fencing materials will be available on site at all times, for use in emergency situations.

The measures that have been prescribed and the approach taken follows best practice and has been successfully employed on similar development schemes in similar forestry sites. In summary, the proposed development will not result in any significant effects on salmonid fish providing that the mitigation measures provided in Appendix 7.6 are adhered to and that a water management plan is put in place. In addition, it should be pointed out that:

- There will be no direct emissions to watercourses during the lifespan of the quarry extension.
- A monitoring of the quarry discharge should be designed to minimise the potential for failure of any silt control measures and to be able to respond in the highly unlikely event of a failure in the proposed control measures.

Contamination from Accidental Spills

Mitigation by Design

Oils and fuels will be used in plant and equipment during the extraction phase of the proposed quarry. Storage of fuels, lubricants and hydraulic fluids shall occur mainly at the dedicated area within the proposed quarry yard, thereby ensuring that the area in which fuels, lubricants and hydraulic fluids are stored will be properly secured against unauthorised access or vandalism and protected against accidental spillage.

Mitigation by Prevention

Within the proposed quarry works there may be a requirement for short-term storage of fuels for diesel generators used on site. The following procedures will be implemented during the operational phase of the quarry deepening:

- Fuels and oils will be carefully handled to avoid spillages.
- Any spillage of fuels, lubricants or hydraulic oils will be immediately contained, and the contaminated soil removed from the site and disposed of appropriately.
- Any waste oils and hydraulic fluids will be collected in leak-proof containers and removed from the site for disposal or recycling.
- As a minimum, simple spill protection equipment that will be held locally will include specialist absorbent mats / pillows and granules for containment / cleanup of oil. Adequate quantities will be held in stock and be available for immediate use.
- Appropriate spill control equipment, such as oil soakage pads, will be available on site to deal with any accidental spillage and emergency response procedures will be put in place.
- Designated contractors' personnel will be trained and certified in oil spill control and clean up procedures, and in the proper and safe disposal of any waste generated through such an event.

Groundwater Quantity

As with the existing quarry, it is anticipated that the bulk of the cone of drawdown induced by the proposed quarry will be limited to 250m around the quarry excavation. No domestic water supplies were identified within this perimeter. However, the well supplying house No. 17 is located at a minimum distance of 350m (based on property boundary) downgradient from the proposed quarry boundary. This well is located on private lands, which was not accessible at the time of survey. It is assumed that this well is boreholes and not a dug well.

As a preventative measure, it would be recommended to monitor the water level fluctuations within the well using automated water level recorders.

The monitoring should ideally start prior to the start of any work within the proposed quarry so as to establish a baseline for the water table at different times of the year. The data from the logger should be retrieved on a quarterly basis and reviewed by a hydrogeologist.

Groundwater Quality

The main potential impacts to groundwater during the operational phase of the quarry are linked to the contamination from accidental spills. The associated mitigations measures are provided in sub section 7.11.7. above.

Other potential risk pertains to the use of emulsion explosives for blasting purposes, which is mitigated as follows:

Mitigation by Management

Implementing such measures as part of a standard operating procedure will eliminate or minimize the potential for these substances to dissolve in or become associated with water. The specific measures included can be grouped into the following four basic categories:

Education / Training of Explosive Users

Both the owners/operators are aware of the location where explosives are being used and the personnel working with commercial explosives should be well informed of all applicable regulations as well as any potential consequences associated with the products' exposure to water.

Selection of Appropriate Explosive for the Job and Conditions

Selecting the proper explosive for the particular job is critical to the prevention of surface or groundwater impact.

ANFO (ammonium nitrate - fuel oil) is not water-resistant and should be avoided at the Quarry as contact with water is likely.

Various types of commercial explosives are available to withstand exposure to water. Water-resistant explosives include the cartridge forms of gelatinous nitroglycerin, watergels and emulsions.

Explosives Loading and Handling

All excess product in augers or hoses is to be recovered and used either in the next blasthole or recycled in the mixer/holding tank.

Explosive spillage around the blasthole collar is to be controlled and any such spillage should be placed into the blasthole before stemming.

Minimize the amount of time that explosives are exposed to wet conditions within the blasthole. The blast should be initiated as near the time the loading is completed as safety and operational procedures allow.

Avoid having explosives exposed to precipitation.

To assure complete detonation of explosives placed into the ground, a sufficient number of boosters must be used.

Attention to Technical Matters

- The actual physical conditions into which explosives are being placed must be taken into account.
- Personnel responsible for loading explosives into the boreholes should be in continuous communication with the drillers of those boreholes or supplied with adequate drill logs, so that any knowledge regarding fractures, crevices or cavities is obtained.
- Choosing and placing the correct drilling patterns that results in the optimal use of explosives with all the explosives undergoing complete detonation.
- Quality assurance/quality control measures to maintain drilling accuracy that prevents the detonation in one blasthole from impacting the proper detonation in a nearby blasthole.
- Selecting the appropriate drilling equipment so that adequate borehole quality is maintained.
- Where appropriate to ensure complete detonation, two (2) primers will be used in each blasthole; one near the top and one near the bottom of the explosive column.
- Correct selection of delay timing for each blasthole to ensure detonation of the entire pattern, and the prevention of cut-off blastholes.

16.5 Climate

Mitigation Measures

Construction Phase

- All construction vehicles and plant will be maintained in good operational order while onsite, thereby minimising any emissions that arise.
- The majority of aggregate and concrete materials for the construction of the proposed development will be sourced from the existing quarry which is only a short distance from the application site.
- Strict adherence to 'good site/engineering practices' such as switching off all vehicles and plant when not in use.

Operational Phase

The following mitigation measures will be practiced at the proposed development in order to limit the effects of the development on the local and regional climate:

- Strict adherence to 'good site/engineering practices' such as switching off all vehicles and plant when not in use.
- Plant will be serviced regularly to ensure efficient fuel consumption.
- Energy consumption and emission volumes will be considered when purchasing new plant and vehicles.

- It is proposed to implement energy audits in order to assess energy requirements and areas where energy usage can be reduced which will lead to a reduction in greenhouse gas emissions.

Decommissioning Phase and After Use

Mitigation measures proposed for the decommissioning phase and after use are the same as the operational phase:

- Strict adherence to 'good site/engineering practices' such as switching off all vehicles and plant when not in use.
- Plant will be serviced regularly to ensure efficient fuel consumption.
- Energy consumption and emission volumes will be considered when purchasing new plant and vehicles.
- It is proposed to implement energy audits in order to assess energy requirements and areas where energy usage can be reduced which will lead to a reduction in greenhouse gas emissions.

Monitoring

It is proposed to implement energy audits in order to assess energy requirements and areas where energy usage can be reduced which will lead to a reduction in greenhouse gas emissions.

16.6 Air

Mitigation Measures

There are a number of mitigation measures proposed to be put in place on site to prevent significant dust emissions from on-site activities. These measures include:

- A wheel wash will be in place on site which trucks must pass through prior to exiting onto the public road.
- A water bowser will be used during dry periods to dampen site roads.
- Speed restrictions will be in place for on-site roads.
- Stockpiles will be dampened during dry periods.

These measures have been incorporated into the modelling assessment to determine the impact of the site on levels of dust deposition and ambient levels of particulate matter (PM_{10} / $PM_{2.5}$). The modelling assessment found that there was an imperceptible impact on the ambient air quality environment as a result of the development and therefore further mitigation is not required. These mitigation measures will be enforced to prevent significant dust emissions from the site.

Monitoring

It is recommended that dust deposition monitoring be undertaken at the boundary of the site. Monitoring will ensure that the TA Luft guideline limit value of 350 mg/(m2*day)

is complied with at the site boundary. Monitoring can be carried out using the Bergerhoff method as recommended by the Department of Environment, Heritage and Local Government (DHLEG, 2004). If monitoring indicates a potential issue with dust deposition, additional mitigation measures shall be implemented to remediate. Monitoring should be conducted at the western, eastern and northern site boundaries at a minimum as these areas are closest to sensitive receptors.

16.7 Noise & Vibration

Mitigation Measures

The following controls are already in place so that ground vibration, air overpressure, noise and flyrock is minimised and kept within the regulatory limits. Specific mitigations measures are listed that is followed by the experienced Contractors who carry out these duties and are as follows;

- Pre-blasting management procedures, loading Management procedures and blasting management procedures) will be in place at all times.
- Considerable care will be taken to conduct the blast only between 12:00 hrs and 16:00 hrs, Monday to Friday. No blast will be conducted on weekends or bank holidays.
- Prior to drilling of a blast face, profiling or a trigonometric bench height measurement is carried out for all blasts.
- Prior to drilling the blasting pattern, the quarry foreman will mark the position of the boreholes and the blast number on the ground as per the agreed blasting plan approved and signed by the Drilling and Blasting Manager.
- A blasting plan will be issue by the blaster in charge for agreement to the Drilling and Blasting Manager prior the drilling of any blast.
- Only personnel with appropriated Certification in drilling and blasting operate the blasting programs.
- A driller's log will be in place at all times.
- A site specific scale distance regression for the proposed development site should be continuously developed as blasting continues over the life of the quarry.
- Monitoring locations for ground vibration and air overpressure will be agreed prior to blasting. Monitoring data will be used to allow for future adjustments to the maximum instantaneous charge of the blast if required.
- All seismographs should have a certificate of calibration from the manufacturer and all certificates and serial numbers of each seismograph to be used for the monitoring of the blast will be kept on file.
- Advance warning notice of all blasts will be given to residents in the near environs of the quarry at least 24hrs prior to blasting.
- Optimum blast ratio should be maintained and this ensures that the maximum amount of explosive on any one delay, the maximum instantaneous charge (MIC)

is optimised so that the ground vibration levels are kept below the regulatory limits.

- Explosive charges should be properly and adequately confined with sufficient amount of quality of stemming using angular chippings and/or a combination of angular chippings and plug.
- The adequate confinement of all charges by means of accurate face survey and the subsequent judicious placement of explosives by certified personnel.
- Overcharging can be avoided by considering depth, burden and spacing when calculating charge weight per hole.
- There will be no exposed detonating cord used in surface.
- The initiation sequence in the blast will be set in a way that it progresses away from the nearest sensitive locations or structure to be protected, where practical.
- An adequate powder factor and energy factor will be chosen for each blast by considering safety, confinement and productivity.
- Borehole deviation studies will be conducted in order to have a better control in potential borehole deviation.
- Only the necessary sub drilling to achieve good breakage will be use (normally 1 to 1.5 m), excessive sub-drilling should be avoided at all times.
- Use of decked charges if required in order to reduce the Maximum Instantaneous Charge (MIC).
- Pre-splitting technique will be use for the final slope stability.

Monitoring

To ensure compliance with regulatory limits, monitoring of all blasting events will be carried out at a selection of nearest sensitive dwellings, the location which may vary as the quarry develops. Keeping within the statutory limits of blast vibration or air overpressure will ensure that the likelihood of damage (or superficial damage) to property approaches zero. Noise monitoring could be carried out on an annual basis at locations N2, N4, N7, N8 and N9 as detailed in Plate 10.1. When compliance is met at the nearest noise receptors, then it will be met at distance further away as noise levels decreases with distance from a source.

16.8 Traffic

Mitigation Measures

The following mitigation measures have been and will be implemented to minimise the impacts of the quarry:

- Sufficient car parking spaces are provided within the quarry for current staff levels. The existing working quarry and proposed quarry development shall result in an increase in staff levels and as such this ensures that parking associated with the quarry does not occur along the public road network;

- Sufficient space has been provided between the L5097 carriageway edge and the gates at the existing access to accommodate 1 HGV clear of by-passing traffic on the mainline;
- Pedestrian facilities are provided where required within the proposed quarry to facilitate safe pedestrian movements in accordance with the Quarry Health and Safety Plan;
- Maintenance of existing visibility splays shall be undertaken in accordance with the Longford Development Plan at the quarry access;
- The quarry products are currently loaded onto open back trucks using wheel loaders, these trucks shall be covered where required to reduce dust impacts; and
- An existing wheelwash is located within the quarry.
- A detailed Traffic Management Plan shall be prepared in advance of the decommissioning works;
- Sufficient car parking spaces shall be provided within the quarry for staff associated with the decommissioning works;
- Materials and plant shall be sourced locally to reduce the impact on the road network and environmental impacts; and
- Transport of materials and plant to the quarry during this phase shall utilise the national and regional road networks, which have a greater traffic capacity in comparison to the local road network.

Monitoring

No monitoring is proposed.

16.9 Landscape & Visual

A Landscaping & Restoration Plan has been compiled for the application site and will be undertaken during the operational phase and on completion of extraction of the available resource. The following matters were taken into consideration as part of the landscape and restoration plan:

- Habitat type and species local to the site.
- Planning requirements and applicable legislation.
- Interaction with the surrounding environment.
- Health & safety considerations.
- Resources available.
- Nature and extent of aggregates extraction.
- Availability of suitable restoration materials.

When quarrying activity has ceased at the site, all fixed and mobile plant, equipment and buildings, fuel tanks, toilets and plant machinery will be removed from the site. Most of the plant and equipment that will be on site will not pose any environmental concern in the event of decommissioning. In the event of decommissioning, all machinery removed

from the quarry will be reused at a different location or if not required at another location, plant will be dismantled and the metal recycled at an appropriate facility.

All stockpiles, plant equipment and unused structures will be removed from the site and an inspection will be undertaken to ensure that all plant and equipment has been decommissioned and removed.

The existing perimeter vegetation will be retained. Landscape work and planting as part of the restoration process will serve to reduce the long-term visual impact of the development. As part of the quarry works measures will be put in place to reduce loss of biodiversity and enhance the conservation value of the area and reduce environmental impacts of quarrying activity on the surrounding area. These include:

- Provision of berms which will be planted and allowed to develop with the natural seed bank in the soil to create ecosystems and to provide corridors of natural habitat which connect existing natural areas around the quarry.
- The use of native species will support a wider range of insects and animals and will contribute more to the ecology of the region than non-native ornamental vegetation.
- Using plants adapted to or tolerant of the existing site conditions will reduce the need for expensive remedial measures (such as replacing failed plants).
- All planting of trees and shrubs will take place during the dormant seasons. Bare-rooted plants transplant most successfully during their dormant season, this is usually between November and March/April. Avoiding times when the ground is actually frozen, this will mean either autumn or spring planting.
- Planting areas will be suitably fenced to exclude farm stock, rabbits, sheep and other browsing animals. It may be more economical to protect each tree individually rather than fence the whole area.

Monitoring

- The removal of vegetation as part of the should be supervised periodically by an appropriately qualified Ecologists.
- The mitigation measures for medium to long term, neutral landscape effects are detailed in the compiled Restoration Plan.
- The restoration of the quarry should be supervised periodically by an appropriately qualified Ecologists. Any removal of vegetation as part this phase should be supervised periodically by an appropriately qualified Ecologists.

16.10 Material Assets

Mitigation Measures

Mitigation measures are proposed in the various chapters of the EIAR 6.0 Land, Soils & Geology, 7.0 Water, 9.0 Air Quality, 10.0 Noise & Vibration and 11.0 Traffic to reduce or offset the impacts identified in relation to the various stages of the proposed development. No additional mitigation measures are proposed in this chapter.

Monitoring

An environmental monitoring programme will be developed and implemented for the proposed development. The monitoring programme will verify that implemented controls prevent and minimise emissions from the proposed development. Monitoring will also assess the effects of the quarrying activities on the environment so that operational changes and improvements can be made where appropriate. The monitoring programme and sampling frequency will be agreed with Longford County Council.

16.11 Cultural Heritage

Mitigation Measures

Due to the possibility of the survival of previously unknown subsurface archaeological deposits or finds within the application area topsoil-stripping in areas 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12 and 13 should be monitored by a qualified archaeologist.

Monitoring

Monitoring of soil stripping as detailed above should be undertaken.