REMEDIAL ENVIRONMENTAL IMPACT ASSESSMENT REPORT

SUBSTITUTE CONSENT APPLICATION FOR AN EXISTING SAND AND GRAVEL PIT AT ROSCAT, TULLOW, CO. CARLOW

Prepared For:

KILCARRIG QUARRIES

Prepared By:

Earth Science Partnership Ire. Ltd
Tonranny
Westport
Co. Mayo

April 2019

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1.0 INTRODUCTION

This remedial Environmental Impact Assessment Report (rEIAR) has been prepared to accompany an application for substitute consent to An Bord Pleanála regarding the historic development of a sand and gravel pit of approximately 4.7ha in area located at Roscat, Tullow, Co. Carlow. The application site forms part of an existing sand and gravel pit which is approximately 6 hectares in area.

This chapter of the rEIAR details an introduction to the Section 261A process, the history of the application site and extraction activities to date. It also outlines the structure of the rEIAR and the competencies of the expert team employed to undertake the assessment. This rEIAR is accompanied by a remedial Natura Impact Statement (rNIS).

1.1 Section 261A Process (Substitute Consent)

Substitute Consent is essentially a form of retrospective consent for an existing development. This is a special provision made under Section 261A of the Planning and Development Act 2000 (as amended), whereby quarries which were deemed to be in breach of the EIA/Habitats Directives, or both, would be permitted to apply for Substitute Consent.

This provision is available to quarry/pit operators provided that the development met the following conditions:

i) The quarry development had commenced prior to the inception of the planning law system in 1964;

   OR

ii) Had obtained a relevant planning permission in the past;

   AND

iii) The quarry must have also registered under Section 261, if required to do so.

Local Authorities were required to assess each quarry in their respective administrative areas in relation to the EIA and Habitats Directive. Where they determined that a quarry was in breach of one or both, the Local Authority was required to make a further decision in relation to the planning status of the quarry, including registration status.

Based on the relevant Planning Authority assessment which is subject to the relevant conditions outlined above being in place, or not as the case may be, the Planning Authority issued a notice in relation to the assessment detailing a decision under Subsection 3(a), 4(a) or 5(a) or issued a notice stating 'No Further Action is required'.

A notice under Subsection 3(a) directed the quarry owner/operator to apply for Substitute Consent with the application to be accompanied a remedial Environmental Impact Statement (rEIS) (now named an Environmental Impact Assessment Report (rEIAR) under the recently updated EIA Directive 2014/52/eu) and/or a remedial Natura Impact Statement (rNIS).

Should conditions (i) or (ii) and (iii) listed not be adhered to, a notice under Subsection 4(a) or 5(a) is issued to a quarry owner/operator and requires that the quarry owner/operator ceases operations and that an enforcement notice will be issued. The determination and decision of the Local Authority can be appealed to An Bord Pleanála who can confirm amended or set aside the Local Authority Determination and Decision.

1.2 Project Background

By Order dated 22nd August 2012, Carlow County Council issued a notice pursuant to Section 261A, with a decision under Section 261A (4)(a) stating that the Council intended to issue an Enforcement Notice under Section 154 of the Planning and Development Act 2000, requiring the cessation of operations at the Roscat Sand and Gravel Pit and the taking of such steps as the Planning Authority considered appropriate.

Following this decision, a review was lodged with An Bord Pleanala (ABP) by SLR Consulting Ireland on behalf of the then pit owner on 11th September 2012.

An Bord Pleanála reviewed the Local Authority Section 261A (2)(a) Determination and Section 261A (4)(a) Decision and confirmed the Local Authority Determination and set aside the Local Authority Decision. In setting aside the decision, the Board stated that:

a) *Permission was granted in respect of this quarry (Planning Authority Reg. CW7850) under Part IV of the Local Government (Planning and Development) Act 1963, and*
b) *The requirements in relation to registration under Section 261 of the Planning and Development Act, 2000 (as amended) were fulfilled.*
c) *Therefore it is considered that the requirements of Section 261A(3)(i) and Section 261A(3)(a)(ii) had been met.*

This was detailed in the An Bord Pleanála Order dated 10th October 2013 (Appendix I).

As such, in accordance with Section 261A (10) of the Planning and Development Act 2000 (as amended), the owner/operator on foot of the previously set aside decision by An Bord Pleanála should be issued with a notice by the Planning Authority directing the owner/operator to submit an application for Substitute Consent to An Bord Pleanála and the application should be accompanied by a rEIS (now rEIAR) and rNIS as confirmed by An Bord Pleanála.

Although this recommendation was made by An Bord Pleanála in October 2013, the Planning Authority only issued direction to apply for Substitute Consent on 25th October 2018, possibly as the site was not in use since 2008 and the previous owner was in receivership. It is noted that the current own (applicant) requested the Section 261A (10) notice as soon as the title to the land was clear i.e. as the first point of legal entitlement. A copy of the Section 261A(10) notice is attached in Appendix II.

1.3 Substitute Consent Application Site

The application site is located in the townland of Roscat which is approximately 3 km south west of Tullow and 2 km east of Rathtoe. The N81 national road which connects Tullow with the N80 at Ballon passes in a north-south direction 1.5 km east of the site.

Planning permission for an area of approximately 1.3ha granted in 1987 (CW 7850) exists in the south eastern section of the site. The existing sand and gravel pit area was registered with Carlow County Council in accordance with the requirements of Section 261 of the Planning and Development Act, 2000 (Quarry Ref. No. QY12/28). An area of approximately 6.02ha of the landholding was registered in this process.

Vehicular access to the pit is off a local road and via a c.1km long gated laneway that provides access to the pit and surrounding lands. The site is surrounded by agricultural fields.

The site is situated on the eastern side of a minor valley which is defined by a small north-south trending ridge that peaks at 94 mOD, 1 km northeast of the site at Ellengrove Crossroads, and a wider area of raised ground which reaches 93 mOD, 1.8 km southwest of the site. This valley flattens out to less than 70 mOD a short distance southwest of the site. OS Discovery maps indicate the site elevation to be in the range 68 – 74 mOD.

The area immediately around the site is sparsely populated, with individual farmsteads and scattered houses along the road network. A series of irregular third class roads run around the lands, serving a number of dwellings and farms.

Material was extracted by excavators and was either processed into various grades depending on market demand for aggregate and stockpiled close to the processing plant or exported to a processing plant offsite.

Plant and machinery which operated in the application area consisted of tracked excavators, wheel loaders, dump trucks, mobile processing plant and road trucks to haul material off site. Ancillary plant such as a water bowser for dust suppression was deployed where required.

Due to the porous nature of the underlying material, precipitation falling on the application site generally percolated to ground. Processing on-site consisted of dry screening with no aggregate washing undertaken.

1.4 The Applicant

Kilcarrig Quarries Ltd. the new owner of the application site are a long established company which has been supplying materials to the civil engineering and construction industries for the past 30 years. Kilcarrig Quarries produce a wide range of quarry products, precast products, a complete selection of building blocks, building stone, crushed rock, drainage material and building sands. In addition, they manufacture and supply precast products such as concrete stairs, concrete flooring and also a full range of precast products for domestic and agricultural construction, as well as ready-mix concrete and mortar. They supply and deliver quarry materials to Carlow, Kilkenny, Laois, Waterford, Wexford, Wicklow, Kildare, also the Greater Leinster and Munster Area from their network of quarry and pit developments.

1.5 Remedial EIAR Methodology

1.5.1 Remedial EIAR Preparation

Section 177F (1) of the Planning and Development Acts 2000-2010 states that a remedial Environmental Impact Statement (now rEIAR) shall contain the following information:

(a) A statement of the significant effects, if any, on the environment, which have occurred or which are occurring or which can reasonably be expected to occur because the development the subject of the application for substitute consent was carried out.

(b) Details of:

(i) Any appropriate remedial measures undertaken or proposed to be undertaken by the applicant for substitute consent to remedy any significant adverse effects on the environment.
(ii) The period of time within which any proposed remedial measures shall be carried out by or on behalf of the applicant.

(c) Such information as may be prescribed under section 177N.

The following guidelines were considered as part of the preparation of this rEIAR:

- Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment (DHP&LG, August 2018)
- Draft Guidelines on the information to be contained in Environmental Impact Assessment Reports (EIAR) (EPA, August 2017)
- 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)
- 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).

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

- Satellite imagery (Bing and OSI);
- Historic online maps (6” and 25”);
- Site visits and field surveys;
- Site investigations (geotechnical, environmental etc.);
- 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.

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.”*

1.5.1 Remedial EIAR Format

The rEIAR 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 rEIAR is structured under the following subject headings:

- 1.0 – Introduction
- 2.0 – Screening, Scoping and Alternatives
- 3.0 – Project Description
- 4.0 – Planning and Legislative Framework

- 5.0 – Population and Human Health
- 6.0 – Biodiversity
- 7.0 – Land, Soils and Geology
- 8.0 – Water
- 9.0 – Climate
- 10.0 – Air
- 11.0 – Noise and Vibration
- 12.0 – Traffic
- 13.0 – Landscape & Restoration
- 14.0 – Material Assets
- 15.0 – Cultural Heritage
- 16.0 – Interactions
- 17.0 – Remedial Measures and Monitoring Summary

Chapter 1.0 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 2.0 provides details in relation to screening, scoping and consideration of alternative designs and processes.

Chapter 3.0 provides details relating to the historic work methods within the development including day to day processes that were undertaken at the existing development.

Chapter 4.0 sets out the planning and development context relating to the development. This chapter reviews the national, regional and local planning policy relevant to the development.

Chapter 5.0 – 15.0 details information on all aspects of the existing environment including any impacts or potential impacts identified. Existing measures are reviewed and remedial measures are proposed where required in order to offset potential impacts identified.

Chapter 16.0 addresses the cumulative impacts, indirect impacts and main interactions between different aspects of the environment likely to be significantly affected by the historic 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 17.0 provides a summary of the remedial measures and monitoring measures proposed in order to offset potential impacts identified. Residual impacts are also described.

1.5.2 Chapter Layout

In accordance with the EPA (2017) draft guidance document, Chapters 5.0 to 15.0 of the rEIAR follow the same general layout, as follows:

1. **Introduction** – Describes the purpose of and rationale for inclusion of the particular environmental topic within the EIAR.
2. **Methodology** – Details the sources of baseline information and data and the methods employed to gather 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** – A clear and concise description of the *likely significant effect*s 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, 2017)

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).
Types of Effects	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.

Characteristic	Level	Description
	Cumulative	The addition of many minor or significant effects, including effects of other projects, to create larger, more significant 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. **Remedial 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 remedial 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.

1.6 Competency of Experts

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."*

As such, Table 1-2 presents details of all competent experts involved in the preparation of this EIAR.

Table 1-2: The EIAR Study Team and their relevant competencies

Chapter	Company	Competent Expert	Area and Level of Expertise
1.0 Introduction 2.0 Screening, Scoping & Alternatives 3.0 Project Description 4.0 Planning & Legislative Framework 5.0 Population & Human Health	Earth Science Partnership (Ire.) Ltd.	Patrick O'Donnell C Eng. BSc. Eng. Dip Eng. MIEI Sarah Ingham MSc. BSc. (Hons) ACIEEM David Killeen BSc. Env	Principal Environmental Engineer Senior Ecologist/Env. Consultant Senior Environmental Consultant
6.0 Biodiversity	Earth Science Partnership (Ire.) Ltd.	Sarah Ingham MSc. BSc. (Hons) ACIEEM	Senior Ecologist/Env. Consultant
7.0 Land, Soils & Geology 8.0 Water	Envirologic Hydrogeological & Hydrological Consulting	Colin O'Reilly PhD (Hydrology) Patrick Breheny MSc. (Hydrogeology)	Consultant Hydrogeologist Consultant Hydrogeologist
9.0 Climate 10.0 Air	Earth Science Partnership (Ire.) Ltd.	Patrick O'Donnell C Eng. BSc. Eng. Dip Eng. MIEI Sarah Ingham MSc. BSc. (Hons) ACIEEM David Killeen BSc. Env	Principal Environmental Engineer Senior Ecologist/Env. Consultant Senior Environmental Consultant
11.0 Noise	Noise and Vibration Consultants Ltd.	Brendan O'Reilly MPhil (Noise and Vibration) ISEE SFA EAA	Noise and Vibration Consultant
12.0 Traffic	Alan Lipscombe Traffic and Transport Consultants	Alan Lipscombe B.Eng (hons) Transportation Engineering	Transportation Engineer
13.0 Landscape 14.0 Material Assets	Earth Science Partnership (Ire.) Ltd.	Patrick O'Donnell C Eng. BSc. Eng. Dip Eng. MIEI Sarah Ingham MSc. BSc. (Hons) ACIEEM David Killeen BSc. Env	Principal Environmental Engineer Senior Ecologist/Env. Consultant Senior Environmental Consultant
15.0 Cultural Heritage	Charles Mount Archaeology	Charles Mount M.A., Ph.D., M.B.A., Dip. EIA & SEA Mgmt., M.I.A.I.	Consultant Archaeologist
16.0 Interactions 17.0 Remedial Measures & Monitoring Summary	Earth Science Partnership (Ire.) Ltd.	Patrick O'Donnell C Eng. BSc. Eng. Dip Eng. MIEI Sarah Ingham MSc. BSc. (Hons) ACIEEM David Killeen BSc. Env	Principal Environmental Engineer Senior Ecologist/Env. Consultant Senior Environmental Consultant

1.7 Technical Limitations

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

1.8 References

Dept. of the Environment, Community and Local Government (2013) Guidance for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessments

Directive 2014/52/EU European Parliament and of the Council EIA Directive (April, 2014)
Environmental Protection Agency (2006) Environmental Management Guidelines – Environmental Management in the Extractive Industry (Non – Scheduled Minerals)

Environmental Protection Agency (2006) Environmental Management Guidelines: Environmental Management in the Extractive Industry (Non-Scheduled Minerals)

Environmental Protection Agency (2015) Advice Notes on Preparing Environmental Impact Statements (Draft) September 2015

Environmental Protection Agency (2017) Guidelines on the Information to be contained in Environmental Impact Assessment Reports (Draft) August 2017

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)

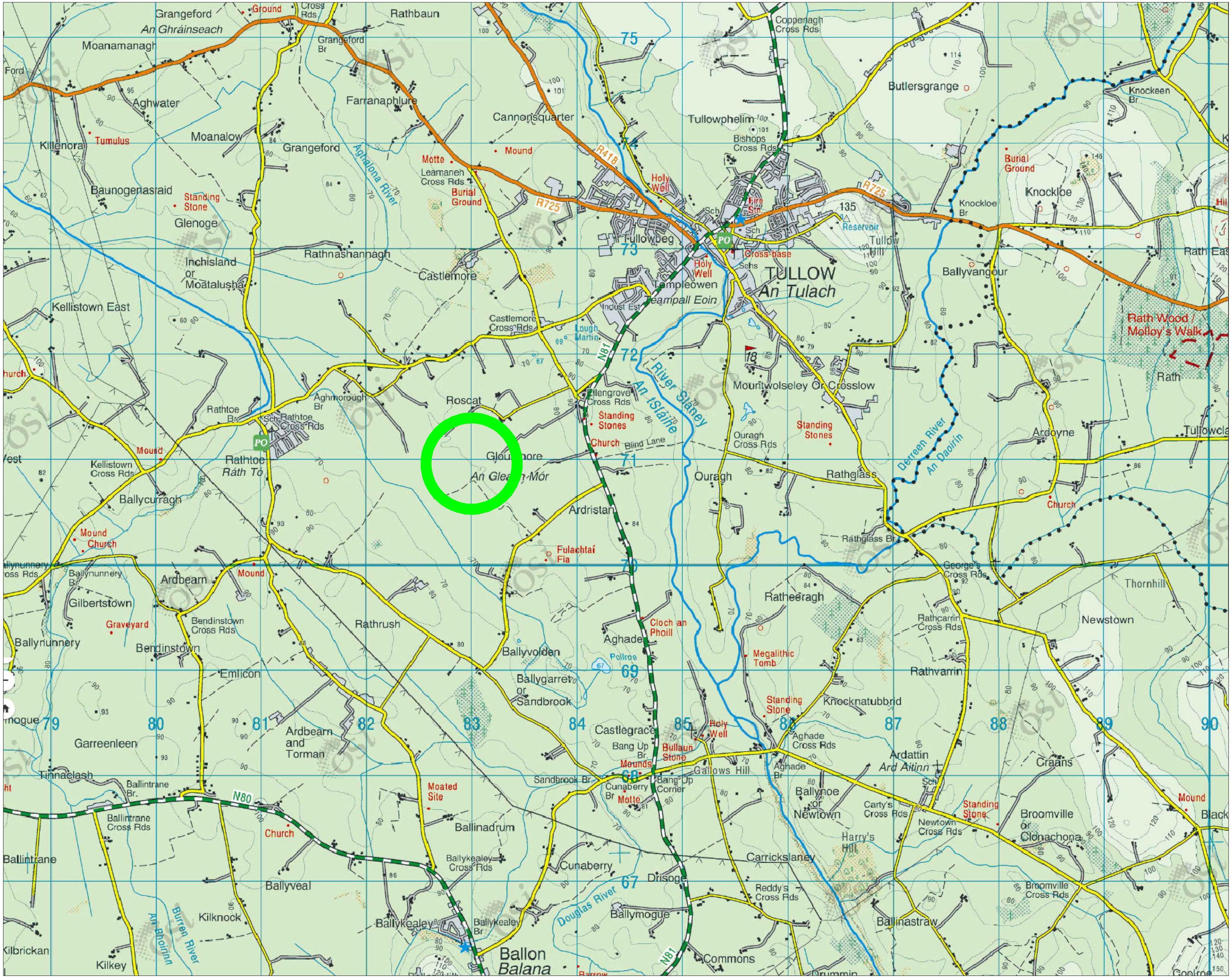
S.I. No. 600 of 2001: Local Government (Planning and Development) Regulations, 2001

S.I. No. 93 of 1999: 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. 349 of 1989: European Communities (Environmental Impact Assessment) Regulations, 1989 to 1999.

Figures



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Legend

Site Location

N

ITM Coordinates: 683027 E, 670998 N

Rev.	Description	Date

EARTH SCIENCE PARTNERSHIP

CONSULTING ENGINEERS, GEOLOGISTS & ENVIRONMENTAL SCIENTISTS

Tonranny Westport Co. Mayo
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e-mail: earthsciencepartnership@gmail.com

Client: Kilcarrig Quarries Ltd.

Project: Remedial Environmental Impact Assessment Report to Accompany a Substitute Consent Application for a Sand & Gravel Pit Located at Roscat, Tullow, Co. Carlow

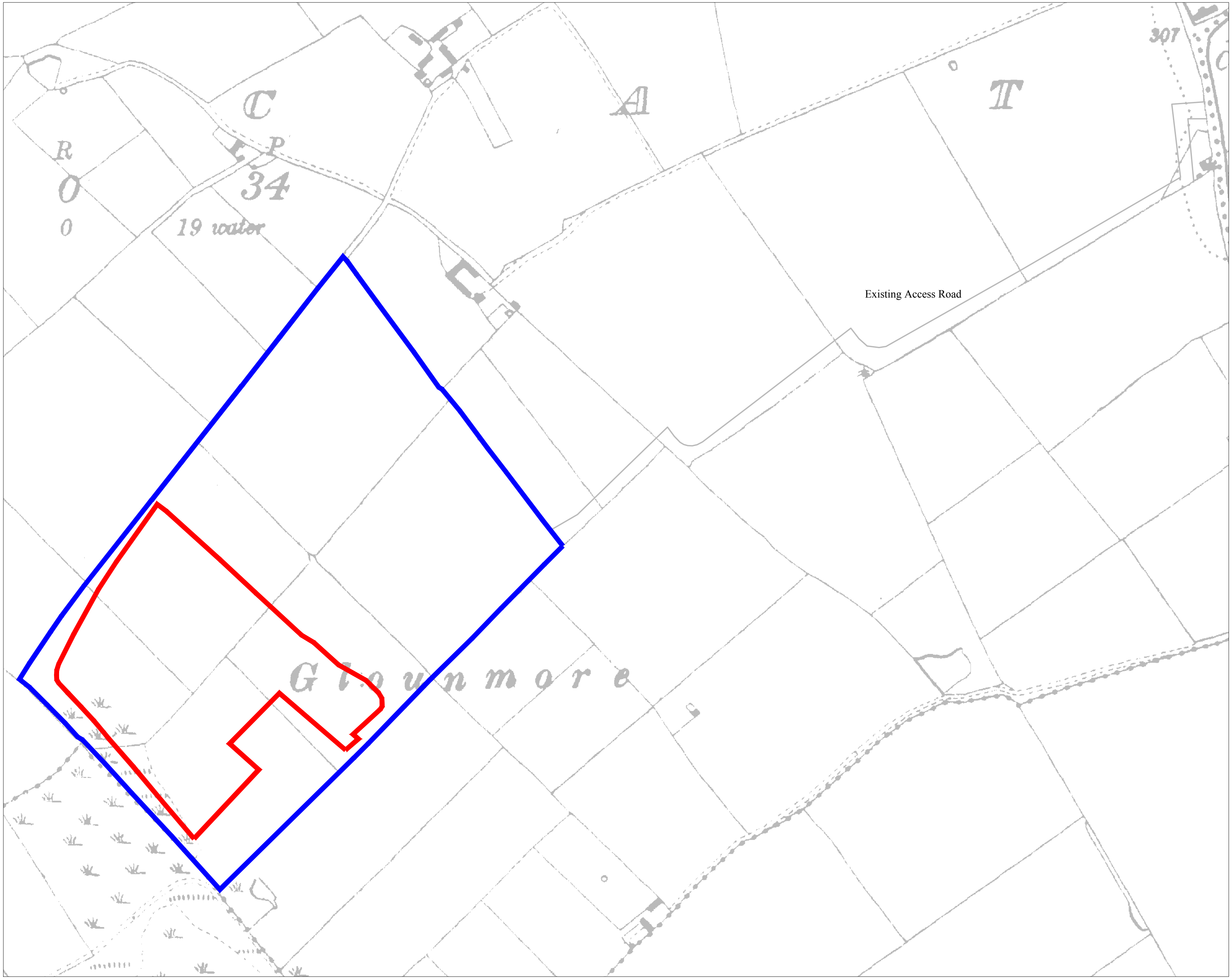
Title: Site Location Map

Drawn By: Sean O' Donnell

Checked By: Patrick O' Donnell

Scale: 1:50,000 @ A4	Date: Apr. 2019
Job No: EI 061	Rev: 0

Figure 1.1



Legend

Ownership Boundary

Application Area

Area = 4.7 Ha

N

O.S. Map Ref No. 4475 - B

ITM Coordinates: 683027 E, 670998 N

Rev.	Description	Date

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Client: Kilcarrig Quarries Ltd.

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Title: Site Location Map

Drawn By: Sean O' Donnell

Checked By: Patrick O' Donnell

Scale: 1:5,000 @ A4	Date: Apr. 2019
Job No: EI 061	Rev: 0

Figure 1.2

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2.0 SCREENING, SCOPING AND ALTERNATIVES

2.1 Introduction

This chapter of the rEIAR details the screening and scoping exercise carried out in relation to the proposal and the alternative locations, layouts and designs considered as part of the process.

2.2 Screening for a Remedial EIA and Remedial AA under Section 261A

2.2.1 Local Authority Assessment

Under Section 261A, Local Authorities were required to assess each quarry in their respective administrative areas in relation to the EIA and Habitats Directive and to determine whether

> *"(i) development was carried out after 1 February 1990 (i.e. the relevant date for EIA transposition) which development would have required, having regard to the Environmental Impact Assessment Directive, an Environmental Impact Assessment or a determination as to whether an Environmental Impact Assessment was required, but that such an assessment or determination was not carried out or made, or*
>
> *(ii) development was carried out after 26 February 1997, (i.e. the relevant date for Habitats transposition), which development would have required, having regard to the Habitats Directive, an Appropriate Assessment, but that such an assessment was not carried out. "*

Carlow Co. Co. assessed the application site under Section 261A of the Planning & Development Acts 2000 (as amended) and in accordance with Section 261A (2)(a)(i) determined that development was carried out after 1 February 1990 which development would have required, having regard to the Environmental Impact Assessment Directive, an Environmental Impact Assessment or a determination as to whether an Environmental Impact Assessment was required, but that such an assessment or determination was not carried out or made.

In relation Section 261A (2)(a)(ii), Carlow Co. Co. determined that development was carried out after 26 February 1997, which development would have required, having regard to the Habitats Directive, an Appropriate Assessment, but that such an assessment was not carried out.

The Planning Authority acknowledged that part of the pit was authorised by way of a planning permission (CW7850) covering an area of 1.3 Ha. which was granted in 1987. Based on this and the analysis of all documents, plans, ortho photography and the screening exercise conducted on the site, Carlow Co. Co. recommended that there should be no further action in respect of the area of 1.3ha which is the subject of the grant of Planning Permission under CW7850 and that the owner/operator be issued with a notice under S261A(4)(a) in respect of development outside of the area covered by CW7850 for which it has been determined that an EIA and Appropriate Assessment would have been required and were not carried out.

By Order dated 22nd August 2012, Carlow County Council issued a notice pursuant to Section 261A, with a decision under Section 261A (4)(a) notifying the owner/operator that the Council intended to issue an Enforcement Notice under Section 154 of the Planning and Development Act 2000, requiring the cessation of operations at Roscat Sand and Gravel Pit and the taking of such steps as the Authority considers appropriate.

2.2.2 An Bord Pleanála Assessment

The determination and subsequent decision of the local authority notice was appealed by the applicant to An Bord Pleanála under Section 261A(6) within the 21 day period by SLR Consulting Ireland on behalf of the then pit owner on 11th September 2012.

An Bord Pleanála reviewed the Local Authority Section 261A(2)(a) Determination and Section 261A (4)(a) Decision and confirmed the Local Authority Determination and set aside the Local Authority Decision. In setting aside the decision, the Board stated that:

a) Permission was granted in respect of this quarry (Planning Authority Reg. Reg. CW7850) under Part IV of the Local Government (Planning and Development) Act 1963, and

b) The requirements in relation to registration under Section 261 of the Planning and Development Act, 2000 (as amended) were fulfilled.

Therefore it is considered that the requirements of Section 261A(3)(i) and Section 261A(3)(a)(ii) had been met.

This was detailed in the An Bord Pleanála order (Ref: 01.QV.0270) dated 11th October 2013 a copy of which is attached in Appendix I.

2.2.3 Revised Local Authority Notice

Although the An Bord Pleanála recommendation was made by the Board in October 2013, the Planning Authority only issued direction to apply for Substitute Consent on 25th October 2018. The Section 261A(10) Notice issued under the Planning and Development Act 2000 (as amended) directed the owner and operator of the quarry to apply to An Bord Pleanála for Substitute Consent and that the application shall contain:

1. A Remedial Natura Impact Statement
2. A Remedial Environmental Impact Assessment Report

A copy of the Section 261A(10) notice is attached in Appendix II. The applicant requested an extension of time for submitting the application to An Bord Pleanála. The Board reviewed the request and granted an extension of time of a further 12 weeks for making the application for Substitute Consent under section 177E (4) of the Planning and Development Act, 2000. The final date for submission of the application is the 22nd April 2019.

2.3 Consultation and Scoping

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 statutory bodies and interest groups 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 expertise and knowledge of experts and interest groups.

Consultation regarding the existing project was undertaken at the Screening and Scoping Stages of the process via the dissemination of a Screening and Scoping Document to relevant consultees. This document provides consultees with an overview of the existing project including an outline project description, location, and scale, in addition to a list of potential effects which could have occurred as a result of the project which have been identified at this stage. The Screening and Scoping Document also dealt with a proposed Section 37L application for further development of the pit which the applicant will submit in tandem with the application for Substitute Consent.

Although not a legislative requirement, provision of this level of detail to relevant consultees during the preparation of an EIAR is best practice and ensures that the EIAR addresses the relevant concerns of those consulted, that the necessary studies have been undertaken and that the EIAR is appropriate to particular local circumstances and the scale of the existing scheme.

The following is a list of consultees to whom the Screening and Scoping Document was disseminated:

- Department of Culture, Heritage and the Gaeltacht serving the Development Applications Unit (DAU)
    - Document submitted to the DAU will be dispersed to:
        - National Parks and Wildlife Service;
        - National Monument Service;
        - Archaeology Advisory Unit.
- Department of Communications, Climate Action and Environment (DCCAE)
- Carlow County Council (CCC)
- An Taisce (AT)
- Environmental Protection Agency (EPA)
- Health Service Executive Ireland (HSE)
- Office of Public Works (OPW)
- Geological Survey Ireland (GSI)

- Heritage Council of Ireland (HCI)
- Health and Safety Authority (HSA)
- Inland Fisheries Ireland (IFI)
- Transport Infrastructure Ireland (TII)
- Irish Water (IW)
- Arts Council of Ireland (ACI)
- ESB Networks
- Irish Aviation Authority (IAA)

Responses received from parties are detailed in Appendix III. Based on discussion and comments from the design team and various third parties, assessment were undertaken in relation to the various elements of the environment to assess any potential impacts associated with the existing development. These are discussed in the various chapters of the rEIAR.

2.4 Alternative Designs and Processes

No alternative designs or processes were considered as the subject rEIAR is being submitted to An Bord Pleanála in order to obtain Substitute Consent for an existing development.

2.5 References

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

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

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)

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

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

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

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

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

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

EPA (2017) Draft Guidelines on the information to be contained in Environmental Impact Assessment Reports (EIAR)

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

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3.0 PROJECT DESCRIPTION

3.1 Introduction

This chapter of the rEIAR provides supporting information in relation to the activities that were undertaken at the application site on a day to day basis when operational and in the authorised planning area in order to assess any potential cumulative impact.

The site is located in the townland of Roscat approximately 3 km south west of Tullow and 2 km east of Rathtoe. The N81 national road which connects Tullow with the N80 at Ballon passes in a north-south direction 1.5 km east of the site. The Substitute Consent application area consists of an existing sand and gravel pit development of approximately 4.7ha (Figure 3.1).

3.2 Existing Environment

The Substitute Consent site consists of approximately 4.7ha of an existing sand and gravel pit which in total is approximately 6 ha. in area. Approximately 1.3 ha of the existing sand and gravel pit is authorised by a current planning permission (Carlow Co. Co. Planning No. CW7850).

Vehicular access is off a local road and via a c.1km long gated laneway that provides access to the existing pit and surrounding lands. The site is surrounded by agricultural fields with the area immediately around the site sparsely populated with individual farmsteads and scattered houses along the road network. A series of irregular third class roads run around the lands, serving a number of dwellings and farms.

The site is situated on the eastern side of a minor valley which is defined by a small north-south trending ridge that peaks at 94 mOD, 1 km northeast of the site at Ellengrove Crossroads, and a wider area of raised ground which reaches 93 mOD, 1.8 km southwest of the site. This valley flattens out to less than 70 mOD a short distance southwest of the site. OS Discovery maps indicate the site elevation to be in the range 68 – 74 mOD.

3.3 Characteristics of the Project

3.3.1 Description of the Existing Development

The application site consists of an area of approximately of 4.7ha which was subject to extraction of the sand gravel deposit. Material was extracted by excavators and was either processed into various grades depending on market demand for aggregate and stockpiled close to the processing plant or exported to a processing plant offsite.Material was extracted by excavators and passed through mobile processing plant which processed the material into various grades of aggregate. The material was then stockpiled on site and sold to market as required. Extracted material was also removed by excavators, loaded onto trucks and exported to a processing plant offsite.

Plant and machinery which operated in the application area and authorised pit area consisted of tracked excavators, wheel loaders, dump trucks, mobile processing plant and road trucks to haul material off-site. Ancillary plant such as a water bowser for dust suppression was deployed where required. As all production was a dry process, precipitous surface water primarily percolated through the pit floor.

3.3.2 Activities Relating to the Existing Development

The activities undertaken at the site as part of the extraction process included the following:

1. Overburden Stripping
2. Extraction of Material
3. Processing of Material
4. Products
5. Loading and Transporting Offsite

Day to day activities associated with the Substitute Consent application site and the authorised pit area when it was operational are detailed on Plate 3-1 below and are described under each subsection.

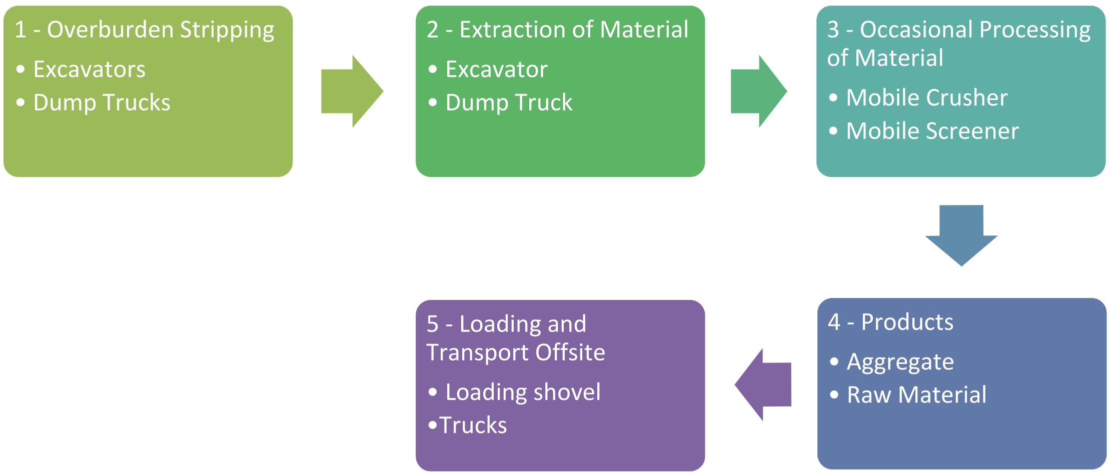


Plate 3-1: Summary of activities undertaken within the Substitute Consent application area.

3.3.2.1 Overburden Stripping

Within the existing pit area, approximately 0.4 meters of overburden was removed in order to excavate the underlying sand and gravel material. This material was removed using an excavator and dump trucks and stored on site for restoration of the pit on completion of removal of the available resource.

3.3.2.2 Extraction of Material

Once the overburden was removed, the sand and gravel material was extracted using excavators. The material was fed into the processing plant or loaded directly onto road trucks for exportation offsite to an external processing plant.

3.3.2.3 Occasional Processing of Material

Material was crushed onsite where required and screened into a number of grades depending on the market requirements. Processing was undertaken using mobile plant set up close to the excavation area.

3.3.2.4 Products

Processed aggregate was sold to the client's requirements. Once processed, the aggregate was stockpiled on the existing hardstand within the existing pit area awaiting transport to market. Material was also extracted, loaded onto road trucks and exported offsite to an external processing plant.

3.3.2.5 Transportation of Material

Material was loaded onto road trucks using wheel loaders and transported off-site.

3.3.2.6 Description of On-Site Plant

The following plant and equipment was used during past activities at the pit:

- Excavators
- Mobile crusher
- Mobile screeners
- Dump trucks
- Wheel loaders
- Tractor and bowser
- Road trucks

3.3.2.7 Fuel and Chemical Storage

No fuel was stored at the pit. Fuel was delivered to the pit by licensed oil companies and dispensed into plant and machinery.

3.3.2.8 Surface and Groundwater Management

All surface water generated as a result of precipitation at the Substitute Consent area followed a number of routes. The majority of the existing site has been stripped of overburden and is primarily underlain by sand and gravel. Precipitation falling on the site followed one of the following routes:

- Percolated through the underlying sand and gravel layers to ground.
- Flowed towards shallow depressions and evaporated off during over time dry periods.
- Directed to the settlement lagoons located in the south eastern corner of the pit where water was retained and used for dust suppression with excess water directed off-site.

3.3.2.9 Working Hours and Employment

Operating hours for the development were between 0700 hours and 1900 hours Monday to Friday and 0730 to 1700 hour on Saturdays as per Section 261 conditions. The pit did not operate outside these hours or on Sundays or Public Holidays. The pit provided employment for approximately 1 person on a part-time basis.

3.3.2.10 Utilities and Services

There were no electrical or telecommunications connection at the pit during its operation. Water for dust suppression purposes was sourced from the settlement lagoons on-site.

3.3.2.11 Transport and Access

Access to the pit is gained from the N81 national road which connects Tullow with the N80 at Ballon. Access to the pit is via a haul road which is approximately 1 km in length which links the pit to the N81. This access road consisted of a paved road which was constructed of a wearing surface course of macadam which remains in place.

3.3.2.12 Offices and Facilities

A porta-cabin facility was located within the application site for staff usage.

Due to the low level of activity and traffic movements, no wheel-wash or weighbridge facilities were located at the existing site.

3.3.2.13 Waste Management

<u>Overburden and Soil Screenings</u>
All overburden material arising from the pit was stockpiled on site for restoration purposes once activities at the pit have ceased. Soil screened from processing of material was also stored on-site for restoration of the pit.

<u>Waste Metal</u>
Waste metal from parts replaced on plant and vehicles and end of life vehicles were sent to a registered waste recovery facility for recycling.

3.3.2.14 Safety and Security

Stock proof post and wire fencing was in place around the boundary of the landholding during the operation of the pit and remains in place currently. The gate located at the entrance to the site was locked outside working hours. Warning signs were in place around the pit.

3.3.2.15 Resource

Within the Substitute Consent area, the extraction of material to date resulted in the removal of approximately 16,800 m^3 of overburden material which is stockpiled on the pit floor for restoring the pit on completion of works. Approximately 214,000 m^3 of sand and gravel material was extracted from the pit which was processed on-site and sold as aggregate or extracted and directly loaded onto vehicles and transported off-site. Using a conversion factor of 2 tonnes/m^3, the annual average extraction rate is estimated to be 50,000 tonnes per annum (25,000m^3 per annum).

3.3.2.16 Dust Generation and Control

During the operation of the Substitute Consent area, the extraction and processing of material and vehicle movement would have had the potential to create wind-blown dust if it was not managed effectively. Dust generation and control are dealt with within Chapter 10.0 (Air) of the rEIAR.

3.3.2.17 Noise Generation and Control

Sources of noise as a result of day to day activities being undertaken at the Substitute Consent site were associated with extraction and processing of material and vehicle movement.

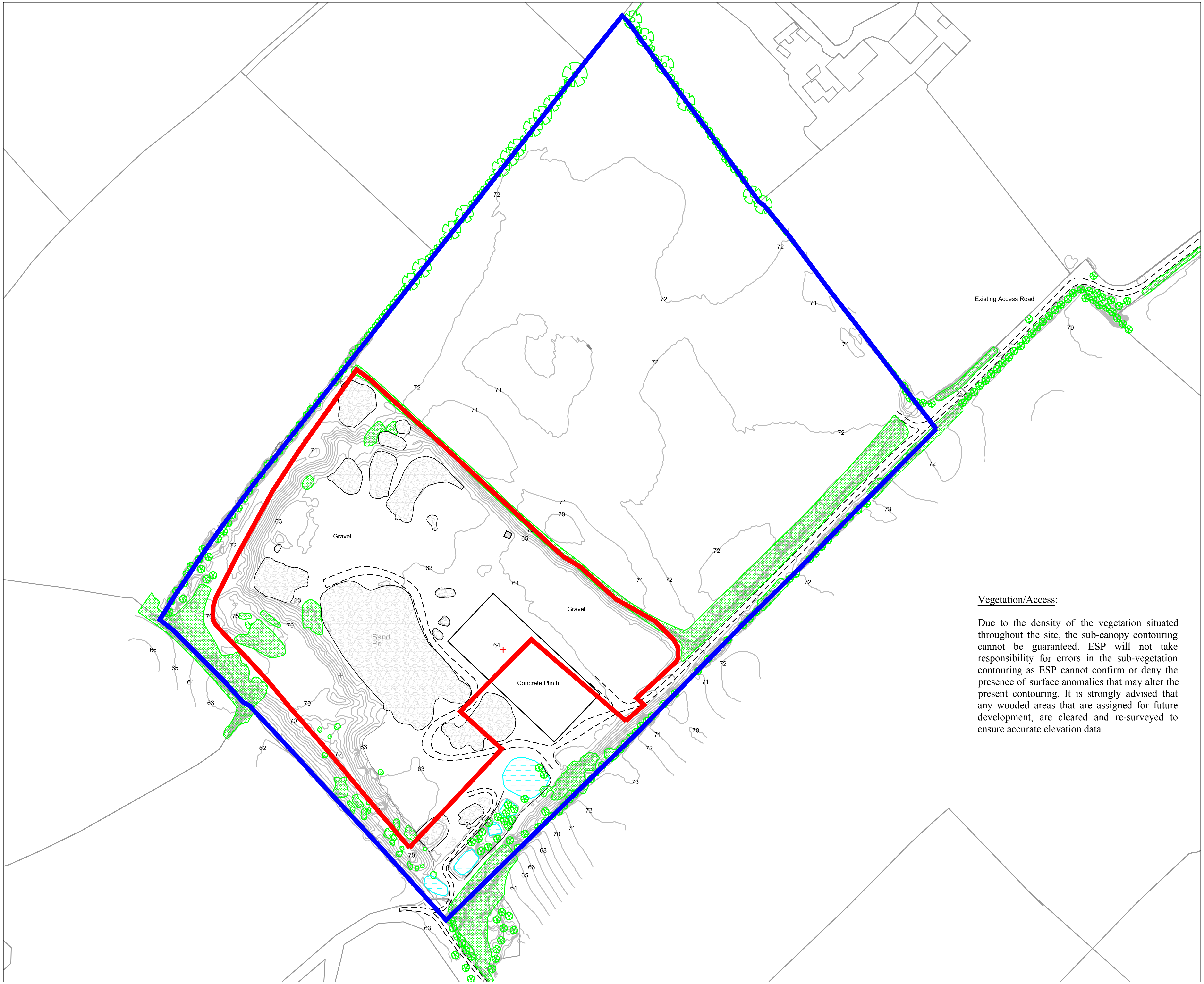
All necessary precautions would have been put in place to ensure that the operations at the pit did not impact significantly on the local environment. Noise and vibration are dealt with within Chapter 11.0 of the rEIAR.

3.3.2.18 Landscape, Restoration, Decommissioning and Aftercare

As the excavation of material at the existing pit has resulted in the creation of a void, it is important that the area is restored on completion of extraction and other activities. A Landscape and Restoration Plan for the site is drafted and included in Chapter 13.0. The Landscape & Restoration Plan consists of the following:

1. All plant and machinery where present will be removed off the site.
2. Landscaping works will be undertaken where required.
3. All site boundaries will be secured.
4. Overburden will be spread on the floor of the pit, seeded and restored to agricultural land.
5. Additional planting of trees and shrubs will be undertaken where required.

Figures



Vegetation/Access:

Due to the density of the vegetation situated throughout the site, the sub-canopy contouring cannot be guaranteed. ESP will not take responsibility for errors in the sub-vegetation contouring as ESP cannot confirm or deny the presence of surface anomalies that may alter the present contouring. It is strongly advised that any wooded areas that are assigned for future development, are cleared and re-surveyed to ensure accurate elevation data.

Legend

Ownership Boundary

Application Area
Area = 4.7 Ha

Aggregate Stockpile

Water

Vegetation

Access Road/Track

Tree Cover

N

All Levels Relative to Ordnance Datum

O.S. Map Ref No. 4475 - B

ITM Coordinates: 683027 E, 670998 N

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Tonranny Westport Co. Mayo
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Client: Kilcarrig Quarries Ltd.

Project: Remedial Environmental Impact Assessment Report to Accompany a Substitute Consent Application for a Sand & Gravel Pit Located at Roscat, Tullow, Co. Carlow

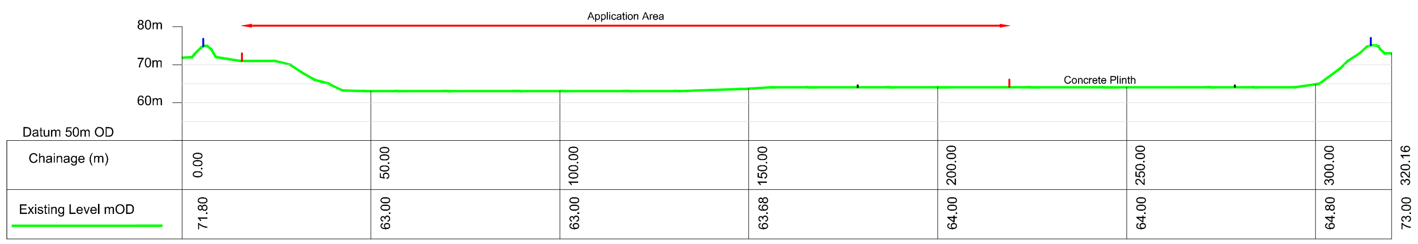
Title: Existing Site Layout Map

Drawn By: Sean O' Donnell

Checked By: Patrick O' Donnell

Scale: 1 : 2,500 @ A3	Date: Apr. 2019
Job No: EI061	Rev: 0

Figure 3.1



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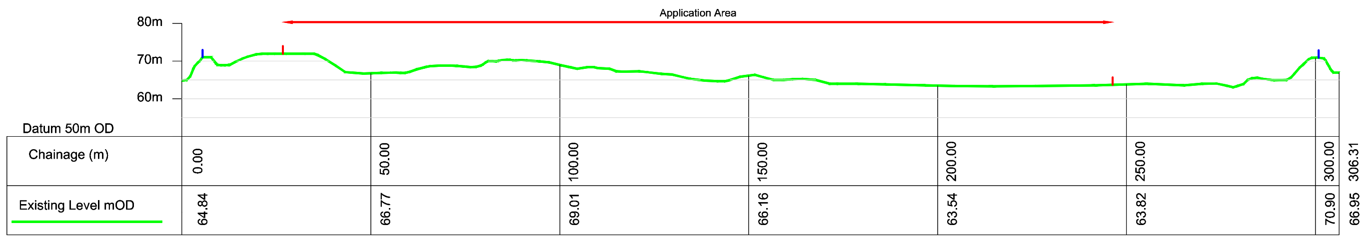
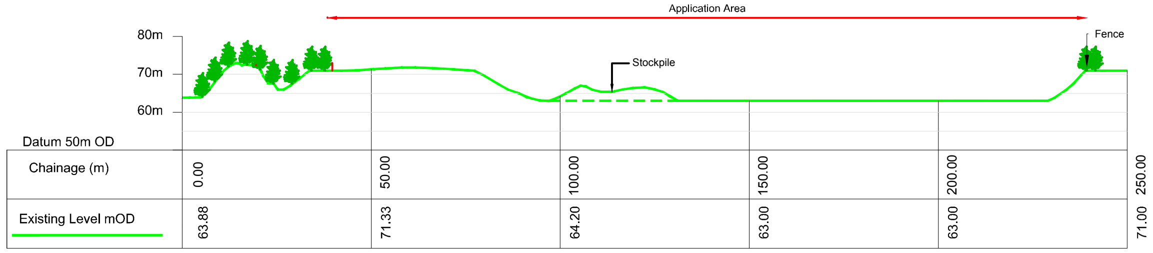
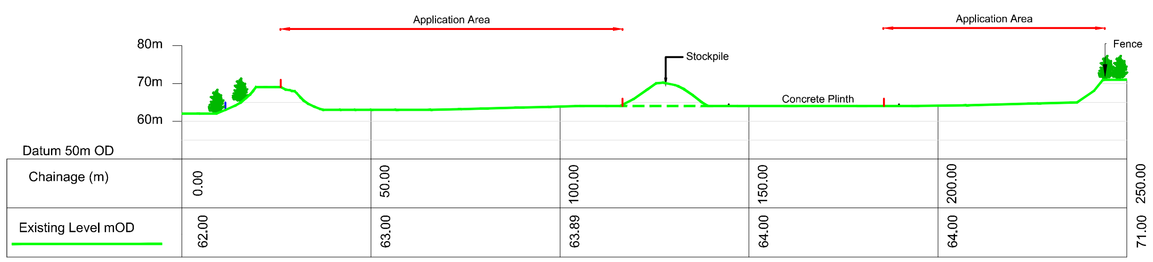


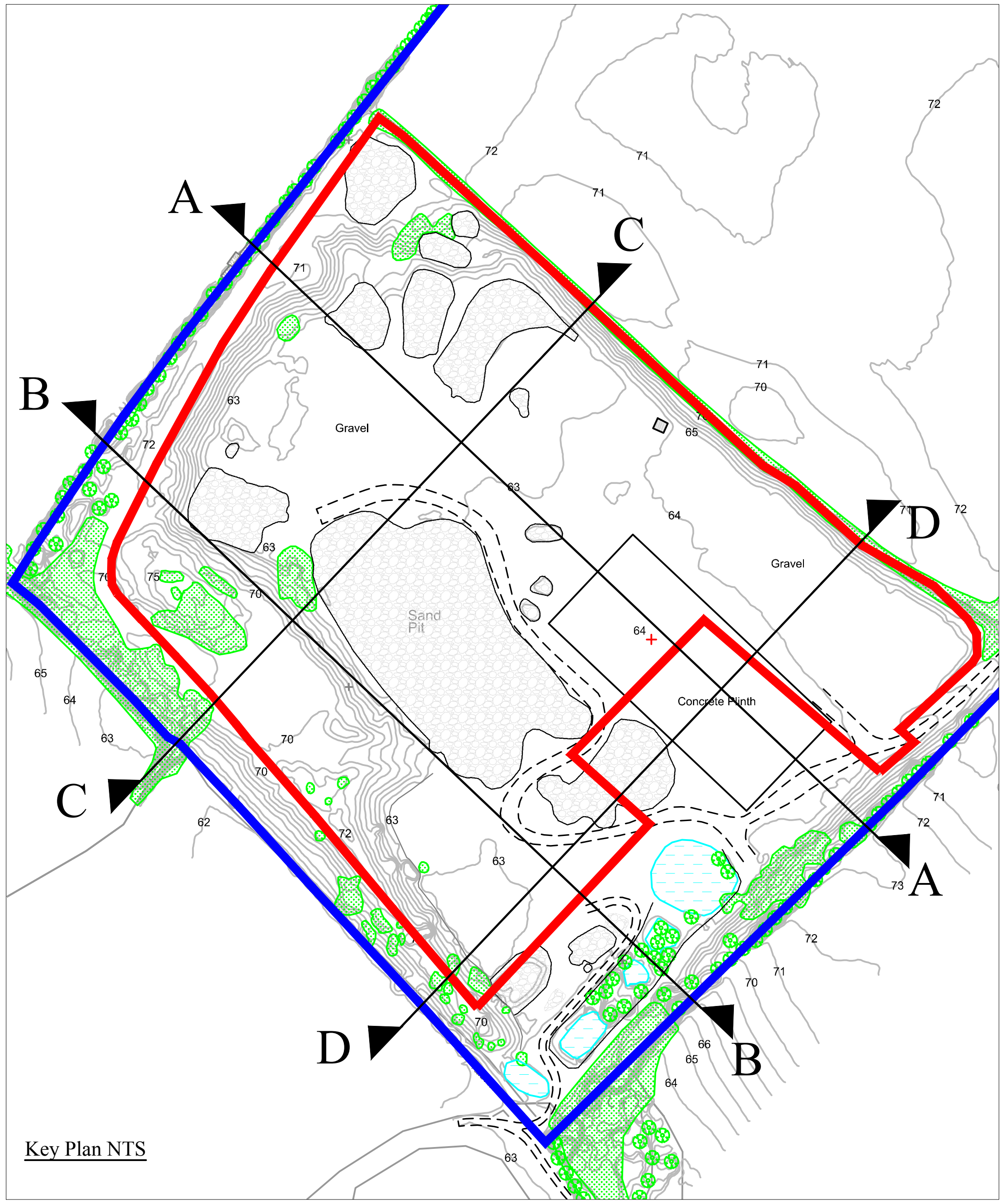
Section B - B Scale 1:2,000



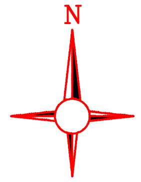
Section C - C Scale 1:2,000



Section D - D Scale 1:2,000



Key Plan NTS



Vegetation/Access:

Due to the density of the vegetation situated throughout the site, the sub-canopy contouring cannot be guaranteed. ESP will not take responsibility for errors in the sub-vegetation contouring as ESP cannot confirm or deny the presence of surface anomalies that may alter the present contouring. It is strongly advised that any wooded areas that are assigned for future development, are cleared and re-surveyed to ensure accurate elevation data.

Legend

- Ownership Boundary
- Application Area
  Area = 4.7 Ha
- Existing Level
- Aggregate Stockpile
- Water
- Vegetation
- Access Road/Track
- Tree Cover

All Levels Relative to Ordnance Datum

O.S. Map Ref No. 4475 - B

ITM Coordinates: 683027 E, 670998 N

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e-mail: earthsciencepartnership@gmail.com

Client: Kilcarrig Quarries Ltd.	
Project: Remedial Environmental Impact Assessment Report to Accompany a Substitute Consent Application for a Sand & Gravel Pit Located at Roscat, Tullow, Co. Carlow	
Title: Site Sections	
Drawn By: Sean O' Donnell	
Checked By: Patrick O' Donnell	
Scale: 1 : 2,000 @ A3	Date: Apr. 2019
Job No: EI061	Rev: 0

Figure 3.2

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4.0 PLANNING AND LEGISLATIVE FRAMEWORK

4.1 Introduction

This chapter of the rEIAR sets out the planning and development context relating to the existing sand and gravel pit development. The national, regional and local planning policy relevant to the development is also reviewed in this chapter.

4.2 Legislative Requirement

Following the decision of the European Court of Justice in the case C-215-06 on 3rd July 2008, Ireland was required to remove the facility to apply for retention planning permission in the case of projects which would have required environmental impact assessment under Directive 85/337/EEC (the Environmental Impact Assessment Directive). This decision affected a number of quarries and gravel pits who had carried out unauthorised development which would have required environmental impact assessment. Such quarries and pits would now be unable to apply for retention permission and would have no means of regularising their operations.

To deal with this, a new Substitute Consent procedure was legislated for, whereby projects requiring environmental impact assessment could apply for a form of retention. It was agreed that for a very limited period, quarries and pits which had commenced works prior to the inception of the planning system in 1964, or which had obtained a planning permission at some stage, would be permitted to apply for Substitute Consent for development which was in breach of the EIA/ Habitats Directive. This would be conditional on such quarries having registered in 2004-2005 if required to do so.

Under Section 75 of the 2010 Act, which inserts a new section 261A into the 2000 Act, each Planning Authority was required to determine which quarries in its administrative area would, having regard to the dates of implementation of the EIA Directive and the Habitats Directive, respectively, would have required an EIA, a determination in relation to EIA, and/or an appropriate assessment in relation to possible effects on the integrity of a European Natura 2000 site, but which had not undergone such an assessment/determination. Where a planning authority determined that a quarry fell within this category, the planning authority was required to make a further decision in relation to the planning status of the quarry, including registration status. Flowing from this decision, the planning authority was required either to direct the applicant to compile and submit an application for Substitute Consent to An Bord Pleanála or take enforcement action requiring the quarry to cease operations.

As stated in Chapter 1.0, Carlow County Council assessed the existing sand and gravel pit pursuant to Section 261A and determined that development was carried out after 1st February 1990 and 26th February 1997 which contravened both the EIA and Habitats Directives respectively and issued a notice with a decision under Section 261A (4)(a).

The Carlow Co. Co. Determination and Decision was appealed to An Bord Pleanala (ABP) on behalf of the then pit owner on 11th September 2012. An Bord Pleanála reviewed the Local Authority Section 261A (2)(a) Determination and Section 261A (4)(a) Decision and confirmed the Local Authority Determination and set aside the Local Authority Decision. In setting aside the decision, the Board stated that:

a) Permission was granted in respect of this quarry (Planning Authority Reg. CW7850) under Part IV of the Local Government (Planning and Development) Act 1963, and

b) The requirements in relation to registration under Section 261 of the Planning and Development Act, 2000 (as amended) were fulfilled.

Therefore it is considered that the requirements of Section 261A(3)(i) and Section 261A(3)(a)(ii) had been met.

Although the An Bord Pleanála recommendation was made by the Board in October 2013, the Planning Authority only issued direction to apply for Substitute Consent on 25th October 2018. The Section 261A(10) Notice issued under the Planning and Development Act 2000 (as amended) directed the owner and operator of the quarry to apply to An Bord Pleanála for Substitute Consent and that the application shall be accompanied by a Remedial Natura Impact Statement and a Remedial Environmental Impact Assessment Report.

4.3 Government Policy

In recent years, there has been a conscious move in Ireland towards strategic planning with various policy documents and plans introduced over the years to support strategic planning and development. Policies and objectives of the Government are contained in documents such as "*Sustainable Development: A Strategy for Ireland (1997)*", *"National Spatial Strategy 2002 – 2020"* and more recently, *"Project Ireland 2040"*. These, in turn, have derived their authority from higher order World and European Union (EU) agreed agendas and directives. Policy support filters down from national and regional levels through to specific County Development Plans and Local Area Plans (LAPs). The following planning documents are relevant to the assessment of the development:

- National Spatial Strategy 2002 – 2020
- Project Ireland 2040
- Regional Planning Guidelines for the Southern Region
- Carlow County Development Plan 2015-2021
- Carlow Local Economic and Community Plan 2016-2021
- Planning permissions relative to the site

4.3.1 The National Spatial Strategy 2002 – 2020

In early 2000, work began on the National Spatial Strategy which ended with its publication in November 2002. The National Spatial Strategy (NSS) was a 20-year strategy designed to enable every place in the country to reach its potential, no matter what its size or location. It recognised that the various regions of the country have different roles and it sought to organise and co-ordinate these roles to benefit the regions. It aimed to achieve a better balance of social, economic, physical development and population growth between regions and focused on people, places and on building communities.

In order to drive development in the regions, the NSS required that areas of sufficient scale and critical mass be built up through a network of gateways and hubs. While the National Development Plan 2000-2006 identified Dublin, Cork, Limerick/Shannon, Galway and Waterford as existing gateways, the NSS designated four new national level gateways - the towns of Dundalk and Sligo and the linked gateways of Letterkenny/(Derry) and the Midland towns of Athlone/ Tullamore/Mullingar.

This Strategy proposed to address the contrast between rapid development in the east of the Country and slower rates of development in other regions. To redress this imbalance, the Strategy identifies gateways and hubs that would have the capacity to support the stronger urban-rural structure needed to drive the development of these other regions. A review of the NSS was announced by Government on 2nd February 2017 which resulted in the new government strategy *'Project Ireland 2040'*.

4.3.2 Project Ireland 2040

Project Ireland 2040 is the Government's policy initiative which aims to provide balanced regional development and to improve the State's infrastructure. It consists of two plans. The National Planning Framework (NPF) which aims to achieve balanced regional development. This plan prioritises growth in the major cities of Dublin, Cork, Galway, Limerick and Waterford.

The second strand is the National Development Plan (NDP) 2018 – 2027. The ten year plan demonstrates the Government's commitment to meeting Ireland's infrastructure and investment needs. The NDP sets out the significant level of investment, almost €116 billion, which will underpin the National Planning Framework and drive its implementation over the ten year period.

The Government is committed to the delivery of the NPF as a blueprint for spatial planning in Ireland to 2040. In setting out a strategic framework for public capital investment, the National Development Plan will support its delivery over the next ten years. Ten National Strategic Outcomes (NSOs) are outlined in the NPF and these are illustrated on Plate 4.1 along with corresponding Strategic Investment Priorities.

A new initiative in the National Development Plan and the NPF, intended to assist with urban and rural renewal, is the establishment of a proposed new public body, the National Regeneration and Development Agency.

Plate 4-1: NPF and its NSO Outcomes and Priorities of the NDP (from: Project Ireland 2040 – National Planning Framework, 2018)

4.3.2.1 Regional Planning Guidelines

The Planning and Development Act, 2000 called for the drawing up of Regional Planning Guidelines (RPGs) which were first adopted in March 2004 as a key implementation mechanism of the Government's overall framework for achieving more balanced regional development and more strategic physical and spatial planning. The principal function for RPGs was to link national strategic spatial planning policies to the planning process at City and County Council level by co-ordinating the Development Plans of the local authorities through the Regional Planning Guidelines.

Following on from the enactment of the Local Government Reform Act 2014 a number of changes were made to the regional structures in Ireland where the eight regional authorities were dissolved. Three new Regional Assemblies came into effect on 1st January 2015, namely the Southern Regional Assembly, the Eastern and Midland Regional Assembly and the Northern and Western Regional Assembly.

4.3.2.2 Southern Regional Assembly

From 1st January 2015, there are 33 councillors appointed to the Assembly in the Southern region, 27 from constituent local authorities and 6 by virtue of their membership of the Committee of the Regions. They are not directly elected but nominated by their respective local authorities from within the Region (Table 4-1).

Table 4-1: Southern Regional Assembly Local Authorities

Region	Local Authority
South-East Region	Carlow, Kilkenny, South Tipperary, Waterford and Wexford
South-West Region	Cork City and County, Kerry
Mid-West Region	Clare, Limerick City and County, Tipperary

The main roles of the Southern Regional Assembly are to:

- Manage and monitor EU programmes of Assistance;
- To co-ordinate, promote and support strategic planning and sustainable development of the region;
- To promote effective local government and public services in the region, in conjunction with the National Oversight and Audit Commission;
- To prepare and oversee the implementation of Regional Spatial and Economic Strategies (RSES).

Carlow is part of the South East Region, which consists of counties Carlow, Kilkenny, South Tipperary, Waterford and Wexford. The South East Region is identified as a region which requires "reinforcing" and "strengthening" in the National Spatial Strategy. Carlow has significant potential for growth and development and can play an important role in regional growth and achieving balanced development. The proximate location of Carlow to the greater Dublin Area highlights Carlow's accessible location within the South East Region.

4.3.3 Carlow County Development Plan 2015 – 2021

4.3.3.1 Background

The County Development Plan (CDP) sets out a strategic spatial framework for the proper planning and sustainable development of County Carlow for the period between 2015 and 2021 and for the term beyond 2021. Carlow CDP 2015 – 2021 will provide the following:

- A sustainable spatial development strategy to guide the location of development;
- Clear guidance on the future use of land and the pattern of development over the next six years;
- A framework for the future investment in physical and social infrastructure;
- A framework for developing the county's economy;
- Management and control by indicating standards to be achieved in new developments;
- Ways to conserve and enhance the urban and rural environment and to protect the diversity of the natural and cultural landscape;
- Guidance for public and private investors in relation to land use and development;
- A framework for developing tourism in the County Carlow.

The Development Strategy of the CDP focuses on key Strategic Development Opportunities (SDOs) for the County to be supported by the policies contained within the Plan. SDO 8 of the CDP relates to the extractive industries within the county as follows:

"SDO 8 Extractive Industries
The County has a rich base of mineral resources which are of strategic importance to the local and regional economy. The Lime Quarry at Clogrennane is one of about only 4 limestone quarries in the country that has a sufficient calcium content in its limestone rock to make high grade Chemical Lime and is of national strategic importance. The County Development Plan contains a specific policy to support and protect this resource."

Furthermore, the CDP states that Carlow County Council recognises the importance of sand and gravel extractions in the economic life of the county and its importance as a valuable source of employment in parts of the county. However, it is also recognized that exploitation of deposits or mining (open cast or underground) can have significant environmental impacts on the amenities of surrounding areas. The Planning Authority will have regard to the provisions of the DoEHLG's "Quarries and Ancillary Activities; Guidelines for Planning Authorities" in the assessment and determination of development proposals.

Whether it is a new quarry or an extension to an existing, Carlow County Council must determine the need for the development in terms of national importance and the impact of the development on the local economy whilst maintaining a satisfactory balance between the needs of the building industry and the need to protect the environment. 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.

Moreover, it is the policy of Carlow County Council to:

- Provide for quarry and extractive development where it can be demonstrated that the development would not result in a reduction of the visual amenity of designated scenic area, to residential amenities or give rise to potential damage to areas of scientific, geological, botanical, zoological and other natural significance including all designated European Sites;
- Ensure compliance with the overall objectives of the Water Framework Directive in the context of quarries, mining and extractive development.

The Carlow CDP also states that in assessing an application for development (whether for a new or extension to an existing quarry or mine), the need for the development, the extent of existing authorised quarry or mining supplies available and the impact of the development on the local environment shall also be taken into consideration, together with the following:

- Developments, including associated processes, which would have a negative impact on existing / established rights of ways, walking routes or tourist, natural or recreational amenities will not be looked upon favourably;
- Nature and quantity of aggregate(s) to be extracted, including total and annual tonnage of excavated aggregate(s);
- Location – relative to dwellings or other developments, aquifers and groundwater;
- Environmentally sensitive areas, protected structures, special amenity areas and areas of archaeological potential;
- Impact on the environment, agriculture, tourism, recreational activities in the area, landscape and residential amenities;
- Noise generation and control;
- Dust generation and control;
- Impact on water table: minimisation of disturbance to the existing surface and subsurface hydrological regime shall be ensured on site and in proximity to the quarry;
- Ecology; due consideration shall also be given to sites of ecological value and designated species which lie outside designated sites;
- Transportation arrangements for products and road network in the area;
- Effects on amenity of the area and in particular residential, visual amenity;
- Natural and proposed screening of site;

- Restoration and aftercare with particular emphasis on protecting and facilitating bio-diversity.

4.3.3.2 Compliance with County Development Plan

The location of any quarry is dictated by the availability of resources at a particular location. Similarly the extent of operations on any site is dictated by the extent of those resources. In this case, the existing sand and gravel pit is located in this particular area due to the presence of available materials. The County Development Plan supports and facilitates the exploitation of aggregate resources in the County provided that they do not impact on environmental elements and residential amenity.

The existing sand and gravel pit would have provided direct and indirect local and regional employment associated with the production of construction materials and transport of these to customers. The proposal consists of an application for Substitute Consent for an area of an existing sand and gravel pit consisting of 6.02 ha registered under Section 261 (QY12/28).

The pit utilised the existing road infrastructure in the area to transport the material to market. A remedial Traffic and Transport Assessment has been compiled and included as part of the rEIAR. There are and were no built and natural heritage features and areas located within the vicinity of the pit which would have been impacted on by the existing development.

4.3.4 Carlow Local Economic and Community Plan 2016 – 2021

4.3.4.1 Background

The Local Economic and Community Plan (LECP) is a 6 year plan prepared to harness the county's many unique physical, natural and human resources, in order to improve the quality of life for all who live, work and visit the county, as the county moves into the future with confidence.

The Plan aims to improve the well-being of the people and economy of Carlow through enhanced strategic planning, better targeting of resources and more meaningful impacts for local communities. It provides the strategic framework for all publicly funded economic, local and community development programmes in the County with the objective of maximizing the social, cultural, sporting and economic development of Carlow at a regional level. The Plan includes measures to tackle poverty and exclusion and to develop opportunities for enterprise and employment, training and education, community wellbeing, rural and community development, local infrastructure and services, tourism, cultural services, innovation/R&D, natural resources, agriculture and the promotion of Carlow. The LECP is based on the following guiding principles:

- The creation of a framework for an economic and community strategy for County Carlow;
- Promotion and main-streaming of equality;
- Sustainability – promoting a more resource efficient, green and more inclusive economy;

- Maximising returns – avoiding unnecessary overlap and duplication and achieving synergies through co-operation;
- Participative planning – meaningful participation and consultation in the planning process;
- Community consultation and engagement – participation, empowerment and collective decision making to achieve change at local level;
- Community development principles – equality, participation, empowerment, collective decision making;
- Accessibility and ownership – the plan is written in a style that is open, straightforward and as accessible as possible.

These guiding principles have been developed taking into account the strategic vision of the Carlow County Development Plan 2015-2021.

4.3.4.2 Compliance with Carlow Local Economic and Community Plan

A grant of Substitute Consent would allow the applicant to apply for planning permission to further develop the pit which would sustain employment at the sand and gravel pit which in turn would lead to indirect economic development associated with employees contributing to the local businesses and economy. The existing development provided aggregate products to both local and regional developments when operational.

4.4 Planning Permissions Relative to the Site

A number of planning permissions relate to the existing site and these are listed below in chronological order.

1. **Reg. Ref. 6889:** Permission granted for development of gravel pit.

2. **Reg. Ref. CW7850:** Permission granted in 1987 by ABP for development comprising development of gravel pit (including machinery for screening, batching, mixing), an office, and septic tank at Roscat, Tullow, County Carlow subject to 12 conditions.

   - Condition no.4 restricted operations to the area indicated on the location plan submitted to the PA on 27/03/86 (c.1.3ha).

3. **Reg. Ref. PL.99.545:** Permission granted in 1999 for a new entrance to existing sand and gravel pit subject to 11 conditions.

4. **Section 261 Registration:** QY12/28 – The pit was registered in 2007 under S.261 of the Planning and Development Act, 2000 and conditions were attached.

   - Condition no.1 (b) required compliance with the conditions attached to the three previous grants of planning permission.

4.5 References

South Eastern Regional Planning Guidelines - http://www.southernassembly.ie

Carlow County Council (2015) Carlow County Development Plan 2015 – 2021
Available at: http://www.carlow.ie/wp-content/documents/uploads/carlow-county-dev-plan-2015-2021.pdf

Carlow County Council (2016) County Carlow 2021 Local Economic and Community Plan 2016-2021
Available at: https://www.localenterprise.ie/Carlow/Enterprise-Development/Local-Economic-and-Community-Plan-LECP-/LECP.pdf

Department of Environment, Heritage and Local Government (2002) National Spatial Strategy for Ireland 2002 – 2020

Department of Housing, Planning and Local Government (2001) Local Government (Planning and Development) Regulations, 2001 (S.I. No. 600 of 2001)

Department of Housing, Planning and Local Government (2018) Guidelines for Planning Authorities and An Bord Pleanala on carrying out Environmental Impact Assessment (August 2018).

Department of Housing Planning and Local Government (2018) National Planning Framework under Project Ireland 2040. Available at: www.npf.ie

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

European Union (Environmental Impact Assessment and Habitats) Regulations 2015, S.I. No 301 of 2015

Irish Concrete Federation - http://www.irishconcrete.ie

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Tables

Figures

5.0 POPULATION AND HUMAN HEALTH

5.1 Introduction

This chapter of the remedial EIAR assesses the existing environment, in addition to the potential effects on population and human health arising from the existing development.

Section 5.2 focuses on population including potential direct and indirect effects of the development with regard to principal socio-economic indicators, including population, land use, employment, tourism and residential amenity. Section 5.3 assesses the potential effects on human health associated with the existing development.

A human health risk assessment is the process of assessing the nature and probability of adverse health effects on human beings as a result of a development. This focuses on potential human health effects related to emissions associated with the existing development. Remedial measures are proposed where required to mitigate any potential effects arising from the existing development.

Other aspects of potential direct and indirect effects on human beings are also considered in the other chapters of this rEIAR which include the following:

- 8.0 - Water
- 9.0 - Air
- 10.0 - Noise and Vibration
- 12.0 - Traffic
- 13.0 - Landscape and Restoration

5.1.1 Characteristics of the Existing Development

The application site consists of an existing 4.7ha sand and gravel pit which was subject to extraction and processing of sand and gravel into various grades of aggregate. Material was extracted by excavators and passed through mobile processing plant which processed the material into various grades of aggregate. The material was then stockpiled on site and sold as aggregate. Material was also extracted, loaded directly onto trucks and transported off site to market or to an off-site location for processing.

Plant and machinery which operated in the application area consisted of tracked excavators, wheel loaders, dump trucks, mobile processing plant and road trucks to haul material off site. Ancillary plant such as a water bowser for dust suppression was deployed where required. As all production was a dry process, precipitous surface water primarily percolated through the pit floor.

The site is located in the townland of Roscat approximately 3 km south west of Tullow and 2 km east of Rathtoe. The N81 national road which connects Tullow with the N80 at Ballon passes in a north-south direction 1.5 km east of the site.

Vehicular access is off a local road and via a c.1km long gated laneway that provides access to the pit and surrounding lands. The site is surrounded by agricultural fields and a farm is located nearby.

The area immediately around the site is sparsely populated, with individual farmsteads and scattered houses along the road network. A series of irregular third class roads run around the lands, serving a number of dwellings and farms.

The existing sand and gravel pit area has been registered with Carlow County Council in accordance with the requirements of Section 261 of the Planning and Development Act, 2000 (Quarry Ref. No. QY12/28). An area of 6.02ha of the landholding was registered in this process which includes the 1.3ha area already subject to planning permission (Planning Ref.: CW7850).

5.2 Population

5.2.1 Introduction

This assessment on population includes potential direct and indirect effects of the existing development with regard to principal socio-economic indicators, including population, land use, employment, tourism and residential amenity.

5.2.2 Methodology

The assessment of impacts on human beings entails the identification of key populations which were most likely to be impacted on by day to day activities undertaken at the pit. Key populations that had the potential to be impacted upon by the development have been identified as persons residing and engaging in activities in close proximity to the existing pit, 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 chapter which are listed in Section 5.7 – References.

5.2.3 Existing Environment

The application site is located in the townland of Roscat, Tullow, Co. Carlow. The application area is situated within the Electoral Division (ED) of Tullowbeg. The nearest urban centre is the village of Tullow, Co. Carlow, which is located approximately 3km to the northeast of the sand and gravel pit. Carlow town, the nearest large urban centre, is located approximately 16km to the northwest of the site.

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. Figure 5.1 at the end of this chapter illustrates the dwellings within 1km of the proposed application site.

5.2.3.1 Population and Age Profile

Based on the latest census data (CSO, 2016), a total of 622 persons resided in the Tullowbeg ED on Census Night in 2016. The majority of the populations of the ED live in one off houses and farmsteads, which are sparsely populated throughout the ED.

The 25-44 (33.3%) age group constitutes the highest proportion of the demographic in the Tullowbeg ED (Table 5-1). Overall, the age profile of the ED is relatively comparable across with the board when equated to the County and State. However, the ED holds a slightly, but not significantly, lower proportion of the population aged 65 and over (9.6%) when compared with the County (12.9%) and State (13.4%). As such, this result gives rise to a lower dependency ratio (31%) within the ED than the County (31.5%) and State (34.5%).

Table 5-1: Proportional age profile of the Electoral Divisions of Tullowbeg ED compared with Co. Carlow and the State.

Area	0-14	15-24	25-44	45-64	65+	Dependency Ratio
Tullowbeg ED	21.4%	12.1%	33.3%	23.6%	9.6%	31.0%
Co. Carlow	22.2%	12.3%	28.7%	23.9%	12.9%	35.1%
Ireland	21.1%	12.1%	29.5%	23.8%	13.4%	34.5%

5.2.3.2 Principal Economic status

The 2016 Census results show that the Tullowbeg ED has a labour participation rate of 54.8%, which is a moderately higher proportion of the population than that of the County (45.5%) but in line with the State (53.4%).

Conversely, the Tullowbeg ED has an unemployment rate of 15.1%, which almost twice that of the County and over twice that of the State. However, these proportional results are slightly skewed relative to the County and State results due to the low population of the ED aged 15 years and over (n = 489) divided by the number of unemployed inhabitants of the ED (n=74). Labour force results (CSO, 2016) for the ED compared with the County and State results are presented in Table 5-2.

Table 5-2: Proportion of the labour force (aged 15 years and over) by principal economic status in the Electoral Divisions of Tullowbeg compared with Co. Carlow and the State.

Economic Status	Area	Tullowbeg ED	Co. Carlow	Ireland
	At work	54.8%	45.5%	53.4%
	Looking for first regular job	1%	0.9%	0.8%
	Unemployed	15.1%	8.4%	7.1%
	Student	10%	10.5%	11.4%
	Looking after home/family	5.7%	8.5%	8.1%
	Retired	9.6%	8.5%	14.5%
	Unable to work	3.7%	12.5%	4.2%
	Other	0%	5.1%	0.4%

5.2.3.3 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 5.3 below indicates that the main ‘known’ socio-economic group in the Tullowbeg ED is ‘Non-manual’ (18.5%), which is slightly higher than the County (16.8%) and roughly on par with the State (18%) (Table 5-3). Results also show that the proportions of ‘Higher’ and ‘Lower professionals’ in the ED (2.8% and 8.8% respectively) are significantly lower than those of the County (4.3% and 9.4% respectively) and State (7.1% and 11.7% respectively).

Table 5-3: Percentage Distribution of Socio-Economic Groups in Tullowbeg ED

Area	A	B	C	D	E	F	G	H	I	J	Z
Tullowbeg ED	13.7	2.8	8.8	18.5	12.4	11.4	3.0	4.3	4.5	1.0	19.7
Co. Carlow	12.8	4.3	9.4	16.8	11.6	9.2	4.3	4.7	6.1	1.3	19.6
Ireland	15.5	7.1	11.7	18.0	9.3	8.6	3.6	5.2	4.9	0.5	15.6

5.2.3.4 Employment Sources and Travel Patterns

Just over three-quarters of the population of Tullowbeg ED travelled to work, school or college by car (75.3%), as either the principal driver (50.9%) or passenger (24.4) (Table 5-4). This is moderately higher than that of the County (66.4%) and State (57.9%). Given the semi-rural location of the Tullowbeg ED, this result can be expected.

Similarly, owing to the semi-rural location, the proportions of the ED population who travel on foot (9.1%), by bicycle (0.3%) and by public transport (0.8%) are significantly lower relative to the proportions of the County and State populations (Table 5-4).

A. On foot
B. Bicycle
C. Bus, minibus or coach
D. Train, DART or LUAS
E. Motorcycle or scooter
F. Motor car: Driver
G. Motor car: Passenger
H. Van
I. Other
J. Not stated

Table 5-4: Means of travel to work, school or college by the proportion of the population (5 years +)

Area	A	B	C	D	E	F	G	H	I	J
Tullowbeg ED	9.1	0.3	1.3	0.8	0.0	50.9	24.4	7.0	0.8	5.5
Co. Carlow	14.4	1.1	5.8	1.0	0.1	42.6	23.8	5.6	0.6	5.0
Ireland	14.4	2.8	10.6	2.8	0.3	40.6	19.2	4.3	0.4	4.6

The figures relating to journey times to work, school or college by the proportion of the population (5 years +) within the ED are comparable across the board with the County and State. Given that the proximity of the of the ED to the town of Tullow is within 3 km, it is likely that the majority of the population of the ED either work or attend schools in Tullow as 40.3% of journey times are reported as being less than 15 minutes.

The second most common journey timeframe is 15 – 30 minutes, with 27.3% of the ED residents commuting this distance. With Carlow town located approximately 16km to the northwest, it is likely that the majority of the demographic within this journey-time category commute to the Carlow for employment and studies at the Carlow Institute of Technology.

Table 5-5: Journey time to work, school or college by the proportion of the population (5 years +)

Area	< 15 mins	15 – 30 mins	31 – 45 mins	46 – 60 mins	61 – 90 mins	90 + mins	Not stated
Tullowbeg ED	40.3%	27.3%	9.1%	3.4%	7.5%	4.4%	8.1%
Co. Carlow	40.3%	25.7%	12.5%	4.0%	6.0%	3.4%	8.0%
Ireland	32.3%	28.8%	17.3%	5.9%	6.0%	2.3%	7.4%

5.2.3.5 Land-Use and Housing

Table 5-6 contains CSO (2016) data on the number of private households in the ED and the number of persons in these households, compared with the County and the State. Results show that the average household size in the ED is slightly higher than the county and national average. Figure 5.1 at the end of this chapter illustrates the dwellings within 1km of the proposed application site. CSO (2016) data shows that there has been consistent building of new private houses within the ED during the past 40 years.

Table 5-6: Household formation and size

Area	No. of Households	No. of Persons in Households	Avg. Household Size
Tullowbeg ED	196	605	3.1
Co. Carlow	20,537	56,609	2.8
Ireland	1,702,289	4,676,648	2.7

The sand and gravel pit is situated in a semi-rural area with one off housing developments and farmsteads located along local roads in the vicinity of the pit. The main land use of the study area is agricultural with livestock grazing being the predominant sector practiced.

The town of Tullow is located approximately 3km to the north of the pit. The town consists of public houses, schools, a post office and a church.

5.2.3.6 Tourism, Recreation and 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. The following is a summary of key statistics from Failte Irelands report for the year ended 31st December 2017:

- 8.7m overseas tourists came to Ireland, representing a growth of 9%
- Overseas tourism expenditure grew by an estimated 9% to €4.6bn

- Volume of holiday trips taken by domestic residents was estimated at 4.8 million
- Spending by Irish people on holiday trips in Ireland rose by 5% to 1.1bn
- Almost 150k people were employed in the accommodation and food service sectors alone.

The Tourism – Objective 1 of the Carlow CDP 2015-2021 states the following:

"Carlow County Council will promote, encourage and facilitate the development of sustainable tourism through the conservation, protection and enhancement of the built and natural heritage, the protection of sensitive landscapes and cultural and community environments in order to maximise upon the economic benefits arising from the industry."

5.2.3.6.1 Local Tourism Amenities

As a primarily rural area, Carlow is ideally positioned to maximise the benefits associated with tourism while preserving the character, natural resources and environment on which the attraction of the county as a holiday destination is built. The local cultural and social landscape, which includes interpretation of local traditions and customs, can contribute to and enhance the visitor's enjoyment of their holiday, while also being sustainable for local people in the long term.

Carlow also benefits hugely from its strategic location on the east coast of Ireland within close proximity to Dublin, the country's main urban area and a major source of tourism business for the county. The completion of the M9 motorway provides easy access to Dublin, Belfast and the entire South East region. Additionally, the Carlow – Dublin and Waterford route is well serviced by bus and train operators. Carlow is also approximately 90km from the ferry and airports of Dublin, Rosslare and Waterford. Its central location offers the perfect base to explore the surrounding counties of Wexford, Kilkenny, Wicklow, Kildare and Laois.

Home to three of Ireland's key national walking routes – the South Leinster, the Barrow and the Wicklow Ways – Carlow is blessed with hundreds of miles of excellent and varied walking. The golfing visitor will find an impressive variety of golfing facilities to suit all levels while the Rivers Barrow and Slaney and their many tributaries provide exciting activities for the passive and active water enthusiast.

County Carlow is steeped in historical and archaeological artefacts from pagan sites such as the Brownshill Dolmen to ecclesiastical settlements, many of which are of national significance. The Carlow Garden Trail is another gem for visitors to enjoy featuring a collection of eighteen gardening attractions including great old gardens such as those at Altamont and smaller gardens which are maturing beautifully with time.

5.2.3.7 Social Infrastructure

There are a number of national schools located within a 10km radius of the proposed application site, the nearest of these being Scoil Naisiunta Muire Lourdes, Mill St and St Columbas National School, Tullowphelim, Tullow, both of which are located 2.9km to the north east of the application area. Ballon National School is located approximately 7.6km to the south of the application site in the village of Ballon.

Tullow Community School is the closest secondary school to the application area, located 3km to the north east in the town of Tullow. The nearest third level institute is Carlow Institute of Technology, approximately 16.5km to the north-west in Carlow town.

There is no local Garda Station in the immediate vicinity of the application area, with the closest station being Tullow Garda Station located 2.9km to the north east of the pit. The closest Fire station is Tullow City Fire Station, located approximately 3.1km to the north east of the pit.

5.2.4 Population Impact Assessment

The likely significant effects on humans associated with the development relate to the issues of socio-economic activity, human health and safety, and nuisance relating to emissions from the sand and gravel pit.

The existing development, as with similar developments of this nature, was brought about by the continued demand for construction materials. Sand and gravel extraction activities have created a long established land use in the area.

5.2.4.1 Population

The sand and gravel pit is located in an area which consists of one off dwellings and farm houses situated along local and minor roads in the vicinity. As evident in the statistical analysis of the population numbers, the average household size is slightly higher in the vicinity of the existing pit than that of the County and National average. Activities associated with sand and gravel sites can deter people from living within proximity to such developments. However, there have been a number of houses built in the vicinity of the pit in recent years.

5.2.4.2 Economic Activity

Kilcarrig Quarries Ltd. is an established employer in Co. Carlow. Their quarry development at Bagnelstown, Co. Carlow provides employment for approximately 15 people directly with a further 5 people employed indirectly. Additional personnel such as contract hauliers, maintenance contractors, material suppliers, etc. also give an additional indirect source of employment.

The existing subject site provided additional employment to the Roscat/Tullow area, therefore, the pit is deemed to have had a positive impact on the local community in terms of employment levels.

5.2.4.3 Land-Use and Housing

Prior to extraction activity commencing the land was used for agricultural purposes. The majority of land in the proximity of the application site is used for agricultural purposes with livestock grazing being the predominant activity practiced. Therefore, extraction activity has not led to a significant loss of an existing land-use in the area. A consistent number of houses have been constructed in the vicinity of the pit over the past 30-40 years, which demonstrates that extraction activity to date has not deterred people from living in the area.

5.2.4.4 Tourism, Recreation and Amenity

The pit is not located within proximity of any identified tourist attractions in the area. According to the landscape appraisal of County Carlow, the sand and gravel pit is located within the Landscape Character Area (LCA) which has been characterised as Central Lowlands (CAAS, 2015). The following Landscape Types are in the Character Area:

- broad and narrow river valleys;
- farmed lowlands and;
- farmed ridges.

The flat lowland topography of the surrounding lands aids in screening the pit from the surrounding landscape.

Quarrying activity is a long established land use of the area and has not impacted on the tourist amenity of the study area. The application area is not located on or adjacent to any Natura 2000 site or near any protected structure.

5.2.4.5 Social Infrastructure

It is unlikely that sand and gravel extraction activity significantly affected the social infrastructure of the area and may have had a positive impact as materials extracted from the pit were used to develop social infrastructure in the study area.

5.2.4.6 Site Safety

Security fencing, screening and other landscaping around the perimeter have secured the site from unauthorised access. It is proposed to further improve perimeter fencing and safety notices in order to make the site more secure. Berms have also been constructed in accordance with "Safe Quarry - Guidelines to the Safety, Health and Welfare at Work (Quarry) Regulations 2008".

5.2.4.7 Traffic

The traffic generated as a result of the pit during peak production was in the region of 20 loads per day when the pit was in full production.

5.2.4.8 Remedial Measures

The existing development was developed in a manner such that the effect on human beings was minimised.

There were no potential negative effects on tourism and amenities in the area and therefore no further remedial measures are required. Remedial measures for Air, Noise, Water, Landscape and

Visual and Material Assets included in the representative chapters of the rEIAR ensure that the existing development's effect on the receiving environment is minimised.

5.3 Human Health

5.3.1 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 rEIA Report, in particular to:

- 5.2 Population
- 8.0 Water
- 10.0 Air
- 11.0 Noise and Vibration
- 12.0 Traffic
- 13.0 Landscape and Restoration

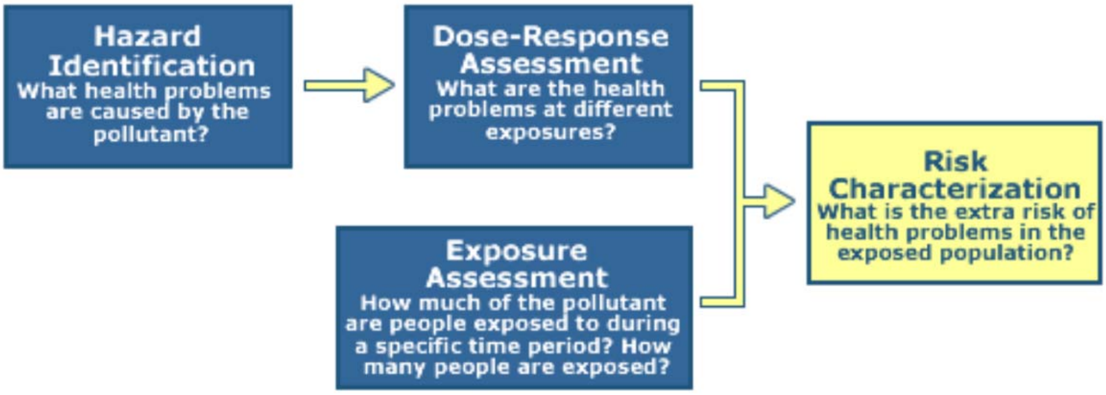
This assessment is focused on potential human health effects associated with potential emissions related to day today activities which were undertaken at the pit in the past.

5.3.2 Methodology

The methodology used in the assessment has regard to that provided by the US Environmental Prospection Agency (US EPA) in their Human Health Risk Assessment process. The assessment also has regard to the Draft Guidelines for Preparing Environmental Impact Assessment Reports (EPA, August 2017).

The Irish EPA has general guidelines on Human Health Risk Assessment, however the US guidelines benefit from being more specific and as a result more user-friendly. Nevertheless, they are entirely in keeping with those recommended by the Irish EPA. The assessment methodology advised by the US EPA follows a 4-step process which is detailed in Plate 5.1 and described thereafter.

Plate 5.1: Risk Assessment Process (United States Environmental Protection Agency)



5.3.2.1 Steps in the Risk Assessment Process

Step 1 - Hazard Identification

- Examines whether a stressor has the potential to cause harm to humans and/or ecological systems, and if so, under what circumstances.

Step 2 - Dose-Response Assessment

- Examines the relationship between exposure and effects.

Step 3 - Exposure Assessment

- Examines what is known about the frequency, timing, and levels of contact with a stressor.

Step 4 - Risk Characterisation

- Examines how well the data support conclusions about the nature and extent of the risk from exposure to environmental stressors.

5.3.2.2 Definition of Terms

The following terms are used in the assessment:

- *Agent* - A chemicals or factors in the environment to which humans are exposed that may cause adverse health effects.

- *Vulnerable / Vulnerable Groups* - An individual or group of individuals who, by nature of their age, health status or other factor is more prone to developing adverse health effects.

- *Robust* - Strong and Healthy

- *Health based Standard* - The dosage of an agent scientifically determined to protect against human health effects.

- *Threshold* - The dosage of an agent below which there is no adverse health effect.

- *PM10* - Particulate matter of diameter less than 10 µm.

- *PM2.5* - Particulate matter of diameter less than 2.5 µm.

5.3.2.3 Health Based Standards

Health based standards by their nature are set to protect against human health effects. The level at which the standard is set is chosen to protect the vulnerable, not the robust. In determining the most appropriate methodology a number of Guidance Notes were reviewed. The Irish EPA Guidance favours the Health Based Standards approach. In its publication, "*EPA Revised Draft Guidelines on the Information to be contained in Environmental Impact Statements*" (August 2017) 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.'*

These Health Based Standards will be discussed further but it is appropriate to understand the principal behind the setting of such standards. In this, it is useful to consider Guidance by the US EPA in performing a Human Risk assessment.

Baseline information gathered to date regarding emissions associated with the day to day operations of the existing development have been used as part of the assessment. These can be compared to various thresholds for air, noise, vibration etc. No detrimental health effects are expected below these thresholds.

5.3.2.4 Significance of Health Effects

There is a difficulty in assigning levels of significance to human health effects. In medicine, as in all science, we use the concept of statistical significance. That is putting a value, often in terms of percentage levels of our confidence, on the data. We would often use confidence measures of 95% or even 99% to measure our levels of certainty that any changes are not due to chance alone.

This is a valid approach for the study of the effects on a population or in large studies but is not possible in the assessment of a significant effect on human health in smaller scale projects. It does not, for example, absolutely exclude a response in an individual. This may be best explained with an example. Low levels of noise emissions from a process undertaken at the existing development may be such that the vast majority of the population do not notice it. However, an individual located within proximity may find them aggravating even when other people in exactly the same location do not.

The significance criteria used in the assessment as adapted from the Irish EPA Guidelines, are set out in Table 5-7.

Table 5-7: 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.

5.3.3 Human Health Impact Assessment

5.3.3.1 Hazard Identification

The 1.3ha sand and gravel pit came into operation in 1987 under planning permission CW7850 with the existing sand and gravel pit now covering an area of approximately 6 hectares. The following chapters of the rEIAR provide detailed information on the existing emissions relating to their respective chapter:

- 8.0 - Water
- 10.0 - Air
- 11.0 - Noise and Vibration

- 12.0 - Traffic
- 13.0 - Landscape and Restoration

Of relevance to the human health are air emissions, noise emissions, emissions to water and traffic associated with day to day activities and therefore, these are assessed as part of this chapter.

5.3.3.2 Dose-Response Assessment

Emissions to air including noise 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 based.

Thresholds are set in relation to emissions to various elements of the environment such as dust-deposition emissions to air, noise associated with day to day operations 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.

5.3.3.3 Exposure Assessment

This is the process of measuring or estimating the magnitude, frequency and duration of human exposure to an agent in the environment, or estimating future exposures for an agent that has not yet been released. An exposure assessment includes some discussion of the size, nature, and types of human populations exposed to the agent, as well as discussion of the uncertainties in the above information.

Health based standards therefore rely on the dose response concept and try to identify by scientific means the threshold below which no significant health effects would occur. When standards are scientifically set by reliable and recognised or statutory agencies, they are a useful method in assessing the impact of any proposed change.

Health standards are not established based on the threshold to protect the robust members of the population, who may be more resilient, but are primarily there to protect the vulnerable. They are to protect the elderly, the very young, and the ill and by extension thereby, the robust are not affected.

5.3.3.4 Risk Characterisation

Risk characterisation is the fourth step of the risk assessment process, integrating information from the exposure assessment and the hazard characterisation to produce the judgment as to the nature and presence or absence of risks. In practice, each component of the risk assessment (e.g. hazard assessment, dose-response assessment, exposure assessment) has an individual risk characterization written to carry forward the key findings, assumptions, limitations and uncertainties.

It involves comparing the predicted impacts of the change in the environment associated with the development and comparing those predicted changes with the relevant health based standards. It can be assumed that provided the predicted changes do not result in exceedances of the health based standards that there will be no significant risk.

5.3.3.4.1 Assessment of Impacts Associated with Emissions to Water

The potential impacts of the proposed development on the water environment have been assessed in Chapter 8.0 of the rEIAR and remedial measures are proposed in order to safeguard the water environment.

Assessment of Effect

Given that there was no effect on water quality standards, the effects on human health from water are assessed as Imperceptible.

5.3.3.4.2 Assessment of Impacts Associated with Emissions to Air

The potential impacts of the proposed development on the water environment have been assessed in Chapter 10.0 of the rEIAR and remedial measures are proposed in order to safeguard the water environment.

Assessment of Effect

Modelled emissions associated with the pit when operational 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 associated with previous activity is assessed as being imperceptible.

5.3.3.4.3 Assessment of Impacts Associated with Noise

As detailed in Chapter 11.0 of this EIAR, a noise assessment undertaken at the application area shows that the pit was compliant with the limits of 55dB(A) L_{Aeg} (60 minutes) daytime and 45dB(A) L_{Aeg} (60 minutes) night-time.

The assessments concluded that there was no significant noise impact as a result of the day to day activities that were undertaken at existing development.

Assessment of Effect

The human health effects on all receptors arising from noise are assessed as being Imperceptible.

5.3.3.4.4 Assessment of Impacts Associated with Traffic

The existing sand and gravel pit development generates a number of traffic movements associated with the transport of material to and from the pit to market. The historical traffic movements associated with the existing development were approximately 20 per day when the pit is at full production.

Assessment of Effect

It is concluded that the relatively low volumes of traffic that were generated by the existing development would have had a slight impact on the surrounding local highway network, which would have operated well within capacity.

5.4 Remedial Measures

No remedial measures other than those detailed in the following chapters of this rEIAR are required:

8.0 – Water
10.0 – Air
11.0 – Noise and Vibration
12.0 – Traffic
13.0 – Landscape and Restoration

5.5 Residual Effects

The assessment concludes that the existing development did not give rise to effects on human health.

5.6 References

CAAS Ltd (2015) Carlow County Landscape Character Assessment and Schedule of Protected Views. Carlow County Council.
Available at: http://www.carlow.ie/wp-content/documents/uploads/carlow-county-development-plan-appendix-6-landscape-character-assessment.pdf

Carlow County Council (2015) Carlow County Development Plan 2015 – 2021
Available at: http://www.carlow.ie/wp-content/documents/uploads/carlow-county-dev-plan-2015-2021.pdf

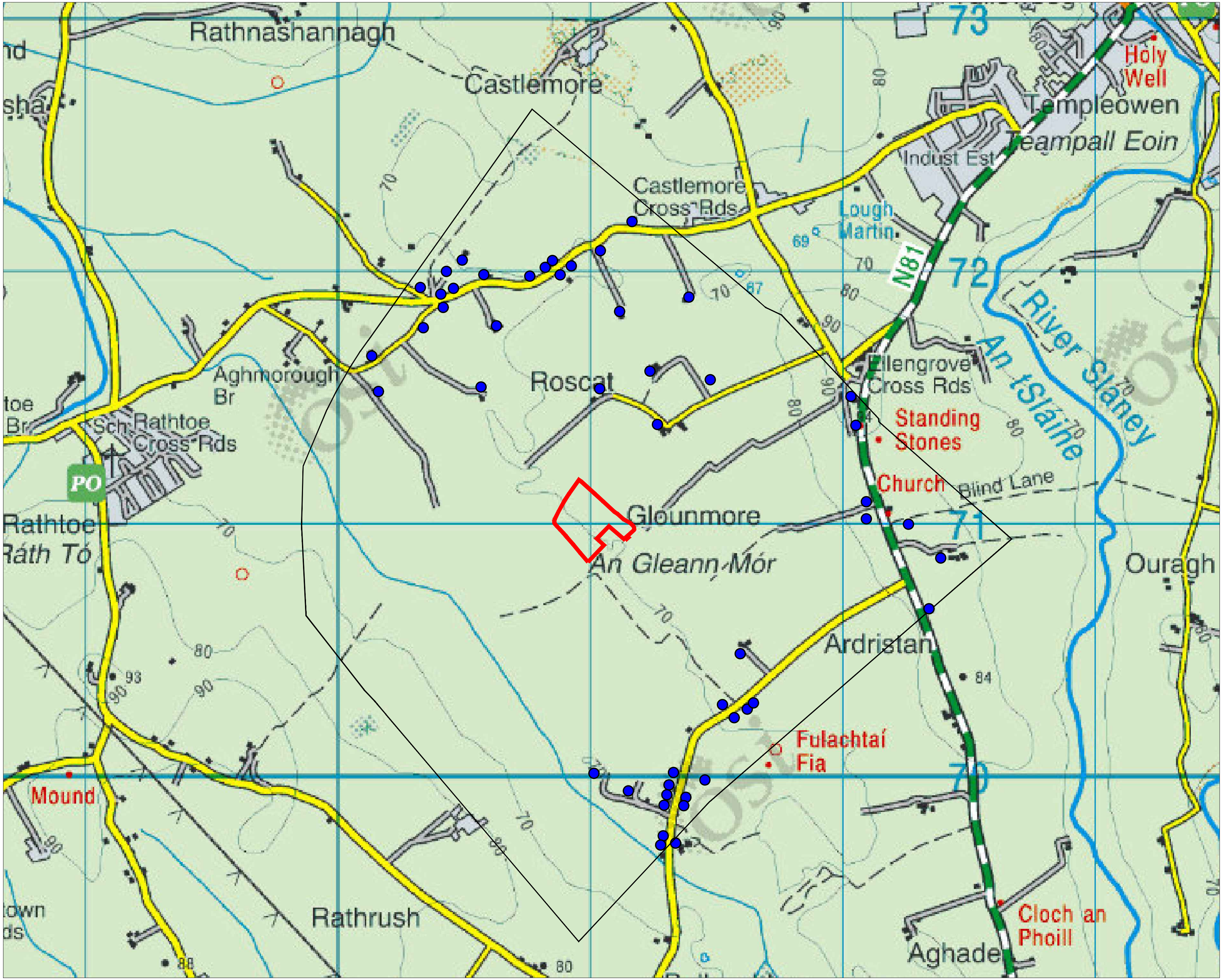
Central Statistics Office (2016) – Results of the 2016 Census - www.cso.ie

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

Fáilte Ireland (2016) - Domestic Tourism 2015 An overview of Irish residents' travel within the Republic of Ireland

United States Environmental Protection Agency - Conducting a Human Health Risk Assessment - https://www.epa.gov/

Figures



Legend

Application Area
Area = 4.7 Ha

Dwelling Location

1Km off Application Boundary

N

All Levels Relative to Ordnance Datum

O.S. Map Ref No. 4475 - B

ITM Coordinates: 683027 E, 670998 N

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Client: Kilcarrig Quarries Ltd.

Project: Remedial Environmental Impact Assessment Report to Accompany a Substitute Consent Application for a Sand & Gravel Pit Located at Roscat, Tullow, Co. Carlow

Project: Dwellings within 1km of Application Site

Drawn By: Sean O' Donnell

Checked By: Patrick O' Donnell

Scale: 1 : 20,000 @ A4	Date: Apr. 2019
Job No: EI061	Rev: 0

Figure 5.1

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6.0 BIODIVERSITY

6.1 Introduction

This chapter appraises the likely significant effects of historic operational works of the existing sand and gravel pit on the receiving environment. Where likely significant effects are identified, appropriate remedial measures to reduce / avoid these effects are outlined.

A separate remedial Natura Impact Statement (rNIS) has been produced, which evaluates the potential for significant effects of historic operations on the Natura 2000 sites within 15 km of the Substitute Consent application area and accompanies the Substitute Consent application as a separate document.

The Substitute Consent site consists of an existing 4.7ha sand and gravel pit, which is an unauthorised extension to a 1.3ha sand and gravel pit authorised by planning permission CW7850.

Please refer to Chapter 3.0 Project Description for a comprehensive overview of the site location and characteristics of the existing development.

6.1.1 Statement of Competency

<u>Ms Sarah Ingham MSc BSc (Hons.) ACIEEM</u>

Ms Sarah Ingham worked as an Ecologist and Project Manager with an environmental consultancy in the west of Ireland from early 2014 prior to taking up her current post of Senior Ecologist with Earth Science Partnership Ireland in November 2017. Ms Ingham 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 Ingham 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 Ingham 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 Ingham 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.

In her current role with Earth Science Partnership, Ms Ingham has sole responsibility for the management and output of all ecological elements of engineering projects which come through the office, as well as sourcing new clients and tendering for environmental work.

Ms Ingham is an Associate Member of the Chartered Institute of Ecology and Environmental Management (ACIEEM) and sits on the Irish Section Committee of CIEEM.

6.2 Materials and Methods

6.2.1 Desktop Review of Existing Data

A desktop review was carried out to identify features of ecological importance within the receiving environment of the existing sand and gravel pit.

A review of the extent of sites designated for nature conservation was carried out by examining the most recent updates of GIS shapefiles downloaded from the NPWS website and exploring these within QGIS 2.18.15. 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, as per published guidance in the Department of the Environment and Local Government (2009).

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);
- Carlow County Council (CCC);
- Inland Fisheries Ireland (IFI);
- Inland Waterways Association of Ireland (IWAI);
- National Parks and Wildlife Service (NPWS);
- Water Framework Directive (WFD);
- National Biodiversity Data Centre (NBDC);
- BirdWatch Ireland (BWI);
- Bat Conservation Ireland (BCI).

Furthermore, a comprehensive examination and comparison of historic aerial imagery, which is publically available on the online resource, GeoHive (http://map.geohive.ie/), was undertaken as a means of evaluating the expansion of the Substitute Consent area at 5 year intervals from 1995 to present and the habitats which previously occurred within that area. The following base information mapping was evaluated:

- Aerial imagery 1995
- Aerial imagery 2000
- Aerial imagery 2005
- Digital Globe 2017

6.2.2 Consultation

A Screening and Scoping document in relation to the full rEIAR, outlining the complete project description and potential effects of the project, was forwarded to the Development Applications Unit (DAU) 26th October 2018, which in turn disseminated the information to the National Parks and Wildlife Service (NPWS). At the time of writing (December 2018) formal written response has not yet been received from the DAU/NPWS.

6.2.3 Site Survey

The existing quarry site was visited by Senior Ecologist, Ms Sarah Ingham MSc. ACIEEM of Earth Science Partnership Ireland, on 25th May 2018 (see Figure 6.1 at the end of this chapter for geographical context of the site). In order to evaluate likely significant effects of historic operations on ecological receptors in the receiving environment, a number of survey area extents were required. These comprised the Substitute Consent application area (see Figure 6.2 at the end of this chapter) plus, if applicable, a wider survey area extent as recommended by specific published Best Practice guidance for specific ecological receptors. 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 6-1. The weather on the day of the survey was dry allowing for good visibility and an above average temperature of 25/28 º C.

Table 6.1: 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 Substitute Consent application area only.	Professional judgement and as per Best Practice (CIEEM, 2016).
Birds	The Substitute Consent application area only.	Professional judgement and as per Best Practice (CIEEM, 2016).
Non-volant Mammals	The Substitute Consent application area only.	Badgers, as per Best Practice guidelines published by the NRA (2005). Other mammal species, professional judgement and as per Best Practice (CIEEM, 2016).
Bats	Desk study only of hectad S87 within which Substitute Consent application area is located.	Professional judgement and as per: "*Bat Surveys for Professional Ecologists: Good Practice Guidelines,* Collins, (2016)".
Amphibians / Reptiles	The Substitute Consent application area only.	Professional judgement and as per Best Practice (CIEEM, 2016).
Invertebrates	The Substitute Consent application area only.	Professional judgement and as per Best Practice (CIEEM, 2016).

6.2.4 Habitat Survey and Evaluation

A Phase I habitat survey was undertaken to inform an ecological evaluation of the habitats present within the existing 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 6-2 below for an outline of this evaluation scheme).

6.2.5 Fauna Survey and Evaluation

6.2.5.1 *Birds*

A list of avifauna, mainly passerine species both seen and heard within the study area, was recorded.

6.2.5.2 *Non-Volant Mammals*

November – April is the most optimum survey period for identifying signs of non-volant mammal presence (NRA, 2005). However, given the late climatic spring of 2018 and the consequential delayed growth in vegetation, professional judgement deemed that mammal surveys undertaken in May would suffice. As such, a badger survey was undertaken within the boundaries of the Substitute Consent area to check for the presence of active or disused badger setts.

An otter survey was conducted along 300m of the Roscat Stream which is located approximately 520m to the south west of the Substitute Consent area. Any tracks and signs encountered along the stream transect was recorded. 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*) were also noted.

6.2.5.3 *Bats*

As there are no sites designated for the protection of Lesser Horseshoe Bats within a 15km radius of the Substitute Consent application area, it was not deemed necessary to undertake bat surveys within the site. However, a desktop review of bat species records within hectad S87 (NBDC, 2018) was undertaken within which the Substitute Consent application area is located.

There were no buildings within 150m of the application area boundary, as such, a preliminary bat roost potential survey was not required.

6.2.5.4 *Amphibians and Reptiles*

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

6.2.5.5 *Invertebrates*

A survey of suitable habitat of invertebrate species was undertaken during the site ecology walkover survey.

6.2.5.6 *Water Quality and Aquatic Ecology*

A hydrology report to accompany this application was prepared by hydrogeologist, Dr Colin O'Reilly PhD (see Chapter 8.0 Water). Effects of water quality on the aquatic ecology within the local environment were extracted from the hydrology report.

A desk-top review on the distribution of freshwater aquatic species within the local hydrological environment was also undertaken by accessing the online data resources of the National Biodiversity Data Centre and the National Parks and Wildlife Service, the findings of which are presented in Section 6.4.1.

6.2.6 Criteria for Evaluating Likely Significant Effects

The significance of a likely effect which could have occurred during past operations at the site 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 Substitute Consent area has been appraised in terms of current habitat types and the habitats which were present prior to excavation activities onsite 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 6-2 in Section 6.2.6.1 below, outlines criteria for evaluating the significance of effects on at various geographical scales.

6.2.6.1 *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 6-2 below and is taken from the NRA publication "*Guidelines for the Assessment of the Ecological Impacts of National Road Schemes*" (NRA, 2009).

Table 6.2: 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. • Ramsar Site (Convention on Wetlands of International Importance Especially Waterfowl Habitat 1971). • World Heritage Site (Convention for the Protection of World Cultural and 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.

Ecological Valuation	Criteria
	• 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. • 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	• Locally important populations of priority species or habitats or

Ecological Valuation	Criteria
(Higher Value)	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 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.

6.2.6.2 *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 (2017) "*Draft Revised Guidelines on the Information to be contained in Environmental Impact Statements*" are presented in Tables 6-3 – 6-7 below.

Table 6.3: Quality of Effects (adapted from EPA, 2017)

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 6.4: Significance of Effects (adapted from EPA, 2017)

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.
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 6.5: Duration of Effects (adapted from EPA, 2017)

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 6.6: Probability of Effects (adapted from EPA, 2017)

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 6.7: Magnitude of Effects (adapted from EPA, 2017)

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 6-5).
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?)?

6.3 Receiving Environment

6.3.1 Designated Sites

6.3.1.1 *Natura 2000 Sites*

There are 3 EU designated sites located within a 15km radius of the application area (Tables 6-8). Figure 6.3 at the end of this chapter shows the locations of these sites relative to the application area.

Table 6.8: EU designated SACs located within a 15km radius of the Substitute Consent application area at Roscat, Tullow, Co. Carlow.

EU Designated SACs and Site Code	Distance and direction from the Substitute Consent application area
Slaney River Valley SAC (Site Code: 000781)	1.8km east
River Barrow And River Nore SAC (Site Code: 002162)	12.7km west
Blackstairs Mountains SAC (Site Code: 000770)	14.2km south

A hydrological connection exists between the River Barrow and River Nore SAC and the Substitute Consent application area via the Roscat Stream which is located approximately 520m to the west of the Substitute Consent application area. The Roscat Stream flows in a north-westerly direction towards its confluence with the Burren River, which flows into the River Barrow in Carlow town. The total hydrological distance between the application area and the SAC is 15.5km, which provides a potential, albeit weak, source-pathway-receptor link between the two.

There are no further hydrological connections between the Substitute Consent application area and the identified Natura 2000 sites.

A remedial Natura Impact Statement (rNIS), which evaluates the likely significant effects the historical development may have had on the above listed European sites, is included in the planning application.

Evaluation: EU designated sites are of International Importance.

6.3.1.2 *Nationally Designated Sites*

There are no Natural Heritage Areas (NHAs) located within a 15km radius of the application area. However, there are 8 proposed Natural Heritage Areas (pNHAs) in the 15km radius of the application area (Table 6-9). Figure 6.4 at the end of this chapter shows the locations of these designated sites relative to the Substitute Consent application area.

Table 6.9: Proposed Natural Heritage Areas (pNHA) located within a 15km radius of the Substitute Consent application area at Roscat, Tullow, Co. Carlow.

Proposed Natural Heritage Areas and Site Code	Distance and direction from the Substitute Consent application area
Ardristan Fen pNHA (Site Code: 000788)	0 km
Slaney River Valley pNHA (Site Code: 000781)	4 km south east
Oakpark pNHA (Site Code: 000810)	12.8 km northwest
Cloghristick Wood pNHA (Site Code: 000806)	12.9 km west
Ballymoon Esker pNHA (Site Code: 000797)	13.6 km southwest
John's Hill pNHA (Site Code: 000808)	13.6 km south east
Blackstairs Mountains pNHA (Site Code: 000770)	14.2 km south
Baggot's Wood pNHA (Site Code: 000792)	14.7 km northeast

Ardristan Fen pNHA is due south of the application site, with the western portion of the fen extending from the Roscat Stream to the southern boundary of the application area at which point there is a slight overlap between the pNHA and the application area. The mapped extents appear to be based on peat area as per Figure 8.3 in Chapter 8.0 - Water. It is unclear if these extents have been ground-truthed by the NPWS as part of the designation process.

A fen is a peat-substrate wetland fed by mineral-rich, basic groundwater. It typically occurs on undulating lowlands, predominantly Carboniferous limestone glacial drifts. Within this geological landscape fens tend to form in river valleys and poorly drained hollows, as well as adjacent to raised bogs, and have an average depth of 1-2m (Hammond, 1981). Sphagnum peat is not found on fen peats because of the continued flushing with groundwater.

Local hydrology is an important element in peat formation as the wetland conditions are maintained by groundwater levels being close to, or above, ground surface. Ardristan Fen is fed by a series of springs around its periphery, predominantly on the northern side. The site survey of Ardristan Fen carried out as part of this study was undertaken in summer 2018 during what has been recognised as an extensive drought period and the lower water table was likely the reason for these springs not being observed at this time.

Historical mapping (OSI 6" and 25" maps) suggests that Ardristan Fen was formerly a more extensive area of seasonally saturated fen and marshland that developed in a topographical depression. The historical marsh extents correspond with the peat-based NPWS extents outlined in Figure 8.3 in Chapter 8.0 – Water.

It is important to note that in relatively recent times the area has undergone significant arterial drainage, presumably by local landowners. Reclamation of drained lands has been ongoing since 1975 and aerial photography (Figure 8.3) shows the result of this is prevalence of improved grassland. The arterial drains shown in Figure 8.3 intercept the water table and transmit these waters in a general southwest direction toward the Roscat Stream. This is fairly typical in Ireland where undisturbed fens are very rare, with most having been drained and cultivated.

There is no hydrological surface or groundwater connectivity between the Substitute Consent application area and any of the other identified pNHAs within a 15km radius.

Evaluation: NHAs and proposed NHAs are of National Importance.

6.3.2 Habitats in the Receiving Environment

The previous (pre-operational) and current habitats recorded within the Substitute Consent application area are presented and evaluated in Table 6-10 and Table 6-11, respectively, as per *"Guidelines for Assessment of Ecological Impacts of National Road Schemes"* (NRA, 2009; please see Table 6-2 for an outline of the geographic frame of reference valuation scheme).

6.3.2.1 *Pre-Operational Habitats*

A combination of detailed examination of aerial imagery (1995, 2000 and 2005) and an assessment of the soils and geology of the application site, allowed for pre-operational habitats to be categorized as per Fossitt (2000). These are illustrated in Figure 6.5 at the end of this chapter. Each habitat is also described and evaluated individually in Sections 6.3.2.1.1 – 6.3.2.1.2.

Table 6.10: Summary of previous (pre-operational) habitats which would have been present within the Substitute Consent application area classified as per Fossitt (2000), their respective evaluations as per NRA (2009) and their respective correspondence, if any, to EU Annex I Habitats.

Fossitt Code	Habitat Type	Habitat Evaluation	Correspondence to EU Annex I Habitats
GA1	Improved agricultural grassland	Local Importance (Lower Value)	N/A
GS4	Wet grassland	Local Importance (Higher Value)	Although wet grassland may be classified as corresponding with the Annex I habitat Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) [6410], given the shallow, well-drained mineral soils with alkaline signature beneath the site, it is not likely that this example of wet grassland was of Annex I quality.

6.3.2.1.1 Improved agricultural grassland (GA1)

As illustrated in Figure 6.5, the dominant habitat within the Substitute Consent area prior to the expansion of extraction works was improved agricultural grassland (GA1). It is not known if this land was used for growing arable crops or as grazing pasture for livestock. Nonetheless, the monoculture of this agricultural land was of low ecological value.

Evaluation: It is concluded that the improved agricultural grassland (GA1) which was present onsite prior to excavation works was of low ecological value and as such is evaluated that it would have been of Local Importance (Lower Value).

6.3.2.1.2 Wet grassland (GS4)

As also illustrated in Figure 6.5, there was a relatively small area of what is assumed to be wet grassland in the middle of the western boundary of the Substitute Consent area. From the assessment of aerial imagery taken in 1995, this habitat appears to be an extension of the adjacent Ardristan fen (Figure 6.5). As the aerial imagery from 1995 is in black and white, this cannot be fully confirmed, however, given the shallow, well-drained mineral soils with alkaline signature beneath the majority of the site and that there also appeared to be drainage along western boundary of the site, it is likely that this habitat was not fen but indeed, wet grassland.

Evaluation: It is concluded that this area of wet grassland (GS4) which was present onsite prior to excavation works had some potential ecological value given the general botanical diversity of wet grassland habitats. However, given its limited size and that it most likely suffered from drainage, it is evaluated that it would have been of Local Importance (Lower Value).

6.3.2.2 *Existing Habitats*

As above, current habitats existing onsite have been categorized as per Fossitt (2000) and are illustrated in Figure 6.6 at the end of this chapter. Each habitat is then described and evaluated individually in Sections 6.3.2.2.1 – 6.3.2.2.8.

Table 6.11: Summary of current habitats recorded during the Phase 1 habitat survey within the Substitute Consent application area classified as per Fossitt (2000), their respective evaluations as per NRA (2009) and their respective correspondence, if any, 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
ED1	Exposed sand, gravel or till	Local Importance (Higher Value)	N/A
ED3	Recolonising bare ground	Local Importance (Lower Value)	N/A
ED4	Active quarries and mines	Local Importance (Lower Value)	N/A
FL8	Artificial lakes and ponds (settlement lagoons)	Local Importance (Higher Value)	N/A
WL1/WL2	Hedgerows	Local Importance (Higher Value)	N/A
WS1	Scrub	Local Importance (Higher Value)	Although some scrub may be classified as a corresponding Annex I habitat and this example of scrub is a higher value semi-natural habitat, given the absence of heath and calcareous grassland, there is no correspondence with the EU Annex I habitat *Juniperus communis* formations on heaths or calcareous grasslands [5130].

6.3.2.2.1 Buildings and artificial surfaces (BL3)

The paved access track (BL3) runs from the main entrance to the site coming from the N81 road and along the south-eastern boundary of the application area (Plate 6-1). As with the adjacent arable field, the track is bordered on both sides by mature hedgerows and treelines.

Plate 6.1: The access track (BL3) to the application area.

Evaluation: The access track, which is categorized as BL3 is considered to be of low ecological value and as such is evaluated as being of Local Importance (Lower Value).

6.3.2.2.2 Exposed sand, gravel or till (ED1)

This category includes natural or artificial exposures of unconsolidated coarse or mixed sediment. Sand and gravel are mostly made up of sediment particles that are less than 16mm in diameter. Till, or boulder clay, is an unsorted mixture of pebbles, cobbles or boulders in a matrix of finer material such as sand, silt or clay. Most exposures of these sediments are associated with sand and gravel pits (Fossitt, 2000).

There are a number of stockpiles of exposed sand and gravel within the worked area of the application site. A breeding Sand Martin (*Riparia riparia*) colony exists in the largest stockpile, which is located in the southwest of the worked area (Plate 6-2). There were approximately 50 nest entrances recorded within the colony.

Some of these stockpiles have become sparsely vegetated with various recolonising species such as Colt's Foot (*Tussilago farfara*), Scutch Grass (*Elymus repens*), Common Poppy (*Papaver rhoeas*) and Creeping Buttercup (*Ranunculus repens*) (Plate 6-3).

Plate 6.3: Sparsely vegetated sand stockpile containing a breeding Sand Martin colony.

Plate 6.2: One of a number of sand/gravel stockpiles within the worked area of the application site.

Evaluation: Given that presence of a breeding colony of Sand Martin within this habitat, onsite exposed sand, gravel and till is considered to be of Local Importance (Higher Value).

6.3.2.2.3 Recolonising bare ground (ED3)

This category is used for any areas where bare or disturbed ground, derelict sites or artificial surfaces of tarmac, concrete or hard core have been invaded by herbaceous plants. Vegetation cover should be greater than 50% for inclusion in this category.

There are a number of areas of recolonising bare ground throughout the worked section of the application area. These mainly occur along the boundaries of the worked area where sand and gravel have been extracted and the exposed faces have been left to recolonise. The largest area of this habitat is located in the south-eastern section of the worked section where overburden from the original pit was placed and levelled (Plate 6-4). The recolonization is patchy and the sward is low suggesting that the sandy substrate is not particularly fertile. Typical colonising species occur such as Greater Plantain (*Plantago major*), Knotgrass (*Polygonum aviculare*), Pineappleweed (*Matricaria discoidea*) and Shepherd's-purse (*Capsella bursa-pastoris*). Grasses are usually also present but should not dominate.

Plate 6.4: Recolonising bare ground in the south-western section of the worked area of the application site.

Evaluation: Given its low species diversity and tight sward, recolonising bare ground is considered to be of Local Importance (Lower Value).

6.3.2.2.4 Active quarries and mines (ED4)

This category is used for all active rock or sediment quarries (including gravel pits) and mines, or parts of these, where levels of disturbance are so high that colonisation by plants and animals is almost entirely prevented.

This habitat is the second most dominant habitat within the application area (Plate 6-5). Sand and gravel were extracted from this area in the past; however, the area has not been worked on an ongoing basis since approximately 2008. Nonetheless, the substrate of compacted gravel has only been colonised very sparsely by typical colonisers and weed plants such as Greater Plantain *(Plantago major)*, Knotgrass *(Polygonum aviculare)*, Pineappleweed *(Matricaria discoidea)* and Shepherd's-purse *(Capsella bursa-pastoris)*.

Plate 6.5: The central area of the worked sand and gravel pit within the south-western half of the application area which can be categorised as ED4 owing to the lack of colonisation of plants.

Evaluation: Given its lack of recolonization this area of the sand and gravel pit is considered to be of Local Importance (Lower Value).

6.3.2.2.5 Scrub (WS1)

This 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. Scrub frequently develops as a precursor to woodland and is often found in inaccessible locations, or on abandoned or marginal farmland.

Pockets of scrub habitat occur at various locations within the worked area of the application site primarily in the southwest of the site along the boundary and on an area of overburden also in that area (Plate 6-6). The species composition of the scrub habitat is primarily willow (*Salix spp*.) and gorse (*Ulex europaeus*). This habitat is of benefit to breeding birds for nesting and foraging purposes.

Evaluation: 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]. Given its foraging and nesting potential for general breeding bird species, scrub habitat is considered to be of Local Importance (Higher Value).

Plate 6.6: Patches of scrub occur primarily in the southern section of the worked area of the site.

6.3.2.2.6 Protected Flora

No rare or protected plant species were found during the Phase I habitat survey. There are no Flora Protection Order records within hectad S87 within which the Substitute Consent application area is situated (NDBC, 2018).

6.3.2.2.7 Invasive Plant Species

No invasive plant species were found during the Phase I habitat survey. Records of the high impact invasive species, Japanese Knotweed (*Fallopia japonica*) and Rhododendron (*Rhododendron ponticum*), were registered in 2010 and 2007 within hectad S87 (NDBC, 2018).

6.3.3 Fauna in the Receiving Environment

Fauna which would have existed within the Substitute Consent area prior to operations according to the habitats which were present at the time are described and evaluated as per the EPA Guidelines (EPA, 2017) in sub-section 6.3.3.1. Existing fauna recorded during the site survey are described and evaluated in the subsequent sub-section 6.3.3.2.

6.3.3.1 *Pre-Operational Fauna*

6.3.3.1.1 Birds

Given the habitats present onsite prior to the extraction works, avifauna within the Substitute Consent area would have been limited primarily to general passerine species using the hedgerows surrounding the site and the small area of wet grassland for nesting and foraging.

The hedgerows surrounding the Substitute Consent area have remained intact throughout operations and as such, birds using these would not have been affected by the historical operations.

The current colony of breeding Sand Martins would not have been present onsite prior to operations within the Substitute Consent area as the suitable habitat in the form of exposed stockpiles of sand was not available at that time.

Evaluation: Given its foraging and nesting potential for general breeding bird species, the pre-operational habitats onsite would have been of Local Importance (Higher Value). It should also be noted that the sand stockpiles within the Substitute Consent area as a result of the works have created habitat for breeding Sand Martin.

6.3.3.1.2 Non-volant Mammals

The open nature of the improved agricultural grassland habitat within the Substitute Consent area prior to the extraction works would have had limited potential to support non-volant mammal species. Small common mammals such as wood mouse (*Apodemus sylvaticus*), pygmy shrew (*Sorex minutus*) and European hedgehog (*Erinaceus europaeus*) would have used this habitat for foraging. Larger mammals such as European rabbit (*Oryctolagus cuniculus*), Irish hare (*Lepus timidus hibernicus*) and red fox (*Vulpes vulpes*) may have also used the area for commuting and foraging, however the lack of vegetative cover within the available habitats would not have been conducive to breeding sites.

Furthermore, it is unlikely that protected species like Otter (*Lutra lutra*) and Badger (*Meles meles*) would have used the Substitute Consent area for anything other than commuting.

Evaluation: Given the open nature of the habitats within the Substitute Consent area prior to operations onsite, the site would have been of Local Importance (Lower Value) to non-volant mammals.

6.3.3.1.3 Bats

Bat species would have potentially used the hedgerows and treelines along the boundaries of the Substitute Consent area as foraging and commuting habitat. As previously mentioned, all hedgerow boundaries have remained intact throughout the operations at the site. There would not have been any habitat present to support the Annex I Lesser Horseshoe Bat (*Rhinolophus hipposideros*) and there were no SACs designated for this species within the known foraging distance of the species of 6km radius of the Substitute Consent area.

Evaluation: Given the habitats present prior to extraction works at Substitute Consent area, it is considered that the site would have been of Local Importance (Lower Value) in relation to bats.

6.3.3.1.4 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 hectad S87 (NBDC, 2018 – accessed 22/11/2018) and there are no records of newt within this database. The Viviparous lizard (*Zootoca vivipara*) is also afforded protection under the Wildlife Act (1976) and Wildlife (Amendment) Act, 2000.

The small area of wet grassland habitat present onsite prior to operations may have supported foraging Common Frogs. However there is no evidence of ponds or waterbodies within the habitat and as such, the limited size and diversity of the habitat would have limited its capacity to support this species.

Evaluation: Given the limited size of the wet grassland habitat available prior to works as well as the absence of waterbodies for potential breeding purposes, it is considered that the Substitute Consent area would have been of Local Importance (Lower Value) in relation to amphibians and reptiles.

6.3.3.1.5 Invertebrates

Improved agricultural grassland would have been of limited ecological value to invertebrates. Depending on its floral diversity, the wet grassland area may have had the potential to support some invertebrate species of butterfly, dragonfly and/or damselfly.

Evaluation: Depending on the floral diversity of the wet grassland habitat present prior to works, it is considered that the Substitute Consent area would have been of Local Importance (Higher Value) in relation to invertebrates.

6.3.3.2 *Existing Fauna*

6.3.3.2.1 Birds

The site survey recorded the presence of a number of bird species. All were common countryside species. The presence of pockets of scrub and hedgerows makes for suitable nesting and roosting sites for a range of these species. A total of 10 species were recorded in the Substitute Consent application area (Table 6-12). No species cited as Red-listed under the Birds of Conservation Concern in Ireland (Colhoun and Cummins, 2014) were recorded during the walk-over survey. A colony breeding Sand Martin (*Riparia riparia*) was also recorded nesting in an onsite stockpile of sand (Plate 6-7). There were approximately 50 nest entrances recorded within the colony. This is an Amber-listed species (Colhoun and Cummins, 2014).

Plate 6.7: Breeding Sand Martins nesting in a stockpile of sand onsite**.**

Table 6.12: Bird species and maximum abundance recorded during the ecology walk-over survey within the Substitute Consent area.

Common and Scientific Name	Total no. birds observed	Conservation Status	
		BoCCI	Annex I
Sand Martin (*Riparia riparia*)	~50	Amber	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
Goldcrest *(Regulus regulus)*	2	Amber	No
Robin *(Erithacus rubecula)*	3	Amber	No
Dunnock *(Prunella modularis)*	2	Green	No
Wood Pigeon (*Columba palumbus*)	3	Green	No
Wren *(Troglodytes troglodytes)*	3	Green	No

Evaluation: The scrub habitat which is used by general passerine species and stockpiles of sand used by breeding Sand Martins within the Substitute Consent application area, the site is considered to be of Local Importance (Higher Value) in respect of bird species.

6.3.3.2.2 Non-Volant Mammals

The site survey revealed evidence of Rabbit (*Oryctolagus cuniculus*) activity onsite by virtue of the presence of a number burrow entrances within the large sand stockpile. A number of rabbits were also observed during the site survey. This is the only evidence of non-volant mammal activity recorded onsite during the survey.

An Otter survey was conducted along 300m of the Roscat Stream which is located approximately 520m to the south west of the Substitute Consent application area. There were no tracks or signs of Otter were encountered along the stream transect.

Hedgerows and field boundaries were surveyed and there was no evidence of Badger activity onsite.

This low level of mammal observance was on a par with what could be expected without night monitoring. The fact that few mammals were seen during the survey is not significant, as most mammals in Ireland, with the exception of shrews, are more active at night. Badgers possibly utilize part of the site for foraging however, due to the open nature of the site; it is unlikely that there are any sets present within the Substitute Consent area.

Table 6-13 lists the non-volant mammal species records presented in the hectad S87 (NBDC, 2018). Also listed is an indication of whether suitable habitat for this species is found within, or near to the development site (within 1 km).

Table 6.13: Non-volant mammal records for hectad S87, within which the application area is located. The table also presents the level of protection afforded to each species and whether suitable habitat is available on or near the application area.

Species	Suitable Habitat	Protected Status
Eurasian Otter	Near to site	Habitats Directive Annex II and Wildlife Act
Pine Marten	Onsite	Habitats Directive Annex II and Wildlife Act
Mountain (Irish) Hare	Near to site	Habitats Directive Annex V and Wildlife Act
Hedgehog	Onsite	Wildlife Act
Badger	Near to site	Wildlife Act
Fallow Deer	Near to site - confirmed	Wildlife Act
Irish Stoat	Near to site	Wildlife Act
Red Fox	Near to site	None
Pygmy Shrew	Near to site	None
Rabbit	Near to site	None
Bank Vole	Near to site	None
Wood Mouse	Onsite	None
Brown Rat	Near to site	None
Feral Goat	Near to site	None
American Mink	Near to site	None

Source: National Biodiversity Data Centre (2018) accessed 21/11/2018)

Evaluation: The Substitute Consent area is considered to be of Local Importance (Lower Value) in relation to non-volant mammals.

6.3.3.2.3 Bats

Bat Conservation Ireland (www.batconservationireland.org) maintains a database of bat activity and roosts in Ireland. The National Biodiversity Data Centre shows records in the vicinity of the site (hectad S87; NBDC, 2018 – accessed 22/11/2018) for Brown Long-eared Bat (*Plecotus auritus*), Lesser Noctule (*Nyctalus leisleri*), Daubenton's Bat (*Myotis daubentonii*) and Common and Soporano pipistrelles (*Pipistrellus pipistrellus* and pygmaeus).

The presence of the Annex II Lesser Horseshoe Bat is deemed to be very unlikely within the Substitute Consent area, as there is no suitable roosting habitat present.

Evaluation: The Substitute Consent area is considered to be of Local Importance (Lower Value) in relation to bats.

6.3.3.2.4 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 hectad S87 (NBDC, 2018 – accessed 22/11/2018) and there are no records of newt within this database.

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, 2018; accessed 22/11/2018) and no Viviparous lizards were recorded on site during the habitat survey, as expected, given the habitats present.

Evaluation: The Substitute Consent area is considered to be of Local Importance (Lower Value) in relation to amphibian and reptile species.

6.3.3.2.5 Invertebrates

A total of three species of Odonata (damselflies and dragonflies) were recorded during the site ecological survey. These species were using the settlement pond system, which is outside the Substitute Consent area but immediately adjacent to it. These species were Common Bluet (Common Blue Damselfly) (*Enallagma cyathigerum*) (n = 2) and Common Spreadwing (Emerald Damselfly) (*Lestes sponsa*) (n = 3) and Ruddy Darter (dragonfly) (*Sympetrum sanguineum*) (n = 1). All of these hold a status of *Least Concern* under the International Union for the Conservation of Nature (IUCN) Red List for Irish dragonfly and damselfly species (Nelson *et al*., 2011).

Orange Tip (*Anthocharis cardamines*) (n = 1), Green-veined White (*Pieris napi*) (n = 1) and Peacock (*Inachis io*) (n = 2) were the only three butterfly species observed onsite during the site survey. All three of these species are common throughout the Irish landscape and are listed as being of Least Concern on the (IUCN) Red List for Irish Butterflies (Regan *et al*., 2010).

Table 6-14 lists the invertebrates that have been recorded in hectad S87 within which the site is situated (NBDC, 2018 – accessed 22/11/2018). There are no records from the 1km square of the development site. Considering the limited extent and quality of semi-natural scrub habitat within the site, it is unlikely any rare or threatened invertebrate fauna occur.

Table 6.14: Invertebrate species recorded in 10km square (S87) within which the site is situated

Species Name (Latin)	Faunal Group	Common Name
Aglais urticae (Linnaeus, 1758)	Insect – butterfly	Small Tortoiseshell
Cicindela campestris Linnaeus, 1758	Insect – beetle	Common Tiger Beetle
Aphantopus hyperantus (Linnaeus, 1758)	Insect – butterfly	Ringlet
Boloria euphrosyne (Linnaeus, 1758)	Insect – butterfly	Pearl Bordered Fritillary
Inachis io (Linnaeus, 1758)	Insect – butterfly	Peacock
Maniola jurtina (Linnaeus, 1758)	Insect – butterfly	Meadow Brown
Pararge aegeria (Linnaeus, 1758)	Insect – butterfly	Speckled Wood
Pyrrhosoma nymphula (Sulzer, 1776)	Insect – damselfly	Large Red Damselfly
Aeshna grandis (Linnaeus, 1758)	Insect – dragonfly	Brown Aeshna
Eulithis testata (Linnaeus, 1761)	Insect – moth	Chevron
Xanthorhoe designata (Hufnagel, 1767)	Insect – moth	Flame Carpet

Source: National Biodiversity Data Centre (2018) accessed 21/11/2018)

Evaluation: The Substitute Consent area is considered to be of Local Importance (Lower Value) in relation to invertebrate species.

6.3.4 Hydrology and Aquatic Ecology in the Receiving Environment

The Substitute Consent area lies within the surface water catchment of the Roscat Stream, which flows in a southeast to northwest direction, passing the site 520 m to the southwest. The stream has a catchment of 5.9 km^2 as it passes adjacent to the site. The stream rises approximately 2 km southeast of the site in a topographical depression at Aghade. It outfalls to the Burren River, just north of Rathtoe and subsequently enters the River Barrow at Carlow Town.

The majority of precipitation that lands within the application site boundary infiltrates freely to ground. Historical aerial photography shows that excavation commenced along the eastern boundary of the area previously granted planning and progressed westwards. Surface gradients are such that the existing pit slopes slightly towards the southeastern corner. Through a combination of compaction from machinery and fine sediment infilling voids at the surface, some parts of the existing pit are capable of generating runoff during high intensity rainfall events.

There is a series of 5 settlement ponds previously installed in sequence in the southeastern corner of the adjacent site which is subject to the existing planning permission (Ref: CW7850). Any surface water generated within the Substitute Consent area during operations, mainly as a result of precipitation would flow by gravity towards these settlement ponds in order to remove suspended solids from water.

Water then overflowed via gravity from the edge of the first settlement pond via a 300 mm concrete culvert to a further four interconnected pond. Water overflowed from one pond to the next. There is no evidence of an artificial liner and as these ponds were used for clarification, it is assumed that permeability was restricted over time as a function of particulate material effectively sealing the side walls and pond bases as it settles out of solution.

There was likely to have been some recycling of clarified water from the final settlement pond (Pond 5) for dust suppression, etc with the excess allowed to flow by gravity across the site boundary in line with undisturbed flow gradient. There was no pumping of groundwater across the site boundary as part of previous activities. Given the high permeability values in sands and gravels there is typically no benefit or useful purpose for dewatering in these activities.

Surface water exited the final settlement pond via a 400 mm culvert which delivered clarified water to an open ditch situated on the southern site boundary, and subsequently towards Ardristan Fen. Surface water elevation within the receiving ditch was surveyed as 61.22 mOD on 27th June 2018 (see Chapter 8.0 – Water for further details). During both site visits by the hydrologist in June 2018 and July 2018, which can be considered representative of summer flow regimes, negligible flow was noted through this outfall drain.

A series of field drains surround the fen and traverse the fen itself. These field drains appear to be interconnected and ultimately transmit water southwest towards the Roscat Stream. No direct route was observed transmitting site runoff towards the Roscat Stream.

There are no natural surface watercourses or waterbodies within the application boundary. Groundwater is only exposed within the existing pit where settlement ponds or test holes were previously excavated.

The Substitute Consent area is located within the Barrow *Margaritifera* Sensitive Area (MSA), which is categorised as a *catchment with previous records of Margaritifera but the current status is unknown* (NPWS, 2017). While there are no recent records of Freshwater Pearl Mussel from this catchment, in most cases there has been little, if any, survey for the species since 1970. A data request from NPWS for this catchment revealed no records for Freshwater Pearl Mussel.

The Slaney Upper and Slaney Derreen MSAs are located 1.1km and 2.4km to the west of the application area respectively. The Slaney Upper MSA is categorised as a *catchment of other extant populations*. These mussel populations may lie (in part) within SAC, other nature conservation sites or in the wider countryside. Those populations within SAC were not considered of sufficient quality to warrant designation for the species and detailed restoration objectives, targets, plans or measures are unlikely to be developed. The Slaney Derreen MSA holds the highest level of categorisation as a *catchment of SAC populations listed in S.I. 296 of 2009*. This is one of 27 mussel populations which are within Special Areas of Conservation (SAC) designated for the protection of the species. Site-specific conservation objectives for the restoration of these populations and their habitats are being developed by the NPWS.

The Substitute Consent area is not hydrologically connected with either of these two sites.

Evaluation: Given its proximity and hydrological connection to the Roscat Stream, the Substitute Consent area is considered to be of Local Importance (Higher Value) in relation to aquatic ecology.

6.4 Likely Significant Effects

6.4.1 Source-Pathway-Receptor-Effect Conceptual Model

Using Source-Pathway-Receptor-Effect (consequences) modelling, all characteristics and historical activities associated with the Substitute Consent area are evaluated for their likelihood that they may have caused significant effects (in the absence of mitigation) on the sensitive ecological aspects of the receiving environment at that time. The conceptual model is presented in Table 6-15 below.

The description, significance, magnitude, probability, duration and type of effects are then described in the subsequent subsections in accordance with the EPA (2017) "*Draft guidelines on information to be contained in EIAR*" (Please see Tables 6-3 – 6-7 in Section 6.2.6.2 for full list of definitions of effects).

Table 6.15: Source-Pathway-Receptor-Effect (consequence) conceptual model for all potential retrospective effects of individual elements (sources) of the historical project on sensitive ecological receptors and their respective potential for significant effects at that time.

Source of Effects on Biodiversity	Pathway	Receptor	Effect (Consequences)	Potential for Effects (Y/N)
Excavation activities	Surface water runoff	• Natura 2000 Designated Sites	Indirect effects through surface water contamination by virtue of sediment runoff.	**Yes.** Significance of effect evaluated in Section 6.4.2.1.
	Groundwater flow-paths		Indirect effects through groundwater contamination by virtue of percolation of hydrocarbons.	**Yes.** Significance of effect evaluated in Section 6.4.2.1.
	Surface water runoff	• NHAs and pNHAs	Direct effects on Ardristan Fen pNHA through surface water contamination by virtue of sediment runoff.	**Yes.** Significance of effect evaluated in Section 6.4.2.2.
	Groundwater flow-paths		Direct effects on Ardristan Fen pNHA through surface water contamination by virtue of sediment runoff.	**Yes.** Significance of effect evaluated in Section 6.4.2.2.
	Groundwater flow-paths	• Habitats	Indirect degradation of habitats within the Substitute Consent application area through ground water contamination.	**Yes.** Significance of effect evaluated in Section 6.4.3.1.

Source of Effects on Biodiversity	Pathway	Receptor	Effect (Consequences)	Potential for Effects (Y/N)
Excavation activities	Surface water runoff	• Water quality/Aquatic Ecology	Indirect effects through surface water contamination by virtue of runoff from sediment and/or hydrocarbons within the Substitute Consent area.	**No.** Absence of surface water hydrological connectivity between the source and local water courses ensured no measurable effects.
	Groundwater flow-paths		Indirect effects through ground water contamination by virtue of percolation of hydrocarbons within the Substitute Consent area.	**Yes.** Significance of effect evaluated in Section 6.4.3.7.
	Air	• Habitats	Indirect degradation of habitats within the Substitute Consent area through fugitive dust emissions.	**Yes.** Significance of effect evaluated in Section 6.4.3.1.
		• Amphibians and Reptiles	Indirect degradation of amphibian and reptile habitats within the Substitute Consent area through fugitive dust emissions.	**Yes.** Significance of effect evaluated in Section 6.4.3.5.
		• Invertebrates	Indirect degradation of invertebrate habitats within the Substitute Consent area through fugitive dust emissions.	**Yes.** Significance of effect evaluated in Section 6.4.3.6.

Source of Effects on Biodiversity	Pathway	Receptor	Effect (Consequences)	Potential for Effects (Y/N)
Excavation activities	Landtake	• Habitats (birds, non-volant mammals, birds (general), bats, amphibians/reptiles and invertebrates)	Direct reduction/loss of habitats within the Substitute Consent area.	**Yes.** Significance of effect evaluated in Section 6.4.3.1.
Noise, vibration and human activity	Visibility and blasting	• Birds (General species)	Indirect effects, through disturbance/displacement, on breeding and foraging bird species which would have used the Substitute Consent area.	**Yes.** Significance of effect evaluated in Section 6.4.3.2.
		• Non-Volant Mammals	Indirect effects, through disturbance/displacement, on breeding and foraging non-volant mammal species which would have used the Substitute Consent area.	**Yes.** Significance of effect evaluated in Section 6.4.3.3.
		• Bats	Indirect effects, through disturbance/displacement, on breeding and foraging bat species which use the Substitute Consent application area.	**Yes.** Significance of effect evaluated in Section 6.4.3.4.

6.4.2 Potential Effects on Designated Sites

6.4.1.1 Potential Effects on European Sites

There are 3 EU sites located within a 15km radius of the Substitute Consent area (see Table 6-8 for a list of SACs and SPAs). A remedial Natura Impact Statement (rNIS) has been prepared for this project, which evaluates the potential for significant retrospective effects on the integrity of these EU sites.

Given that no element of the Substitute Consent development was undertaken within or directly adjacent to any Natura 2000 site, there was no potential for direct effects on the qualifying interests of any designated site as a consequence of the development.

The conceptual model presented in Table 6-15 reveals that there would have been potential for indirect effects on the EU sites identified within a 15km radius of the Substitute Consent area through surface and ground water contamination as a result of the pit extension and operational excavation activities.

The closest EU site to the Substitute Consent area is the Slaney Valley SAC (Site Code: 000781), which at its closest point, is located at a direct distance of 1.8km to the east of the Substitute Consent area. However, there is no hydrological connectivity between this SAC and the Substitute Consent area.

A hydrological connection exists between the River Barrow and River Nore SAC and the Substitute Consent area via the Roscat Stream which is located approximately 495m to the west of the application area. The Roscat Stream flows in a north-westerly direction towards its confluence with the Burren River, which flows into the River Barrow in Carlow town. The total hydrological distance between the application area and the SAC is 15.5km, which provides a potential source-pathway-receptor link between the two.

However, given the considerable hydrological distance between the Substitute Consent area and the SAC, the surface water hydrological connection is weak owing to the dilution effect and as such, there would have been no potential for indirect effects on the qualifying interests of the SAC. As such, no pathway existed between the Substitute Consent area and the River Barrow and River Nore SAC. Furthermore, given the considerable distance, there would have also been no potential for indirect effects from the historical development on the qualifying interests of the River Barrow and River Nore SAC by virtue of groundwater contamination.

Regarding the remaining EU site, Blackstairs Mountains SAC (Site Code: 000770), the rNIS also concludes that, given the distance and the absence of both hydrological and ecological connectivity between the Substitute Consent application area and this SAC, the potential for likely significant effects on the integrity of the EU site as a result of the retrospective project, does not exist.

6.4.1.2 Potential Effects on Nationally Designated Sites

There are 8 proposed Natural Heritage Areas (pNHAs) (Table 6-9) located within a 15km radius of the Substitute Consent application area (see Figure 6.4 at the end of this chapter for their locations relative to the Substitute Consent application site). The features of interest for these designated sites and any ecological or hydrological connectivity to the Substitute Consent area were examined to determine if there was potential for effects on nationally important sites designated for nature conservation.

Ardristan Fen pNHA is due south of the application site, with the western portion of the fen extending from the Roscat Stream to the southern boundary of the application area at which point there is a slight overlap between the pNHA and the application area. The mapped extents appear to be based on peat area as per Figure 8.3 in Chapter 8.0 - Water. It is unclear if these extents have been ground-truthed by NPWS as part of the designation process.

It is important to note that in relatively recent times the area has undergone significant arterial drainage, presumably by local landowners. Reclamation of drained lands has been ongoing since 1975 and aerial photography (Figure 8.3) shows the result of this is prevalence of improved grassland. The arterial drains shown in Figure 8.3 intercept water table and transmit these waters in a general southwest direction toward the Roscat Stream. This is fairly typical in Ireland where undisturbed fens are very rare, with most having been drained and cultivated.

Ardristan Fen pNHA was an area that was permanently or seasonably saturated and supported flora and fauna tuned to these hydrological conditions and its historical condition prior to the extraction of the Substitute Consent area are shown in Figure 6.7. The aerial photography from 1995, as shown in Figure 6.5, illustrates that there were a number of established farm tracks crossing the fen. These tracks were most likely for agricultural use and would have substantially altered the hydrological regime of the fen resulting in a loss of water dependant botanical species.

The arterial drains within the fen tend to be to the sides and downgradient of this area. On this basis, there is no evidence that the application site encroached on the fen. Furthermore, the groundwater flow direction is perpendicular to the Roscat Stream; as such the application site is not upgradient of the fen in terms of groundwater flow.

Furthermore, as outlined in Section 6.4.1, the conceptual model presented in Table 6-15 reveals that there is no potential for indirect effects on the nationally important sites identified within a 15km radius of the Substitute Consent application area owning to the absence of surface and groundwater connectivity and thus, pathways to cause contamination as a result of historical extension and excavation activities.

6.4.3 Potential Effects on the Existing Environment

6.4.1.3 Potential Effects on Existing Habitats

Commencing top-soil and sand/gravel extraction within the Substitute Consent area lead to additional land-take and the irreversible loss of habitats existing within that area. The maximum ecological value of the habitats present within the application area is evaluated as being of Local Importance (Higher Value), with the dominant habitat of the site being improved agricultural grassland (GA1), which is evaluated as being of Local Importance (Lower Value). As such, the general overall ecological value of habitats in the Substitute Consent area is considered to be low.

Considering the generally low ecological value of the habitats to be removed through historical land-take resulting from the extension of the original sand and gravel pit and the large availability of alternative habitats of this type in the wider landscape, the potential retrospective direct effect on habitats within the Substitute Consent area would have been **imperceptible in the long-term.**

Fugitive dust arising from additional excavation activities, bare ground and stockpiles/overburden would have had the potential to become deposited on habitats adjacent the Substitute Consent area. The habitats within 25m of bare ground and stockpiles are considered to be susceptible to significant effects as a result of fugitive dust deposition (IEA, 1995). The berms which were put in place around the border of the Substitute Consent area would have assisted in filtering and containing air borne emissions as this further ensured that operational activity was kept below the surrounding ground level.

As such, the potential for retrospective indirect effects on the adjacent habitats as a result of fugitive dust arising from additional quarrying activities would have been **imperceptible in the long-term.**

6.4.1.4 Potential Effects on Birds

No hedgerow removal took place within the Substitute Consent area. As such, retrospective direct and indirect effects by virtue of disturbance/displacement on general breeding bird species using this habitat would have been **imperceptible in the long-term**.

6.4.1.5 Potential Effects on Non-Volant Mammals

Given the absence of suitable habitat for protected mammal species within the Substitute Consent area prior to operations and the site’s limited ecological value, the potential for indirect effects on non-volant mammal species utilizing the Substitute Consent area by virtue of direct loss of breeding and/or foraging habitat, in addition to noise and vibration from operational excavation activities resulting in disturbance/displacement would have been **imperceptible in the long-term**.

6.4.1.6 Potential Effects on Bats

Given that habitats within the Substitute Consent area were of limited ecological value to bats and that there is no suitable roosting habitat within 150m of the Substitute Consent area, the potential for indirect effects on bat species utilizing the Substitute Consent area by virtue of direct loss of foraging habitat, in addition to noise, vibration and lighting from operational excavation activities resulting in disturbance/displacement would have been **imperceptible in the long-term**.

6.4.1.7 Potential Effects on Amphibians and Reptiles

Given the limited size of the wet grassland habitat available prior to works as well as the absence of waterbodies for potential breeding purposes, it is considered that the potential for significant retrospective direct and indirect effects of operations in the Substitute Consent area would have been **imperceptible** for amphibians and reptiles.

6.4.1.8 Potential Effects on Invertebrates

Given the limited availability of suitable habitat for breeding and foraging invertebrates within the Substitute Consent prior to excavation operations, potential for significant retrospective direct or indirect effects on invertebrate species would have been **imperceptible in the long-term.**

6.4.1.9 Potential Effects on Water Quality and Aquatic Ecology

Please see Chapter 8.0 – Water for a complete hydrological impact assessment. The main factors with the potential to affect water quality and thus, aquatic ecology, are described below.

Potential impacts on water quality and by consequence, aquatic ecology, which may have arisen from historical activities, are summarized in Table 6.16. Table 6.16 has been adapted from Table 8.7 in Chapter 8.0 – Water to include effects of potential water quality deterioration on aquatic ecology using the headings discussed under the criteria for determination of impacts (EPA, 2017). The key activities include stripping and stockpiling of soils, excavation of sands and gravels, and haulage of material off site.

Table 6.16: Summary of Potential Impacts of Water Quality Deterioration on Aquatic Ecology

Activity	Attribute	Character of potential impact	Potential consequential impact on aquatic ecology	Importance of attribute	Magnitude of potential impact	Term	Significance of potential impact
Compaction of pit floor and hardstanding pad	Ardristan Fen and Roscat stream	Silt-laden runoff from pit floor. The increased silt content in runoff would have had the potential to degrade local surface water quality.	Silt has the potential to clog salmonid spawning beds and juvenile salmonids are particularly sensitive to siltation of gill structures. Similarly, plant and macro-invertebrate communities can be blanketed over and this can lead to loss or degradation of valuable habitat.	Very High	Small	Long-term	Moderate
Stockpiling of topsoil/subsoil/ screenings	Ardristan Fen and Roscat stream	Silt-laden runoff from stockpiles. The increased silt content in runoff would have had the potential to degrade local surface water quality.	As above.	Very High	Small	Medium-term	Moderate
Removal of overburden	Ardristan Fen /Aquifer	Increase in vulnerability of underlying aquifer.	As above.	Very High	Small	Long-term	Moderate
Storage of hydrocarbons; leakages from machinery;	Ardristan Fen/Roscat Stream/Aquifer	Runoff/recharge may contain hydrocarbons.	A reduction in water quality due to hydrocarbons would have had the potential result in effects on salmonids and	Very high	Small	Temporary	Moderate

Activity	Attribute	Character of potential impact	Potential consequential impact on aquatic ecology	Importance of attribute	Magnitude of potential impact	Term	Significance of potential impact
spillages during refuelling			plant species within Roscat stream. In addition, given the ubiquitous nature of Otter in the Irish landscape, it is likely that they were present in Roscat stream prior to the works and since then. Otters may have been secondarily affected by a reduction in water quality through a reduction in potential prey should fish have been impacted upon as a result of hydrocarbon runoff to groundwater.				
Increased runoff rates from hardstanding pad and pit floor	Ardristan Fen /Aquifer	Increase in surface water flow input to Fen. Decrease in infiltration to aquifer	A significant change in the hydrological regime of Ardristan Fen would have had the potential to result in direct degradation on the fen habitat and the floral species dependent upon it.	Very High	Small	Long-term	Moderate

6.4.4 Potential In-combination Effects

Following a comprehensive desktop review of Carlow County Council's planning website (http://www.eplanning.ie/CarlowCC/searchtypes) and satellite imagery; the following developments were evaluated for cumulative effects which have the potential to act in-combination with the Substitute Consent development.

6.4.1.10 Landfill Site

According to aerial imagery from 1995, an unauthorised landfill site of approximately 1.6ha in area and 8m in depth, located approximately 1km to the south of the Substitute Consent area at Roscat Pit, was present prior to the commencement of works within the Substitute Consent area.

Given its unauthorised status, a Tier 3 Risk Assessment and Restoration Plan was commissioned by Carlow County Council and undertaken by RPS in 2011, in accordance with the "EPA Code of Practice Environmental Risk Assessment for Unregulated Waste Disposal Sites".

A detailed qualitative risk assessment was carried out to determine the potential risks to human health and controlled waters for the contaminants identified as being of concern (e.g. heavy metals, hydrocarbons, ammonia, volatile organic compounds and ground gases). Groundwater monitoring was undertaken as part of the risk assessment. The assessment concluded that, at that time, the site represented a moderate risk to groundwater quality via leachate being produced at the site. This would have had the potential to act in-combination with the Substitute Consent development. However, as no impacts on groundwater have been identified as a result of the Substitute Consent development, it is considered that it can be clearly demonstrated that the Substitute Consent development did not act in-combination with the proximal unauthorised landfill site to result in significant cumulative effects on the surrounding environmental receptors including the qualifying interests of the River Barrow and River Nore SAC.

6.4.1.11 Ardristan Sand and Gravel Pit (QY 27)

This pit is located 1.3km to the south of the Substitute Consent development and was also present prior to the commencement of works within the Substitute Consent area. Permission for the development of the sand and gravel pit to include continuation of existing extraction, screening crushing, washing and ancillary activities and phased restoration of the pit to agricultural afteruse at Ardristan, Tullow, Co. Carlow was granted under the Substitute Consent process with a number of planning conditions in 2007 under PL 07/769; ABP Ref: 01.232014. Of particular relevance to the current application is Condition 11, which directs the implementation of ground water monitoring scheme at the consented site and the submission of the results of same to Carlow County Council.

Groundwater quality monitoring was carried out on behalf of the developer by trained personnel employed by SLR Consulting Ireland (formerly John Barnett and Associates). Groundwater quality was monitored at 3 no. locations. The report concluded results indicate that the operation does not adversely impact on water quality in the locality.

In 2013, a remedial Natura Impact Statement (rNIS) was undertaken on this site, which considered the potential effects associated with the extraction of sand and gravel at the existing quarry, of which the proposal is part, on the River Barrow and River Nore SAC.

The rNIS concluded that the extraction of sand and gravel had not had any significant effects on the River Barrow and River Nore SAC, nor is it likely to have any effects through any continuation of extraction operations to affect the integrity of this relevant European site, or on any of its qualifying features for which this site is of European importance, in light of its conservation objectives.

Therefore, it is concluded that the extraction works at Ardristan Pit did not act in-combination with the current Substitute Consent development at Roscat Pit to result in cumulative effects on the surrounding environmental receptors including the qualifying interests of the River Barrow and River Nore SAC.

6.4.1.12 Conclusion of Cumulative Impact Assessment

In conclusion, it is determined that the surrounding land management did not result in significant in-combination effects i.e. the risk of cumulative impact is deemed to have been **not significant**.

As there were no other relevant plans or projects in the vicinity of the Substitute Consent area during the time of extraction, no potential in-combination effects as a result of the historical works with regard to other plans or projects occurred.

6.5 Mitigation Measures for the Protection of Water Quality and Aquatic Ecology

Measures relating to water quality and aquatic ecology are outlined in Table 6-17 with the resultant predicted impact following the implementation of mitigation measures.

Table 6.17: Summary of measures relating to the protection of water quality and aquatic ecology

Activity	Attribute	Character of potential impact	Mitigation measure	Predicted impact
Compaction of pit floor and hardstanding pad	Ardristan Fen and Roscat stream	Silt-laden runoff from pit floor. The increased silt content in runoff has potential to degrade local surface water quality.	Runoff passes through a series of settlement ponds which have been shown to clarify the water prior to it crossing the site boundary. Results from sampling show that water quality in the fen has not been negatively impacted upon.	Imperceptible
Stockpiling of topsoil/subsoil/screenings	Ardristan Fen and Roscat stream	Silt-laden runoff from stockpiles. The increased silt content in runoff has potential to degrade local surface water quality.	Stockpiles have been vegetated and are considered to be stable. Establishment of rooting restricts surface erosion.	Imperceptible
Storage of hydrocarbons; leakages from machinery; spillages during refuelling	Receiving stream/ aquifer	Runoff/recharge may contain hydrocarbons.	Stockpiles shall be used in the restoration process.	Imperceptible
Removal of overburden	Ardristan Fen /Aquifer	Increase in vulnerability of underlying aquifer.	Overburden stored on site for restoration of the pit.	Imperceptible
Foul water	Receiving stream/ aquifer	Septic tank and percolation area.	All waste containers were stored within a secondary containment system (e.g. a bund for static tanks or a drip tray for mobile stores and drums). Bunds were capable of storing 110% of tank capacity, plus a minimum 30 mm rainwater allowance where the bund was uncovered.	Neutral
Historical activities	3rd party well	Decrease in yield/quality in 3rd party well	No hydrocarbons were detected in groundwater at the downgradient boundary.	Neutral

6.6 Remedial Measures

The following primary measures will be implemented:

- Increase permeability on the pit floor by mechanical ripping to a depth of 0.5 m. This will decrease the amount of surface runoff being diverted towards the ponds, and subsequently the fen, and will restore substrate permeability characteristics closer to that of pre-works, prior to raising the floor by deposition of screenings.
- Overburden stored on site will be spread on the pit floor to reduce the vulnerably of the floor beneath.
- Slide slopes will be restored as per the landscape and restoration plan to accommodate breeding sand martins.

6.7 Monitoring

A designated person from the project management team will have overall responsibility for ensuring that all landscape and restoration operations are carried out in such a way as to minimise potential impacts to hydrological and hydrogeological receptors. This person will also have responsibility of monitoring the performances of any pollution control measures adopted.

6.8 Residual Effects

The residual effect is defined as the degree of environmental change that will occur after the proposed measures have taken effect (EPA, 2015). 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 should be considered (CIEEM, 2016). Significant residual environmental effects may be offset by appropriate compensatory measures nearby/elsewhere (CIEEM, 2016).

Table 6-18 presents those elements of the environment with the potential for significant or moderate effects prior to any mitigation measures. A revised potential effect which could have occurred post-mitigation is provided here also, in addition to the significance of any potential residual effects. Please refer to the accompanying rNIS for conclusions in regard to effects on the integrity of European sites under consideration within same.

Table 6.18: Significance of residual effects of the Substitute Consent application.

Environmental Element	Ecological Receptor	Potential Significance of Effect - Pre-Mitigation	Potential Significance of Effect - Post Mitigation	Significance of Residual Effect
Water quality	Surface and groundwater, Ardristan Fen, Roscat Stream, salmonids, Otter, aquatic plant species	Moderate	Imperceptible	Not significant
Overall Significance of Residual Effects				**No Significant Residual Effects**

6.9 Conclusions and Recommendations

Following a detailed ecological impact assessment of the Substitute Consent application, it is concluded that the historical extension of the existing sand and gravel pit at Roscat, Tullow, Co. Carlow did not have any significant residual effects assuming the mitigation measures outlined herein were strictly adhered to during operations at the pit.

Impacts of historical activities on the hydrological and hydrogeological environment and their potential consequential ecological effects were assessed, and appropriate remedial measures have been presented. In terms of flow and quality, the groundwater regime in the area has been unimpeded by historical activities and there have been no impacts to groundwater flows through Ardristan Fen pNHA. Runoff from compacted areas of the pit floor and a hardstanding pad passes through a series of settlement ponds to remove suspended sediment prior to outfalling at the southern boundary. Ardristan Fen has contracted significantly in the latter part of the last century due to arterial drainage, implemented to restore peats to productive grassland soils. Water quality in the fen also appears to have been affected by nutrient inputs. There were no nutrient sources in previous activities and these are assumed instead to come from local agriculture. Hence any impacts to the fen appear to have been from local agricultural practices rather than historical activities at the working pit.

It is recommended that ongoing monitoring of water quality be undertaken on a biannual basis during the restoration works.

Reports on the findings should be submitted to the National Parks and Wildlife Service, Inland Fisheries Ireland and to the competent authority (Carlow County Council).

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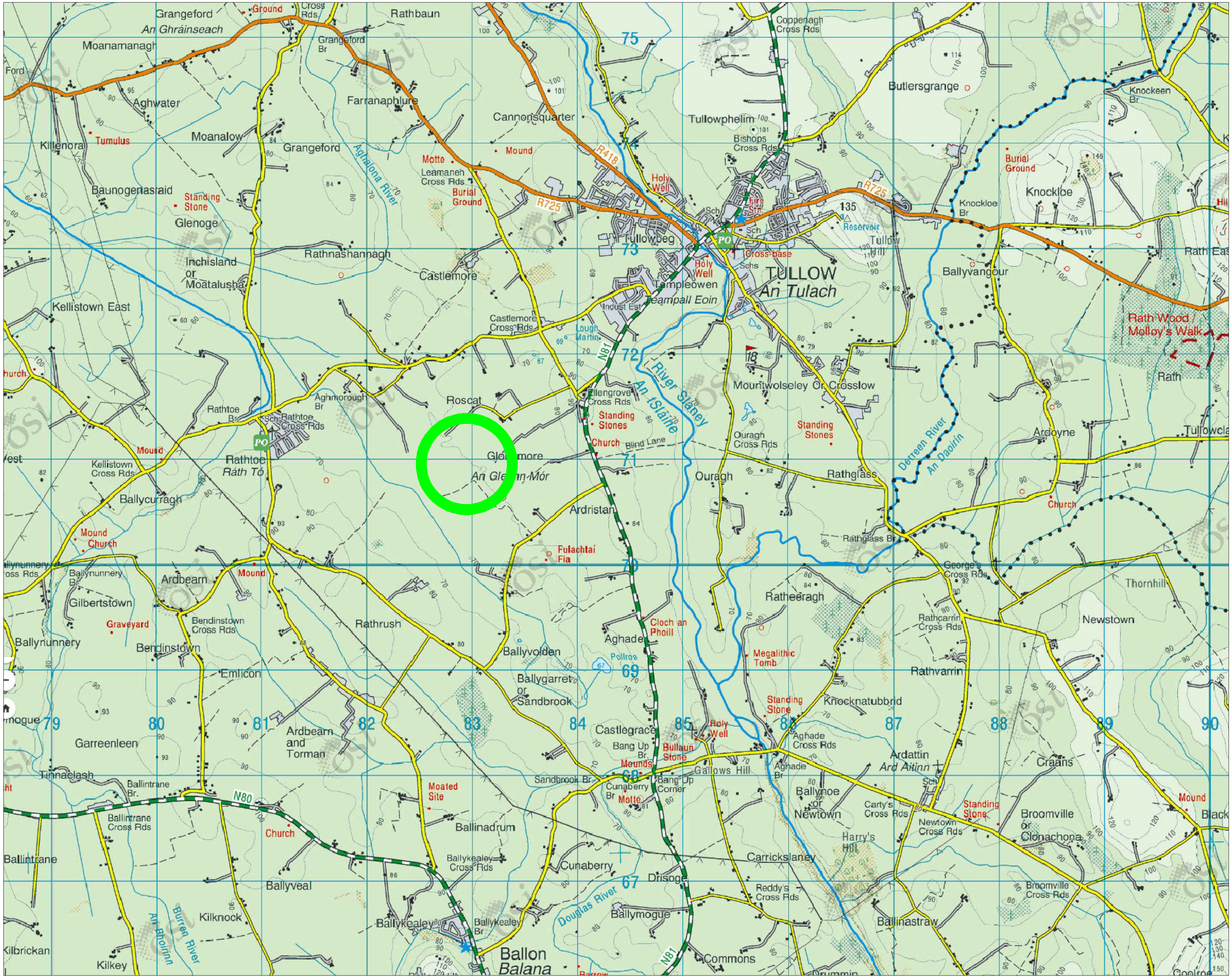
Figures



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Site Location

N

ITM Coordinates: 683027 E, 670998 N

Rev.	Description	Date

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Client: Kilcarrig Quarries Ltd.

Project: Remedial Environmental Impact Assessment Report to Accompany a Substitute Consent Application for a Sand & Gravel Pit Located at Roscat, Tullow, Co. Carlow

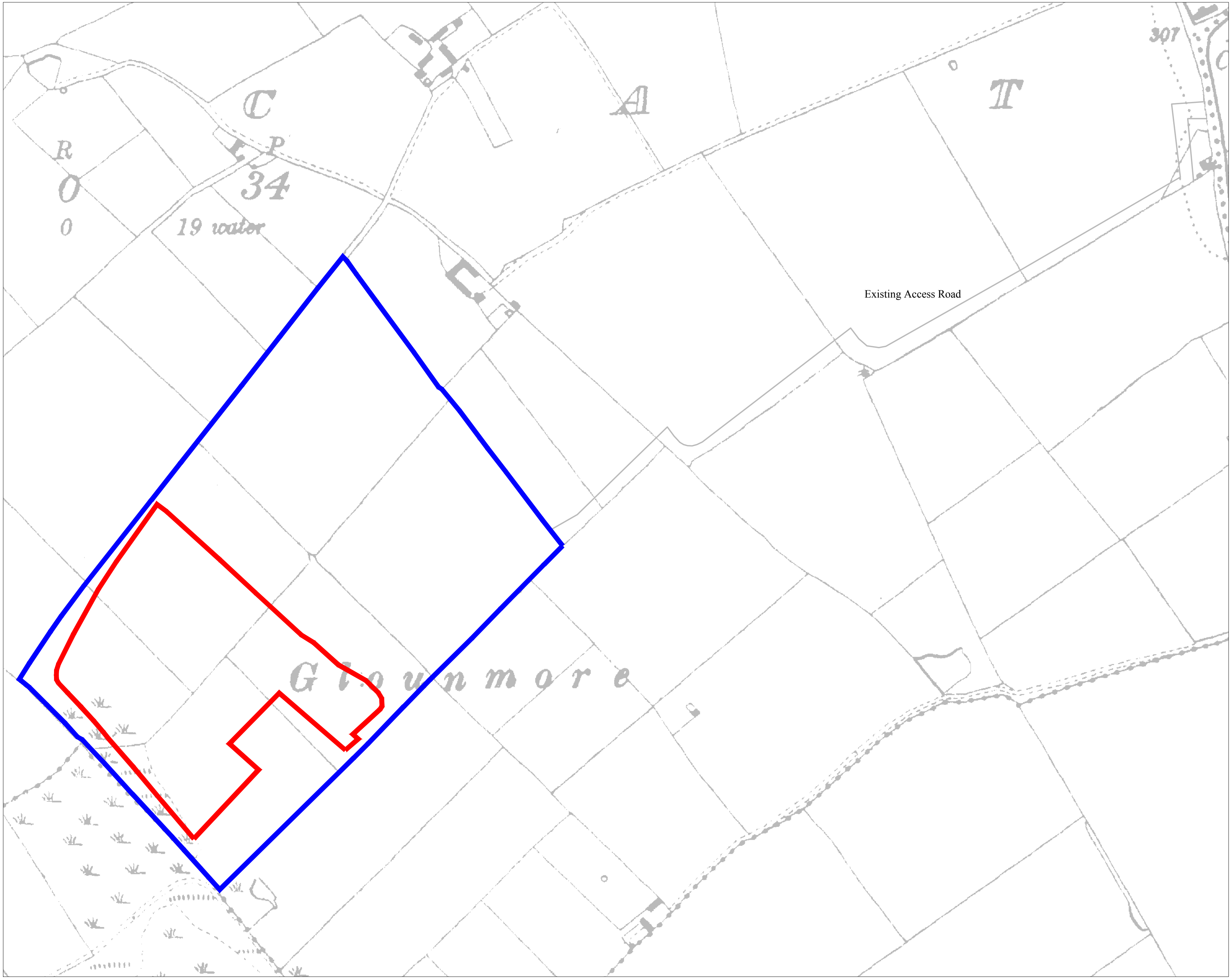
Title: Site Location Map

Drawn By: Sean O' Donnell

Checked By: Patrick O' Donnell

Scale: 1:50,000 @ A4	Date: Apr. 2019
Job No: EI 061	Rev: 0

Figure 6.1



Legend

Ownership Boundary

Application Area
Area = 4.7 Ha

N

O.S. Map Ref No. 4475 - B

ITM Coordinates: 683027 E, 670998 N

Rev.	Description	Date

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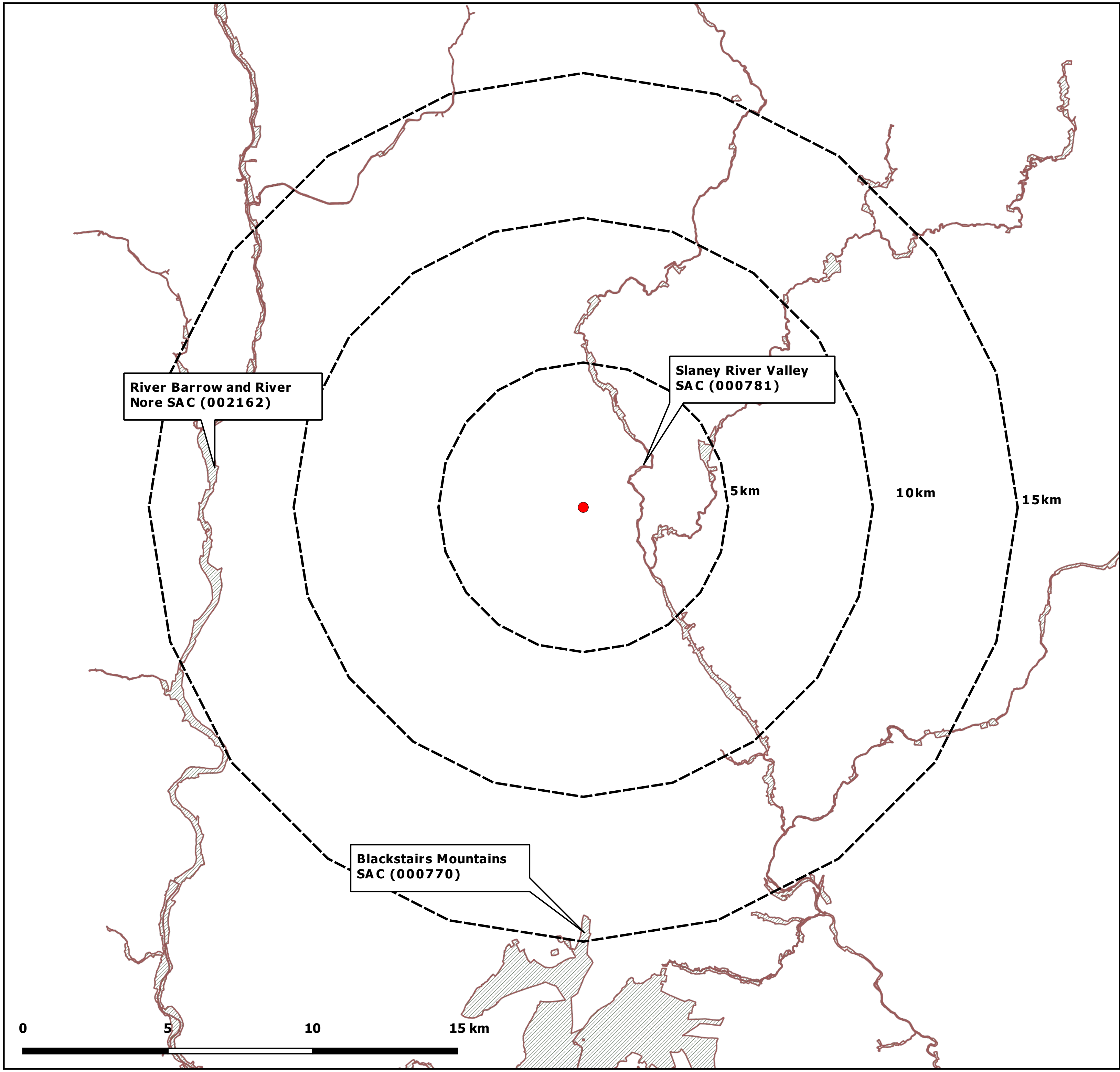
Title: Site Location Map

Drawn By: Sean O' Donnell

Checked By: Patrick O' Donnell

Scale: 1:5,000 @ A4	Date: Apr. 2019
Job No: EI 061	Rev: 0

Figure 6.2



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Project: Substitute Consent application for Roscat Quarry, Tullow, Co. Carlow

Title: Natura 2000 within 15km of the application area

Drawn by: Sarah Ingham

Checked by: Patrick O'Donnell

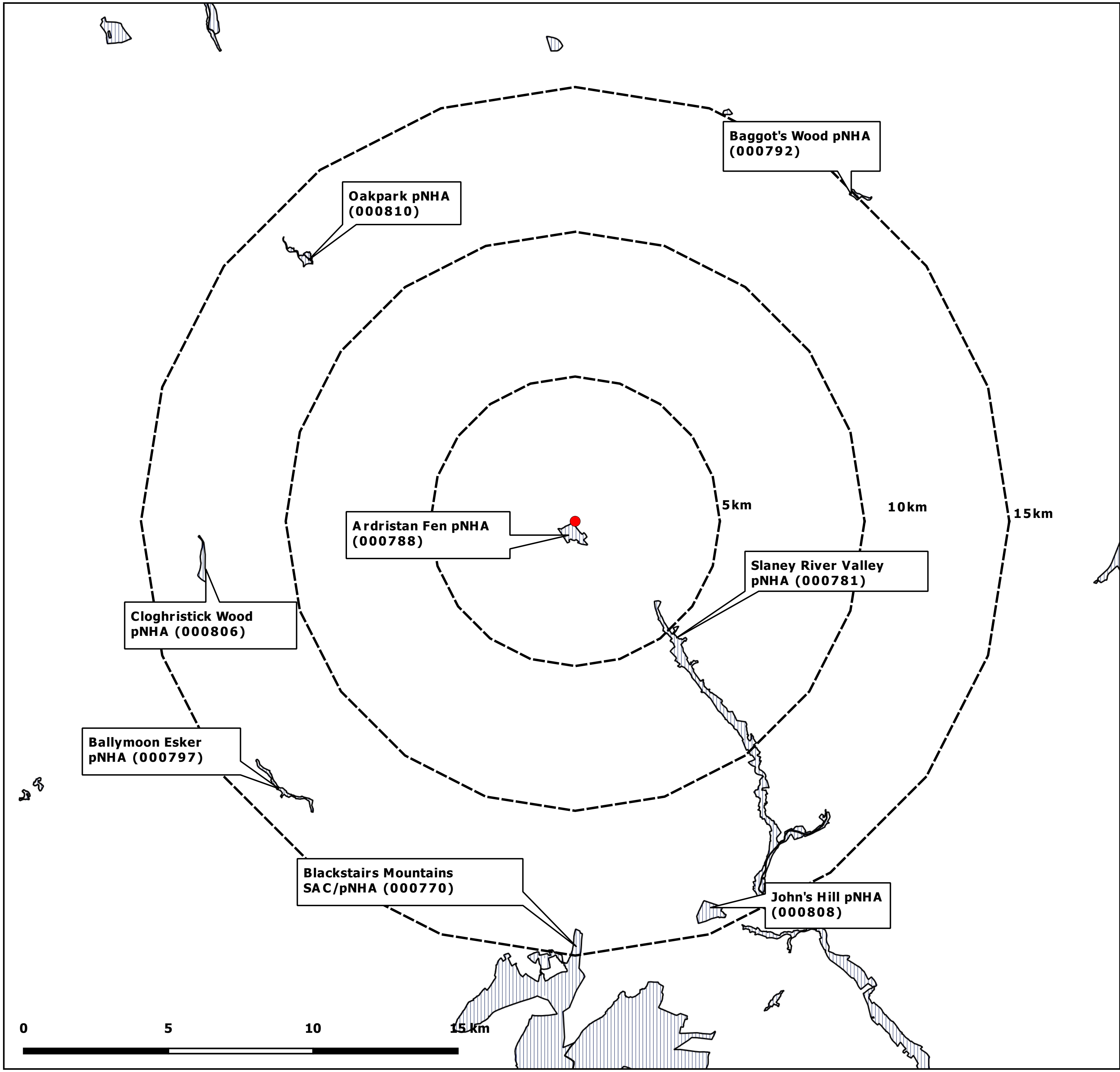
Scale: 1:18k @ A4	Date: 21/12/2018
Job No.: EI 061	Rev.: 1.0

Figure: 6.3

Legend

- Substitute Consent Application Area Location
- SAC
- 5, 10 and 15km Buffer

N



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Project: Substitute Consent application for Roscat Pit, Tullow, Co. Carlow

Title: National sites (pNHAs) designated for nature conservation within 15km of the Substitute Consent area

Drawn by: Sarah Ingham

Checked by: Patrick O'Donnell

Scale: 1:18k @ A3	Date: 21/12/2018
Job No.: EI 061	Rev.: 1.0

Figure: 6.4

Legend

- Proposed Application Area Location
- pNHA
- 5, 10 and 15km Buffer

N

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Client: Kilcarrig Quarries Ltd.

Project: Substitute Consent Application, Roscat Sand and Gravel Pit, Roscat, Tullow, Co. Carlow

Title: Map of habitats present in the Substitute Consent application area prior to extraction works within the site (Aerial imagery, 1995)

Drawn by: Sarah Ingham

Checked by: Patrick O'Donnell

Scale: 1:5k @ A4	Date: 11/12/2018
Job No.: EI 061	Rev.: 1.0

Figure: 6.5

Legend

Substitute Consent Application Area

Habitats

Improved agricultural grassland (GA1)

Wet Grassland (GS4)

N

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Project: Substitute Consent Application, Roscat Sand and Gravel Pit, Roscat, Tullow, Co. Carlow

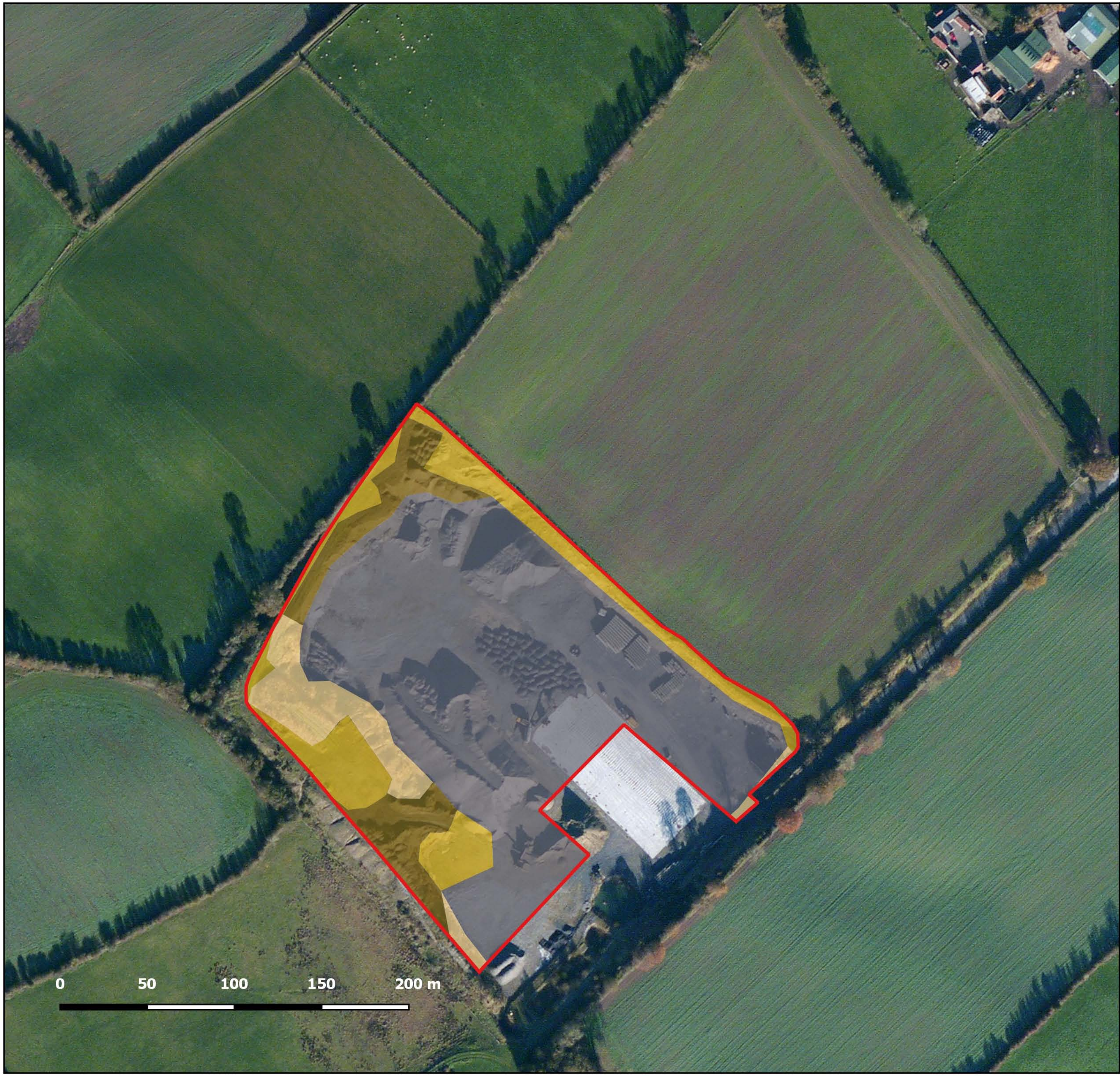
Title: Phase 1 habitat map of the Substitute Consent application area as it exists following extraction works within the site (Satellite imagery, 2018)

Drawn by: Sarah Ingham

Checked by: Patrick O'Donnell

Scale: 1:4k @ A4	Date: 11/12/2018
Job No.: EI 061	Rev.: 1.0

Figure: 6.6



Legend

Substitute Consent Application Area

Habitats

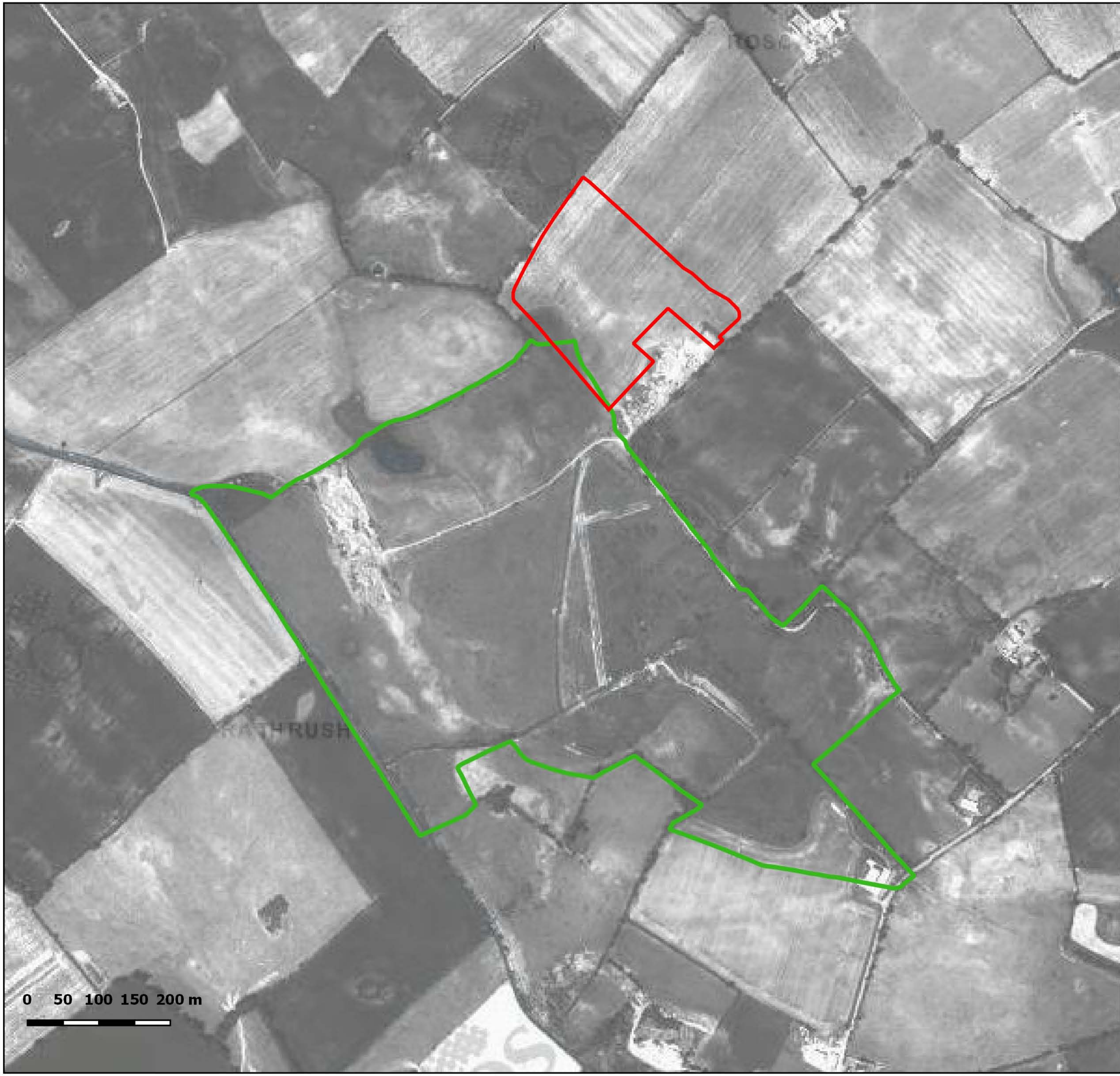
ED1

ED3

ED4

WS1

N



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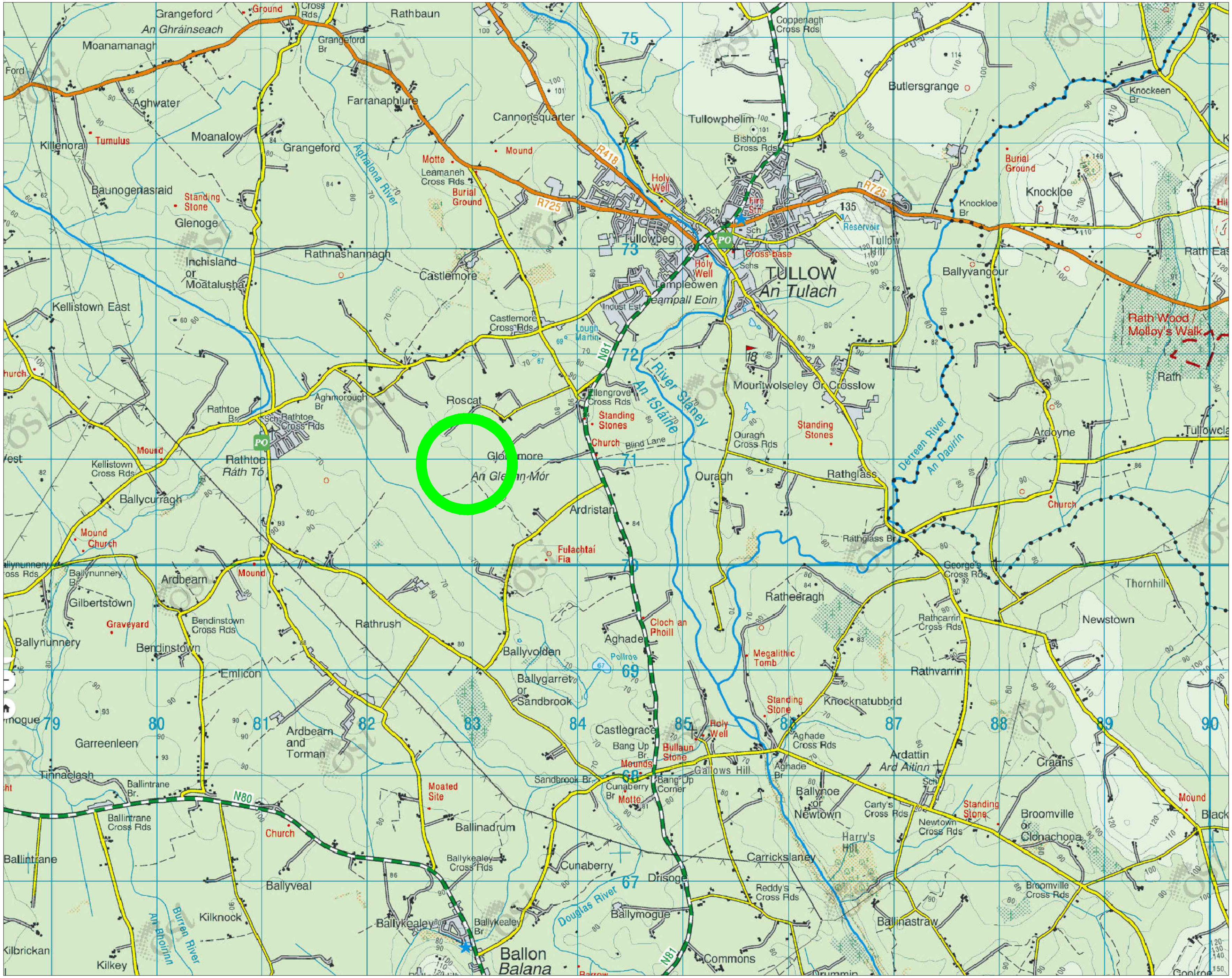
Client: Kilcarrig Quarries Ltd.	
Project: Substitute Consent Application, Roscat Sand and Gravel Pit, Roscat, Tullow, Co. Carlow	
Title: Pre-operational aerial imagery (1995) of Ardristan Fen pNHA in relation to the Substitute Consent application area.	
Drawn by: Sarah Ingham	
Checked by: Patrick O'Donnell	
Scale: 1:7k @ A4	Date: 11/12/2018
Job No.: EI 061	Rev.: 1.0
Figure: 6.7	

Legend

SC Area Boundry

Ardristan Fen pNHA

N



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Legend

Site Location

N

ITM Coordinates: 683027 E, 670998 N

Rev.	Description	Date

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Client: Kilcarrig Quarries Ltd.

Project: Remedial Environmental Impact Assessment Report to Accompany a Substitute Consent Application for a Sand & Gravel Pit Located at Roscat, Tullow, Co. Carlow

Title: Site Location Map

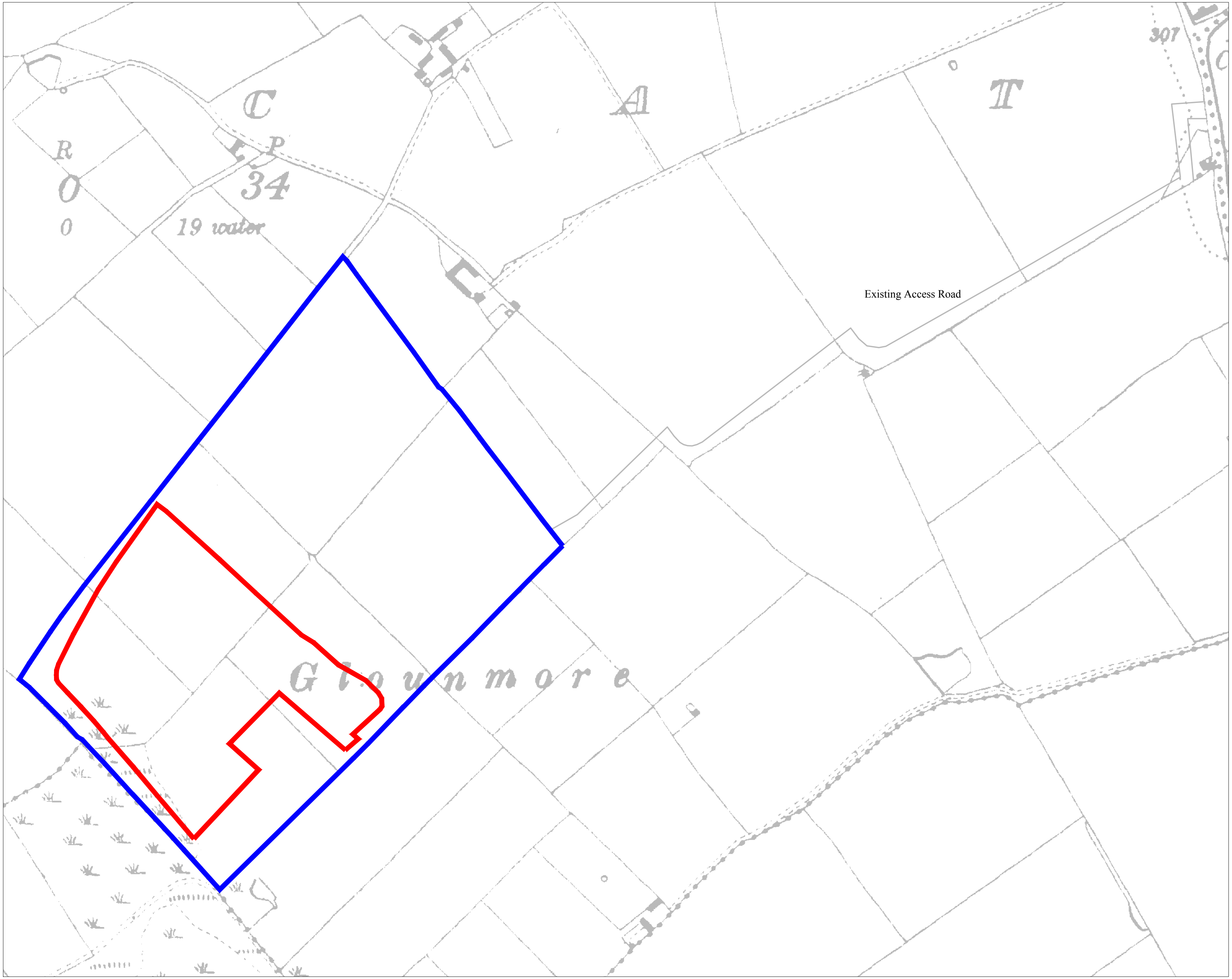
Drawn By: Sean O' Donnell

Checked By: Patrick O' Donnell

Scale: 1:50,000 @ A4 | Date: Apr. 2019

Job No: EI 061 | Rev: 0

Figure 6.1



Legend

Ownership Boundary

Application Area
Area = 4.7 Ha

N

O.S. Map Ref No. 4475 - B

ITM Coordinates: 683027 E, 670998 N

Rev.	Description	Date

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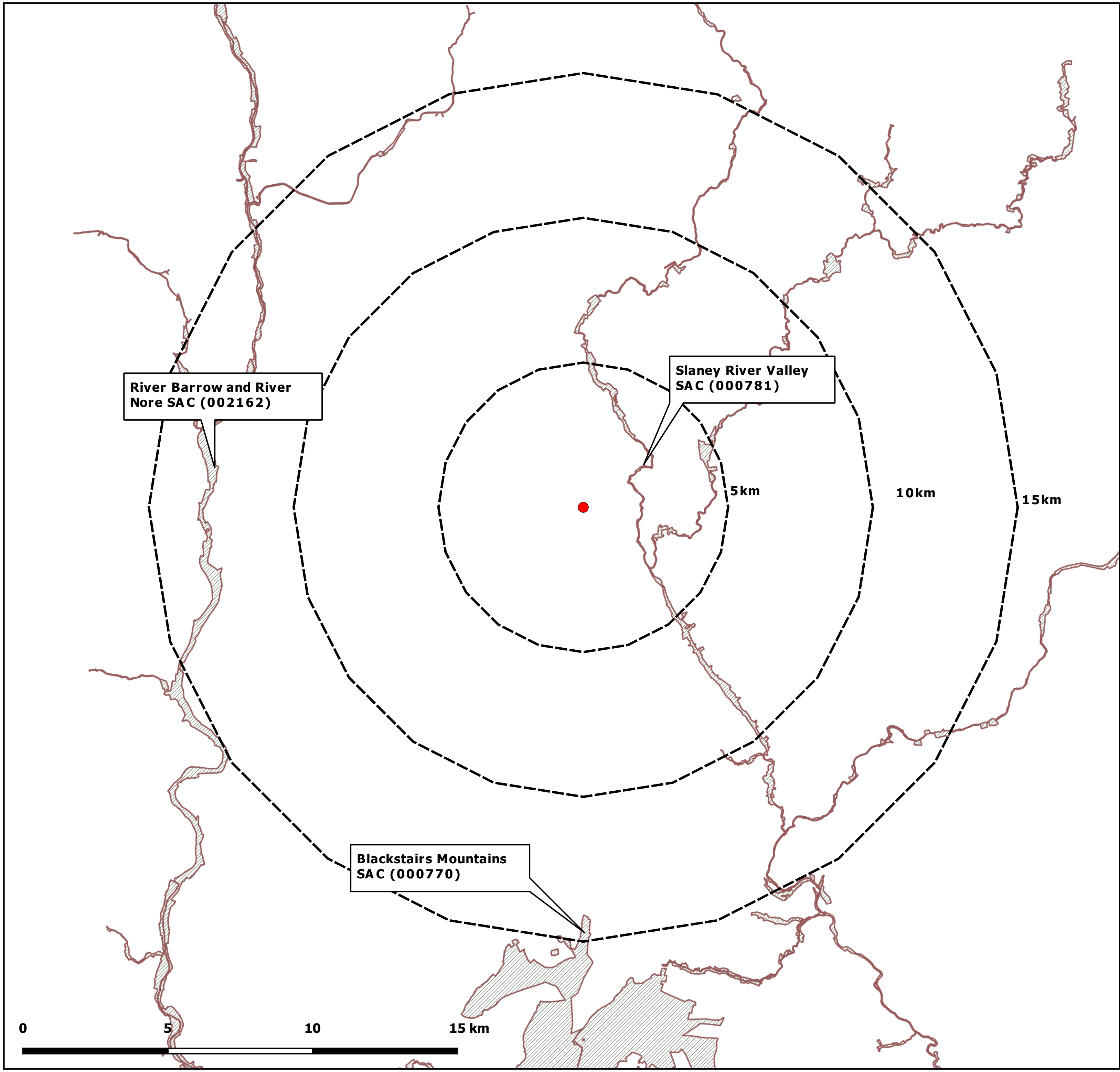
Title: Site Location Map

Drawn By: Sean O' Donnell

Checked By: Patrick O' Donnell

Scale: 1:5,000 @ A4	Date: Apr. 2019
Job No: EI 061	Rev: 0

Figure 6.2



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Client: Kilcarrig Quarries Ltd

Project: Substitute Consent application for Roscat Quarry, Tullow, Co. Carlow

Title: Natura 2000 within 15km of the application area

Drawn by: Sarah Ingham

Checked by: Patrick O'Donnell

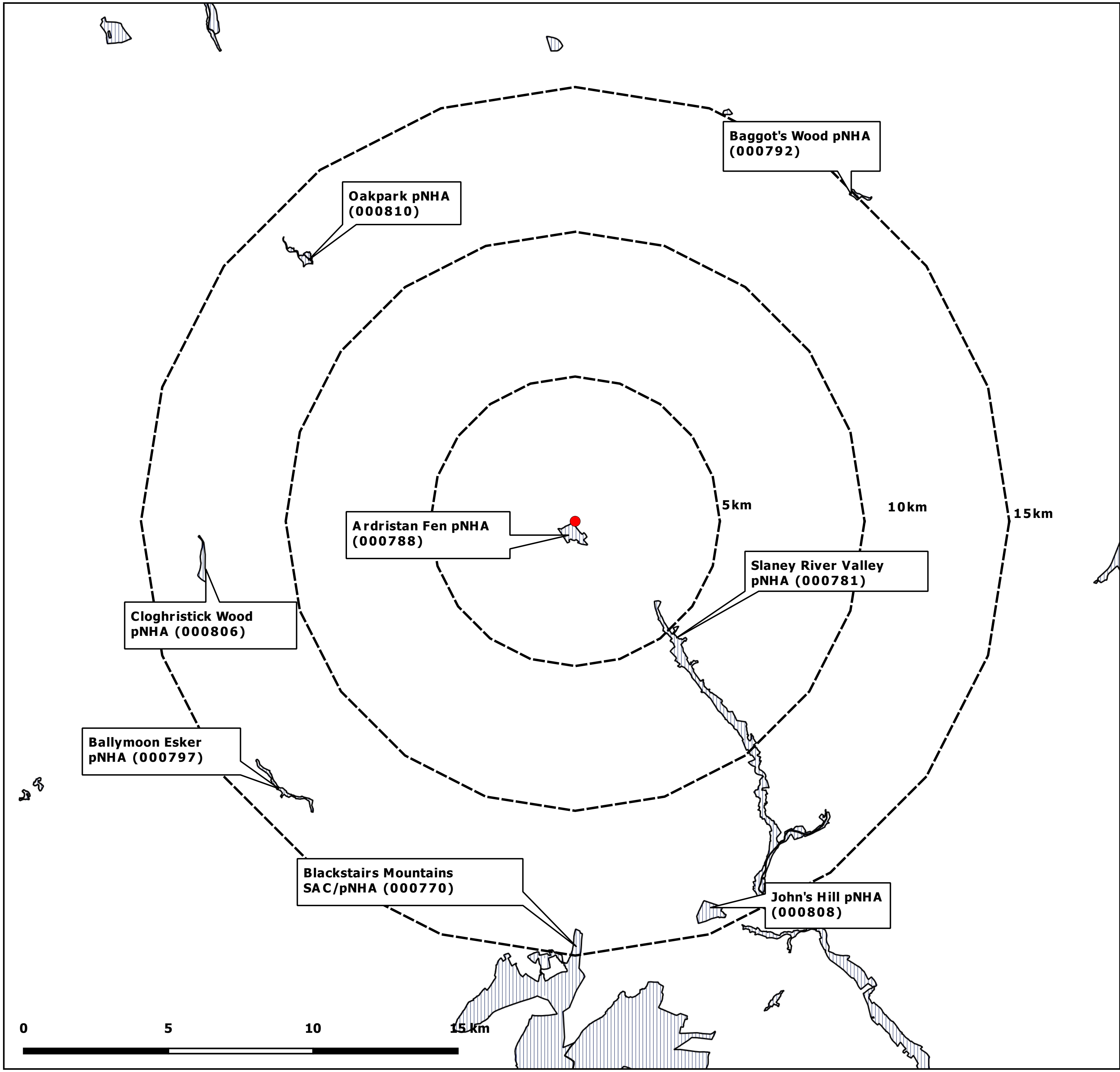
Scale: 1:18k @ A4	Date: 21/12/2018
Job No.: EI 061	Rev.: 1.0

Figure: 6.3

Legend

- Substitute Consent Application Area Location
- SAC
- 5, 10 and 15km Buffer

N



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Email: earthsciencepartnership@gmail.com

Client: Kilcarrig Quarries Ltd

Project: Substitute Consent application for Roscat Pit, Tullow, Co. Carlow

Title: National sites (pNHAs) designated for nature conservation within 15km of the Substitute Consent area

Drawn by: Sarah Ingham

Checked by: Patrick O'Donnell

Scale: 1:18k @ A3	Date: 21/12/2018
Job No.: EI 061	Rev.: 1.0

Figure: 6.4

Legend

Proposed Application Area Location

pNHA

5, 10 and 15km Buffer

N

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Client: Kilcarrig Quarries Ltd.

Project: Substitute Consent Application, Roscat Sand and Gravel Pit, Roscat, Tullow, Co. Carlow

Title: Map of habitats present in the Substitute Consent application area prior to extraction works within the site (Aerial imagery, 1995)

Drawn by: Sarah Ingham

Checked by: Patrick O'Donnell

Scale: 1:5k @ A4	Date: 11/12/2018
Job No.: EI 061	Rev.: 1.0

Figure: 6.5

Legend

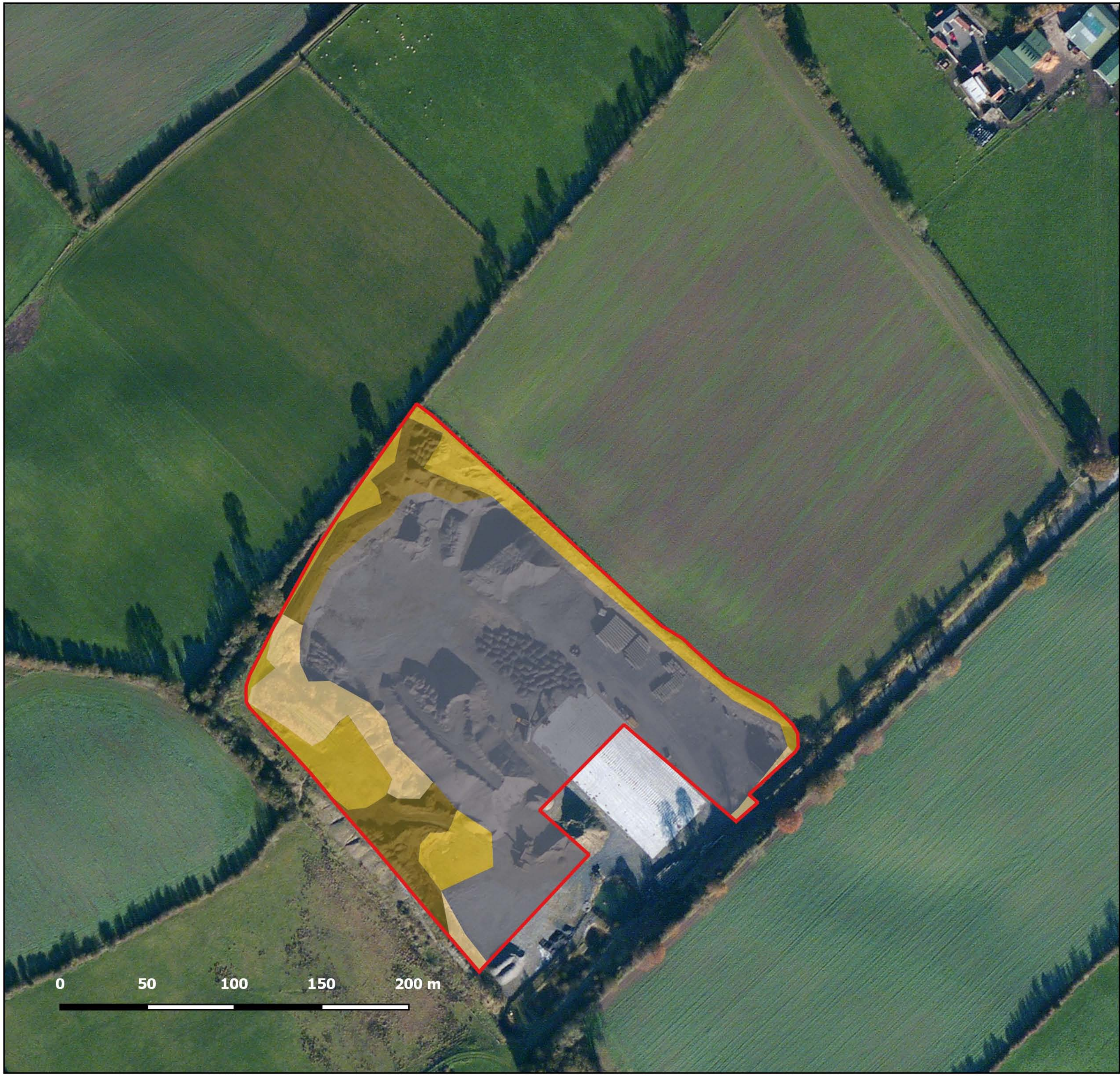
Substitute Consent Application Area

Habitats

Improved agricultural grassland (GA1)

Wet Grassland (GS4)

N



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Drawn by: Sarah Ingham

Checked by: Patrick O'Donnell

Scale: 1:4k @ A4	Date: 11/12/2018
Job No.: EI 061	Rev.: 1.0

Figure: 6.6

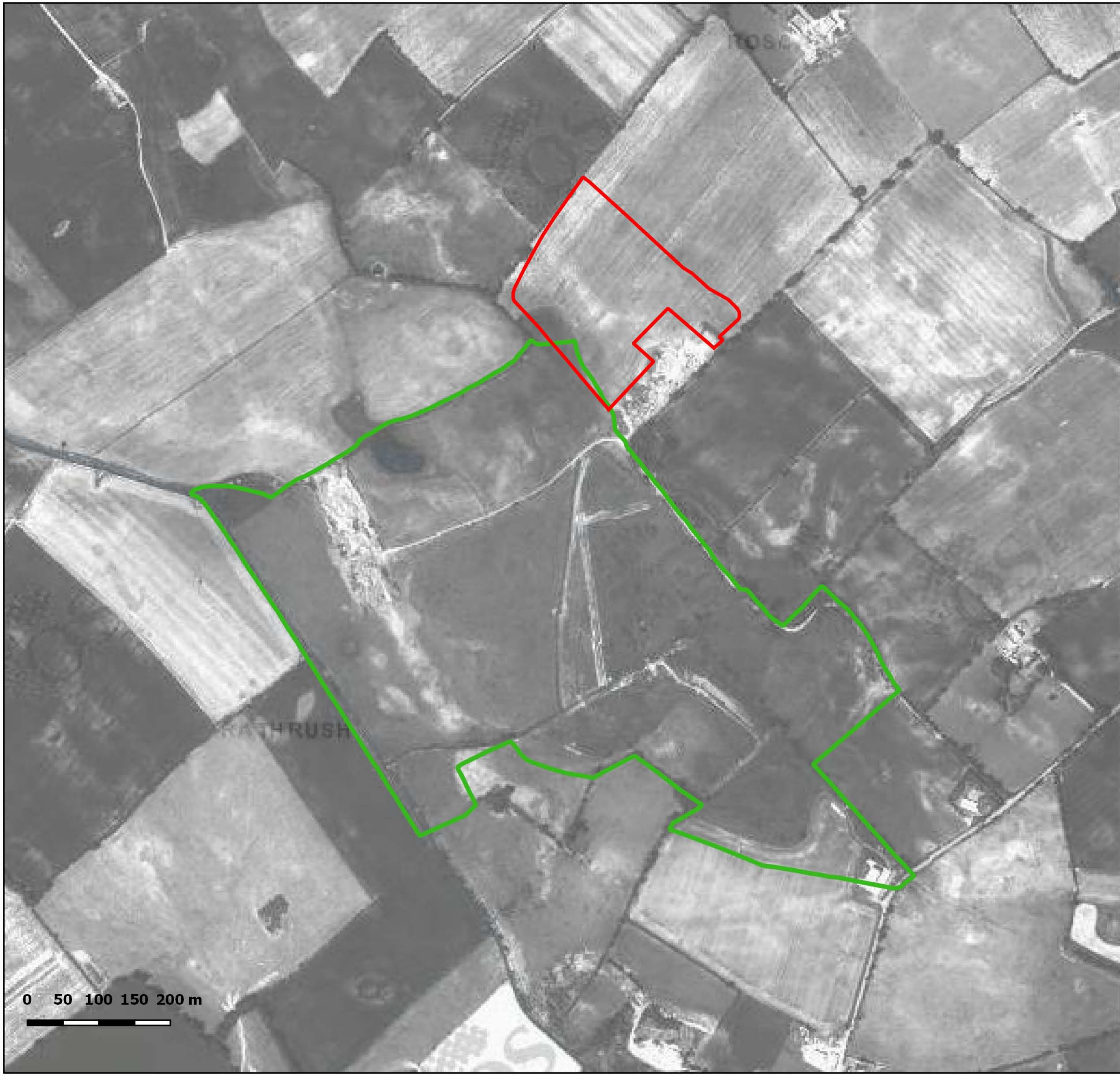
Legend

Substitute Consent Application Area

Habitats

- ED1
- ED3
- ED4
- WS1

N



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Drawn by: Sarah Ingham	
Checked by: Patrick O'Donnell	
Scale: 1:7k @ A4	Date: 11/12/2018
Job No.: EI 061	Rev.: 1.0
Figure: 6.7	

Legend

SC Area Boundry

Ardristan Fen pNHA

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7.0 LAND, SOILS AND GEOLOGY

7.1 Introduction

The following rEIAR section has been prepared by Colin O'Reilly PhD (Hydrology) and Patrick Breheny MSc (Hydrogeology) of Envirologic Ltd., on behalf of Earth Science Partnership Ltd.

The chapter details information in relation to soils, geology and land which is intended to satisfy the requirements of An Bord Pleanála in relation to an application for Substitute Consent for an existing sand and gravel pit at Roscat, Tullow, Co. Carlow (Applicant Name: Kilcarrig Quarries Ltd.). This follows a notice issued under Section 261A to submit a Substitute Consent application to An Bord Pleanála, requiring a remedial EIAR.

The existing pit has a footprint of approximately 6 ha. Approximately 1.3 ha of the existing pit has a planning permission attached for a gravel pit including machinery for screening and batching concrete, an office and septic tank.

The aim of this rEIAR section is to establish the following:

- baseline conditions relevant to the land, soil and geological environment within the site boundary, and the local surrounding environs;
- significant effects, if any, on the land, soil and geological environment, which have occurred, which are occurring or which can reasonably be expected to occur because the development, the subject of the application for Substitute Consent;
- assessment of impacts, including cumulative impacts, where applicable to the land, soil and geological environment;
- recommend suitable remedial measures where requried to address identified adverse impacts.

7.2 Methodology

The initial evaluation consisted of inspections of the site and adjacent lands by examination of aerial photography and Ordnance Survey plans, followed by site walkover surveys. Relevant geological data from the Geological Survey of Ireland (1:100,000 Sheet 19: Geology of Carlow-Wexford) was reviewed together with additional data collated from data sources at Carlow County Council, Environmental Protection Agency (EPA), National Parks and Wildlife Service (NPWS), Ordnance Survey of Ireland (OSI), Teagasc and Met Eireann.

The report has been compiled primarily taking cognisance of:

- *Guidelines for the preparation of soils, geology and hydrogeology chapters of* *environmental impact statement.* Institute of Geologists of Ireland (2013);

- *Revised guidelines on the information to be contained in Environmental Impact Statements.* Environmental Protection Agency (2015);
- *Guidelines on the information to be contained in Environmental Impact Assessment Reports. Environmental Protection Agency (2017);*
- *Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment. Department by the Department of Housing, Planning and Local Government (August, 2018).*

A site walkover which included an examination of the exposed faces in the historical pit was carried out in June 2018 in order to assess the material previously excavated. Intrusive investigation involved trial pitting and borehole drilling with geological strata logged and presented graphically.

7.3 Existing Environment

7.3.1 Land

The site is located in the townland of Roscat approximately 3 km southwest of Tullow and 2 km east of Rathtoe. The N81 national road which connects Tullow with the N80 at Ballon passes in a north-south direction 1.5 km east of the site.

In terms of regional topography, lands within a 6 km radius of the site form part of a broad valley partially confined by the following features:

- a narrow north-south trending ridge 7km to the west, that peaks locally at 195 mOD;
- the southern extents of the Wicklow Mountains 11.5 km to the east, which peak locally to the east at Aghowle Upper (420 mOD);
- to the northeast by lands which rise gradually through Tullow and Rathvilly;
- the northern limits of the Blackstairs Mountains 13 km to the south which peak locally at Croaghaun (455 mOD). Another small hill is noted 5 km south of the site at Ballon (131 mOD).

At a more local scale, the site is situated on the eastern side of a minor valley which is defined by a small north-south trending ridge that peaks at 94 mOD, 1 km northeast of the site at Ellengrove Crossroads, and a wider area of raised ground which reaches 93 mOD, 1.8 km southwest of the site. This valley flattens out to less than 70 mOD a short distance southwest of the site. OS Discovery maps indicate site elevation to be in the range 68 – 74 mOD.

Natural ground levels adjacent to the northeastern and southwestern boundaries of the existing working pit are 70 mOD and 61.7 mOD, respectively. The current floor of the existing pit is reasonably level with elevations generally between 62 – 64 mOD. Hence it has been deduced that land in the existing working pit has been lowered by a maximum of 7 m.

The site is located in a rural setting and land is used for moderate to high intensity tillage and grassland agriculture. The nearest dwelling to the existing working pit is located 350 m to the northeast, and has an accompanying farmyard. There are three other dwellings within a 500 m radius, two of which have accompanying farmyards. Beyond this are additional one-off dwellings and small ribbon developments along roads.

7.3.2 Soils

Reference was made to Gardiner and Radford (1980) and Teagasc soil maps which show that the agricultural soils which originally overlaid the existing working pit, consist principally of shallow, well-drained mineral soils with alkaline signature (Figure 7.1).

Soils of County Carlow (Conry and Ryan, 1967) show that soils at the site belong to the shallower sub-group Broughillstown Complex Series. These have developed on esker hummocks and are described as gravelly sandy (coarse) loams, classified as Brown Earths. The profile is characterised by a dark greyish-brown, friable and crumb-structured upper horizon of depth 150 – 250 mm, which passes directly into the coarser-textured, calcareous parent material. These soils are shown to have a wide-use range but are best suited to tillage. They exhibit moderate to rapid permeability which can develop a moisture deficit during dry periods, resulting in crops maturing unevenly.

Soils observed in-situ over exposed faces were noted as being thin. Soils have been stripped in order to facilitate extraction of overburden during previous activities. This stripped material has been stockpiled and formed into earthen bunds which partly define the site boundary. This soil will be available for site rehabilitation.

Figure 7.1 shows that a localised area inside the south east boundary is classified as fen peat.

7.3.3 Quaternary Deposits

The quaternary period encompasses the last 1.6 million years and deals with the current soils that were deposited over the bedrock described below. The Pleistocene (1.6 million years - 10,000 years ago) is commonly known as the last Ice Age, which was a period of intense glaciation separated by warmer inter-glacial periods. Deposits resulting from this glaciation period were widespread and laid down in a diverse range that differ in thickness, extent and lithology. During the early stages of the Holocene, i.e. today’s climate, the climate became warmer and wetter, approaching that which pertains to today.

Figure 7.2 shows that quaternary deposits in the existing working pit consist almost entirely of limestone-derived gravels, consistent with the surrounding area. This parent material of the Broughillstown Complex consists of fluvio-glacial outwash and esker gravels of Weichsel Age, composed mainly of limestone with an admixture of mica-schist, granite and sandstone. In general, this outwash material is coarse and poorly sorted with inter-bedded lenses of better sorted material (GSI, 1998). Meltwater tunnels and channels through the retreating glaciers washed out finer sediment, leaving behind deposits of fluvioglacial coarse-textured sands and gravels in the form of kames, moraines and eskers. Esker deposits tend to be linear in form and a minor, discontinuous, linear deposits of esker gravels are present between the site and the nearby watercourse. Moraines tend to resemble humps or small hillocks and these are more prevalent in the area. The flow direction of the primary meltwater channel in this part of north Carlow is from north to south.

Overburden on the more elevated ridges in the area is made up of granite-derived tills. These till thins out sufficiently on topographical peaks to expose bedrock. Peats have developed on topographically depressed grounds, including those south of the site which are denoted as fen-type peats. The watercourse to the southwest of the site is underlain and narrowly flanked by discontinuous alluvial deposits. Other segments are flanked by fen peat and cut peat which infers that the watercourse is not naturally formed along its entirety.

7.3.4 Bedrock and Structural Geology

The bedrock and structural geology in the vicinity of the site is illustrated in Figure 7.3. The 1:100,000 GSI bedrock geology Sheet 19: Geology of Carlow-Wexford (Tietzsch-Tyler and Sleeman, 1995) shows the subject site and surrounding area to be underlain by the Tullow Type 2 Sparsely Porphyritic Granite Formation.

Conry and Ryan (1967) describe how the rolling lowlands that slope gently from the foot of the mountains defining the Barrow valley have developed over an extensive granite intrusion. The Tullow Granites are described by the GSI as a late Silurian granite which was formed underground as molten igneous rock was forced upward before being slowly cooled beneath the remnants of older sea floor Ordovician sediments. The granite is mostly of medium-grained texture but some coarse and fine veins cut the mass. Being composed of well-developed potash feldspar crystals, glassy quartz and black mica, it has a white background colour flecked with black. Along joints the granite is often deeply weathered to sand leaving solids blocks in between.

The Tullow granite is intersected by a fault orientated along in a northwest – southeast plane, located approximately 700m northeast of the site.

7.3.5 Site Geology

Previous operations in the existing pit have targeted the local sands and gravels for extraction. Multiple exposures show this material to be of a minimum thickness of 7 m. No extraction has taken place below the water table. The pattern of excavation progressed westwards across the site.

Multiple exposures of sub-vertical sand and gravel faces of up to 7 m, generally along the northern extents of the worked out area reveal the nature of targeted material. A typical exposure exhibits rounded to sub-rounded intermixed limestone gravels and cobbles, up to 100 mm in diameter. On the whole, material is generally poorly sorted but interbedded in places with (i) lenses of well-sorted coarse-grained sands and (ii) rounded gravels and cobbles (<50 mm) in a coarse sand matrix. The multiple layering doesn't necessarily follow surface topography when considered in 3 dimensions and this is attributed to the chaotic environment under which this material was deposited. A typical example of the exposed pit face (northern quarry boundary) is shown in Plate 7.1.

Plate 7-1: View of exposed pit face in northern portion of site.

7.3.6 Depth to Bedrock

The GSI well database shows depth to bedrock (DTB) information ascertained from two wells drilled previously for Carlow County Council in the Roscat area as follows (n.b. these could not be located as the mapped information is only accurate to 1 km resolution):

1. Well depth = 12.5 m; DTB = 6.1 m; well yield = 32.7 m^3/d; yield class = moderate.
2. Well depth = unconfirmed; DTB = 7.0 m; yield class = poor.

There was no evidence of exposed bedrock within the existing working pit or the general vicinity of the site.

7.3.7 Geological Heritage

The site is not within a geological heritage area. The nearest such designation is the Ballymoon Esker 15 km south-east of the site, close to Bagnelstown. This unit is described as a ridge of glacial sands and gravels which developed beneath and within melting ice sheets towards the end of the last glaciation period.

7.4 Site Investigation

7.4.1 Trial Pitting

Four trial pits were excavated on 18th June 2018 within the existing working pit using a tracked excavator. The purpose of this was to observe fresh exposures which would facilitate a detailed examination of subsurface lithology.

Trial pit locations (TP1, TP2, TP3, & TP4) are presented in Figure 7.4, with summary details shown in Table 7.1. Where possible subsoil descriptions were logged at each location in accordance with BS: 5930 (1999). In summary the excavated trial pits encountered gravels and coarse sand, deemed to be representative of overburden across the site. Bedrock was not encountered in any of the trial pits.

Table 7-1: Trial pit details

ID	Location	Easting (m)	Northing (m)	Ground elevation (mOD)	Pit depth (m)	Pit base elevation (mOD)
TP1	Western boundary, base of exposure	682,859	671,100	62.26	3.4	58.86
TP2	Northern boundary, base of exposure	683,006	671,101	63.22	2.92	60.30
TP3	Southeastern corner	682,965	670,880	63.03	3.73	59.30
TP4	Centrally, towards southeastern boundary	682,937	670,963	63.16	3.94	59.22

The pit face from TP2 was described as generally grey-brown, small to medium rounded to sub-rounded, unbedded gravels with medium to coarse sand.

Plate 7-2: Typical subsurface profile as encountered in TP3

In the other two trial pits (TP1 and TP4) significant groundwater ingress occurred between 1.0 and 1.5 m below ground level (bgl). This made the pit faces unstable and prevented collection of accurate subsoil descriptions beyond these depths.

With the exception of TP4 there was no evidence of clay or silt banding within any of the excavated trial pits. With the absence of localised clay banding, vertical and horizontal permeability in this stratum is likely to be uninhibited and therefore high (as water can move unrestricted both vertically and laterally within the sand and gravel layers).

7.4.2 Monitoring Well Installation

Three monitoring wells were installed on 19th-20th June 2018 in the plot to the north of the site as part of site investigation works for a separate application. Borehole logs for these installations are included in Appendix IV – Borehole Logs. Summary details of the wells are provided below in Table 7.2. Bedrock was encountered at depths of between 12.25 m (MW1) and 13 mbgl (MW2). Bedrock was described as being soft weathered granite.

Table 7-2: Details of monitoring wells installed in in the area surrounding the application site

Monitoring Point No.	MW1	MW2	MW3
Location	Eastern boundary, in laneway	Northern boundary, d/g of 3rd party dwelling	Western boundary
Easting (m)	683,145	683,192	682,965
Northing (m)	671,002	671,311	670,880
Ground elevation (mOD)	69.01	73.22	72.65
Top of Casing (mOD)	69.41	73.63	73.13
Well Depth (m)	12.7	15.51	15.30
Base of Well (mOD)	56.31	57.71	57.35

7.5 Characteristics of the Development

7.5.1 Description of Activities

The application site has an area of approximately 4.7 ha. This area is broadly rectangular with a width of 300 m perpendicular to the slope, and length of 220 m. The L-shaped indentation in the southeastern corner is an area previously granted planning permission. The remainder of the perimeter is generally well defined by hedgerows and soil berms. The site is accessed via a 1 km private haul road which extends southwest from the N81 at Ardristan Heights.

The quarry commenced operations in 1987 with the existing working pit being most active within the period 2000 - 2008. The existing working area has generally been unused since 2008.

Previous activities at the site included:

- Stripping and stockpiling of topsoil in screening embankments. Vegetation has become established on these perimeter berms.
- Extraction of sand and gravel deposits using mechanical excavator. All extraction took place above groundwater. Maximum depth of extraction is estimated to be 7 m.
- Excavated material was directly loaded onto vehicles and transported off-site to market or for further processing at an alternative location. Material was also screened, graded and stockpiled on site.
- Processed material stored on-site was loaded onto vehicles and exported off site to market.
- There was no production of readymix concrete/mortar or manufacture of concrete blocks on the application site.
- Fines resulting from screening (i.e. fine sand, silt and clay) were stockpiled in the central part of the site. This material remains on site and is suitable for use in rehabilitation.
- Refuelling of on-site machinery (assumed to be mobile screening/grading plant and loading shovel) was carried out by a local third party fuel supplier using a double-skinned mobile fuel tanker. Fuel was delivered to site as required and dispensed directly into plant. There has reportedly been no storage of fuels on site.
- Lubricating products were stored on bund trays within a secure steel container.
- Planning permission on a 1.3 ha area of the existing point was granted for *a gravel pit, screening and batching plant with office and septic tank.* However Envirologic could find no evidence of a septic tank during the site walkover. It is therefore assumed that a portable toilet was used to provide sanitary services at the site and that this was reportedly serviced by a licenced contractor. It is estimated that 1-2 staff members would have been operating at the site during 2000-2008.
- A site compound was located in the centre of the site. At present there is no site office, weighbridge or wheel washing facilities at the site.

7.5.2 Use of Land Resource

The development of the sand and gravel pit in line with the planning permission attached to the 1.3 Ha. area and the extension into the 4.7 Ha. which is the subject of this application resulted in the loss of the previous land use. From viewing aerial photography, the land was previously used for crop production land which is the dominant land use in the study area.

7.5.3 Use of Natural Resources

Natural resources being extracted at the site consist of glaciofluvial sands and gravels derived from limestone. Sand and gravel are extremely important in the construction industry, and these materials are generally considered to be suitable for a wide range of uses as construction aggregates. Previously extracted resource would have been and is suitable for use in the construction industry for the production of precast concrete, readymix concrete, readymix mortar, blocks and bricks. Sands and gravels are also important for local agriculture as permeable fill, yard surfacing, drainage material, etc.

The destination of this raw material would most likely have been at a local scale serving agriculture, extending to a regional scale as required for use in the construction industry. The regional extents are presumed to be north Carlow, south Wicklow and north Wexford.

Diesel would have been consumed by on-site machinery and processing plant, and in haulage vehicles transporting material from the site and upon return.

7.6 Impact Assessment

The procedure for determination of potential impacts on the receiving soil and geological environment is to identify potential receptors within the site boundary and surrounding environment and use the information gathered during the desk study and field investigation to assess the degree to which these receptors will likely have been impacted upon. Impacts are described in terms of quality, significance, duration and type in accordance with current EIAR guidelines (EPA, 2017; DHPLG, 2018).

In accordance with the NRA Guidelines (2009) (as included in 'Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements' (IGI, 2013)), the site is deemed to be an attribute of Medium importance as a function of being a small existing sand and gravel pit. The geological resource removed was an attribute of value or significance on a local scale only.

The potential impacts from historical activities are summarised below and in further detail in Table 7.3.

7.6.1 Direct Impacts

Extraction activities to date have resulted in the change in land use from crop production to resource extraction. The change in land use has not resulted in a significant loss of the previous land use (crop production) as the area the subject of this application is minor in comparison to the availability of land which is available for crop production. The proposed restoration plan will result in the application site being restored to agricultural land which will offset extraction activities to date.

By definition the historical extraction of sand and gravel involved the excavation and removal of glacial deposits. This is therefore considered to be a permanent, adverse impact to an attribute of medium importance. Any soils and screening by-product currently stockpiled on site as perimeter berms will be reused or integrated as a fundamental part of site rehabilitation. Impacts to subsoils were limited to within the application boundary and there is no impact to subsoils outside the site boundary. There has been no impact to underlying bedrock.

The sand and gravel previously extracted was used as a raw aggregate for the construction and agricultural industries. This activity has had a beneficial impact to the local and regional economy in this regard. The necessity for such raw materials is recognised in the Carlow County Development Plan 2015-2021.

Historically there has been the potential for contamination of exposed subsoils as a result of spillages or leakages from stationary and mobile plant. Laboratory analysis of a downgradient shallow well has shown that groundwater quality at the site has not been adversely impacted by previous operations and as such contamination from previous activities is deemed to be undetectable. There are no designated sites with respect to geological features within the vicinity of the site.

7.6.2 Indirect Impacts

The historical extraction of sands and gravels on the application site will have had the following adverse indirect impact to the land, soil and geological environment:

- Extraction activities to date has temporarily removed the capacity of these lands to provide agricultural production namely crop production until future restoration. The change in land use has not resulted in a significant loss of the previous land use (crop production) as the area the subject of this application is minor in comparison to the availability of land which is available for crop production. The resulting impact on the soils may be considered to be of a medium term nature in that they will be reused or re-integrated as a fundamental part of future site rehabilitation. The proposed restoration plan will result in the application site being restored to agricultural land which will offset extraction activities to date.

The historical extraction of sands and gravels has had the following positive indirect impact to the land, soil and geological environment:

- stored soils are available for reuse in the rehabilitation of the site to a condition suitable for agricultural production.
- The use of the geological resource, i.e. sand and gravel, as a raw material had benefits in the production of aggregates and products for use in construction and agriculture. These aggregates and products cannot be reasonably be manufactured by other means.

Previous extraction has not had any indirect impact on the soil and geological environment outside the site.

7.6.3 Cumulative Impacts

The existing working pit is considered to be small in terms of scale in the quarrying industry.

Aerial photographs reveal a quarry 1 km to the south of the application area. The presence of large, irregularly shaped ponds suggests resource has been extracted below groundwater at this location. There are no other clearly identifiable quarries within 5 km of the site.

Hence the cumulative impact to the geological resources in the area is considered to be negligible. Quarrying is established at this site and it has been integrated into the local environment. It is also in line with the Carlow County Development Plan 2015 – 2021.

7.6.4 Do-Nothing Effects

In the event that substitute consent is not granted the proposed landscape and restoration works would not go ahead leaving the existing working pit unrestored until a restoration proposal was agreed with Carlow Co. Co..

7.6.5 Interaction with other Impacts

The EIAR guidelines (EPA, 2017; DHPLG, 2018) highlight that the interaction of impacts to the land, soils and geological environment, arising from historical use, must be given due consideration alongside potential receptors identified in other sections of the rEIAR. The likely interactions have been identified as follows:

- The movement of soils and subsoils may have given rise to increased dust emissions.
- The operation of plant associated with extraction and haulage may have given rise to increased noise emissions.
- The extraction of overburden may have impacted upon surface and groundwater quality and flow patterns.
- The extraction of overburden may have impacted upon biodiversity and caused disturbance to habitats in the area.
- Haulage of resource may have given rise to increased traffic movements.

Each of these issues are addressed in detail in the relevant sections of this rEIAR.

7.6.6 Unplanned Events

The 2014 EIA directive requires the development be assessed in terms of vulnerability to the risks of major accidents and/or disasters which are relevant to the project. It is highly unlikely that any unplanned events should occur that could lead to an impact on Land, Soils & Geology. Extracted side slopes are stable and it is proposed vegetate these to ensure that they remain stable on completion of restoration works.

7.7 General Mitigation Measures

Extractive operations were undertaken in accordance with "best practice" and appropriate guidelines for example EPA's Environmental Management in the Extractive Industry guidelines and Irish Concrete Federation (ICF) Environmental Code.

7.8 Remedial Measures

The implementation of the proposed landscape and restoration plan will offset the impact associated with extraction to date in so far is possible. The following measures will be practiced during the Landscape and restoration phase.

- Soils retained on site shall be used in rehabilitation. The site will be capped with a layer of topsoil in order to restore the back to agricultural use.
- Landscape & restoration works shall not be carried out during excessively dry or wet weather.
- Post-completion contours should be such that there are no direct pathways for suspended solids from exposed subsoils to leave the site via runoff.
- Material shall be deposited in layers not exceeding 300 mm, with the objective being to achieve extensive and vertical infiltration of precipitation.
- Fuelling and lubrication will be in a designated area, or where possible off-site, and not within 30 m of drainage ditches or surface waters. There will be no storage of fuels on site.
- An adequate supply of spill kits and hydrocarbon absorbent packs shall be stored in this area and staff shall be trained in the appropriate use of same.

7.9 Residual Impacts

Residual impacts refer to the degree to environmental change that will occur after any proposed mitigation and remedial measures have taken effect. Assuming implementation of the remedial measures namely landscaping and restoring the site, the residual impacts on the soil and geological environment are assessed to be long-term and negligible.

Table 7-3: Summary of potential impacts

Activity	Attribute	Character of potential impact	Importance of attribute	Magnitude of potential impact	Term	Significance of potential impact
Handling/placement of soils	Soil	Loss of soils due to erosion and dust generation. Damage to soil structure	Medium: thin, rapid permeability soils	Adverse/Negligible	Short tem	Imperceptible
Handling/placement of screenings	Screenings	Dust generation. Reduction of permeability	Low: Discarded fines from sands/gravels	Negligiblble	Short term	Imperceptible
Use of fuels/hydrocarbons	Soil, subsoil, bedrock	Potential for contamination of exposed subsoils as a result of spillages/leakages.	Medium	Adverse/Moderate	Temporary	Moderate

7.10 References

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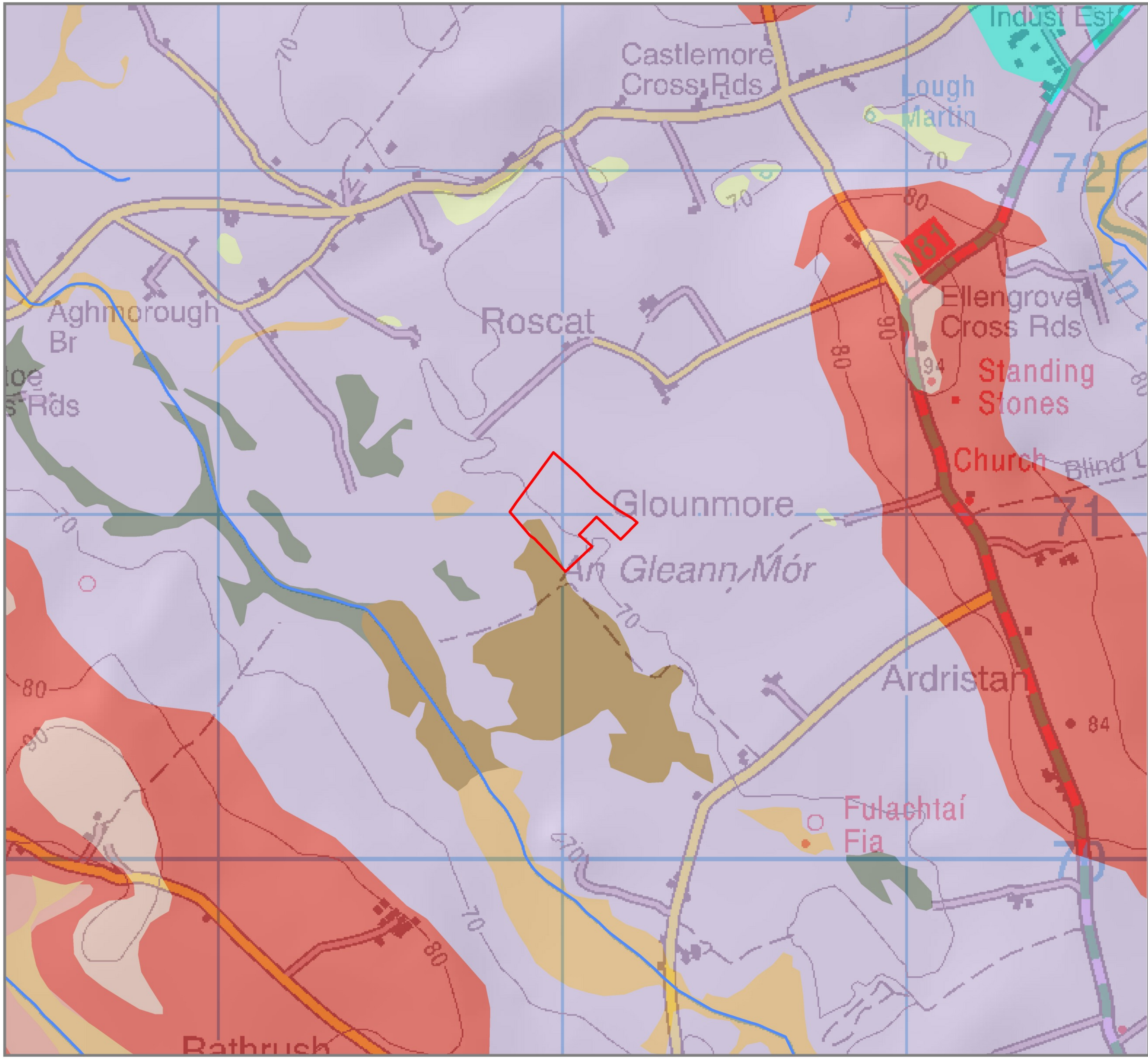
Figures



Application Boundary
Surface Watercourses

Soils Legend:

- Alluvium
- Deep well drained mineral (acidic)
- Mineral poorly drained (acidic)
- Shallow poorly drained mineral (acidic)
- Shallow well drained mineral (acidic)
- Deep well drained mineral (basic)
- Shallow poorly drained mineral (basic)
- Shallow well drained mineral (basic)
- Cutover / cutaway peat
- Fen peat
- Lacustrine deposits
- Made ground
- Water

N

0 750
metres

Client:	Earth Science Partnership Ltd		
Project:	rEIAR Section: Land, Soils & Geology		
Location:	Roscat, Tullow, Co. Carlow		
Figure 7.1:	General Soils Classification Map		
Scale:	1 : 15 000	Date:	September 2018
Ref:	1679	Author:	C. O'Reilly

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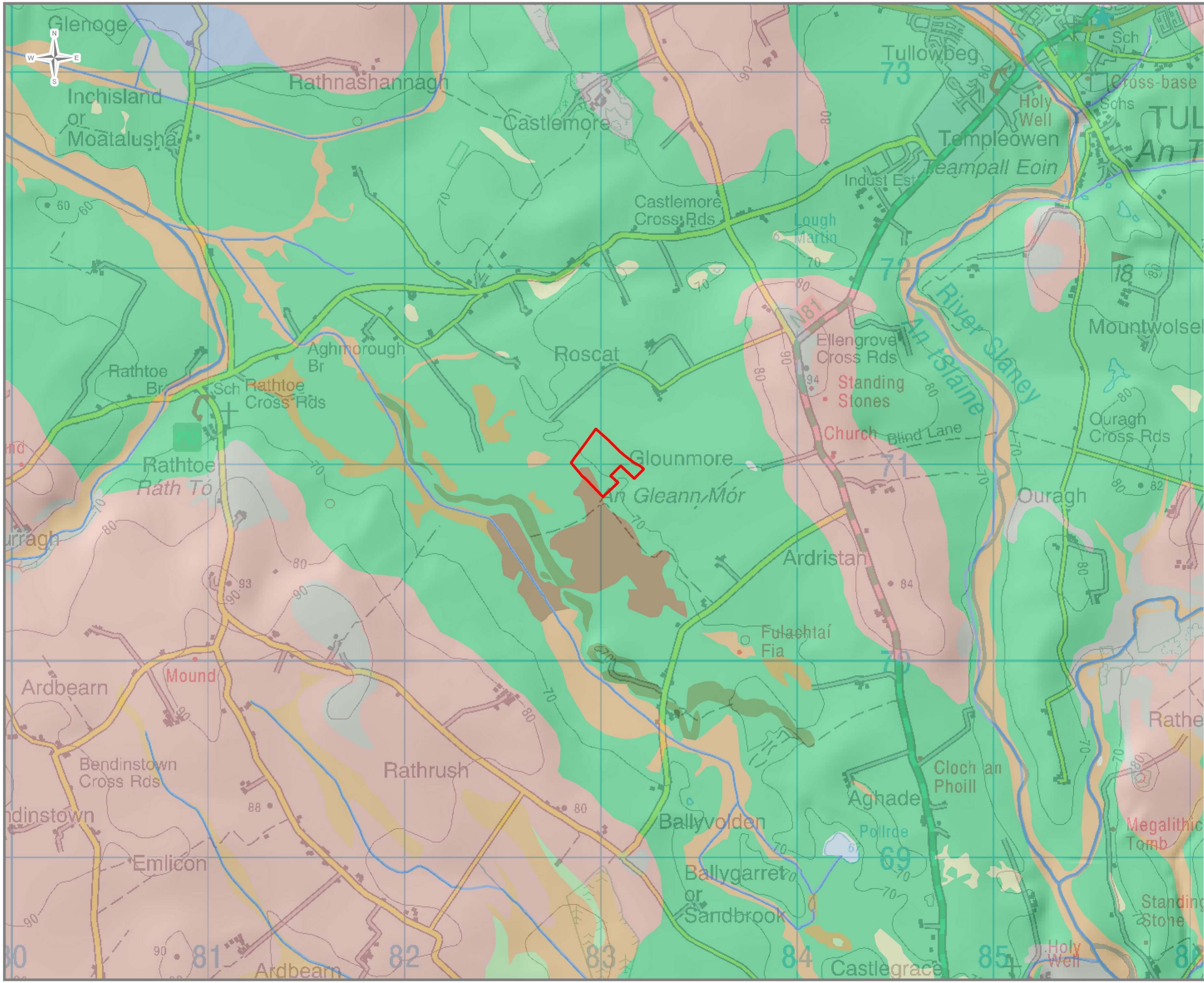

Legend:

Application Boundary

EPA River Network

Subsoils:

- Alluvium
- Esker comprised of gravels
- Cutover peat
- Fen peat
- Gravels derived from granite
- Gravels derived from limestone
- Lacustrine Deposits
- Bedrock outcrop or subcrop
- Till dervied from granites
- Till dervied from limestones
- Water

0 750

metres

Fig. 7.2:	Quaternary Deposits Map
Date:	September 2018
Author:	C. O'Reilly
Scale:	1 : 25 000
Client:	ESP Ltd
No.:	1679
Project:	rEIAR Section: Land, Soils & Geology
Location:	Roscat, Tullow, Co. Carlow

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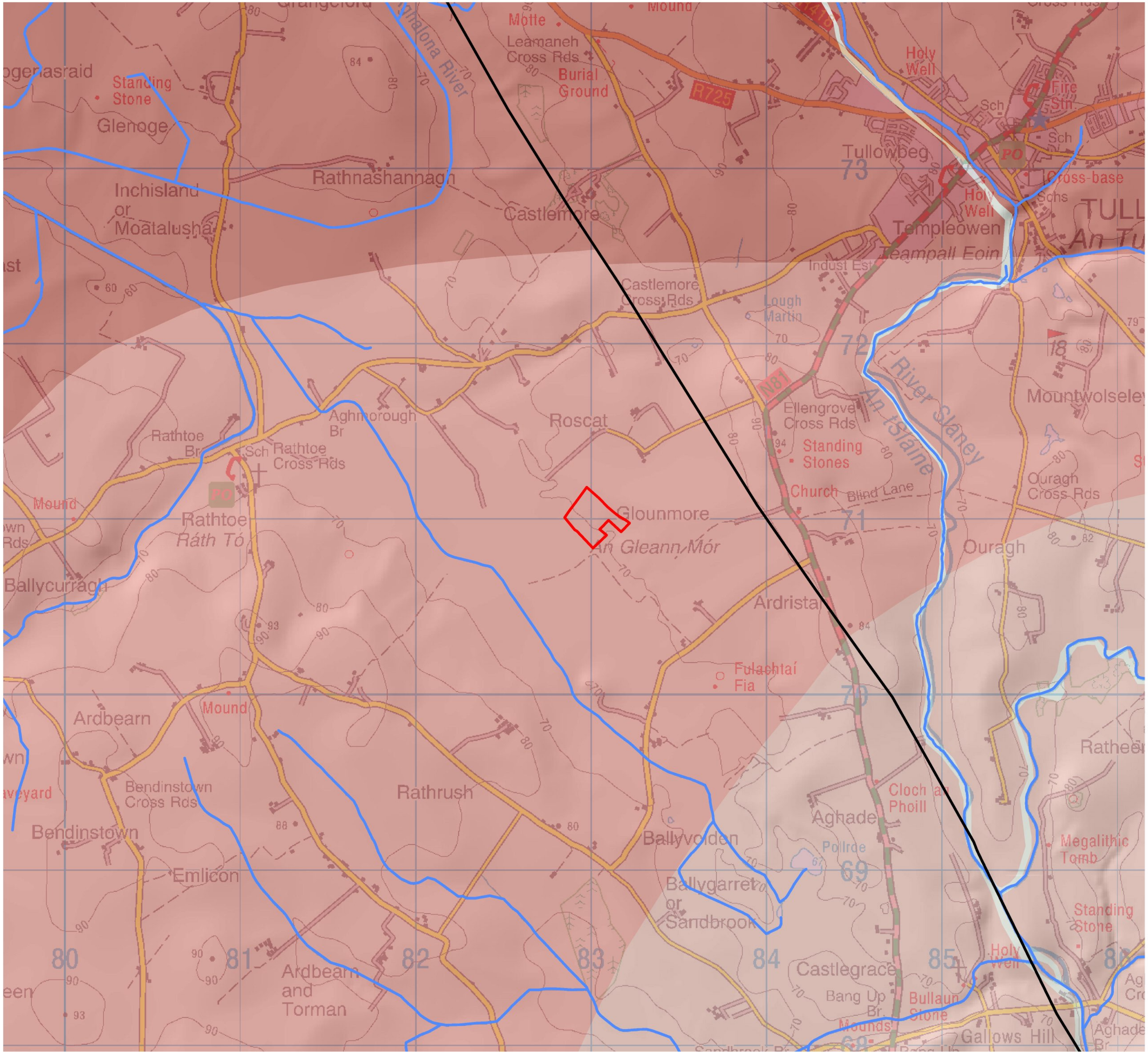

	Application Boundary
	Surface Watercourses

Bedrock Legend:

	Type 2 Equigranular Granite (Tullow Pluton)
	Type 2 Sparsley Phorphyritic Granite (Tullow Pluton)
	Type 2 Microcline Porphyritic Granite, (Tullow Pluton)
	Structural Geology

0 1,500
metres

N

Client:	Earth Science Partnership Ltd.		
Project:	rEIAR Section: Land, Soils & Geology		
Location:	Roscat, Tullow, Co. Carlow		
Figure 7.3:	Bedrock & Structural Geology Map		
Scale:	1 : 30 000	Date:	September 2018
Ref:	1679	Author:	C. O'Reilly

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Legend:

Application Boundary

Trial Pit Location

Monitoring Well Location

0 125

metres

Fig. 7.4:	Site Investigation Point Locations
Date:	September 2018
Author:	C. O'Reilly
Scale:	1 : 3 500
Client:	ESP Ltd
No.:	1679
Project:	rEIAR Section: Land, Soils & Geology
Location:	Roscat, Tullow, Co. Carlow

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8.0 WATER

8.1 Introduction

The following EIAR section has been prepared by Colin O'Reilly PhD (Hydrology) and Patrick Breheny MSc (Hydrogeology) of Envirologic Ltd., on behalf of Earth Science Partnership Ltd.

The section is intended to satisfy the requirements of An Bord Pleanála, relating to an existing sand and gravel pit at Roscat, Tullow, Co. Carlow (Applicant Name: Kilcarrig Quarries). This follows a notice issued under Section 261A to submit a Substitute Consent application to An Bord Pleanála, requiring a remedial EIAR.

The existing working pit has a footprint of approximately 6 ha. Approximately 1.3 ha of the existing working pit has a planning permission attached for a gravel pit, screening and batching plant with office and septic tank. The Section 261A assessment requires that Substitute Consent be issued on the existing working area which does not have planning permission attached (i.e. 4.7 ha).

The aim of this EIAR section is to establish the following:

- baseline conditions relevant to the hydrological and hydrogeological environment within the site boundary, and the local surrounding environs;
- significant effects, if any, on the hydrological and hydrogeological environment, which have occurred, which are occurring or which can reasonably be expected to occur because the development, the subject of the application for substitute consent was carried out;
- assessment of impacts, including cumulative impacts, where applicable to the hydrological and hydrogeological environment;
- recommend suitable mitigation measures to address identified adverse impacts.

8.2 Methodology

The initial evaluation consisted of inspections of the site and adjacent lands by examination of aerial photography and Ordnance Survey plans, following by site walkover survey. Relevant hydrogeological data from the Geological Survey of Ireland (1:100,000 Sheet 19: Geology of Carlow-Wexford) was reviewed together with additional data collated from data sources at Carlow County Council, Environmental Protection Agency (EPA), National Parks and Wildlife Service (NPWS), Ordnance Survey of Ireland (OSI) and Met Eireann.

The report has been compiled primarily taking cognisance of:

- *Guidelines for the preparation of soils, geology and hydrogeology chapters of environmental impact statement.* Institute of Geologists of Ireland (2013);

- *Revised guidelines on the information to be contained in Environmental Impact Statements.* Environmental Protection Agency (2015);

- *Guidelines on the information to be contained in Environmental Impact Assessment Reports. Environmental Protection Agency (2017).*

- *Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment. Department by the Department of Housing, Planning and Local Government (August, 2018).*

Intrusive investigation in June 2018 involved trial pitting and borehole drilling to assess groundwater flow patterns. Groundwater sampling along with groundwater and surface water level monitoring was carried out to interpret summer and winter hydrogeological regimes.

8.3 Existing Environment

8.3.1 Aquifer Classification

Figure 8.1 shows that the site is underlain by a poor bedrock aquifer, consisting bedrock which is generally unproductive except for local zones (Pl). This type of aquifer is described as having limited groundwater potential whereby flow is generally restricted to the uppermost weathered bedrock zone. They exhibit relatively shallow and short localised flow systems with very little continuity between them. Much of the potential recharge to these strata is rejected and throughflow is low. There is no primary permeability and limited fracture possibilities in these rock units, which restricts groundwater seepage and movement. Groundwater is likely to circulate predominantly through faults and fractures, or perhaps along the axes of anticlines.

Due to the low permeability and poor storage capacity, the aquifer has a low recharge acceptance. Some recharge in the upper, more fractured/weathered zone is likely to flow along the relatively short flow paths and rapidly discharge to streams, small springs and seeps. Groundwater discharge to streams (baseflow) can significantly decrease in the drier summer months. The bedrock aquifer lies within the New Ross Groundwater Body (GSI, 2004) which is large and as such there is no site specific data relevant to the study area.

The GSI have determined that the Burren Basin gravel deposits that overlie the bedrock unit are of sufficient magnitude to be classified as a locally important gravel aquifer (Lg). The Burren Valley Gravels may contribute to abstractions in the area and provide storage for the underlying aquifer, possibly helping to maintain yields during dry weather. Since groundwater levels are relatively close to the surface in this body surface water levels may be influential.

Limited information is available from the GSI website on well yields in the vicinity of the site. Historical data in the townland of Roscat indicates the existence of two Carlow County Council boreholes (No. 163 & 228) and an unnamed borehole (GSI name 2617SEW138). The installations are situated to the northwest of the existing site. With the exception of the unnamed borehole which exhibits a poor yield, the recorded yields in the County Council wells are indicated to be moderate between 30-40 m^3/d.

8.3.2 Vulnerability

The vulnerability categories, and methods for determination, are presented in Groundwater Protection Schemes (1999). The guidelines state that *'as all groundwater is hydrologically connected to the land surface, it is the effectiveness of this connection that determines the relative vulnerability to contamination. Groundwater that readily and quickly receives water (and contaminants) from the land surface is considered to be more vulnerable than groundwater that receives water (and contaminants) more slowly and in lower quantities. The travel time, attenuation capacity and quantity of contaminants are a function of the following natural geological and hydrogeological attributes of any area:*

1. the subsoils that overlie the groundwater;
2. the type of recharge - whether point or diffuse;
3. the thickness of the unsaturated zone through which the contaminant moves.

As shown in Figure 8.2, the GSI has assigned the existing site and proposed extension area as having groundwater vulnerability classification of High (H), consistent with the broad valley area. In accordance with the criteria in Table 8.1 this infers high permeability sand and gravel greater than 3 m in thickness. Depth of overburden decreases on elevated ground where glacial deposits have been washed with receding meltwaters, with resultant vulnerability increasing through Extreme (E) to Extreme (X).

Table 8.1: Vulnerability Mapping Criteria (DELF/EPA/GSI, 1999)

Subsoil Thickness	Hydrogeological Requirements				
	Diffuse Recharge			Point Recharge	Unsaturated Zone
	Subsoil Permeability & Type			(Swallow holes, losing streams)	(sand & gravel aquifers *only*)
	High permeability (sand & gravel)	Moderate permeability (sandy subsoil)	Low permeability (clayey subsoil, clay, peat)		
0-3m	Extreme	Extreme	Extreme	Extreme (30m radius)	Extreme
3-5m	High	High	High	N/A	High
5-10m	High	High	Moderate	N/A	High
>10m	High	Moderate	Low	N/A	High

Notes: (i) N/A = not applicable
(ii) Permeability classifications relate to the material characteristics as described by the subsoil description and classification method

8.3.3 Source Protection Areas

There are no mapped groundwater source protection zones within an 18 km radius of the site. Potable water supplying the dwelling to the northeast of the extension area is abstracted from an on-site well. There are no drinking water supply wells downgradient of the site.

8.3.4 Climatic Data

Monthly gridded rainfall data was sourced from Met Éireann (Walsh, 2012) and is presented in Table 8.2.

Table 8.2: Long term mean monthly rainfall data (mm) (*Met Éireann*)

J	*F*	*M*	*A*	*M*	*J*	*J*	*A*	*S*	*O*	*N*	*D*	Annual
82	58	64	60	61	65	60	74	72	90	87	82	854

The closest synoptic station to the site is at Oak Park, Carlow, 15 km to the northwest, where average potential evapotranspiration (PE) is 529 mm yr^{-1}. This value is used as a best estimate of the site PE. Actual evapotranspiration (AE) is estimated by multiplying PE by 0.95, to allow for the reduction in evapotranspiration during periods when a soil moisture deficit is present (Water Framework Directive, 2004). Actual evapotranspiration is therefore 502.7 mm yr^{-1} (0.95 PE).

The Effective Rainfall (ER) for the site is determined from:

ER = AAR – AE

= 854 mm yr^{-1} – 502.7 mm yr^{-1}

ER = 351.3 mm yr^{-1}

The application site area is 4.7 ha. Hence, the volume of water from precipitation that is available for runoff or recharged from the substitute consent area directly is given by:

Site area runoff-recharge:

= area x ER

= 47,000 m^2 x 0.351 m y^{-1}

= 16,497 m^3 yr^{-1} (45.2 m^3 d^{-1}

The total area of the pit is approximately 6 hectares therefore the volume of water available for runoff or recharged from the substitute consent area directly is given by:

= area x ER

= 60,000 m^2 x 0.351 m y^{-1})

= 21,060 m^3 yr^{-1} (57.7 m^3 d^{-1})

8.3.5 Recharge

Recharge coefficients can be utilised to estimate the proportion of water infiltrating to bedrock, against that moving laterally as shallow subsurface flow and surface overland flow. The recharge coefficient applicable to high groundwater vulnerability and sand and gravel overburden thicker than 3 m is 85% (as per the Recharge Coefficient Calculation Method developed by the Geological Survey of Ireland (Water Framework Directive, 2004)). The volume of groundwater recharge generated by precipitation falling within the application site area can thus be estimated as:

Annual Recharge = (area x ER) x recharge coefficient
= recharge on high permeability sands and gravels
SC Area = 16,497 $m^3\ yr^{-1}$ x 0.85
= 14,022 $m^3\ yr^{-1}$ (38.4 $m^3\ d^{-1}$)

Total Pit Area = 21,060 $m^3\ yr^{-1}$ x 0.85
= 17,901 $m^3\ yr^{-1}$ (49 $m^3\ d^{-1}$)

The recharge estimates above do not take into account bedrock permeability and are therefore more a representation of the amount of water available for recharge to bedrock. The national recharge map (GSI) implies between 0 – 100 mm yr^{-1} infiltrates bedrock and this seems reasonable given the poor aquifer classification and low-moderate well yields in the area.

8.3.6 Surface Water Catchment

The site lies within the surface water catchment of the Roscat Stream, which flows in a southeast to northwest direction, passing the site 520 m to the southwest. The stream has a catchment of 5.9 km^2 as it passes adjacent to the site (see Figure 8.4). The stream rises approximately 2 km southeast of the site in a topographical depression at Aghade. It outfalls to the Burren River just north of Rathtoe, which subsequently enters the River Barrow at Carlow Town.

8.3.7 EPA Water Quality

The EPA Maps application and www.catchments.ie were viewed to obtain data on chemical and biological water quality assessments undertaken in the area since 2007. A national water monitoring station is present on the Roscat Stream, immediately upgradient of its confluence with the Burren River, however there is no biological or chemical water quality data for this station. Under WFD Risk Classification the Roscat Stream has been designated as ‘not at risk’. WFD Status is ‘unassigned’ for the Roscat Stream, and designated ‘good’ for the Burren River.

8.3.8 Flood Risk

The OPW pFRA maps show that the site is not at risk of potential fluvial flooding during a 1 in 100 year or 1 in 1000 year return period. Given the high permeability sands and gravels underlying the application site there is no risk of pluvial flooding. OPW Floodmaps show there are no historical flood events in the area.

8.3.9 Designated Areas

Designated areas within 15 km of the application site are shown in Table 8.3.

Table 8.3: Designated Areas of Hydrogeological Importance

Designation	*County Carlow*
Proposed NHA	Ardristan Fen, adjacent to southern boundary
SAC	Slaney River Valley, 1.4 km northeast
SAC	River Barrow and River Nore, 13 km west

The extents of Ardristan Fen, a proposed Natural Heritage Area (pNHA), as defined by National Parks and Wildlife Service, are presented in Figure 8.3. The mapped extents occupy an area of 38 ha, most of which is due south of the application site, with the western portion of the fen extending from the Roscat Stream to the southwestern boundary of the site, at which point there is a slight overlap. The mapped extents appear to be based on peat area as per Figure 7.2. There was no evidence of peat within the site boundary and It is unclear if the NPWS fen extents have been ground truthed as part of the designation process.

A fen is a peat-substrate wetland fed by mineral-rich, basic groundwater. Local hydrogeology is therefore an important element in fen peat formation as the wetland conditions are maintained by groundwater levels being close to, or above, ground surface. Fen peat typically occurs on undulating lowlands, predominantly Carboniferous limestone glacial drifts. Within this geological landscape fens tend to form in river valleys and poorly drained hollows, as well as adjacent to raised bogs, and have an average depth of 1-2m (Hammond, 1981). Sphagnum peat is not found on fen peats because of the continued flushing with groundwater.

Historical mapping (OSI 6” and 25” maps) suggests that Ardristan Fen was formerly a more extensive area of seasonally saturated fen and marshland that developed within a topographical depression. The historical marsh extents in the 6” and 25” OSI maps correspond with the peat-based NPWS extents outlined in Figure 8.3.

It is important to note that in relatively recent times the area has undergone significant arterial drainage, presumably by local landowners. Reclamation of drained lands has been ongoing since 1975 and aerial photography (Figure 8.3) shows the result of this as prevalence of improved grassland. The arterial drains shown in Figure 8.3 intercept water table and transmit these waters in a general southwest direction toward the Roscat Stream. This is fairly typical in Ireland where undisturbed fens are very rare, with most having been drained and cultivated. Ardristan Fen is presumably fed by groundwater from the north.

If we consider Ardristan Fen to be the area that is permanently or seasonably saturated, and supporting flora and fauna tuned to these hydrological conditions, it’s actual current extents are more likely to be closer to the green polygon shown in Figure 8.3. The arterial drains tend to be lateral to, and downgradient of, this area. On this basis there is no evidence that the application site encroaches on the fen. Furthermore, if the groundwater flow direction is perpendicular to the Roscat Stream, i.e. from northeast to southeast, then the application site is not upgradient of the fen in terms of groundwater flow. This approach is based on hydrology only and needs to be verified by an ecologist.

The estimated area contributing groundwater to the fen (NPWS extents) based on topographical divides and inferred groundwater flow direction is shown in Figure 8.4. In this scenario the application site is upgradient of the fen.

The Slaney River SAC passes 1.4km to the northeast of the site. The river rises at the base of Lugnaquilla mountain (near Glendalough) and flows westwards towards Baltinglass, changing direction southward as it flows towards Tullow. Although relatively close to the site it is considered to be within a separate surface water catchment to the application site.

The River Barrow SAC is situated approximately 13 km west of the site. The Barrow rises in the Slieve Bloom mountains, County Laois and flows southwards to its confluence with the River Nore and River Suir at Waterford Harbour.

8.4 Site Investigation

8.4.1 Groundwater Level Survey

Groundwater level surveys were conducted on 27th June 2018, 14th February 2019 and 11th March 2019, results of which are shown in Table 8.4. Groundwater level monitoring events were selected on the basis that June 2018 was during of what has been recognised as an extensive drought period (i.e. summer groundwater regime), with February/March 2019 representative of winter groundwater regime.

Ground and top of casing elevations were surveyed using RTK VRS, and depth to water table measured using a dipmeter. Groundwater levels were surveyed at:

1. Three groundwater monitoring wells installed June 2018 – MW1, MW2, MW3 (see Appendix IV for logs);
2. Four standpipes installed in trial pits TP01 – TP04;
3. Private well at upgradient farm/dwelling – TPW1.

Table 8.4: Groundwater level survey data

ID	*Top of casing, mOD*	*Depth to water table, m btoc*	*Groundwater level, mOD*	*Depth to water table, m btoc*	*Groundwater level, mOD*	*Depth to water table, m btoc*	*Groundwater level, mOD*
		27/06/18		14/02/19		11/03/19	
MW1	69.41	7.00	62.41	6.94	62.47	7.01	62.40
MW2	73.63	10.24	63.39	10.25	63.38	10.23	63.40
MW3	73.13	10.72	62.41			11.01	62.12
TP01	63.05	1.13	61.92	1.03	62.02	1.02	62.03
TP02	64.01	1.97	62.04	1.88	62.13	1.89	62.12
TP03	63.94	2.10	61.84	2.05	61.89	2.01	61.93
TP04	64.33	2.46	61.87	2.39	61.94	2.36	61.97
TPW1	72.61	9.45	63.16				

Table 8.4 shows that there is negligible difference between groundwater levels when comparing summer to winter groundwater regimes. Groundwater levels surveyed during Summer 2018 are illustrated in Figure 8.5. Surface water levels are also shown in Figure 8.5 and it can be seen that surface and groundwater appear to be broadly in continuum.

8.4.2 Groundwater Flow Direction

Groundwater levels surveyed demonstrate a relatively low range (61.84 – 63.40 mOD) suggesting a low hydraulic gradient, when compared with the steeper topographical gradients. Groundwater elevation contours have been superimposed on Figure 8.6, from which groundwater flow direction is inferred as being in a general northeast to southwest direction. This is broadly in line with local topographical patterns, i.e. falling from the ridgetop at Ellengrove Crossroads towards the Roscat Stream.

There has been no pumped discharge of groundwater across the site boundary in the past. Hence historical activities shall have had no influence on groundwater levels or flow patterns in the area.

8.4.3 Site-Specific Vulnerability

At each of the trial pit standpipes in the existing pit groundwater is within 1.1 – 2.5 m of ground level, which equates to groundwater vulnerability classification of Extreme.

8.4.4 Groundwater Quality

Groundwater samples were retrieved on 27th June 2018 from:

- two monitoring wells (MW1 and MW2);
- two trial pit standpipes (TP1 and TP3);
- the centre of Ardristan Fen, recognised in this case as the green polygon in Figure 8.3.

Follow up samples were obtained on 14th February 2019 to measure any differences in hydrochemistry between summer and winter conditions. The latter samples were retrieved from the final quarry pond outfall and from the centre of the fen.

The monitoring well and standpipe samples were obtained in compliance with Envirologic internal protocols using low-flow sample technique before being dispatched to Exova and ALS for analysis. The pond outfall and fen samples were retrieved as grab samples. Results are presented in Table 8.5 below and accompanying certificates of analysis are included in Appendix V.

In terms of groundwater flow, monitoring points MW2 and MW1 represent upgradient conditions which are assumed to be unaffected by historical activities. Of these, MW2 has the potential to have been affected by the upgradient farm, making MW1 a more credible baseline dataset.

Results from the samples obtained from trial pit standpipes should be treated with caution due to unknown chemical signature of backfill material around the screened standpipe. The primary reason for sampling these points was to serve as indicators of significant historical contamination which would justify installation of additional dedicated monitoring wells.

Groundwater in the upgradient baseline dataset is of good quality with the majority of parameters satisfying the Groundwater Regulations (SI 9 of 2010 as amended by SI 366 of 2016). Three exceedances were noted:

- Elevated suspended solids at MW2 – likely due to excessive fine sands/silt in the natural substrate surrounding the screened section.
- Elevated nitrates in MW1, MW2 (and TP1) – attributed to pressures from organic and inorganic nutrient application to tillage lands, and typical of groundwater in this region.
- Slight detection of faecal contamination in MW2 – attributed to septic tank, yard runoff or slatted tank at farmyard in close proximity and upgradient.

Groundwater collected from TP1 was of a similar hydrochemical signature to the groundwater collected from MW1 and MW2. Groundwater from TP3 was shown to have a different hydrochemical signature, perhaps being influenced by its proximity to the on-site ponds:

- Elevated nitrites in TP3 – when considered in tandem with the very low nitrate concentrations this is symbolic of denitrification.
- Elevated manganese in TP3 – when considered in combination with the slightly elevated iron this is suggestive of anaerobic conditions. TP3 was less than 20 m from the final settlement pond and there is a possibility that it was installed in the remnants of what was previously part of Pond 5. Trial pit logging of TP3 noted possible screening material in TP3. The water in Pond 5 was observed as being stagnant.
- Elevated faecal and non-faecal coliforms in TP3 – as per above rationale, this water is presumed to be in connectivity with the contents of Pond 5 which was drawn in during pre-sampling purge. The exposed water in Pond 5 water is prone to direct faecal contamination from birds, wildfowl and grazing animals with access to the quarry (i.e. sheep). Historical activities do not present any potential sources of faecal coliforms. As a rule of thumb faecal coliforms are considered to have a lifespan of 100 days. There has

been no human activity at the site for a minimum of 5 years, hence human wastewater is not considered to be a viable source of faecal coliforms detected in water samples.

The central portion of Ardristan Fen was inundated with water and was heavily vegetated. Samples were retrieved as close to the centre as possible, approximately 150 m from the site boundary. Results are therefore representative of groundwater quality in the fen. Elevated nutrients were detected in Ardristan Fen only in the summer samples and are attributed to increased eutrophication due to the high water temperatures, combined with the high amount of suspended solids in the sample container:

- Elevated suspended solids in Ardristan Fen (summer only) – sampling was performed in prolonged warm, drought conditions resulting in excessive algal growth on the water surface. Sediment was mobilised when retrieving the sample unavoidably resulted in disturbance of this algal growth.
- Elevated ammonia and nitrite in Ardristan Fen (summer only) – when considered in tandem with the very low nitrate concentrations this is presumed to be a result of denitrification in the fen. No historical sources of ammonia and nitrite were identified in the existing working pit, nor are any associated with historical activities.
- Elevated orthophosphate in Ardristan Fen (summer only) – attributed to grazing sheep observed defecating throughout the fen.

Moderately elevated microbiological contamination in the fen was attributed to grazing sheep observed defecating throughout the saturated area.
No hydrocarbons were detected in downgradient groundwater during June sampling event. Minor detections were reported in February 2019 samples but give comments on the laboratory cert, which is unaccredited for this parameter, these detections are attributed to laboratory error. There have been no hydrocarbon sources at the site since previous activities ceased, and there are no sources between the final pond outfall and the fen.

In summary, results indicate previous activities at the site have not had a detrimental impact on groundwater quality.

Table 8.5: Groundwater and fen hydrochemistry 2018/2019

		27/06/18					14/02/19			
Parameter	*Units*	*MW1*	*MW2*	*TP1*	*TP3*	*Ardristan Fen*	*Final Pond Outfall*	*Ardristan Fen*	Groundwater Regs (2010 as amended 2016)*	Drinking Water Regs (SI 278 2010)
Temperature	C	10.7	10.2	15.2	15.0					
Conductivity	$\mu S\ cm^{-1}$	665	668	718	723	730	608	568	1875	
pH		7.68	7.70	7.50	7.52	7.43			6.5 - 9.5	6.5 – 9.5
DO	mg/l	9.9	10.02	6.63	7.02		9.1 (lab)	9.2 (lab)		
Suspended solids	mg/l	< 10	**1512**	< 10	11	**105**	4	7		
Alkalinity ($CaCO_3$)	mg/l	262	360	230	190	358	273	352		
Ammoniacal Nitrogen as N	mg/l	< 0.03	0.03	< 0.03	0.14	**0.61**	0.015	0.082	0.175	0.23
Nitrate (NO_3)	mg/l	**49.7**	**54.5**	**48.9**	6.2	5.0	57.9	<0.44	37.5	50
Nitrite (NO_2)	mg/l	< 0.02	0.04	< 0.02	**0.62**	0.33	<0.017	<0.017	0.375	0.5
Orthophosphate (PO_4)	mg/l	<0.03	<0.03	<0.03	<0.03	**1.24**	0.034	<0.03	0.11	
Arsenic	µg/l	<2.5	<2.5	<2.5	<2.5	<2.5	0.6	1.2	7.5	10
Barium	µg/l	15	14	19	33	44	25	19		
Cadmium	µg/l	<0.5	<0.5	<0.5	<0.5	<0.5	<0.6	<0.6	3.75	
Chromium	µg/l	<1.5	<1.5	<1.5	<1.5	<1.5	0.6	<0.6	37.5	50
Cobalt	µg/l	<2	<2	<2	<2	<2	<0.6	<0.6		
Copper	µg/l	<7	<7	<7	<7	<7	<1.2	<1.2	1500	2000
Iron	µg/l	< 20	< 20	< 20	88	<20	13	28	200	200
Lead	µg/l	<5	<5	<5	<5	<5	<0.6	<0.6	18.75	10
Manganese	µg/l	<2	16	11	**1647**	<2	<6	89	50	50
Mercury	µg/l	< 1	< 1	< 1	< 1	<1			0.75	1
Nickel	µg/i	<2	<2	<2	5	<2	<0.6	1	15	20
Zinc	µg/l	<3	<3	<3	<3	<3	<6	<6		
EPH	µg/l				<10		32**	97**		
Total coliforms	mpn/ 100ml	***23***	**135**	**1982**	**>2420**	**185**				0
E Coli	mpn/ 100ml	0	**4**	**228**	**1046**	**121**				0
Faecal coliforms	mpn/100ml	0	**4**	**361**	**>2420**	**39**				

* *threshold values relevant to an 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 this threshold was not stated, that relevant to an assessment of inverse impacts of chemical inputs from groundwater on associated surface water bodies.*

** laboratory commented '*unknown pattern*' and confirmed that result is not INAB accredited.

8.5 Characteristics of the Development

8.5.1 Site Water Management

The majority of precipitation that lands within the application site boundary infiltrates freely to ground. Historical aerial photography shows that excavation commenced along the eastern boundary of the area previously granted planning and progressed westwards. Surface gradients are such that the existing pit slopes slightly towards the southeastern corner. Through a combination of compaction from machinery and fine sediment infilling voids at the surface, some parts of the existing pit may be capable of generating runoff during high intensity rainfall events.

A series of 5 settlement ponds were previously installed in sequence in the southeastern corner of the site to remove suspended solids from this pit floor runoff along with that from the hardstanding pad. Clarified water could then be harvested from final pond for re-use on site for dust suppression, with the excess allowed to flow by gravity across the site boundary in line with undisturbed flow gradient.

Excess infiltration from the pit floor or concrete hardstanding pad flows via gravity towards Pond 1. Water overflows between each pond via gravity through a 300 mm PVC pipe or open ditch. Figure 8.5 shows that settlement pond water levels as surveyed on 27th June 2018 were in the range 62.14 – 61.84 mOD, approximately 2 m below surrounding ground level. There was no evidence of an artificial liner and as these ponds were used for clarification it is assumed that permeability may have been restricted over time as a function of particulate material effectively sealing the side walls and pond bases as it settles out of solution. Figure 8.5 suggests that pond water levels are in continuum with groundwater.

Currently, surface water exits the final settlement pond via a 400 mm culvert which delivers clarified water to an open ditch outside the southern site boundary, and subsequently towards Ardristan Fen. Surface water elevation within the receiving ditch was surveyed as 61.22 mOD on 27th June 2018. During all site visits in 2018 and 2019, which can be considered representative of summer and winter flow regimes, negligible flow was noted through this outfall drain. A series of open channels surround the fen and traverse the fen itself. These field drains appear to be interconnected and ultimately transmit water southwest towards the Roscat Stream. No direct route was observed transmitting site runoff towards the Roscat Stream.

There was likely to have been some recycling of clarified water from the final settlement pond (Pond 5) for dust suppression, etc. There was no pumping of groundwater across the site boundary as part of previous activities. Given the high permeability values in sands and gravels there is typically no benefit or useful purpose for dewatering in these activities.

There are no natural surface watercourses or waterbodies within the application boundary. Groundwater is only exposed within the existing pit where settlement ponds or test holes were previously excavated.

8.5.2 Water Usage

Historically, water was recycled from the final settlement pond to facilitate dust suppression. There are no historical records available to indicate former water usage rates at the quarry. However based on standard operations at similar sites this would not be expected to have exceeded 3 m^3/d when required.

8.5.3 Potable Water

It is understood that drinking water for the temporary office/canteen was previously supplied from a water bowser.

8.5.4 Domestic Wastewater

Permission was granted for an office and septic tank under Pl. Ref. CW/7850 in 1986. However, during site walkover and trial pitting there was no evidence of a septic tank or percolation area, and nothing to suggest presence of same. It is assumed that a portable chemical toilet was in use at the site, and emptied by a licensed contractor as necessary.

8.6 Conceptual Site Model

The impact assessment is guided by the source-pathway-receptor (S-P-R) model, as outlined in Table 8.6 below. The S-P-R model is used to identify the sources of water and potential contaminants, the environmental assets affected by such, and the pathways by which water and contaminants reach those receptors. It is refined as the assessment evolves and more information is acquired.

Table 8.6: Preliminary S-P-R

Sources		*Pathways*		*Receptors*
Precipitation		Surface overland flow		Gravel aquifer
Process water		Infiltrating water		Bedrock aquifer
Sediment transport		Gravel aquifer flow		Ardristan Fen pNHA
Hydrocarbons -refuelling/maintenance		Bedrock aquifer flow		Roscat Stream
Domestic wastewater		Settlement ponds		Burrin River
		Ditch connecting ponds to Fen		River Barrow and River Nore SAC

The conceptual model can be summarised as follows:

- The majority of precipitation landing within the existing working pit penetrates the exposed pit surface and infiltrates freely to the saturated zone in the sands and gravel aquifer (Lg). In areas were original overburden remains, or areas of the pit floor that have become excessively compacted, recharge rate may be slightly lower. Any excess rainfall-runoff infiltrates as it passes through more permeable portions of the quarry floor, or enters the settlement ponds.
- A limited amount of groundwater that passes vertically through the sand and gravel aquifer will enter the underlying poor bedrock aquifer (Pl) via a network of fractures. The remainder is likely to discharge as baseflow to the local surface water network or the fen.
- Groundwater is within 3 m of ground level in the existing pit, hence groundwater vulnerability in this area is classified as Extreme (E).
- Prior to activities having commenced at the site groundwater vulnerability classification was High (H) as a function of there being greater than 3 m of unsaturated gravels present.
- Groundwater flow direction generally follows topographical gradients, predominantly from northeast-southwest, towards the Roscat Stream and to a lesser degree Ardristan Fen pNHA. Groundwater is unconfined. The majority of flow takes place in the sand and gravel aquifer with a much lower proportion occurring in the bedrock aquifer.
- Excess surface water on site (either rainfall-runoff or hardstanding runoff) is collected in a primary settlement lagoon which overflows to a series of smaller interconnected settlement ponds. Clarified water outfalls via a concrete culvert to a ditch which directs it into Ardristan Fen.
- A proportion of the existing pit is mapped as being within the NPWS limits of Ardristan Fen. The NPWS extents of the fen appear to be an overestimate of the actual functioning fen observed on the ground (i.e. saturated peats).
- Monitoring results show groundwater quality in the upgradient area to be good. High nitrates are indicative of surrounding land use, i.e. intensive tillage agriculture.
- Groundwater quality in the existing pit was shown to be moderate, in light of gross microbial contamination. This was attributed to faeces from grazing animals and natural wildlife, and in the case of TP3 proximity to the final settlement pond which was noted as

being effectively stagnant. Nutrient concentrations were very low in the gravity outall from the site in February 2019. No hydrocarbons were detected in groundwater at the downgradient boundary.

- Hydrochemical signature of groundwater in the fen is different to other samples, indicative of altered nutrient cycling processes. Elevated ammonia and nitrite were attributed to denitrification of the high agricultural nitrate loading in the area. Elevated orthophosphate is attributed to faeces from sheep openly grazing throughout the fen. There are no nutrient sources attributed to historical site activities that could have introduced same to the hydrological and hydrogeological receptors. This is reinforced given the time that has elapsed since any activity took place on the application site.

8.7 Impact Assessment

The procedure for determination of potential impacts on the receiving hydrological and hydrogeological environment is to identify potential receptors within the site boundary and surrounding environs and use the information gathered during the desk study and site investigation to assess the degree to which these receptors will likely have been impacted upon. Impacts are discussed in terms of quality, significance, duration and type in accordance with current EIAR guidelines (EPA, 2017).

In accordance with the NRA Guidelines (2009) (as included in 'Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements' (IGI, 2013)), the site is deemed to be an attribute of Very High importance which signifies it has a high quality, significance or value on a regional or national scale (see Appendix V). Groundwater passing through the site potentially supports a wetland which is designated as a proposed NHA. Given that the NHA is only proposed the attribute's importance could be downgraded to High, but as a conservative measure the initial consideration of Very High will be upheld.

8.7.1 Direct Impacts

The impacts that may have arisen as a result of previous activities at the existing pit are summarized in Table 8.7, using the headings discussed under the criteria for determination of impacts (Tables 8.B.1, 8.B.2, 8.B.3).

The key activities included excavation of sands and gravels, grading of excavated material and haulage of material off site. The primary potential impacts to the hydrological and hydrogeological environment arising from such activities are considered to be:

- Groundwater quality due to alteration in vulnerability classification;
- Groundwater quality due to use of hydrocarbons;
- Groundwater quality due to domestic wastewater;
- Groundwater quality flowing into Ardristan Fen;
- Groundwater quality and flows in local third party wells;
- Groundwater flow patterns due to impermeable surfaces;
- Surface water quality leaving the site boundary and flowing into Ardristan Fen;

- Surface water quality in Roscat Stream;
- Surface water flows resulting from precipitation falling on impermeable surfaces;
- Flood risk resulting from increase surface water flows from site.

8.7.2 Indirect Impacts

Historical activities at the site may have had indirect impacts relating to the hydrological and hydrogeological environment. These have been identified as positive impacts for the following reasons:

- No extraction took place below the water table meaning some level of groundwater protection was maintained by overburden cover.

8.7.3 Cumulative Impacts

The existing working pit is considered to be small in terms of scale in the quarrying industry. Aerial photographs reveal a quarry 1 km to the south of the application area. The presence of large, irregularly shaped ponds suggest resource has been extracted below groundwater at that location. There are no other clearly identifiable quarries within 5 km of the site and hence cumulative impacts are considered to be negligible.

Quarrying is established at the application site and it has been integrated into the local environment. It is also in line with the Carlow County Development Plan 2015 – 2021.

8.7.4 Do-nothing Scenario

This item requires consideration of the effect on the environment as it would be in the future should any proposed measures not be carried out. In addition to site restoration, remedial measures include raising the pit floor using on-site screenings and overburden in order to provide a protective overburden. In the event that substitute consent is not granted the scenario may arise where there is no valid permission to complete restoration works on the existing working pit which would leave it in an unrestored post-works condition.

8.7.5 Interaction with other Impacts

The EIAR guidelines (EPA, 2017; DHPLG, 2018) highlight that the interaction of impacts to the hydrological and hydrogeological environment, arising from historical activities, must be given due consideration alongside potential receptors identified in other EIAR sections. The likely interactions have been identified as follows:

- The extraction of overburden may have impacted upon biodiversity and caused disturbance to habitats in the area.
- Precipitation can result in mobilisation and transport of sediment within water leaving the site as runoff. Unsatisfactory control and removal of sediment can impact habitats in Ardristan Fen;
- Haulage of resource may have given rise to increased traffic movements.

Each of these issues are addressed in detail in the relevant sections of this EIAR.

8.7.6 Unplanned Events

Consideration has been given to the likely environmental impacts that may have arisen in association with unplanned events such as accidents, floods, etc. Intense rainfall events during the operational phase may have given rise to increased runoff and hence increased sediment mobilisation. Overland flow from the hardstanding pad or compacted areas passed through a settlement lagoon system consisting of 5 ponds, resulting in retention of particulates on site. The perimeter of the site being confined by elevated perimeter berms in combination with the very high permeability characteristics of overburden, means that no overland flow is leaving the site untreated.

Unplanned events such as high-speed winds would have had the potential to generate dust. It is assumed that works would have ceased during excessively high winds. It is also assumed that dust suppression techniques were enabled during historical activities.

8.8 Mitigation Measures

The significant impacts that may potentially have occurred, as identified in Table 8.7, were resolved under the measures set out under Table 8.8.

8.9 Remedial Measures

The following primary measures relating to hydrology and hydrogeology will be implemented:

- The landscape and restoration plan for the pit will be implemented.
- The permeability on the pit floor will be increased by mechanical ripping to a depth of 0.5m. This will decrease the amount of surface runoff being diverted towards the ponds, and subsequently the fen, and will restore substrate permeability characteristics closer to that of pre-works, prior to raising the floor by deposition of screenings.
- A layer of overburden will be placed on the pit floor to allow vegetation to establish and to provide a level of protection to groundwater.

8.9.1 Residual Impacts

Residual impacts refer to the degree to environmental change that will occur after any proposed mitigation measures have taken effect.

Assuming implementation of the measures described in Table 8.8 the residual impacts on the hydrological and hydrogeological environment during the operational phase are assessed to be long-term and negligible.

Table 8.7: Summary of Potential Impacts

Activity	Attribute	Character of potential impact	Importance of attribute (refer to Appendix V)	Magnitude of potential impact (refer to Appendix V)	Term	Significance of potential impact (refer to Appendix V)
Compaction of working pit floor and hardstanding pad	Ardristan Fen and Roscat stream	Silt-laden runoff from pit floor. The increased silt content in runoff has potential to degrade local surface water quality.	Very High	Small	Long-term	Moderate
Stockpiling of topsoil/subsoil/screenings	Ardristan Fen and Roscat stream	Silt-laden runoff from stockpiles. The increased silt content in runoff has potential to degrade local surface water quality.	Very High	Small	Medium-term	Moderate
Storage of hydrocarbons; leakages from machinery; spillages during refuelling	Ardristan Fen/Roscat Stream/Aquifer	Runoff/recharge may contain hydrocarbons.	Very high	Small	Temporary	Moderate
Removal of overburden	Ardristan Fen /Aquifer	Increase in vulnerability of underlying aquifer.	Very High	Small	Long-term	Moderate
Foul water	Ardristan Fen /Aquifer	Discharge from septic tank and percolation area.	Very High	n/a	n/a	n/a
Increased runoff rates from hardstanding pad and pit floor	Ardristan Fen /Aquifer	Increase in surface water flow input to Fen. Decrease in infiltration to aquifer.	Very High	Small	Long-term	Moderate
Increased runoff rates from hardstanding pad	Roscat Stream	Increase in flood risk to local watercourses.	Low	Small	Long-term	Imperceptible
Historical activities	3rd party well	Decrease in yield/quality in 3rd party well.	Moderate	Negligible	n/a	Imperceptible

Table 8.8: Summary of mitigation measures

Activity	Attribute	Character of potential impact	Mitigation measure	Predicted impact
Compaction of working pit floor and hardstanding pad	Ardristan Fen and Roscat stream	Silt-laden runoff from pit floor. The increased silt content in runoff has potential to degrade local surface water quality.	Runoff passes through a series of settlement ponds which have been shown to clarify the water prior to it crossing the site boundary. Results from sampling show that water quality in the fen has not been negatively impacted upon.	Imperceptible
Stockpiling of topsoil/subsoil/screenings	Ardristan Fen and Roscat stream	Silt-laden runoff from stockpiles. The increased silt content in runoff has potential to degrade local surface water quality.	Stockpiles have been vegetated and are considered to be stable. Establishment of rooting restricts surface erosion. Stockpiles shall be used in the restoration process.	Imperceptible
Storage of hydrocarbons; leakages from machinery; spillages during refuelling	Receiving stream/ aquifer	Runoff/recharge may contain hydrocarbons.	Potentially contaminating substances were stored in designated areas isolated from surface water drains or open waters. Hazardous wastes such as waste oil, chemicals and preservatives were stored in sealed containers. Fuelling, lubrication and storage areas were in a designated area, not within 30 m of drainage ditches or surface waters. All waste containers were stored within a secondary containment system (e.g. a bund for static tanks or a drip tray for mobile stores and drums). Bunds were capable of storing 110% of tank capacity, plus a minimum 30 mm rainwater allowance where the bund was uncovered. Refuelling was by a licensed third party using a mobile bunded bowser. Haulage vehicles were refuelled off-site. No hydrocarbons were detected in groundwater at the downgradient boundary.	Imperceptible
Removal of overburden	Ardristan Fen /Aquifer	Increase in vulnerability of underlying aquifer.	Overburden stored on site for restoration of pit	Imperceptible
Foul water	Receiving stream/ aquifer	Septic tank and percolation area.	Septic tank and percolation could not be located. It is assumed that none present and that a chemical portable was utilised instead. No human activity on site in over 5 years and this is not considered to be a viable source of faecal contamination detected on site.	Neutral
Historical activities	3rd party well	Decrease in yield/quality in 3rd party well	No decrease on yield or water quality reported. Only third party well in vicinity is upgradient of site.	Neutral

8.10 Monitoring

Monitoring of surface water and groundwater quality will be undertaken during the restoration phase of the development.

8.11 Summary

An existing working sand and gravel pit is situated on the southern edge of a significant deposit of quaternary sands and gravels a short distance southwest of Tullow, Co Carlow. Historical excavation has taken place across a footprint of approximately 4.7 ha. in the substitute consent area which is located within an existing sand and gravel pit of 6 hectares. Trial pit standpipes and monitoring wells show that all previous works took place above groundwater.

Impacts of historical activities on the hydrological and hydrogeological environment were assessed, and appropriate mitigation measures have been presented. In terms of flow and quality the groundwater regime in the area has been unimpeded by historical activities and there have been no impacts to groundwater flows through Ardristan Fen pNHA. Runoff from compacted areas of the pit floor and a hardstanding pad passes through a series of settlement ponds to remove suspended sediment prior to outfalling via gravity at the southern boundary. Ardristan Fen has contracted significantly in the latter part of the last century due to arterial drainage, implemented to restore peats to productive grassland soils. Water quality in the fen appears to be affected by nutrient inputs from agriculture, through this was less pronounced during winter conditions. There were no nutrient sources in previous activities and these are assumed instead to come from local agriculture. Hence any impacts to the fen appear to have been from local agricultural practices rather than historical activities at the working pit.

8.12 References

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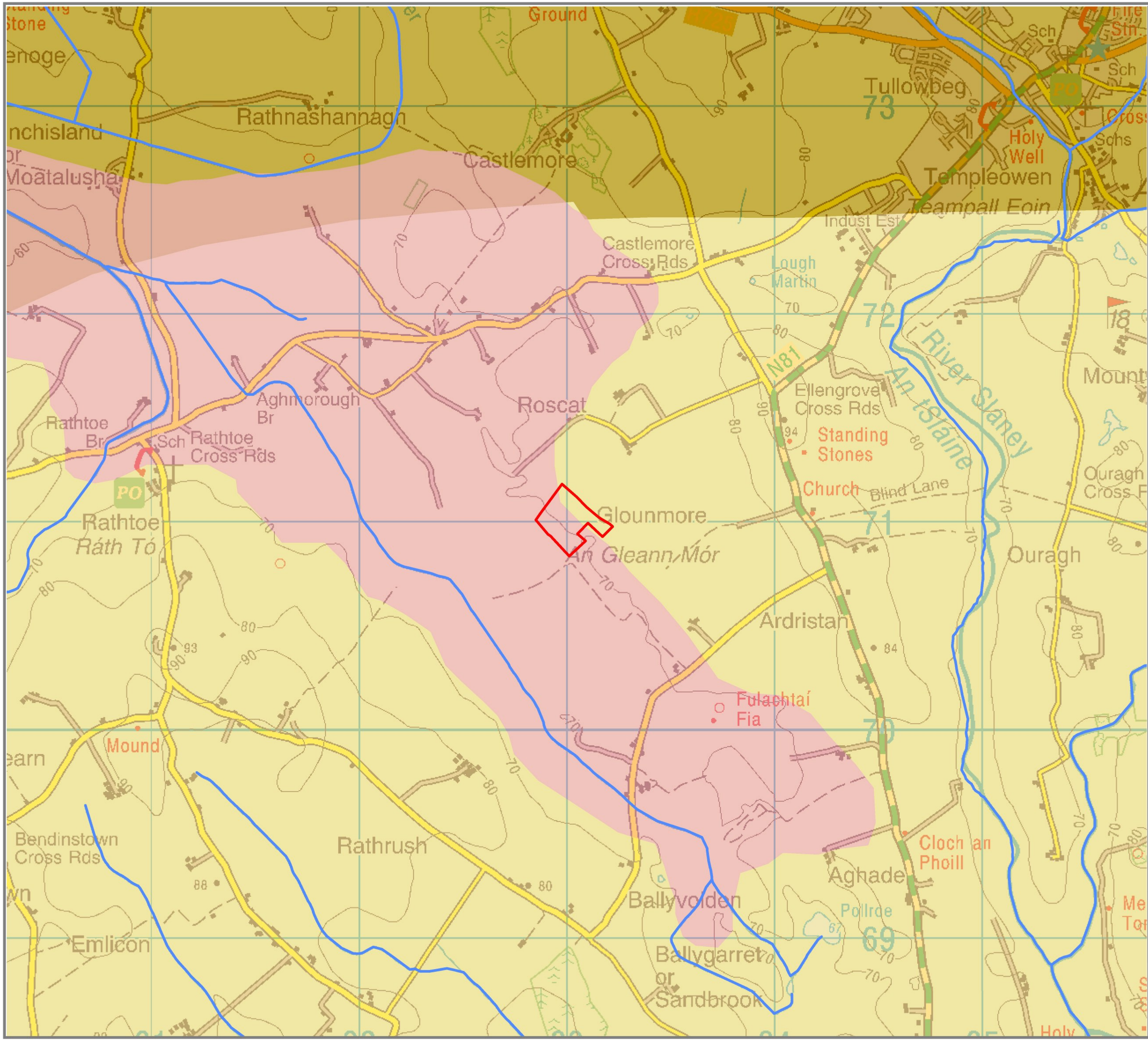
Figures



Application Boundary

Surface Watercourses

Aquifer Legend:

Poor Aquifer - generally unproductive except for local zones (Pl)

Locally Important Aquifer - moderately productive only in local zones (Ll)

Sand & Gravel Aquifer (Lg)

0 1,250

metres

N

Client:	Earth Science Partnership Ltd.		
Project:	rEIAR Section: Water		
Location:	Roscat, Tullow, Co. Carlow		
Figure 8.1:	Aquifer Classification Map		
Scale:	1 : 25 000	Date:	September 2018
Ref:	1679	Author:	C. O'Reilly

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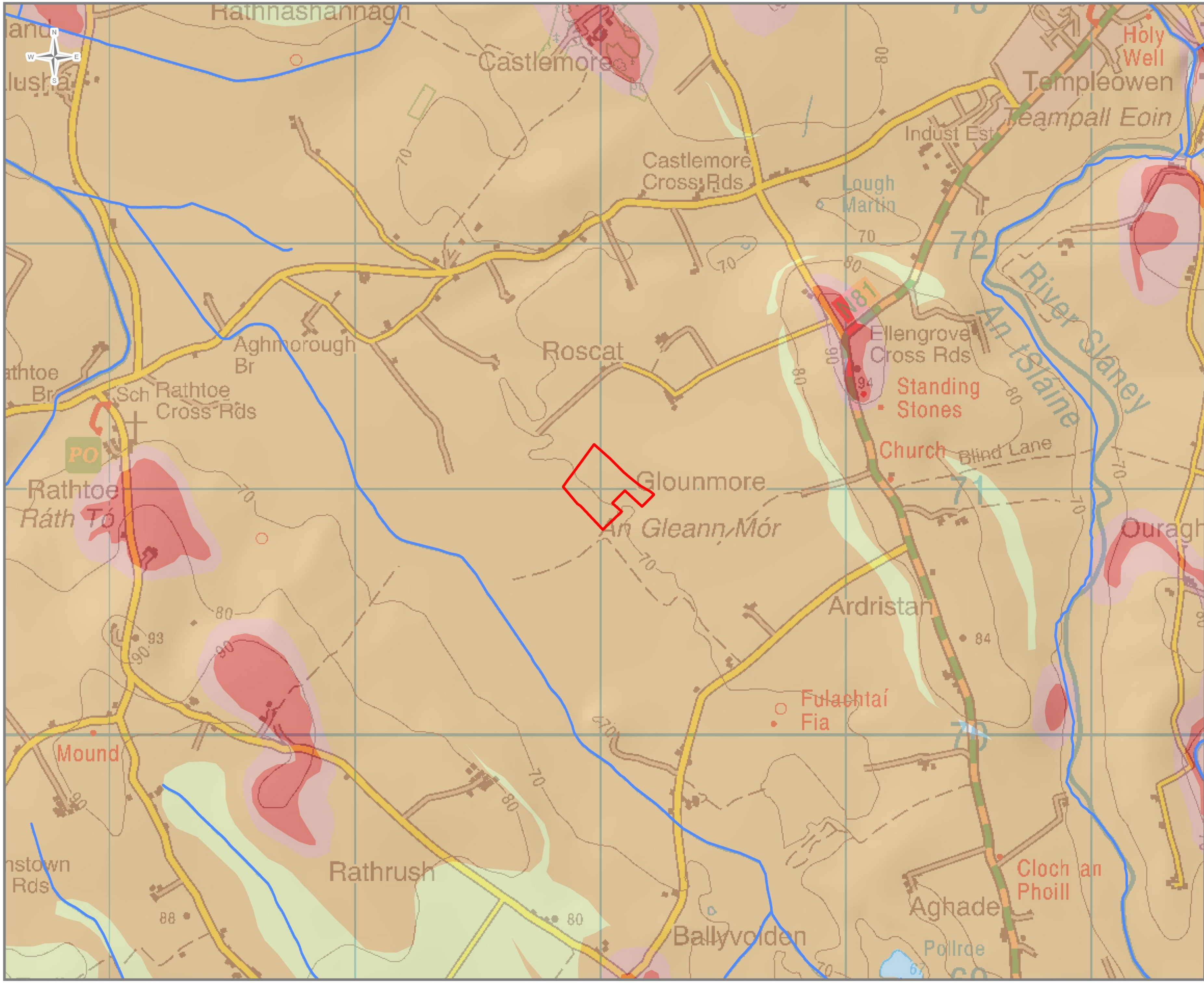

Legend:

Application Boundary

EPA River Network

Vulnerability:

Extreme (X)

Extreme (E)

High (H)

Moderate (M)

Water

0 600

metres

Fig. 8.2:	Groundwater Vulnerability Map
Date:	September 2018
Author:	C. O'Reilly
Scale:	1 : 20 000
Client:	ESP Ltd.
No.:	1679
Project:	rEIAR Section: Water
Location:	Roscat, Tullow, Co. Carlow

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Legend:

- Application Boundary
- EPA River Network
- Open Drain
- NPWS Ardristan Fen Extents
- Heavily vegetated and undrained area of fen
- Pit settlement ponds

0 135

metres

Fig. 8.3:	NPWS Fen Extents Map
Date:	September 2018
Author:	C. O'Reilly
Scale:	1 : 4 500
Client:	Earth Science Partnership
No.:	1679
Project:	rEIAR Section: Water
Location:	Roscat, Tullow, Co. Carlow

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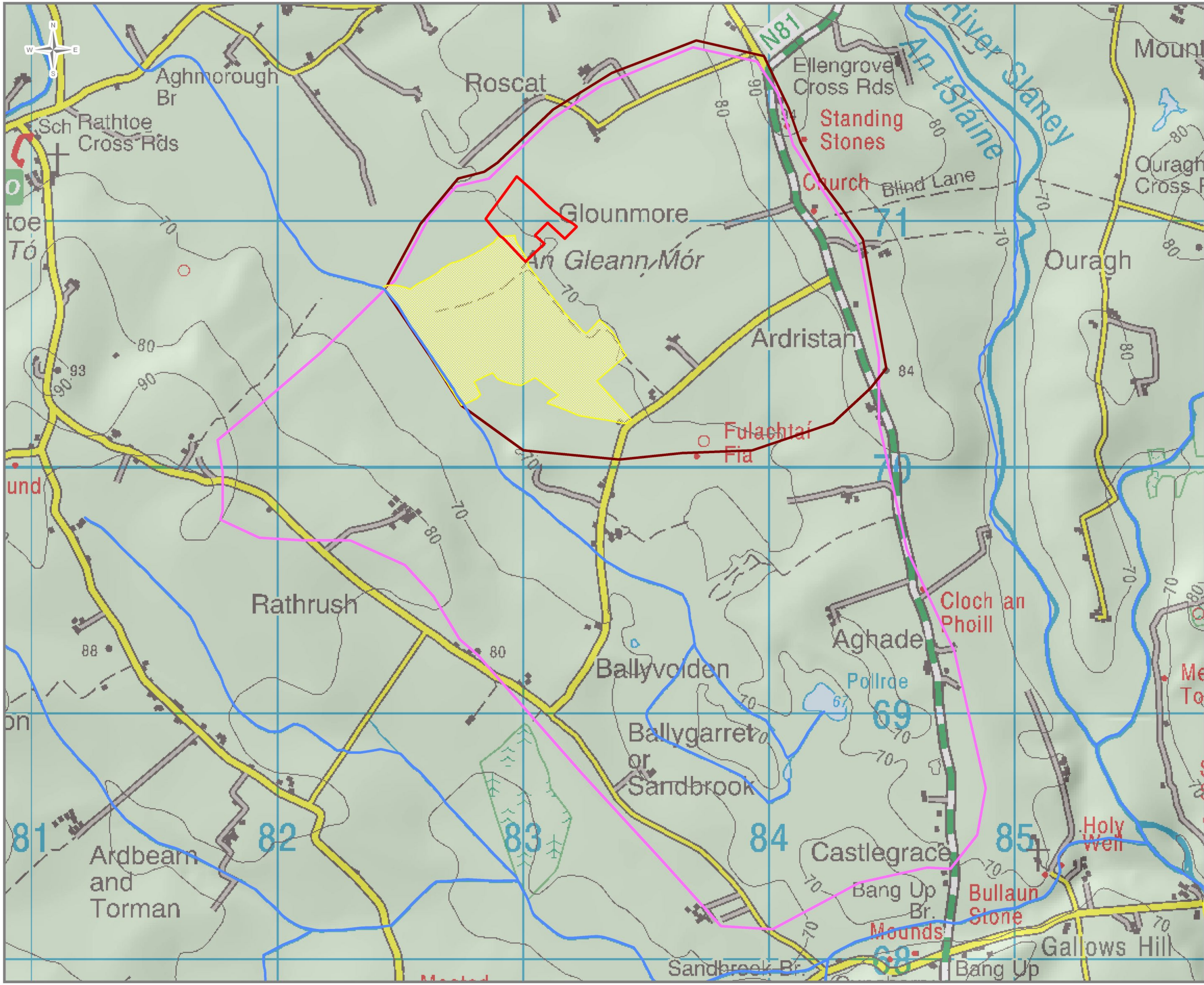

Fig. 8.4:	Surface Water & Groundwater Catchment
Date:	September 2018
Author:	C. O'Reilly
Scale:	1 : 20 000
Client:	Earth Science Partnership
No.:	1679
Project:	rEIAR Section: Water
Location:	Roscat, Tullow, Co. Carlow

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Legend:

Application Boundary

EPA River Network

Groundwater Level Monitoring Point, GW Elevation, mOD Malin 27/06/18

Surface Water Elevation, mOD Malin 27/06/18

0 150

metres

Fig. 8.5:	Groundwater and Surface Water Levels Map
Date:	September 2018
Author:	C. O'Reilly
Scale:	1 : 5 000
Client:	Earth Science Partnership
No.:	1679
Project:	rEIAR Section: Water
Location:	Roscat, Tullow, Co. Carlow

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Legend:

- Application Boundary
- NPWS Ardristan Fen Extents
- Groundwater Level Monitoring Point, GW Elevation, mOD Malin 27/06/18
- Groundwater Elevation Contour
- Inferred Groundwater Flow Direction

0 150
metres

Fig. 8.6:	Groundwater Level Contour & Flow Direction
Date:	September 2018
Author:	C. O'Reilly
Scale:	1 : 5 000
Client:	Earth Science Partnership
No.:	1679
Project:	rEIAR Section: Water
Location:	Roscat, Tullow, Co. Carlow

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Table of Contents

Tables

9.0 CLIMATE

9.1 Introduction

This section of the remedial EIAR assesses the development in terms of climate and climate change and assesses potential impacts that the historical development may have had with regards to climate. Climate can be thought of as the ‘average weather’ over an extended period of time and so refers to temperature, precipitation and wind.

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.

9.2 Methodology

The methodology for the description of the climate in the region of the historical development at the time of its operation included a desk study review of the data available from Met Éireann, the Environmental Protection Agency and other bodies which have responsibility for the Climate of Ireland. Met Éireann data from the closest synoptic station at Oak Park, Co. Carlow, 15km to the northwest of the application area.

9.3 Climate Change

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.

9.3.1 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.

Recognizing 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 is 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).

In December 2009, efforts were made to negotiate a successor to the Kyoto Protocol. Whilst the conference was not as successful as many countries had hoped it did result in the Copenhagen Accord which many countries signed up to. The Copenhagen Accord endorsed the continuation of the Kyoto Protocol. The Copenhagen Accord, while only a political agreement, reflected significant progress on several fronts.

The following year in Cancun, parties adopted the Cancun Agreements, effectively formalising the essential elements of the Copenhagen Accord under the UNFCCC. The Cancun Agreements were regarded as an interim arrangement through 2020, and parties left the door open to further negotiations toward a legally binding successor to the Kyoto Protocol.

In December 2012, the Kyoto Protocol was amended by the parties to the Kyoto Protocol. This amendment was referred to the "Doha Amendment to the Kyoto Protocol" which included the following amendments:

- New commitments for Annex I Parties to the Kyoto Protocol who agreed to take on commitments in a second commitment period from 1st January 2013 to 31st December 2020;
- A revised list of greenhouse gases (GHG) to be reported on by Parties in the second commitment period; and
- Amendments to several articles of the Kyoto Protocol which specifically referenced issues pertaining to the first commitment period and which needed to be updated for the second commitment period.

During the second commitment period, parties committed to reduce GHG emissions by at least 18 percent below 1990 levels in the eight-year period from 2013 to 2020; however, the composition of parties in the second commitment period differed from the first. This placed binding targets on Ireland in climate change, with penalties for non-compliance.

9.3.2 Paris Agreement 2015

A legally binding, global agreement on climate change was agreed in Paris on 12th December 2015. The Paris Agreement puts in place the necessary framework for all countries to take ambitious mitigation action. It sets out a long-term goal to put the world on track to limit global warming to well below 2 degrees centigrade above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5 degrees. It aims to tackle 95% of global emissions through 188 Nationally Determined Contributions (NDCs). The agreement also places significant importance on actions needed, both nationally and globally, to help people adapt to climate change.

Ireland will contribute to the Paris Agreement via the NDC tabled by the EU in March 2015 on behalf of Member States, which commits to at least a 40% reduction in EU-wide emissions by 2030 (compared to 1990 levels); this is based on reductions in the Emissions Trading Scheme (ETS) and non-ETS sectors of 43% and 30% respectively (compared to 2005).

In July 2016, the European Commission presented a legislative proposal, the Effort Sharing Regulation (ESR), setting out binding annual greenhouse gas emission targets for Member States for the period 2021–2030. The ESR proposal suggests a 39% GHG reduction target for Ireland, based on GDP per capita, for the period 2021 to 2030. This target is adjusted downward for cost-effectiveness by 9 percentage points to give a headline target of 30%. While this target is not yet agreed, it is clear that it will present an enormous challenge for Ireland, which will require substantial investment by both the public and private sectors, as well as a broad range of non-financial policy tools, including regulations, standards, education initiatives and targeted information campaigns. Work is ongoing to cost various suites of measures that could meet the 2030 target as cost-effectively as possible.

9.3.3 Compliance with EU and International Commitments

Projections of emission levels are based on two measures depending on the level of policy implementation which are as follows:

- With Existing Measures (WEM) scenario assumes that no additional policies and measures, beyond those already in place by the end of 2016, are implemented.
- The With Additional Measures scenario assumes implementation of the With Existing Measures scenario in addition to, based on current progress, further implementation of Government renewable and energy efficiency targets for 2020, as set out in the National Renewable Energy Action Plan (NREAP) and the National Energy Efficiency Action Plan (NEEAP).

EU greenhouse gas emission targets and reduction obligations for Ireland are split into two broad categories. The first category covers the large energy and power (i.e. energy intensive) industry which have their emissions controlled under the EU Emissions Trading Scheme. The second category (which is the main subject of the press release) deals with the non-Emissions Trading Scheme sectors such as agriculture, transport, residential, commercial, waste and non-energy intensive industry.

A recent update by the EPA on the 31st May 2018 in relation to compliance with projected targets stated the following:

- Greenhouse gas emissions are projected to increase from most sectors, given strong economic growth and an expansion of the agriculture sector.
- These figures show that, at best, Ireland will only achieve a 1% reduction by 2020 compared to a target of 20%.

- Fossil fuels such as coal and peat are expected to continue to be significant contributors to emissions from power generation.
- Agriculture emissions are projected to increase with an expansion of animal numbers, particularly for the dairy herd.
- Further growth in emissions from the transport sector is projected in line with a growth in fuel consumption in diesel cars and freight up to 2025.

In relation to 2030, Ireland's target calls for a 30 per cent reduction of emissions compared to 2005, with binding annual limits over the 2021-2030 period. These latest projections indicate that Ireland will exceed the allowable carbon budget implied by those limits. The latest projections also show that increasing fossil fuel consumption and an expanding agriculture sector are leading to increased emissions. The following are the main points taken from the data:

- Energy industry emissions – mainly power generation – are projected to grow strongly from 2020 to 2025 as a result of an expansion of co-firing of peat and biomass;
- Transport emissions are projected to increase from current levels by 17-18 per cent by 2020 and by 17-20 per cent by 2030. A decline in emissions is projected from 2025 to 2030, resulting from an acceleration in the number of electric vehicles on Irish roads;
- Agriculture emissions are projected to increase by between 3-4 per cent by 2020 and 6-7 per cent by 2030 on current levels based on an expansion of animal numbers, particularly for the dairy herd.

Table 9-1: Projected greenhouse gas emissions to 2030 under the "with additional measures scenario"

Mt CO_2 eq	2016	2020	2025	2030	Growth 2017 - 2030
Energy Industries	12.55	11.08	12.17	7.48	-40.3%
Residential	6.04	6.53	6.47	6.45	6.7%
Manufacturing Combustion	4.55	4.72	4.90	5.06	11.1%
Commercial and Public Services	1.86	1.68	1.81	1.94	4.3%
Transport	12.29	14.39	15.26	14.32	16.5%
Industrial Processes	2.14	2.43	2.83	3.27	52.34%
F-Gases	1.26	0.96	0.88	0.75	-40.5%
Agriculture	19.85	20.50	20.78	20.94	5.5%
Waste	0.95	0.57	0.49	0.44	-53.3%
Total	61.54	62.91	65.64	60.70	-1.3%

9.3.4 Regional and Local Climate

9.3.4.1 Regional Climate

The Irish climate is subject to strong maritime influences, the effects decreasing with increasing distance from the Atlantic coast. The climate in the area of the site is typical of the Irish climate, which is temperate maritime.

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 night time.

The closest Met Éireann synoptic station to the pit is at Oak Park, Co. Carlow, which is approximately 15km northwest of the application area. Mean and absolute monthly meteorological data for the decade 2007 to 2017 recorded at Oak Park weather station is tabulated in Table 9-2. Parameters presented include temperature, precipitation and wind speed.

Table 9-2**:** Mean monthly and extreme meteorological data recorded at Oak Park Synoptic Station from January 2007 to December 2017.

Parameter	**Month**											
	Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Mean Air Temp. (C)	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	9.9	9.9	9.9	9.9
Absolute Max. Air Temp (C)	16.2	14.8	18.9	21.6	26.6	24.0	29.5	26.6	25.6	20.6	17.7	15.1
Absolute Min. Air Temp (C)	-1.0	-5.9	-6.2	-3.8	-2.1	1.4	5.6	3.3	0.4	-2.9	-9.1	-12.9
Mean Precip. (mm)	71.8	71.3	70.5	70.9	71.3	71.6	71.3	71.7	72.1	72.5	72.8	73.2
Absolute Max. Precip. (mm)	147.2	176.7	98.1	102.4	89.4	162.6	152.4	142.4	108.7	170.0	215.5	270.9
Mean Grass Min. Temp. (C)	-4.2	-4.2	-4.2	-4.2	-4.2	-4.2	-4.2	-4.2	-4.3	-4.3	-4.3	-4.2
Mean Wind Speed (knot)	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.5	7.5	7.5	7.5	7.5
Absolute Max. Mean Wind Speed (knot)	10.8	12.0	10.0	9.3	10.3	5.3	7.8	8.9	9.9	9.2	10.3	12.0
Absolute Min. Mean Wind Speed (knot)	5.5	5.0	5.3	5.9	5.8	7.8	5.7	6.1	4.2	5.1	5.8	4.5
Highest Gust (knot)	56.0	68.0	54.0	50.0	44.0	35.0	41.0	41.0	52.0	60.0	68.0	55.0

*Data source: Met Éireann (2018) https://www.met.ie/climate/available-data/historical-data

Meteorological data for the area are as can be expected with December being the coldest month with an absolute minimum of -12.9. It should be noted that this value is slightly skewed owing to the below average winter temperatures of 2010. Mean rainfall was consistent over all months across the years with a range of 70.5 – 73.2 mm per month. Shorter term monthly averages 2013-2017 are presented in Table 9-3.

Table 9-3: Mean monthly rainfall data (mm) recorded at Oak Park Synoptic Station from January 2013 to December 2017.

Month	Year					Mean Monthly Precipitation
	2013	**2014**	**2015**	**2016**	**2017**	
January	76.2	147.2	66.0	110.9	36.3	**87.3**
February	35.8	176.7	36.3	95.7	57.8	**80.5**
March	57.6	65.0	53.5	40.6	66.6	**56.7**
April	44.4	52.6	26.3	64.3	15.8	**40.7**
May	35.6	78.6	89.4	61.6	81.8	**69.4**
June	37.5	61.9	29.7	61.7	91.0	**56.4**
July	-*	24.6	79.4	29.6	52.7	**46.6**
August	85.6	122.1	83.0	46.0	62.3	**79.8**
September	24.4	18.2	27.6	97.4	-*	**41.9**
October	170.0	138.2	56.8	32.3	62.9	**92.0**
November	27.7	165.6	110.0	26.3	52.8	**76.5**
December	136.6	47.7	270.9	80.2	84.2	**123.9**
Mean Monthly Precipitation	**66.5**	**91.5**	**77.4**	**62.2**	**60.4**	**71.0**
Total Annual Precipitation	**731.4**	**1098.4**	**928.9**	**746.6**	**664.2**	**851.6**

* No data available

**Data source: Met Éireann (2018) https://www.met.ie/climate/available-data/historical-data

The mean rainfall from January 2013 to December 2017 recorded at Oak Park was 71 mm/month/year (total/year = 851.6mm). Average rainfall across the 5 years ranged from a low of 60.4mm/month in 2017 to a high of 91.5mm/month in 2014. A total mean monthly precipitation rate of approximately 517mm across all years fell during the winter months (October to March). The monthly total during the winter months (October-March) accounts for approximately 61% of the annual total for these years. Indeed, trends in the data show that the highest rainfall occurrences alternated between December and February across each of the analysed years, with a maximum monthly precipitation rate of 270.9mm falling in December 2015. The lowest monthly rainfall rate across each of the years occurred in April 2017 with 15.8mm recorded.

During the winter months, the rainfall will be commonly associated with Atlantic frontal depressions, whereas during the summer months high rainfall amounts will tend to be associated with intense thundery showers.

Table 9-4**:** Mean monthly temperatures (°C) recorded at Oak Park Synoptic Station from January 2013 to December 2017.

Month	Year					Mean Monthly Temperatures
	2013	2014	2015	2016	2017	
January	5.3	5.5	5.0	5.9	6.0	**5.5**
February	4.7	5.7	4.3	4.9	6.5	**5.2**
March	3.8	7.0	6.2	6.1	8.3	**6.3**
April	7.5	10.1	8.7	7.5	9.0	**8.6**
May	10.4	11.9	10.2	12.3	12.4	**11.4**
June	13.7	14.5	13.4	15.1	15.0	**14.3**
July	18.2	16.9	14.6	16.0	15.7	**16.3**
August	16.3	14.5	14.6	16.0	15.0	**15.3**
September	14.0	14.3	12.4	14.6	-*	**13.8**
October	12.1	11.4	10.2	10.6	11.5	**11.2**
November	6.4	7.2	9.2	5.2		**7.0**
December	6.6	5.6	8.6	6.3	5.6	**6.5**
Mean Annual Temperatures	**9.9**	**10.4**	**9.8**	**10.0**	**10.5**	**10.1**

* No data available

**Data source: Met Éireann (2018) https://www.met.ie/climate/available-data/historical-data

The mean annual temperature recorded at Oak Park across all 5 analysed years was 10.1°C. The lowest and highest recorded mean monthly temperature was 4.7°C in February 2013 and 18.2°C in July 2013 respectively. As expected, July was the warmest month across all years with an average temperature of 16.3°C.

9.3.4.2 Local Climate

Long-term rainfall and evaporation data was sourced from Met Éireann (Walsh, 2012).

The 30-year (1981–2010) average monthly rainfall recorded at Oak Park, Co. Carlow is presented in Table 9-5 with the Average Annual Rainfall (AAR) calculated as the sum of all monthly averages across the 30 years.

Table 9-5: Long term mean monthly rainfall data (mm) (Met Éireann)

J	F	M	A	M	J	J	A	S	O	N	D	Annual
82	58	64	60	61	65	60	74	72	90	87	82	854

Average potential evapotranspiration (**PE**) at Oak Park is 529 mm yr^{-1}. This value is used as a best estimate of the site PE.

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. AE is estimated by multiplying PE by 0.95, to allow for the reduction in evapotranspiration during periods when a soil moisture deficit is present (Water Framework Directive, 2004). Actual evapotranspiration is therefore 502.7 mm yr^{-1} (0.95 PE).

Effective rainfall (**ER**) is the proportion of rainfall which is available to recharge groundwater. Using the following equation, the effective rainfall **(ER)** is therefore taken to be an average of 352.4mm/yr^{-1}:

$$\mathbf{ER} \quad \mathbf{= AAR - AE}$$

$$= 854 \text{ mm yr}^{-1} - 502.7 \text{ mm yr}^{-1}$$

$$\mathbf{ER} \quad \mathbf{= 351.3 \text{ mm yr}^{-1}}$$

9.3.5 Land-Use

The Substitute Consent application area is comprised of a 4.7ha existing sand and gravel pit which is located within an existing sand and gravel pit of 6 hectares. Topography in the existing pit has been lowered by up to 7 m below surrounding land. The current floor of the existing pit is reasonably level with elevations generally between 62 – 64mOD. The land-use in the vicinity of the pit consists mainly of agricultural land.

9.4 Characteristics of the Development

The application site has an area of approximately 4.7 ha. This area is broadly rectangular with a width of 300 m perpendicular to the slope, and length of 220 m. The L-shaped indentation in the south eastern corner is an area previously granted planning permission. The remainder of the perimeter is generally well defined by hedgerows and soil berms. The site is accessed via a 1 km private haul road which extends southwest from the N81 at Ardristan Heights.

The quarry commenced operations in 1987 with the existing working pit being most active within the period 2000 - 2008. The existing working area has generally been unused since 2008.

Previous activities at the site included:

- Stripping and stockpiling of topsoil in screening embankments. Vegetation has become established on these perimeter berms.
- Extraction of sand and gravel deposits using a mechanical excavator. All extraction took place above groundwater. Maximum depth of extraction is estimated to be 7 m.
- Excavated material was directly loaded onto vehicles and transported off-site to market or for further processing at an alternative location. Material was also screened, graded and stockpiled on site.
- Processed material stored on-site was loaded onto vehicles and off site to market.
- Fines resulting from screening (i.e. fine sand, silt and clay) were stockpiled in the central part of the site. This material remains on site and is suitable for use in rehabilitation.
- Refuelling of on-site machinery (assumed to be an excavator, mobile screening/grading plant and loading shovel) was carried out by a local third party fuel supplier using a double-skinned mobile fuel tanker. Fuel was delivered to site as required and dispensed directly into plant. There has reportedly been no storage of fuels on site.

- Lubricating products were stored on bund trays within a secure steel container.
- Planning permission on a 1.3 ha area of the existing point was granted for *a gravel pit, screening and batching plant with office and septic tank.* However Envirologic could find no evidence of a septic tank during the site walkover. It is therefore assumed that a portable toilet was used to provide sanitary services at the site and that this was reportedly serviced by a licenced contractor. It is estimated that 1-2 staff members would have been operating at the site during 2000-2008.
- A site compound was located in the centre of the site. At present there is no site office, weighbridge or wheel washing facilities at the site.

Plant and machinery which operated in the application area consisted of tracked excavators, wheel loaders, dump trucks and mobile processing plant. Ancillary plant such as a water bowser was deployed where required.

9.5 Impact Assessment

The historic development consisted mainly of sand and gravel extraction related activity associated with the removal of the resource for the local agriculture and construction industry. Day to day activities associated with the historical operation of the pit are evaluated under the operational phase as there was no construction phase.

9.5.1 Operational Phase Impacts

9.5.1.1 Plant and Vehicle Emissions

The movement of all vehicles and particularly heavy commercial vehicles and operation of plant such as excavators and processing plant would have generated exhaust emissions (e.g. $C0_2$ and N_20) which could not be eliminated as, in order for material to be extracted and processed, plant and vehicles need to operate.

Emissions associated with the development are assessed as having a slight impact over a long term period.

9.5.2 Cumulative Impact

The Substitute Consent application area must also be considered in association with other developments located within or close to the application site. The application area forms part of an overall working pit which consists of an existing operational area where extraction areas are located.

9.5.2.1 Existing Authorised Pit

<u>Plant and Vehicle Emissions</u>

The operation of plant and machinery in this area of the pit would have also contributed to greenhouse gas emissions to the atmosphere. Plant associated with extraction of material and processing where required would have operated in only one are of the pit at any one time i.e. in the authorised area or Substitute consent Area. Emissions associated with this area of the pit are assessed as having a slight impact over a long term period.

9.5.2.2 Other Developments

Other contributors of CO_2 emissions within the study area would have been associated with road traffic using national, regional and local roads in the vicinity.

Another main contributor of emissions to the atmosphere in the region would have been likely to have been associated with the agricultural sector with livestock farming being practiced.

9.5.2.3 Conclusion

It is unlikely that there was a cumulative impact on the local climate as a result of activities associated with the Substitute Consent development and other activities of the study area due to the low level of activity in the area which is unlikely to have generated significant emissions.

9.6 Mitigation Measures

The following measures were practiced at the existing development during the operational phase of the development in order to limit the effects of the development on the local and regional climate:

- Strict adherence to 'good site/engineering practices' (e.g. all vehicles and plant were be switched off when not in use) which would have minimised the generation of any unnecessary air emissions.
- Plant was serviced regularly to ensure efficient fuel consumption.
- Energy audits were undertaken at the pit in order to reduce energy requirements.
- When purchasing plant, preference was given to plant which have low emissions.

9.7 Remedial Measures

The above measures will be practiced during any future work undertaken at the pit associated with landscaping and restoration.

9.8 Residual Impacts

No residual impacts are predicted.

9.9 Technical Difficulties

No technical difficulties were encountered.

9.10 References

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10.0 AIR

10.1 Introduction

This chapter assesses the likely air quality impacts, if any, associated with previous activity undertaken within and in the vicinity of the Substitute Consent application area with respect to air quality. Sensitive receptors, such as residential areas were reviewed as part of this assessment.

Dr. Avril Challoner completed this Chapter. She is a Senior Consultant in the Air Quality section of AWN Consulting. She holds a BEng (Hons) in Environmental Engineering from the National University of Ireland Galway, HDip in Statistics from Trinity College Dublin and has completed a PhD in Environmental Engineering (Air Quality) in Trinity College Dublin. She is a Member of the Institute of Air Quality Management and specialises in the fields of air quality, EIA and air dispersion modelling.

10.2 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 2010, 2015, 2017) and using the methodology outlined in the guidance documents published by the USEPA (USEPA 2004, 2005, 2017). The air dispersion modelling input data consisted of information on the physical environment, design details from all emission sources on-site and a full year 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 year. 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.

10.2.1 Assessment Methodology

The rating of potential environmental effects of the proposed project on air quality is based on the criteria presented in Table 10-1 below. These criteria consider the quality, significance, duration and types of effect characteristics identified and are based on Table 3.3 presented in the EPA (2017) *document titled "Guidelines on the Information to Be Contained in Environmental Impact Assessment Reports".*

Table 10-1: Criteria Used in the Assessment of Impacts on Air Quality (EPA, 2017)

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).

Characteristic	Level	Description
Types of Effects	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.
	'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.

10.2.2 Dispersion Modelling Methodology

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 proposed 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 2017) (version 18081) was used as recommended by the USEPA (USEPA 2005). The model is a steady-state Gaussian plume model used to assess pollutant concentrations associated with industrial sources. The model has been designated the regulatory model by the USEPA for modelling emissions from industrial sources in both flat and rolling terrain (USEPA 2005). The AERMET PRO meteorological pre-processor (USEPA 2004) 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 VI.

10.2.3 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 each 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 report identifies and quantifies the dust sources from the pit.

10.2.4 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 the 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 10-2. The moisture content of limestone (site contains limestone derived gravel) has been estimated at 2.1%, which is based on a literature review.

Table 10-2: 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. Only a small number of sensitive locations are present which can be affected by dust deposition. The pit is located in an area with a low population density and there is only one house within 500m from the extraction of material. 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 iner grid extended to 1.25 km from the site with concentrations calculated at 50m intervals. The outer grid extended to 5 km from the site with concentrations calculated at 250m intervals. Boundary receptor locations were also placed along the land ownership boundary of the site, at 25m intervals. The modelling has investigated the deposition and concentrations of dust, PM_{10} and $PM_{2.5}$ for the activities outlined in Section 10.5.

10.3 Legislation

10.3.1 Air Quality

A number of international initiatives, protocols and Directives exist to limit and reduce emissions at a national level. The following criteria were considered in the assessment of impact on air quality:

- Air Quality Standards Regulations (S.I. No. 180 of 2011).
- Directive 2001/81/EC on National Emission Ceilings for certain pollutants (NECs) (S.I. No. 10 of 2004).
- There are no statutory limits for deposition of dusts and industry guidelines are typically employed to determine any impact. The TA Luft (German Government 'Technical Instructions on Air Quality') states a guideline of 350 mg/m^2/day for the deposition of non-hazardous dusts. This value was used to determine the impact of dust deposition as an environmental nuisance.
- The National Roads Authority (NRA) has published guidance for assessing dust impacts from road construction ('Guidelines for the Treatment of Air Quality during the Planning and Construction of National Road Schemes'). This has been used to determine the potential impacts from the proposed construction site operations.

The relevant Irish ambient air standards have been adopted from the European Commission (EC) Directives 1996/62/EC, 1999/30/EC and 2000/69/EC and are cited as the Air Quality Standards Regulations, which came into force on 17th June 2002 (Irish Legislation S.I. No. 271 of 2002). In May 2008, these EC Directives on air quality were replaced with a new Directive on ambient air quality and cleaner air for Europe (2008/50/EC), which has been transposed into Irish Legislation through the revised Air Quality Standards Regulations (S.I. 180 of 2011). The new legislation specifies limit values in ambient air for sulphur dioxide (SO_2), lead (Pb), benzene (C_6H_6), particulate matter (PM_{10} and $PM_{2.5}$), carbon monoxide (CO), nitrogen dioxide (NO_2) and oxides of nitrogen (NO_x). These limits are set for the protection of human health and are largely based on review of epidemiological studies on the health impacts of these pollutants. The pollutants of concern for the remedial EIAR are PM_{10} and $PM_{2.5,}$ the limit values of which are presented in Table 10-3.

Table 10-3: Revised Air Quality Standard Regulations S.I. 180 of 2011 and TA-Luft

Pollutant Criteria Value	Criteria	Value
Particulate Matter (PM_{10})	24-hour limit for protection of human health - not to be exceeded more than 35 times/year	50 µg/m^3 PM_{10}
	Annual limit for protection of human health	40 µg/m^3 PM_{10}
Particulate Matter ($PM_{2.5}$)	Annual target value for the protection of human health	25 µg/m^3 $PM_{2.5}$
Dust deposition (non-hazardous dust)	Average daily dust deposition at the boundary of the site	350 mg/(m^2*day) Total Dust

10.3.2 Dust Deposition

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 350mg/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, Health & Local Government (DOELG 2004), apply the Bergerhoff limit of 350 mg/(m^2*day) to the land ownership boundary of quarries.

10.3.3 Environmental Management and Guidance Documents

A number of publications were referred to during the compilation of this chapter which are detailed below. All offer guidance in relation to assessing air quality.

- *Guidelines for the Treatment of Air Quality during the Planning and Construction of National Road Schemes* (NRA, 2011) – This document provides updated guidance for the assessment of air quality impacts during the planning and design of national road schemes.

- *AG4 Air Dispersion Modelling from industrial installations guiance Note #4* (AG4) (EPA, 2009) - This guidance note was commissioned by the EPA to provide information on the subject of air dispersion modelling in the Irish context.

- *AERMOD Description of Model Formulation and Evaluation* (USEPA, 2017) This document descripbes the USEPA approved air quality dispersion model AERMOD.

- *Advice Notes for Preparing Environmental Impact Statements (Draft) on the Information to be Contained in Environmental Impact Assessment Reports* (Draft) (EPA, 2015) This draft advice note document informs the reader what information should be contained within an environmental assessment.

- *Guidelines on the Information to be Contained in Environmental Impact Assessment Reports* (Draft) (2017) This draft document informs the reader what information should be contained within an environmental assessment.

10.4 Existing Environment

The 4.7ha Substitute Consent application area from part of an existing pit of approximately 6 ha. in area and is located in the townland of Roscat approximately 3 km south west of Tullow and 2 km east of Rathtoe. The N81 national road which connects Tullow with the N80 at Ballon passes in a north-south direction 1.5 km east of the site. Vehicular access is off a local road and via a c.1 km long gated laneway that provides access to the pit and surrounding lands. The site is surrounded by agricultural fields and a farm is located nearby.

10.4.1 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 Met Éireann synoptic station to the pit is at Oak Park, Co. Carlow, which is approximately 15km northwest of the application area.

The mean monthly rainfall from January 2013 to December 2017 recorded at Oak Park was 71 mm/month (total/year = 851.6mm). Average rainfall across the 5 years ranged from a low of 60.4mm/month in 2017 to a high of 91.5mm/month in 2014. A total mean monthly precipitation rate of approximately 517mm across all years fell during the winter months (October to March). The monthly total during the winter months (October-March) accounts for approximately 61% of the annual total for these years. Indeed, trends in the data show that the highest rainfall occurrences alternated between December and February across each of the analysed years, with a maximum monthly precipitation rate of 270.9mm falling in December 2015. The lowest monthly rainfall rate across each of the years occurred in April 2017 with 15.8mm recorded.

Long-term (1981–2010) average monthly rainfall was also recorded at Oak Park. Met Éireann records for this station show that the Average Annual Rainfall (AAR) for the period 1981 - 2010 in the area was 854 mm.

Wind frequency is 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, in common with most of Ireland, are south-westerly, thereby predominantly dispersing any potential dust emissions to the north-east of the site.

The air quality dispersion model, AERMOD, requires a more detailed data set than is available at the Oak Park site. The nearest representative weather station collating detailed weather records is at Casement Aerodrome meteorological station, which is located approximately 60 km north east of the site. Long-term hourly observations at Casement Aerodrome meteorological station provide an indication of the prevailing wind conditions for the region (see Figure 10-1). This location is a similar distance to the Johnstown Castle Meteorological station, however Casement Aerodrome was chosen due to its loation being further from the coastline and therefore considered more representative of the likely meterological conditions at the subject site. Results indicate that the prevailing wind direction is westerly to south-westerly in direction over the period 2013 - 2017. The mean wind speed was approximately 5.7 m/s over the period 1981 - 2010. All meteorological data referenced within this report is provided by Met Éireann (source www.met.ie).

10.4.2 Background Sources of Dust

The sources of dust arising from the facility 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.

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 pit at Roscat, Co Carlow.

10.4.3 Dust Deposition Monitoring

As the applicant has only recently gained control of the development, no environmental monitoring results were available for review. The Environmental Section of Carlow County Council was contacted in relation to environmental monitoring results and none were available on file.

For this reason historical dust deposition monitoring is not available. Monitoring began on October 15th 2018. The currently available baseline data is shown in Table 10-4 below and the monitoring locations are shown in Figure 10-2.

The average dustfall level from the initial set of monitoring data measured at three locations did not exceed the TA Luft limit value of 350 mg/(m^2*day). Overall, dustfall levels are low with two locations considerably lower than the third location. The peak across the three sites reached at most 55% of the TA Luft limit value. However, these results should be taken with caution as they are only a single month of monitoring data. As long-term dustfall levels in the pit are not available, the estimate of 191 mg/m^2*day is the worst case conservative background level assumed for the area prior to adding the contribution due to pit related activities.

Table 10-4: Dust Deposition Monitoring at Kilcarrig Pit

Monitoring Period	Limit Value	D 1 mg/(m^2*day)	D 2 mg/(m^2*day)	D 3 mg/(m^2*day)
15/10/2018 -10/11/2018	350	25	68	191
Average		25	68	191
Percentage of Limit		7%	19%	55%

Note 1: Limit value is TA Luft limit of 350 mg/m^2*day

There are no significant air emissions from industrial or commercial properties in the area, with the surrounding land-use mainly agricultural in nature.

10.4.4 Background Sources of PM_{10} and $PM_{2.5}$

Long-term PM_{10} monitoring was carried out at the rural Zone D locations of Kilkitt and Claremorris in 2017 (EPA 2017, 2018). The maximum 24-hour concentration (as a 90th%ile) at each of the Zone D locations is shown in Table 10-5. The long-term average of the 90th%ile of 24-hour concentrations at rural locations ranges from 15.5 – 16.2 µg/m^3. The average annual mean concentrations at rural locations measured at the two sites (Claremorris and Killkitt) from 2013 to 2017 were 10.2 and 8.5 µg/m^3, respectively, as shown in Table 10-6. Based on the above information an estimate of the background PM_{10} concentration in the region of Roscat is 11 µg/m^3 whilst a value of 17 µg/m^3 has been selected for the 90th%ile of 24-hr means.

Table 10-5: 90th%ile of 24-Hour PM_{10} Concentrations In Zone D Locations 2013 – 2017 (µg/m^3)

Year	Claremorris	Kilkitt	Enniscorthy	Castlebar
2013	21	18.6	-	26.9
2014	9.5	15.4	37.6	21.4
2015	10.2	18	34.4	22.7
2016	17.4	15	32.3	20
2017	17.3	14	46.9	19.1
Average	**15.5**	**16.2**	**34.8**	**21.7**

Table 10-6: Annual Mean PM_{10} Concentrations In Zone D Locations 2013 - 2017 (µg/m^3)

Year	Claremorris	Killkitt	Enniscorthy	Castlebar
2013	13	11	-	15
2014	10	9	22	12
2015	10	9	18	13
2016	10	8	17	12
2017	10.8	7.8	29	11.2
Average	**10.2**	**8.5**	**21.5**	**12.1**

The results of $PM_{2.5}$ monitoring at Claremorris (Zone D) in 2018 (EPA 2018) indicated an average $PM_{2.5}/PM_{10}$ ratio of 0.52. Based on this information, a ratio of 0.52 was used to generate a rural background $PM_{2.5}$ concentration of 6.2 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 2010) 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}.

10.4.5 Dust Sensitive Receptors

Potentially dust sensitive activities, which can be categorised in relation to their dust sensitivity as potential increases in ambient dust levels, will have varying degrees of effects. This is dependent on the type and sensitivity of the receptor. Although this principle does not always apply, Table 10-7 categorises dust sensitive receptors and highlights their risk in relation to potential sources of dust.

Table 10-7: 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 a number of dwellings located within a 1km radius of the application area as illustrated on Figure 5.1. Vegetation, berms and the natural topography can act as breaks between the sources and the receptor. Tree lines can also act as an efficient dust filter and can be a useful dust control safeguard.

10.5 Characteristics of the Development

The application site has an area of approximately 4.7 ha which forms part of an existing sand and rgavel pit which is approximately 6 Ha. in area. This area is broadly rectangular with a width of 300 m perpendicular to the slope, and length of 220 m. The L-shaped indentation in the southeastern corner is an area previously granted planning permission. The remainder of the perimeter is generally well defined by hedgerows and soil berms. The site is accessed via a 1 km private haul road which extends southwest from the N81 at Ardristan Heights.

The pit commenced operations in 1987 with the existing working pit being most active within the period 2000 - 2008. The existing working area has generally been unused since 2008.

For the purposes of this assessment it has been assumed that 50,000 tonnes of sand and gravel was extracted in a one-year period. This extraction rate has been used in order to estimate the impact of the pit in the surrounding environment.

During the average year, there was a maximum of 20 truck movements in and 20 truck movements out of the site per day. Thus, for the purpose of the assessment an estimate of 2 truck movements in and out of the site per hour has been assumed.

The hours of operation at the pit were ebwteen Monday to Friday 7:00 to 19:00 and Saturday 7:00 to 17:00. These hours have been used for the purpose of the assessment.

The following operations are the main dust generating sources or activities at the development:

1) Movement of empty trucks along paved public roads
2) Movement of empty trucks along unpaved haul roads
3) Extraction of material
4) Screening of material
5) Stockpiling of material
6) Loading of material
7) Movement of full trucks along unpaved haul roads
8) Movement of full trucks along paved public roads
9) Wind erosion at dump areas, stockpiles and exposed pit surface.

10.6 Impact Assessment

10.6.1 Operational Phase

The main potential sources of emissions to air would have been associated with plant and machinery undertaking day to day activities such as extraction, onsite processing and transportation of material 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.

<u>Dust</u>

Emissions from the site lead to a dust deposition level averaged over the full year of 42 mg/(m^2*day) at the land ownership boundary to the pit (see Table 10-8). Based on a worst case background dust deposition of 191 mg/(m^2*day) in the region of the site, the combined dust deposition level peaks at 233mg/(m^2*day) which is 67% of the TA Luft Limit Value of 350 mg/(m^2*day), see Figure 10-3. However, operational activities from the pit contributes a maximum of 12% of the TA-Luft Limit Value. The impact of dust deposition is considered slight adverse, localised and long-term.

Table 10-8: Dispersion Modelling Results for Dust Deposition at Boundary

Pollutant / Scenario	Worst Case Background Level (mg/(m^2*day))	Process Contribution (mg/(m^2*day))	Predicted Deposition (mg/(m^2*day))	Limit Value (mg/(m^2*day)) Note 1
Dust Deposition / 2013	191	37	228	350
Dust Deposition / 2014	191	35	226	350
Dust Deposition / 2015	191	36	227	350
Dust Deposition / 2016	191	39	230	350
Dust Deposition / 2017	191	42	233	350

Note 1 TA-Luft as interpreted by DOEHLG (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 site (see Table 10-9). For emissions from the pit the predicted 24-hour and annual concentrations (excluding background) at the worst-case receptor peak at 1.6 µg/m^3 and 0.65 µg/m^3 respectively. Based on a background PM_{10} concentration of 11 µg/m^3 in the region of the site, the combined annual PM_{10} concentration including the site peaks at 11.65 µg/m^3 (See Figure 10-4). This predicted level equates to at most 29% of the annual limit value of 40 µg/m^3. The predicted 24-hour PM_{10} concentration (including background) peaks at 17.65µg/m^3 which is 35% of the 24-hour limit value of 50 µg/m^3 (measured as a 90.4th%ile). Operational activities from the pit would have contributed a maximum of 1.6% of the PM_{10} annual mean limit value. The impact of PM_{10} is considered negligible, localised and long-term.

Table 10-9: Dispersion Modelling Results for PM_{10}

Pollutant / Scenario	Annual Mean Background ($\mu g/m^3$)	Averaging Period	Process Contribution PM_{10} ($\mu g/m^3$)	Predicted Immission Concentration PM_{10} ($\mu g/m^3$) Note 2	Standard ($\mu g/m^3$) Note 1
PM_{10} / 2013	N/A	90.4th%ile of 24-hr means	1.38	17.56	50
	11	Annual Mean	0.56	11.56	40
PM_{10} / 2014	N/A	90.4th%ile of 24-hr means	1.38	17.63	50
	11	Annual Mean	0.63	11.63	40
PM_{10} / 2015	N/A	90.4th%ile of 24-hr means	1.35	17.55	50
	11	Annual Mean	0.55	11.55	40
PM_{10} / 2016	N/A	90.4th%ile of 24-hr means	1.66	17.65	50
	11	Annual Mean	0.65	11.65	40
PM_{10} / 2017	N/A	90.4th%ile of 24-hr means	1.54	17.62	50
	11	Annual Mean	0.62	11.62	40

Note 1 S.I. 180 of 2011 and EU Directive 2008/50/EC

Note 2 90.4th%ile of 24-Hr PM_{10} Concentration Calculated According To UK DEFRA Guidance and using background data from the rural Zone D EPA 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 10-10) for the site.

The predicted annual concentration (excluding background) at the worst-case receptor peaks at 0.21 $\mu g/m^3$. Based on a background $PM_{2.5}$ concentration of 5.7 $\mu g/m^3$ in the region of the sand and gravel pit, the annual $PM_{2.5}$ concentration including the operations peaks at 5.9 $\mu g/m^3$. This peak level equates to 24% of the annual limit value for $PM_{2.5}$. Operational activities from the pit contribute a maximum of 0.84% of the $PM_{2.5}$ annual mean limit value. The impact of $PM_{2.5}$ is considered negligible, localised and long-term.

Table 10-10: Dispersion Modelling Results for $PM_{2.5}$

Pollutant / Scenario	Annual Mean Background ($\mu g/m^3$)	Averaging Period	Process Contribution $PM_{2.5}$ ($\mu g/m^3$)	Predicted Immission Concentration $PM_{2.5}$ ($\mu g/m^3$)	Standard ($\mu g/m^3$) Note 1
$PM_{2.5}$ / 2013	5.72	Annual Mean	0.18	5.90	25
$PM_{2.5}$ / 2014	5.72	Annual Mean	0.20	5.92	25
$PM_{2.5}$ / 2015	5.72	Annual Mean	0.18	5.90	25
$PM_{2.5}$ / 2016	5.72	Annual Mean	0.21	5.93	25
$PM_{2.5}$ / 2017	5.72	Annual Mean	0.20	5.92	25

Note 1 S.I. 180 of 2011 and EU Directive 2008/50/EC

Contour Plots

The geographical variation in site concentrations as a percentage of the relevant limit values for the worst-case scenario for each pollutant are illustrated as concentration contours in Figures 10-3 and 10-4. The contents of each figure are described below:

Figure 10-3 Predicted Annual Average Dust Deposition (g/m^2/year)
Figure 10-4 Predicted Annual Average PM_{10} Concentrations ($\mu g/m^3$)

The concentrations and deposition levels listed in Tables 10-8 – 10-10 are for the maximum concentrations / deposition levels predicted at the worst-case receptors. All other receptors are below these values. The concentration contours show where the maximum concentrations and deposition levels are predicted to occur and the reduction in concentration or deposition with distance away from the maximum.

Road Traffic emissions

There was 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, CO, benzene, PM_{10} and $PM_{2.5}$.

The nature of the development is such that there is no significant predicted impact on traffic emissions. The development generated an increase of 20 HGVs movments into and out of the pit daily. As detailed in the DMRB guidance on which TII's 2011 document *Guidelines for the*

Treatment of Air Quality During the Planning and Construction of National Road Schemes was based, a quantitative air quality assessment is required in the following circumstances:

- Road alignment change of 5 metres or more;
- Daily traffic flow changes by 1,000 AADT or more;
- HGVs flows change by 200 vehicles per day or more;
- Daily average speed changes by 10 km/h or more; or
- Peak hour speed changes by 20 km/h or more.

Therefore, using the DMRB screening criteria, no road links can be classed as 'affected' by the development and therefore, a local air quality assessment is not required as impacts are neutral in the long and short term.

10.6.2 Cumulative Impacts

Cumulative effects have been assessed for the site. 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.

There are no other significant sources of dust, PM_{10} or $PM_{2.5}$ within the area of impact from the pit and therefore no further prediction of cumulative impact is required.

10.6.3 Unplanned Events

Should an unplanned event have occured which could result in emissions to air, the activity would have been suspended and assessed with repairs carried out before resuming activity. In the event of an emergency such as a fire to plant or equipment, the emergency response plan would have been implemented and the relative emergency services contacted.

10.7 Mitigation Measures

The following mitigation measures are standard measures adopted at extractive developments and were implemented within the Substitute Consent area and extended pit area in order to limit the effects of pit activity on air quality:

- Vehicles using site roads have their speed restricted, and this speed restriction must be enforced rigidly. On any un-surfaced site road, this will be 30 kph, and on hard surfaced roads as site management dictates.
- Hard surface roads are swept to remove mud and aggregate materials from their surface while any un-surfaced roads will be restricted to essential site traffic.
- The access road was inspected regularly and kept in good condition.
- During very dry periods, dust emissions from heavily trafficked locations were controlled by spraying surfaces with water.
- Stockpiles were sprayed with water to reduce dust blow where required.

- Before entrance onto public roads, trucks were adequately inspected to ensure no potential for dust emissions.
- Material handling systems and site stockpiling of materials was designed and laid out to minimise exposure to wind. Water misting or sprays is used as required if particularly dusty activities are necessary during dry or windy periods.
- Inspection of the work area was undertaken on a daily basis to ensure that there is no dust blow.

10.8 Remedial Measures

The following measures should be practiced during landscape and restoration works undertaken at the pit.

- Vehicles using site roads shall have their speed restricted, and this speed restriction must be enforced rigidly.
- During very dry periods, dust emissions from heavily trafficked locations should be controlled by spraying surfaces with water.
- Inspection of the work area should be undertaken on a daily basis to ensure that there is no dust blow.
- Restored areas should be seeded as soon as possible after grading.

10.9 Monitoring

To ensure that the existing development is not impacting on air quality, dust deposition monitoring will be undertaken during the restoration phase of the development at the locations shown on Figure 10-2 at the end of this chapter. If monitoring indicates a potential issue with dust deposition, additional mitigation measures shall be implemented to remediate.

10.10 Residual Impacts

It is not anticipated that there was an adverse impact on air quality in the vicinity of the application site.

Modelled emissions from the pit 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 of the pit is not significant and thus no residual impact is anticipated.

10.11 Technical Difficulties

There were no significant difficulties encountered during the completion of the chapter.

10.12 References

German VDI (2002) Technical Guidelines on Air Quality Control – TA Luft

DOELG (2004) Quarries and Ancillary Activities, Guidelines for Planning Authorities

EPA (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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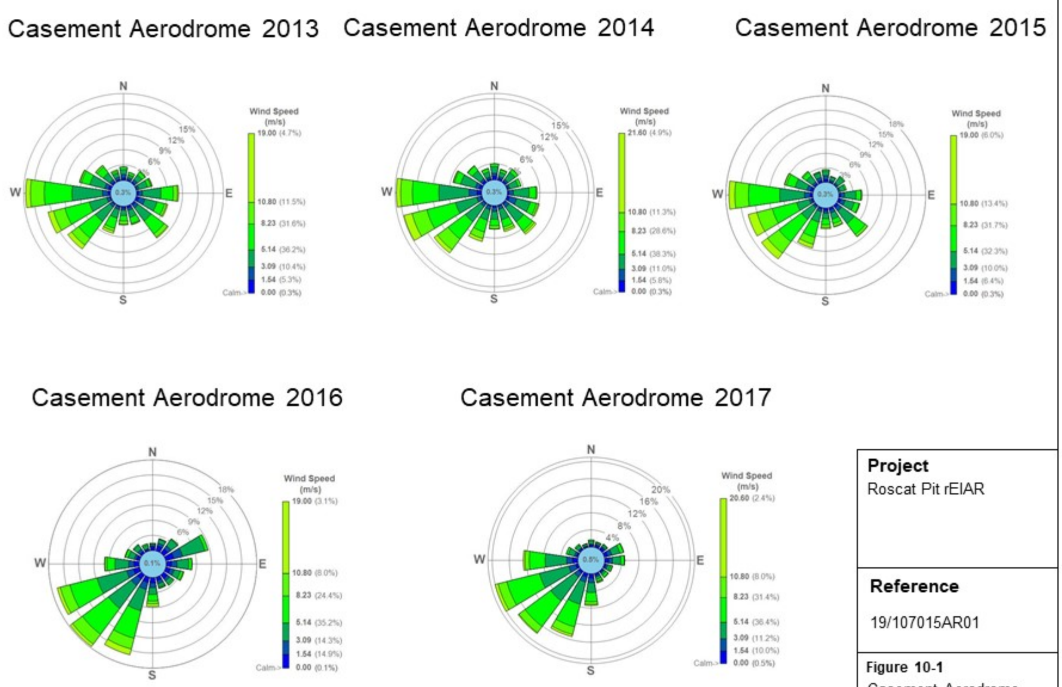
Figures



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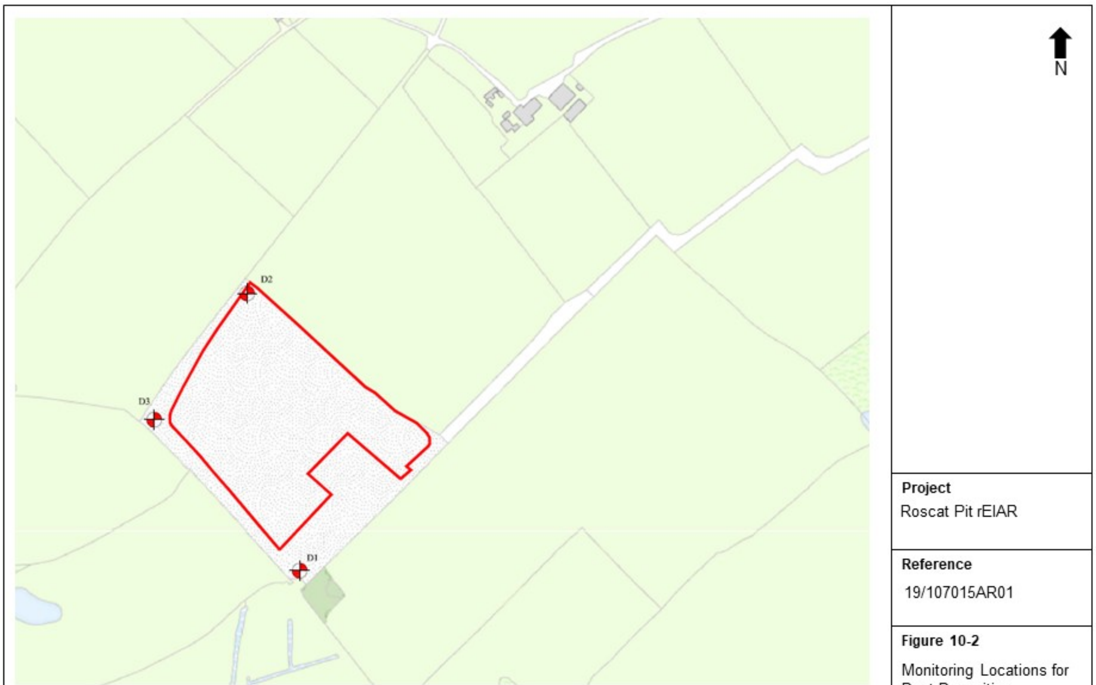
Project
Roscat Pit rEIAR

Reference
19/107015AR01

Figure 10-1
Casement Aerodrome Windrose 2013 - 2017



Project
Roscat Pit rEIAR

Reference
19/107015AR01

Figure 10-2
Monitoring Locations for Dust Deposition

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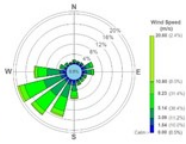

Background Mapping from Google Earth

Annual Mean Dust Deposition (excluding background)
Maximum Deposition Rate = 15.32 g/m²/yr (42 mg/m²/day)

Boundary Of Land Ownership

Scale
1:5,500

N

Project
Roscat Pit rEIAR

Reference
19/107015AR01

Figure 10-3
Annual Mean Dust Deposition Rate (g/m²/yr) (Year 2017)

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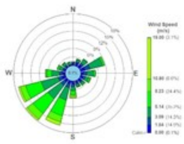

Background Mapping from Google Earth

Annual Mean PM_{10} Concentrations (excluding background)
Worst case Receptor Concentration = 3.9 µg/m³

Boundary Of Land Ownership

Scale
1:5,500

N

Project
Roscat Pit rEIAR

Reference
19/107015AR01

Figure 10-4
Annual Mean PM_{10} Concentrations (µg/m³) (Year 2016)

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11.0 NOISE & VIBRATION

11.1 Introduction

This section of the rEIAR was prepared by Noise and Vibration Consultants Ltd. to assess the environs surrounding the existing Substitute Consent area and authorised pit area for potential noise and vibration impacts associated with the operation of the sand and gravel pit (referred to as Roscat Pit).

The Substitute Consent application area is currently comprised of an area of 4.7ha which has been previously extracted to a depth of approximately 63 mOD. The application area forms part of a total pit area of approximately 6 hectares which includes an authorised area of approximately 1.3 hectares

11.1.1 Site Location and Setting

The existing sand and gravel pit area is situated approximately 3 km south of Tullow and 2 km east of Rathtoe, Co. Carlow. The N81 national road which connects Tullow with the N80 at Ballon passes in a north-south direction 1.5km of the site.

Vehicular access is off a local road and via a c.1km long gated laneway that provides access to the quarry and surrounding lands. The site is surrounded by agricultural fields and a farm is located nearby.

The area immediately around the site is sparsely populated, with individual farmsteads and scattered houses along the road network. A series of irregular third class roads run around the lands, serving a number of dwellings and farms.

11.2 Description of Previous Activity

The activity included the removal of overburden and extraction of underlying sand and gravel. Landscaping of the sand and gravel pit will be undertaken following consent and restoration of the pit will be under taken. All associated ancillary facilities/works are also included in this application.

11.2.1 Existing Development On-Site

The Substitute Consent site consists of a sand and gravel pit where material was extracted and hauled offsite for processing at another existing processing plant or processed onsite into various grades of aggregate and sold to market. The existing sand and gravel pit area, which is subject to Substitute Consent, has been registered with Carlow County Council in accordance with the requirements of Section 261 of the Planning and Development Act, 2000 (Quarry Ref. No. QY12/28). Material was extracted by excavators some of which passed through a mobile processing plant which then processed the material into various grades of aggregate. The material was then stockpiled on site and sold as aggregate or used to manufacture ready-mix concrete and concrete products offsite. There was no concrete plant onsite.

11.3 Statement of Authority

This section of the rEIAR has been prepared by 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 and 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.

11.4 Methodology

As noise monitoring was not previous undertaken onsite during operations and the Substitute Consent area has remained non-operational since approximately 2008, there is no existing noise monitoring data upon which to base a site specific impact assessment. As such, a noise survey was carried out in order to make an assessment of the current/ baseline noise conditions at and around the site boundary and to assess the potential previous noise emissions from the historical works. The following relevant guidance and legislation were consulted during this process:

- 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
- BS5228, 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

11.4.1 Baseline Noise Monitoring Survey

The baseline noise survey was carried out at some of the nearest receptors to the proposed development. Three noise monitors were set up to run continuously between 4th and 6th October 2018.

11.4.2 Noise Monitoring Methodology

The following instruments were used:

- One Larson Davis LxT Sound Expert Precision Integrating Sound Level Analyser/Data logger.
- Two Larson Davis 812 Precision Integrating Sound Level Analyser/Data logger
- Wind Shields Type: Double Skinned Wind Screens.
- Calibration Type: Larson Davis Precision Acoustic Calibrator.

All instruments conform to BS EN 61672-1 and BS EN 60942, Class 1 and ISO Type 1.

11.4.2.1 Weather

The baseline noise survey was in a range of wind speeds between 2-6m/s. There was no precipitation during the day periods (08.00 to 20.00hrs).

During the survey there were dry conditions with a west to north-west light wind ranging from 1 to 2m/s (14-18 degrees C).

11.4.2.2 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_{AFMax} is the maximum A-weighted sound level during a stated time period (Fast Time weighting).

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.

L_{A5} is the A-weighted sound level, which is exceeded for 5% of the sample period.

11.4.2.3 Measurement Procedure

Noise monitors were set up to run continuously with instruments set on 30 minute intervals with microphones at 1.2-1.5m 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 0.02dB. All monitors were within calibration certification times.

The noise monitoring and prediction locations are shown in Figure 11.1 at the end of this chapter. Locations N1A and N3A on Figure 11.1 are used as additional locations for prediction.

11.5 Results of Baseline Noise Survey

A summary of the baseline mean noise levels (rounded to whole numbers) is given in Table 11.1 (data in Appendix VII).

Table 11-1: Recorded mean noise levels taken at 30-minute intervals

ID	Date	Leq dBA	L10 dBA	L50 dBA	L90 dBA	Comments
N1	4th – 6th Oct'18	52	56	48	39	Mainly traffic from N80 traffic flow
N2	4th – 6th Oct'18	51	51	44	41	Mainly traffic from N80
N3	4th – 6th Oct'18	47	48	42	37	Local domestic activity with the background L90 noise levels being from the N80 traffic flow

11.6 Relevant Guidance and Legislation

The EPA has produced Environmental Management Guidelines 2006[2]. 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 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] 'Environmental Management in the Extractive Industry (Non-Scheduled Minerals),2006

[1] Ref. EPA's Guidance Note For Noise In Relation to Scheduled Activities, 1996

The guidelines also recommend that where existing background noise levels are very low, lower noise levels ELV's may be appropriate. It is also appropriate to permit higher ELV's for short term temporary activities such as construction of screening bunds etc. where such activities will result in considerable environmental benefit.

Very low background noise environment is well defined and referenced in the EPA's NG4 (Jan'16). Quiet areas are referenced in NG4 and refer to in Environmental Quality Objectives-Noise in Quiet Areas. To qualify the first stage involves screening and a number of criteria needs to be satisfied, one which involves being more than 5km from a National Primary Route. The N80 is a National Primary Route and is significantly closer to the nearest receptors. The background noise survey demonstrates that the noise level at receptors around the Substitute Consent site are well above that encountered at a low level noise environment as set out in "Environmental Management Guidelines-Environmental Management in Extractive Industry (Non Scheduled Minerals)".

The extraction times of operation were between 0700 hours and 1800 hours Monday to Friday and 0700 to 1400 hour on Saturdays. The pit did not operate outside these hours or on Sundays or Public Holidays. The pit provided employment for 1 person on a part-time basis.

11.8.1 Construction Noise

Relevant Guidance

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 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 11.2.

Table 11-2: Noise levels that are typically acceptable

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

[1] National Roads Authority, *Guidelines for Noise and Vibration in National Road Schemes.*

Part 1 of BS 5228 provides several example criteria for the assessment of the significance of noise effects from construction activities. Noise levels generated by construction activities are considered significant if:

- The LAeq, period level of construction noise exceeds lower threshold values of 65dB during daytime, 55dB during evenings and weekends or 45dB at night, and;
- The total noise level (pre-construction ambient noise plus construction noise) exceeds the pre-construction noise level by 5dB or more for a period of one month or more.

11.9 Noise Impacts

11.10.1 Extraction and Processing

The onsite activity involved removal of overburden and extraction of underlying sand and gravel. Material was extracted by excavators and processing onsite into various grades of aggregate. The material was stockpiled on site and sold as aggregate.

Plant and machinery which operated in the Substitute Consent area consisted of tracked excavators, wheel loaders, dump trucks and mobile processing plant. Ancillary plant such as a water bowser for dust suppression was deployed where required. A list of the equipment that would have operated at the site and associated noise levels is given in Table 11.3.

Table 11-3: Main noise sources and associated noise levels

Noise Source	Noise level @ 10m Leq dBA*	Comments
Mobile screener	81	Operating at normal operation
Mobile crusher with mobile screener plant	83	Crushing and screening system
CAT 966H front-end loader-7 tonne	84.5	Pulling load up a low level slope
Komatsu 400 dump truck-30 tonne Komatsu 400-idling	84 73.5	Load being carried on low level slope Idling
Komatsu excavator	83.5	Operating filling truck
Tractor and bowser	77	Spraying water

*Noise levels obtained from measurements from active quarries

11.10.2 Previous Potential Noise Levels

The previous potential noise levels are made for a number of scenarios and these are:

1. **Scenario 1:** Removal of overburden at the boundary of the site, at locations nearest to receptors.

2. **Scenario 2:** Extraction of sand and gravel in the middle of the site while assuming mobile processing being carried out in mid-site area.

3. **Scenario 3:** Extraction of sand and gravel while assuming mobile processing being carried out at extraction face of pit.

Table 11.4 gives the distance to the nearest receptors surrounding the site of the main noise sources in the sand and gravel pit for the different scenarios. The boundary distance referred to is the nearest distance from the boundary of the site to each receptor.

Table 11-4: Distance to receptors for noise sources in meters (m)

Location id	Scenario 1 Overburden removal at boundary of site	Scenario 2 Excavation at boundary of site	Scenario 2 Processing Mid-site	Scenario 3 Excavation and Processing at site boundary
N1	898	898	1069	898
N1A	600	600	732	600
N2	966	966	1112	966
N3	353	353	474	353
N3A	490	490	617	490

The difference between noise levels at two far-field locations can be modelled as follows:

$$\mathbf{L}_{p2} - \mathbf{L}_{p1} = 10 \log (R_2 / R_1)^2 - (A_{atm} + A_{gr} + A_{br} + A_{mis})$$
$$= 20 \log (R_2 / R_1) - (A_{atm} + A_{gr} + A_{br} + A_{mis})$$

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 and miscellaneous effects is assumed as zero in all the predictions.

An allowance of 20dBA has been assumed with a 3m high barrier constructed of overburden / topsoil on the north-east boundary. Noise levels in development works using excavators / dumpers within 10m have the highest spectral energy in the range above 500Hz (refer to Appendix VII barrier calculations as per BS 5228-1:2009).

Table 11.5 gives the predicted noise levels for the different scenarios. Scenario 1 gives the maximum LAeq 1hr noise levels for overburden removal activity while Scenario 2 and 3 gives the maximum LAeq 1hr noise levels for operational noise activity.

Table 11-5: Predicted noise level for Scenario 1, 2 and 3

Scenario No.	**Noise Monitor ID**				
	N1	**N1A**	**N2**	**N3**	**N3A**
Scenario 1* LAeq 1hr – Overburden Removal	42.3	46.4	42.9	50.4	47.6
Scenario 2 LAeq 1hr - Operation	36.2	39.5	35.9	43.3	41.0
Scenario 3-(m) LAeq 1hr - Operation	39.2	42.7	38.6	47.3	44.5

* Maximum levels for overburden will of duration of no more than 1 day equivalent (8 hrs)

11.10.3 Noise Assessment of Overburden Removal

Noise levels have been predicted at receptor locations on the perimeter of the site. The maximum level predicted was during the removal of overburden on the north-east development. The predicted noise levels are within the guidelines recommended by the NRA and by those given in Part 1 of BS 5228.

11.10.4 Noise Assessment of Sand and Gravel Operation

Noise levels have been predicted at receptor locations using different scenarios for receptors surrounding the site. Mitigating measures have been recommended where deemed necessary. The predicted noise levels are maximum levels and include the cumulative effects of all activity. The predicted noise levels are below the levels recommended by the EPA Environmental Management Guidelines for Quarries.

11.10.5 Road Traffic Noise Impacts

The low level traffic flow from the pit is via an established slip tarred road which leads on to a L7062 road and then a short distance on to the N80 road. There are no houses along this section of road, however there are houses located to the north and south which are more than 20m away.

A traffic flow assessment has been undertaken by road traffic consultant (Mr. Alan Lipscombe) for years 2020 and 2035. Flows were taken of the Local Road and the N80 north and south. The increase to the N80 is given as 2.1% while the greatest increase is 28.1% on the Local Road.

There is a logarithmic relationship between traffic flow and noise levels and typically doubling the road traffic flow will increase the noise levels by 3dBA. An increase in traffic flow by 28.1% will increase traffic noise levels by no more than 1dBA. The increase in road traffic will be negligible at all receptors.

11.10.6 Ground Vibration

The level of ground vibration at 20m from a loaded truck will be below the human threshold at less than PPV of 0.03mm/sec.

11.11 Unplanned Events

In the event of an emergency such as a fire to plant or equipment, an emergency response plan would have been implemented and the relative emergency services would be contacted should they be required.

11.12 Mitigation Measures

The following are standard mitigation measures for extractive developments and would have been implemented at the pit during the operational phase.

- Haul roads were maintained to a good standard in order to reduce the noise level associated with vehicles transporting material
- Regular maintenance and lubrication of plant and machinery.
- The enclosure and cladding of plant and machinery where possible.
- Minimising drop heights of material from plant and machinery.
- Avoidance of over revving where possible.

11.13 Remedial Measures Proposed

The following measures are proposed as part of any future works associated with landscaping and restoration:

- Reversing beeper on mobile plant can be replaced with ‘white noise beepers’ which is not audible to any receptors.
- All motors and pulleys will be maintained to a high standard with regular maintenance so as to avoid any tonal or impulsive components in the emission.
- Machinery will be throttled down or turned off when not in use.

11.14 Decommissioning

It is likely that the duration of decommissioning will be short. Any legislation, guidance or best practice relevant at the time of decommissioning would be complied with.

11.15 Noise Monitoring

Monitoring of noise levels will continue at 3 locations (N1, N2 & N3) as shown on Figure 11.1 on an annual basis during landscape and restoration to ensure that noise levels are below the recommended guideline values.

11.16 Residual Impacts

It is not anticipated that there will be an adverse impact on noise quality in the vicinity of the application site provided that various measures and best practice is applied.

11.17 Technical Difficulties

The main technical difficulty encountered was the fact that there was no noise monitoring undertaken within the Substitute Consent area during operations at the site. Furthermore, the Substitute Consent area has not been operational since approximately 2008 so the opportunity to collect recent operational data did not exist.

As detailed in Section 11.4, this technical difficulty was overcome by undertaking an onsite noise survey in order to make an assessment of the current/ baseline noise conditions at and around the site boundary with a view to assessing the potential previous noise emissions from the historical works.

11.18 Conclusion

Noise levels have been predicted and include the cumulative effects of previous activity. The noise levels are well within the levels recommended by the EPA Environmental Management Guidelines-Environmental Management in Extractive Industry (Non Scheduled Minerals).

11.19 References

Department of Communities and Local Government (1993) Minerals Planning Guidance 11 – The Control of Noise at Surface Mineral Workings (MPG-11)

Department of the Environment, Heritage and Local Government (2004) Quarries and Ancillary Activities: Guidelines for Planning Authorities

DEFRA (2005) Update of Noise Database for Prediction of Noise on Construction and Open Sites

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

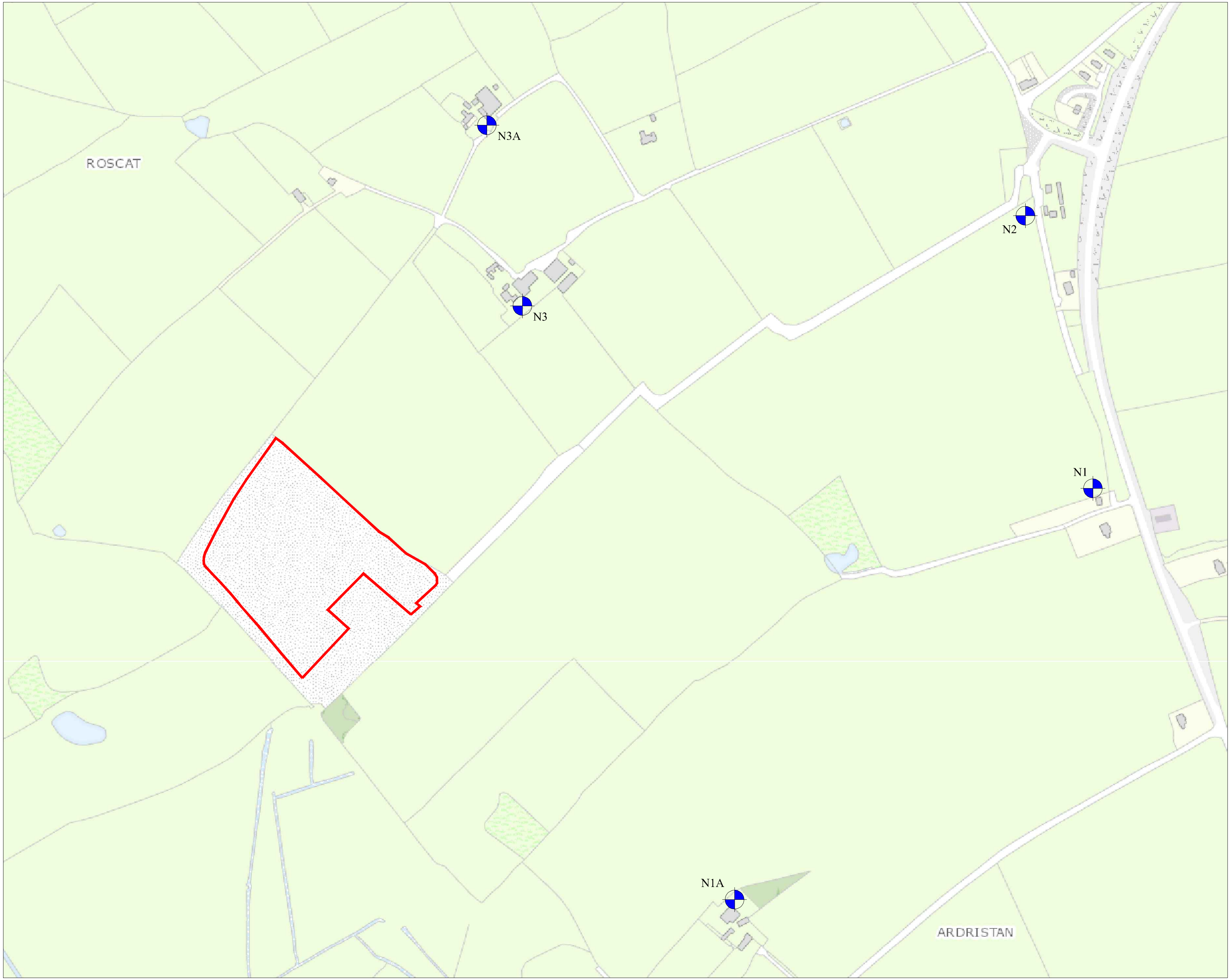
EPA (2012) Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4)

EPA (2016) Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4)

BS5228 (2009) Code of Practice for Noise Control on Construction and Open Sites. Part 1: Noise

Safety Health and Welfare at Work (Control of Noise at Work) Regulations 2006 (S.I. No. 371 of 2006)

Figures



Legend

Application Area

Area = 4.7 Ha

N1 Noise Monitoring Location

N

O.S. Map Ref No. 4475 - B

ITM Coordinates: 683027 E, 670998 N

Rev.	Description	Date

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Client: Kilcarrig Quarries Ltd.

Project: Remedial Environmental Impact Assessment Report to Accompany a Substitute Consent Application for a Sand & Gravel Pit Located at Roscat, Tullow, Co. Carlow

Title: Noise Monitoring Location Map

Drawn By: Sean O' Donnell

Checked By: Patrick O' Donnell

Scale: 1:7,000 @ A4	Date: Apr. 2019
Job No: EI 061	Rev: 0

Figure 11.1

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12.0 TRAFFIC

12.1 Introduction

12.1.1 Purpose of Chapter

The purpose of this chapter is to assess the retrospective traffic impact of the additional traffic movements that were generated by the existing Roscat Pit, which is located in the townland of Roscat, County Carlow. The site is situated approximately 3 kms to the south of Tullow off the N81 National Secondary Road, which links Tullow and Enniscorthy. The magnitude of the increase in traffic volumes experienced on the surrounding network during the most recent year of operation (year 2008) is identified during the operational phase of the existing development.

12.1.2 Scoping and Meetings

In order to ensure the scope of this report was to the satisfaction of Carlow County Council, a scoping document was issued in October 2018 to Carlow County Council Roads Department.

All of the traffic and transport related issues raised in the written correspondence received from Carlow County Council are addressed in this Section

12.1.3 **Statement of Authority**

This section of the rEIAR has been prepared by Alan Lipscombe of Alan Lipscombe Traffic and Transport Consultants. Alan is a competent expert in traffic and transport assessments. In 2007, Alan set up a traffic and transportation consultancy providing advice for a range of clients in the private and public sectors. Prior to this, he was a founding member of Colin Buchanan's Galway office having moved there as the Senior Transportation Engineer for the Galway Land Use and Transportation Study.

Since the completion of that study in 1999, Alan has worked throughout the West of Ireland on a range of projects including: major development schemes, the Galway City Outer Bypass, Limerick Planning Land-Use and Transportation Study, Limerick Southern Ring Road Phase II and Shannon Tunnel traffic forecasts and cost benefit analyses (COBA) and various studies for the NUI Galway. Before moving to Galway in 1997, Alan was involved in a wide variety of traffic and transport studies for CBP throughout the UK, Malta and Indonesia. He has particular expertise in the assessment of development related traffic and transport modelling, including for numerous wind and solar farm developments, and is an accomplished analyst who has experience of a wide variety of modelling packages and methods.

12.2 Methods

12.2.1 Method and Structure of the Traffic Assessment

The report adopts the guidance for such assessments set out by Transport Infrastructure Ireland (TII) in the document PE-PDV-02045-01 “Traffic and Transport Assessment Guidelines”. The key elements of the study are:

- A review of the existing transport infrastructure in the vicinity of the existing development, including an assessment of 2018 traffic flows and traffic flows adopted for the retrospective assessment year of 2008 *(Section 12.3 - Receiving Environment)*,
- A description of the nature of the existing development and the traffic volumes that were generated when it was operational *(Section 12.4 –Existing Development and Traffic Generation)*,
- A review of the impact of development generated traffic on the surrounding network *(Section 12.5 –Traffic impact of Existing Development)*,
- A geometric assessment of the route and its capacity to accommodate the loads associated with the existing development *(Section 12.6 – Route Assessment)*,
- A summary of likely and significant impacts *(Section 12.7 – Likely and Significant Impacts),*
- The conclusion is presented in the final section *(Section 12.8 – Conclusion).*

During the preparation of this assessment reference was made to the following documents:

- PE-PDV-02045-01 *‘Traffic and Transport Assessment Guidelines,* Transport Infrastructure Ireland (TII), *May* 2016,
- DN-GEO-03060 *“Geometric Design of Junctions,* Transport Infrastructure Ireland (TII), April 2017,
- PE-PAG- 02017 “*Project Appraisal Guidelines, Unit 5.3 Travel Demand Projections,* Transport Infrastructure Ireland (TII), October 2016,
- Automatic Traffic Count Data – TII Ireland,
- Collision Statistic – Road Safety Authority,
- Carlow County Development Plan 2015 to 2021.

12.3 Receiving Environment

12.3.1 Site Location and Network Summary

The location of the existing development in Roscat, Tullow, County Carlow is shown in the context of the national and local highway networks in Figure 12.1. The site is accessed from the N81 approximately 3 kms south of Tullow, followed by the L6026 westbound for approximately 80 metres, and then south towards the site access on an un-named local road.

The surrounding road network is shown in Plates 12.1 to 12.9 in Appendix VIII.

The most likely route for HGV trips to (and from) the existing development would be from the direction of Tullow on the N81, followed by a right turn at the existing priority junction with the L6026, as shown in Plates 12.1 to 12.3. This junction is a standard priority type junction with a right turn facility for vehicles turning right off the N81. The junction has standard geometry with 3 x 3 m lanes on the N81 with the L6026 having a width of 6 metres. As shown in Plates 12.1 and 12.2 visibility splays are clear at this junction.

The route then turns left off the L6026 at the priority junction with the un-named local road (see Plates 12.4 to 12.6) which is just over 5 metres wide. While visibility is clear to the east at this junction, as shown in Plate 12.5, visibility to the west, while sufficient to see approaching vehicles, would be significantly improved by trimming existing trees that overhang the carriageway edge.

Access to the quarry was gained via the existing access junction as shown in Plates 12.7 to 12.9.

A geometric assessment of the locations indicated in Figure 12.2 along the transport route is included in Section 12.5 based on the largest vehicles that would have accessed the site, which is a large Tipper Truck with dimensions shown in Figure 12.3.

12.3.2 Existing and Future Traffic Flows

12.3.2.1 Hours for traffic impact assessment

Trip generation estimates provided by the Client for the existing development, as discussed in Section 12.4.2, show that the peak hours of activity for the existing development would be the AM and PM peak hours. As background traffic flows also peak during these hours they were selected as the time periods on which to base the traffic impact assessment for the existing development.

12.3.2.2 Observed 2018 flows

Traffic count surveys were undertaken at the N81 / L6026 junction during the AM and PM peak periods on 24th May by Traffnomics Ltd. The counts are shown in terms of PCUs (passenger car equivalent units) for the weekday AM and PM peak hours, in Figure 12.4. The main points to note are as follows:

- The AM and PM peak hours were observed to be 08:45 to 09:45 and 16:45 to 17:45 respectively,
- Traffic flows on the N81 were observed to be slightly higher during the PM peak hour compared to the AM, with a maximum of 390 PCUs observed during the PM peak hour and 326 pcus during the AM.

- While traffic volumes on the L6026 were observed to be very light, flows were also observed to be higher during the PM peak hour (48 PCUS) compared to the AM peak hour (37 PCUs).

These traffic counts were adopted as base flows for the purpose of the junction capacity tests discussed in Section 12.5.2 of this report. A full listing of the traffic counts is included as Appendix IX.

A review of continuous Automatic Traffic Count (ATC's) sites maintained by Transport Infrastructure Ireland (TII), would suggest that a count on the N81 located to the south of Tullow is the most appropriate available source of continuous seasonal traffic count data. Data from 2017 shows that traffic flows during August were observed to be 5% higher than the survey month of May. The observed traffic flows were therefore factored by 1.05 in order to provide seasonally adjusted base year traffic flows, as shown in Figure 12.5. The TII data for the N81 is included as Appendix X.

12.3.2.3 Retrospective assessment year 2008 traffic flows

As we do not have traffic counts on the study road network for the retrospective assessment year of 2008, and the TII ATC traffic count data extends back until 2013 only, assumptions were required to be made with regards the background traffic flows that would have existed on the study network in the assessment year of 2008.

It is generally acknowledged that the years 2007 /2008 were the period at which economic activity in Ireland peaked prior to the recent recession taking hold. Since then, it is reported that the economic activity has returned to pre-recessions levels. Based on this, together with the fact the traffic volumes are directly linked to economic activity, it is assumed for the purpose of this retrospective assessment, that background traffic volumes in 2008 were the same as those observed in 2018, as set out in Figure 12.5.

12.3.2.4 RSA Collision data

It is noted from the collision database maintained by the Road Safety Authority, included as Appendix XI, that there were no collisions at the N81 / L6026 junction, or on the local road leading to the site during the years 2005 to 2014 inclusive. This would indicate that the local road network operated relatively safely during the years up to 2008.

12.4 Existing Development and Traffic Generation

12.4.1 Description of the Existing Development

The existing development comprised of a sand and gravel pit, with a full description presented in Section 3.0 (Project Description) of this EIAR.

12.4.2 Development Trip Generation

Traffic generation estimates resulting from the existing development is based on the following;

- 50,000 tonnes of material was extracted per annum, with 20 tonnes per truck load, resulting in 2,500 truck movements per annum.
- Based on 255 working days per year, there were approximately 20 truck movements in and out of the site per day.
- For the AM and PM peak hours it was assumed that 2 of these trips travelling in and out of the site occurred during each peak hour.
- The existing development employed one person on site, who arrived by car during the AM peak hour, and left during the PM peak hour.
- Each HGV movement was weighted by 2.4 to covert to PCUs.

A summary of the trips generated by the existing development is provided by time period in Table 12.1 with the additional trips generated through the N81 / L6026 junction shown in Figure 12.6. With existing development traffic flows for the retrospective assessment year of 2008 are set out in Figure 12.7.

Table 12-1: Trip generation for existing development, by time period.

Time period	In			Out		
	Cars	HGVs	PCUs	Cars	HGVs	PCUs
AM peak hour	1	2	6	0	2	5
PM peak hour	0	2	5	1	2	6
All day	1	10	25	1	10	25

12.5 Traffic Impact of Existing Development

12.5.1 Impact on link flows

The impact that the existing development is estimated to have had on link flows on the surrounding road network during the AM and PM peak hours, and all day, is shown for the retrospective year of 2008 in Tables 12.3 to 12.4. The key points to note are as follows:

- The maximum increase in traffic volumes on the N81 due to the existing development is estimated to have been +2.1%, which applied to the N81 northern arm during the AM peak hour.
- In terms of all day traffic flows, the existing development is estimated to have increases traffic volumes on the N81 by a maximum of 0.5%.
- The existing development is forecast to have increased traffic volumes by a maximum of 28.2% on the L6026 during the AM peak hour, and by 5.9% all day.

TII guidelines suggest that a detailed capacity assessment should be undertaken for junctions where the subject development is estimated to result in an increase in traffic volumes of +10% on the main traffic route, or +5% in instances where the network is already congested. This would suggest that a detailed junction capacity assessment is not required for the existing development. As an assessment of this junction was, however, requested by Carlow County Council, a detailed capacity assessment is presented in the following Section 12.5.2.

Table 12-2: Link flows for without and with existing development AM peak hour (2-way in PCUs)

Arm	Year 2019			
	Existing	**With Proposed Dev.**	**Difference**	**% diff**
N81 (north)	333	340	7	2.1%
L6026	39	50	11	28.2%
N81 (south)	342	346	4	1.2%

Table 12-3: Link flows for without and with existing development, PM peak hour (2-way in PCUs)

Arm	Year 2019			
	Existing	**With Proposed Dev.**	**Difference**	**% diff**
N81 (north)	376	383	7	1.9%
L6026	50	61	11	22.0%
N81 (south)	410	414	4	1.0%

Table 12-4: Link flows for without and with existing development, All day (2-way in PCUs)

Arm	Year 2019			
	Existing	**With Existing Dev.**	**Difference**	**% diff**
N81 (north)	6,343	6,375	32	0.5%
L6026	844	894	50	5.9%
N81 (south)	6,917	6,935	18	0.3%

12.5.2 Traffic impact on N81 Tullow Road / L6026 junction

The junction capacity assessment was undertaken using the industry recognised junction analysis programme PICADY which allows the capacity of any priority junction to be assessed with respect to existing or forecast traffic movements and volumes for a given time period. The capacity for each movement possible at the junction being assessed is determined from geometric data with the output used in the assessment as follows:

- Queue – This is the average queue forecast for each movement and is useful to ensure that queues will not interfere with adjacent junctions.

- Ratio of flow to capacity (RFC) – As suggested, this offers a measure of the amount of available capacity being utilised for each movement. Ideally each movement should operate at a level of no greater than 0.85, or at 85% of capacity.
- Delay – Output in minutes, this gives an indication of the forecast average delay during the time period modelled for each movement.

Tests were undertaken for the AM and PM peak hours at the N81 / L6026 junction for the retrospective assessment year of 2008, and for the background and with existing development flow scenarios.

The results of the capacity tests for the priority junction are shown in Table 12.5 with the main point to note as follows:

- The impact of the existing development traffic at the N81 / L6026 junction, during the year 2008, was to increase the maximum RFC, which applied to the right turn onto the N81 during the PM peak hour, from 6.2% to 6.8%.

With an RFC of up to 85% considered to be within capacity, it is therefore concluded that the junction operated well within capacity during the year 2008, and that the impact of the additional traffic generated by the existing development was negligible.

The PICADY output file for the worst case scenario (PM peak hour with existing development, year 2008) is attached as Appendix XII.

Table 12.5: Junction capacity test results - N81 / L6026 junction, without and with existing development, by time period, year 2008.

Year	Arm	No development			With development		
		RFC	Q	Delay	RFC	Q	Delay
AM	Right turn onto N81	3.4	0.03	0.15	4	0.04	0.15
	Left turn onto N81	2.3	0.02	0.12	2.9	0.03	0.11
	Right turn into L6026	0.8	0.01	0.11	1.6	0.02	0.11
PM	Right turn onto N81	6.2	0.07	0.14	6.8	0.07	0.15
	Left turn onto N81	1	0.01	0.14	1.9	0.02	0.13
	Right turn into L6026	0.8	0.01	0.11	1.4	0.01	0.11

12.6 Route Assessment

12.6.1 Design vehicle

The largest vehicles that required access to the site was a large tipper truck 10.2 meters long and 2.5 meters wide. The profile of such a vehicle is provided in Figure 12.3.

12.6.2 Route assessment

12.6.2.1 Location 1 – N81 / L6026 junction

Tipper trucks travelling to / from Tullow were required to negotiate this junction. An autotrack assessment based on OS mapping and the large tipper truck, as illustrated in Figure 12.8, shows that the largest vehicles that required access to the site were accommodated at this location.

12.6.2.2 Location 2 – L6026 / local road junction

The autotrack assessment shown in Figure 12.9 indicates that tipper trucks visiting the site were able to negotiate this junction.

12.6.2.3 Location 3– Existing access junction

An autotrack assessment showing that the junction accommodated the design tipper truck is shown in Figure 12.10.

12.7 Likely and Significant Impacts

12.7.1 "Do Nothing" Scenario

If the existing development was not present there would have been no impact in terms of changes in traffic levels on the surrounding road network.

12.7.2 Likely Effects of Existing Development on Highway Network

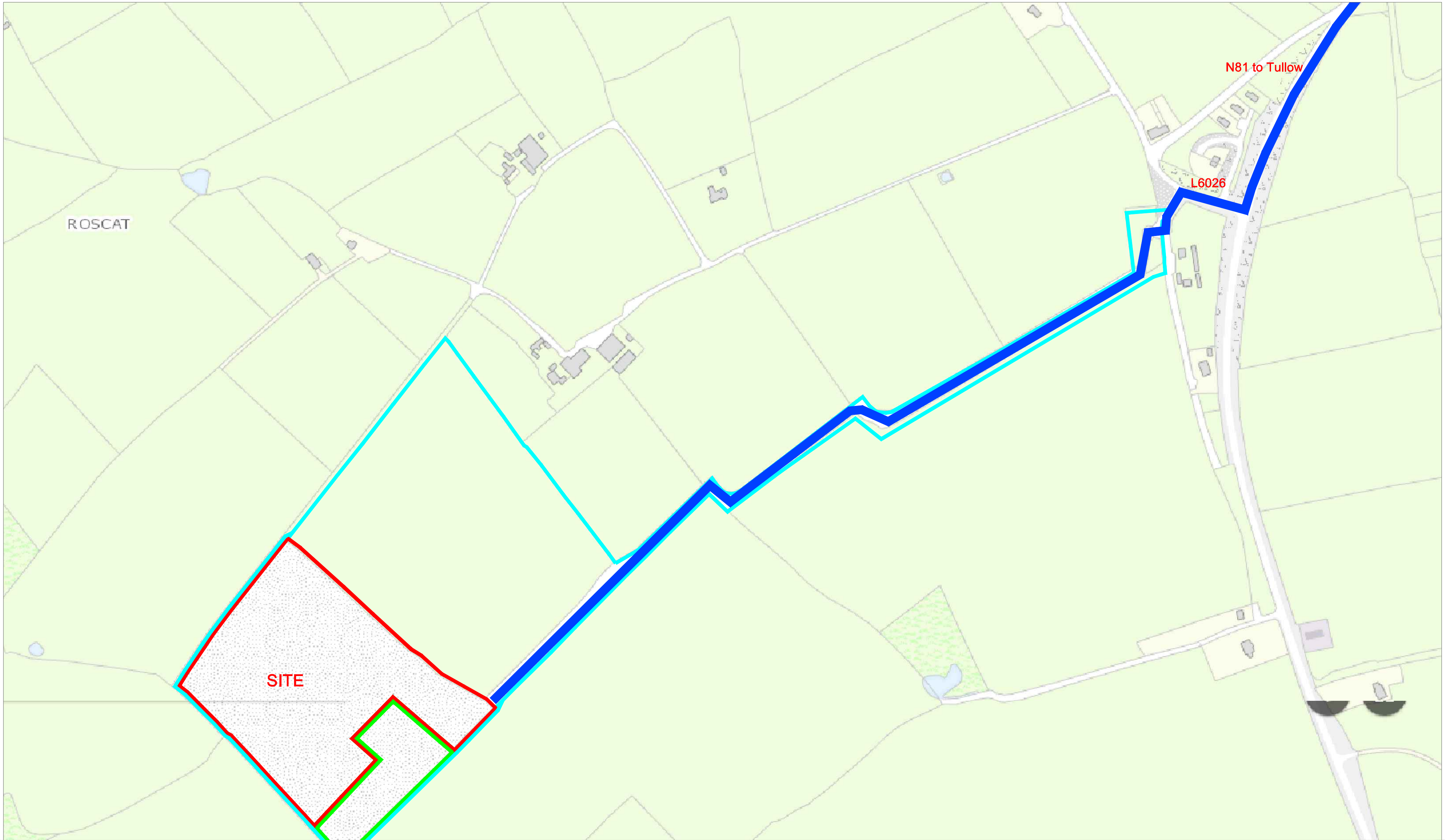
During the operational phase of the existing development the impact of the additional development generated traffic on the N81 was slight, increasing traffic flows by a maximum of 2.1% during the AM peak hour and by 0.5% all day, in the year 2008.

On the L6026 leading to the site access, background traffic volumes were very low, and the impact of the additional traffic generated by the existing development would have been more noticeable. With a daily maximum 2-way flow of 50 pcus, equating to +28.2% during the AM peak hour, and +5.9% during the day, the impact on the L6026 and local road leading to the site was also slight.

12.8 Conclusion

From the assessment outlined in this section, it is concluded that the relatively low volumes of traffic that were generated by the existing development would have had a slight impact on the surrounding local highway network, which would have operated well within capacity up to the year 2008 when operations ceased.

Figures



NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Figure 12.1 Site location and delivery route

PROJECT: Roscat Pit, Tullow, County Carlow			
CLIENT: Kilcarraig Quarries Ltd		SCALE:	NTS
PROJECT NO: 7150	DATE: 02.12.18	DRAWN BY:	AL

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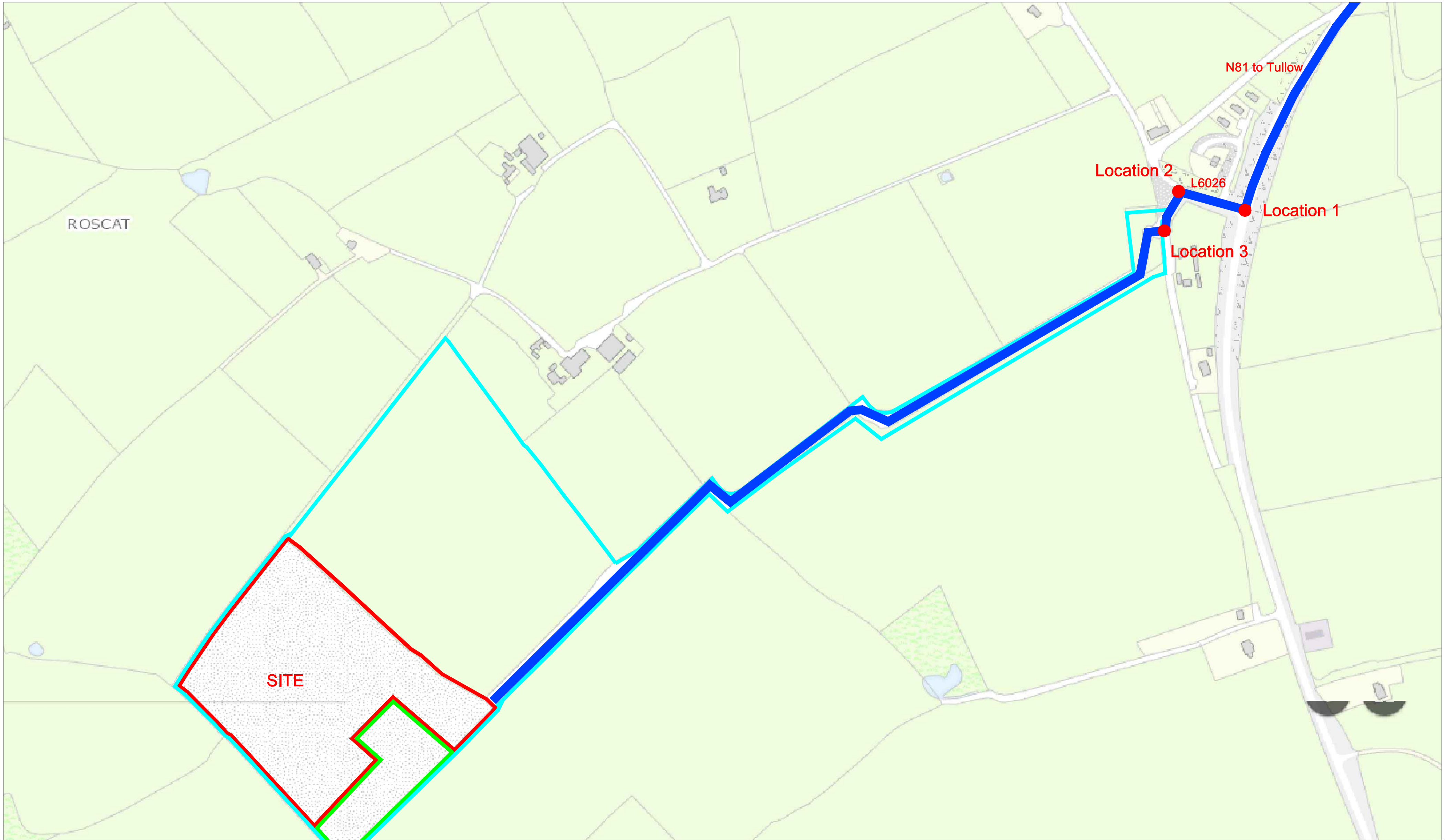
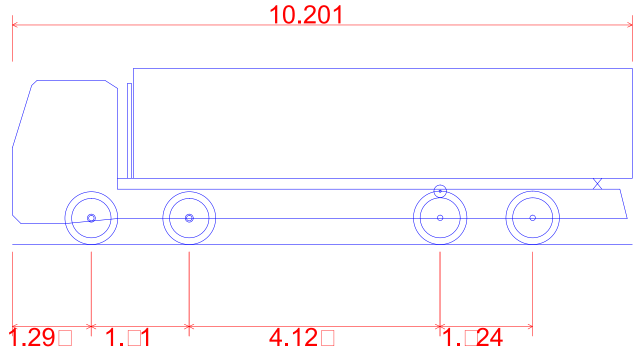


NOTES:	Figure 12.2 Delivery route and autotrack assessment locations		
PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES	PROJECT: Roscat Pit, Tullow, County Carlow		ALAN LIPSCOMBE TRAFFIC & TRANSPORT CONSULTANTS
	CLIENT: Kilcarraig Quarries Ltd	SCALE: NTS	
	PROJECT NO: 7150 DATE: 02.12.18	DRAWN BY: AL	



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PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Figure 12.3 Large Tipper Truck Profile

PROJECT:	Roscat Pit, Tullow, County Carlow		
CLIENT:	Kilcarraig Quarries Ltd	SCALE:	1:500
PROJECT NO: 7150	DATE: 02.12.18	DRAWN BY:	AL

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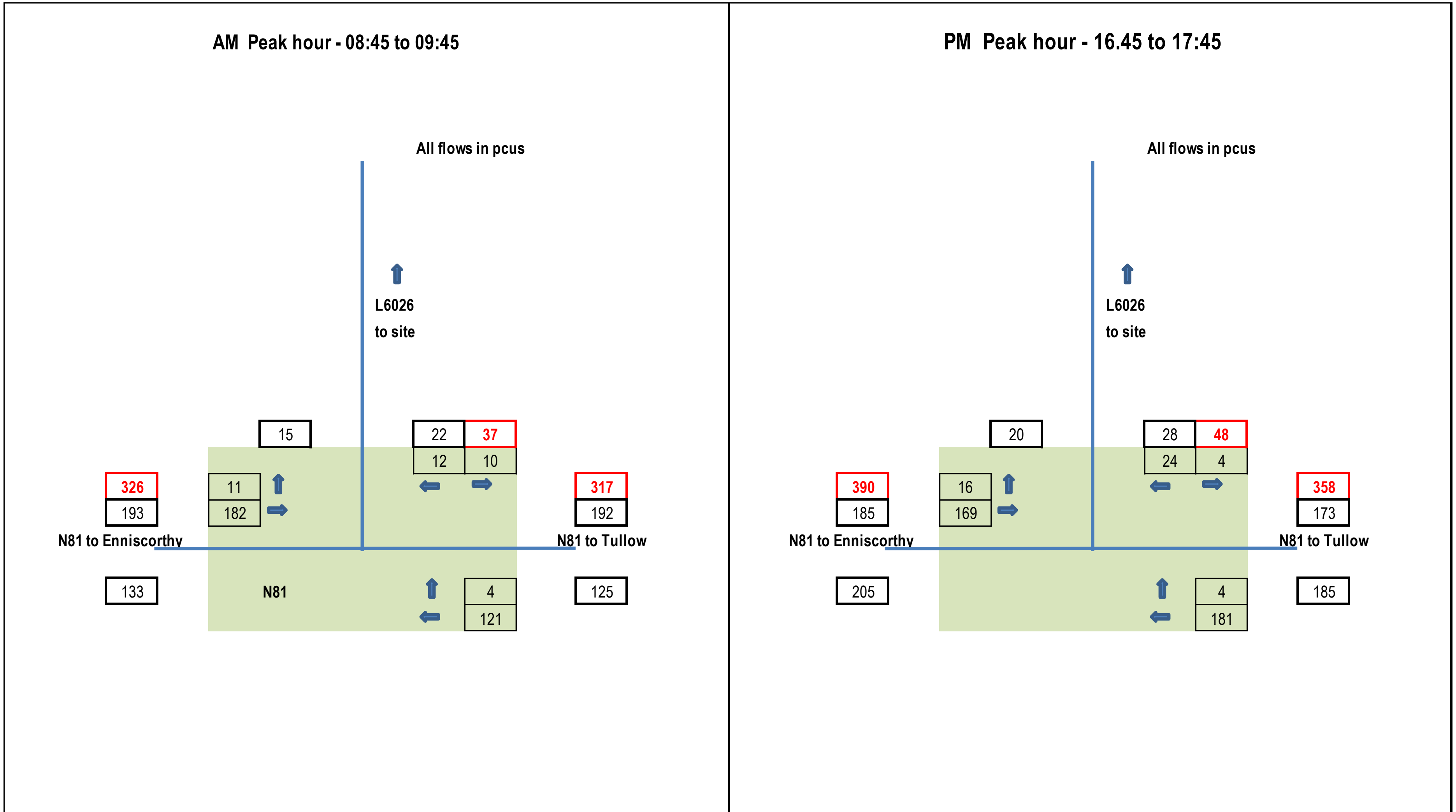

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Figure 12.4 Observed traffic flows, AM & PM peak hours, May 2018

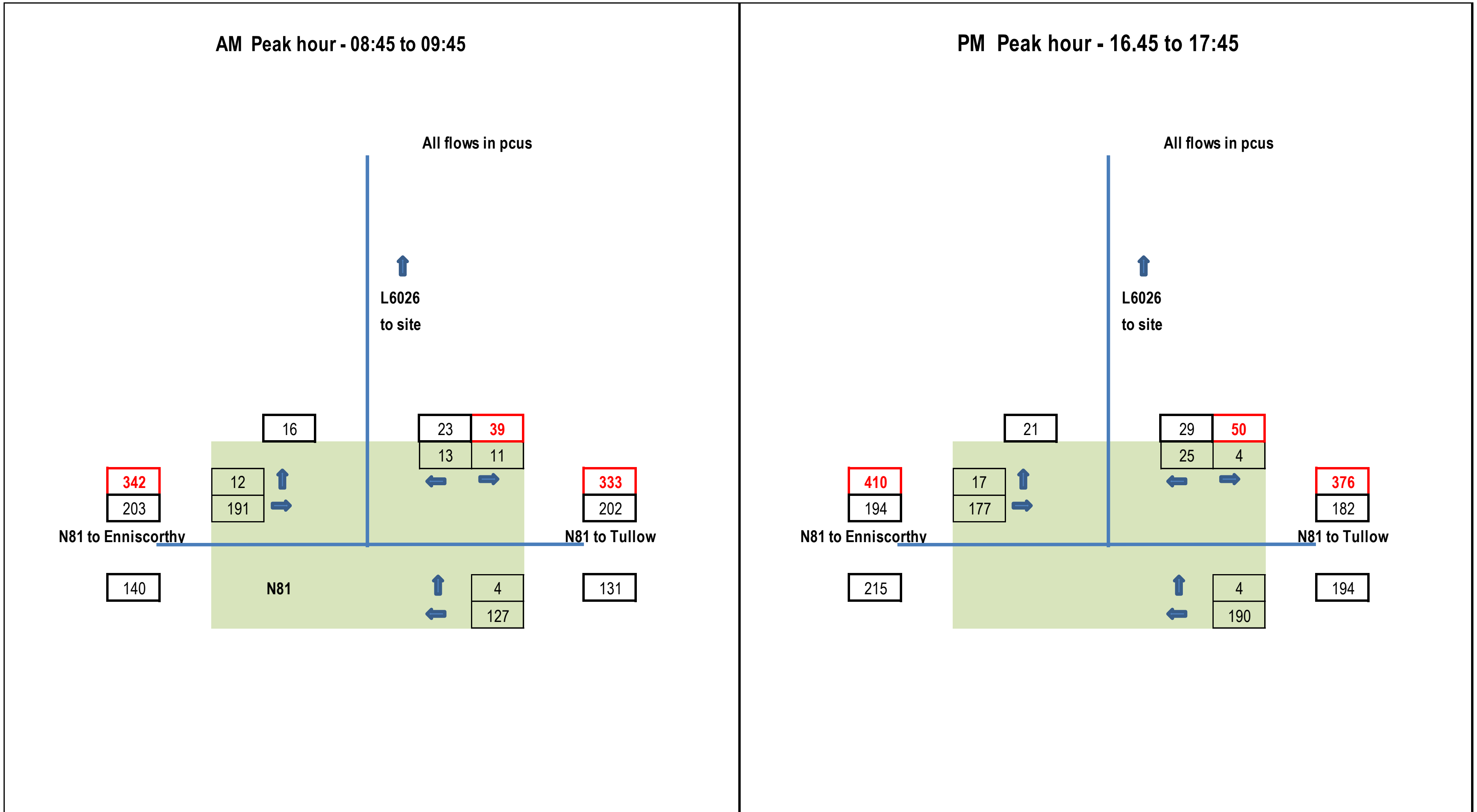

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Figure 12.5 Seasonally adjusted traffic flows, AM & PM peak hours, August 2018 and assumed 2008 flows

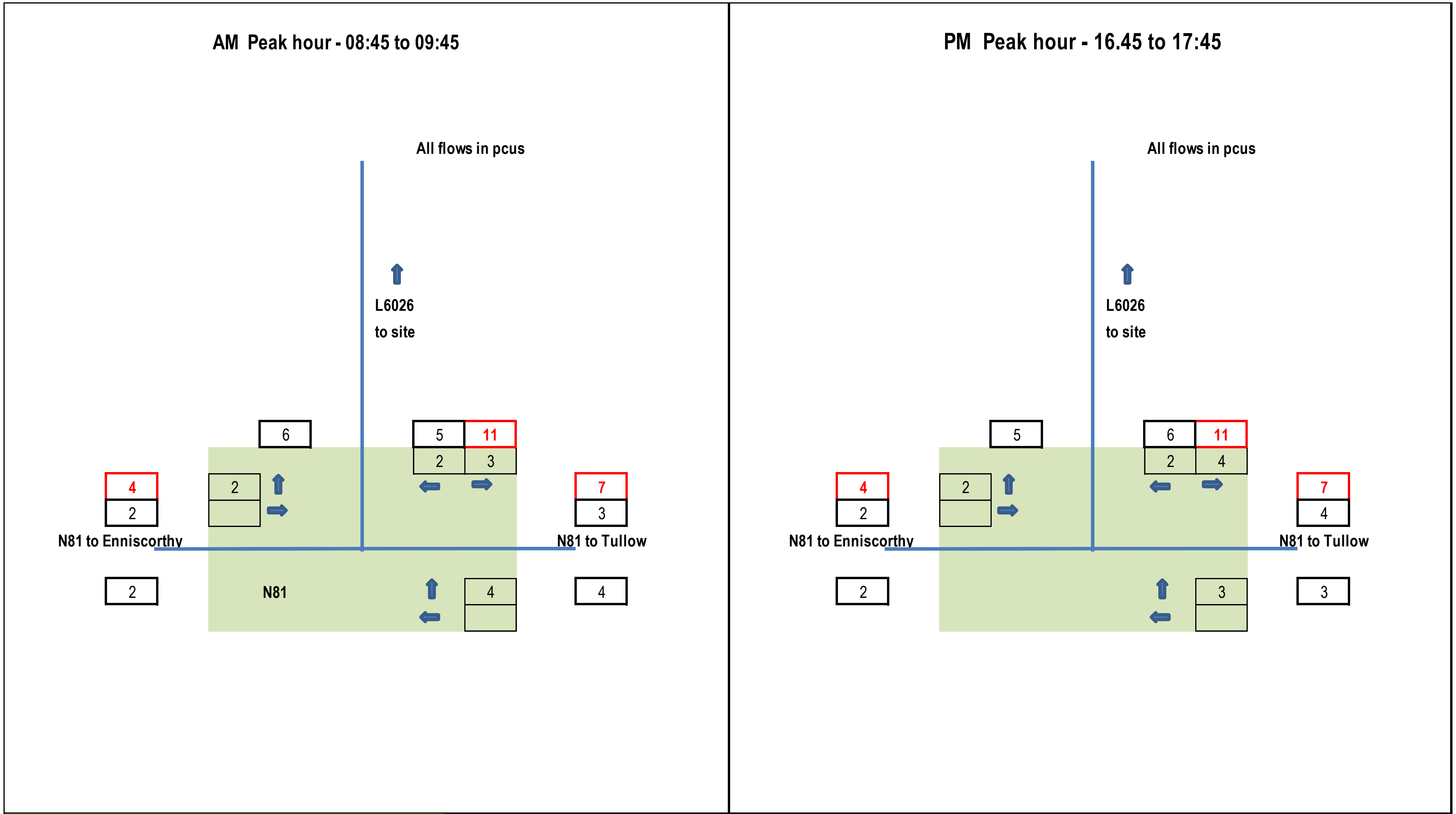

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Figure 12.6 Development generated traffic flows, AM & PM peak hours

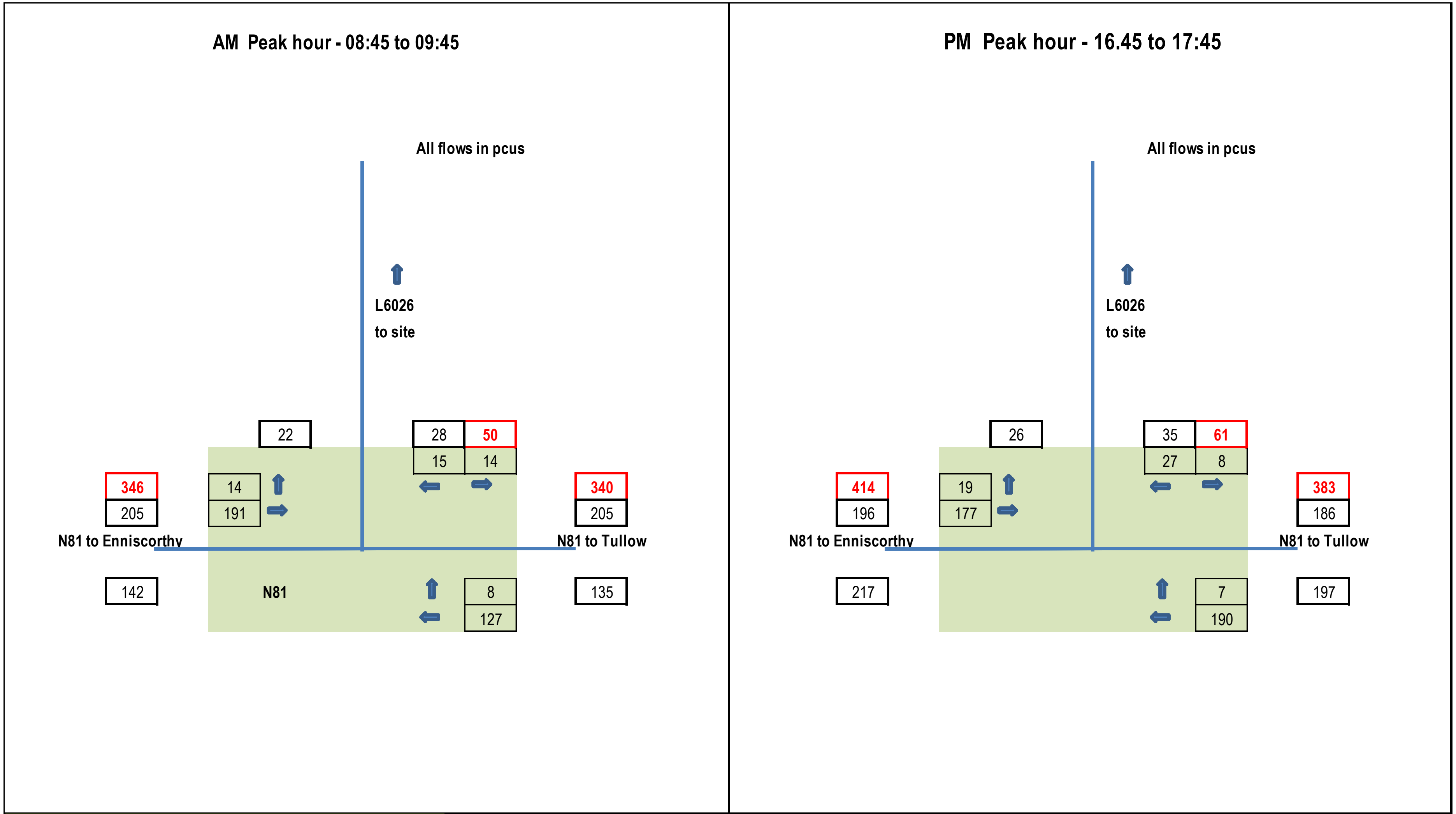

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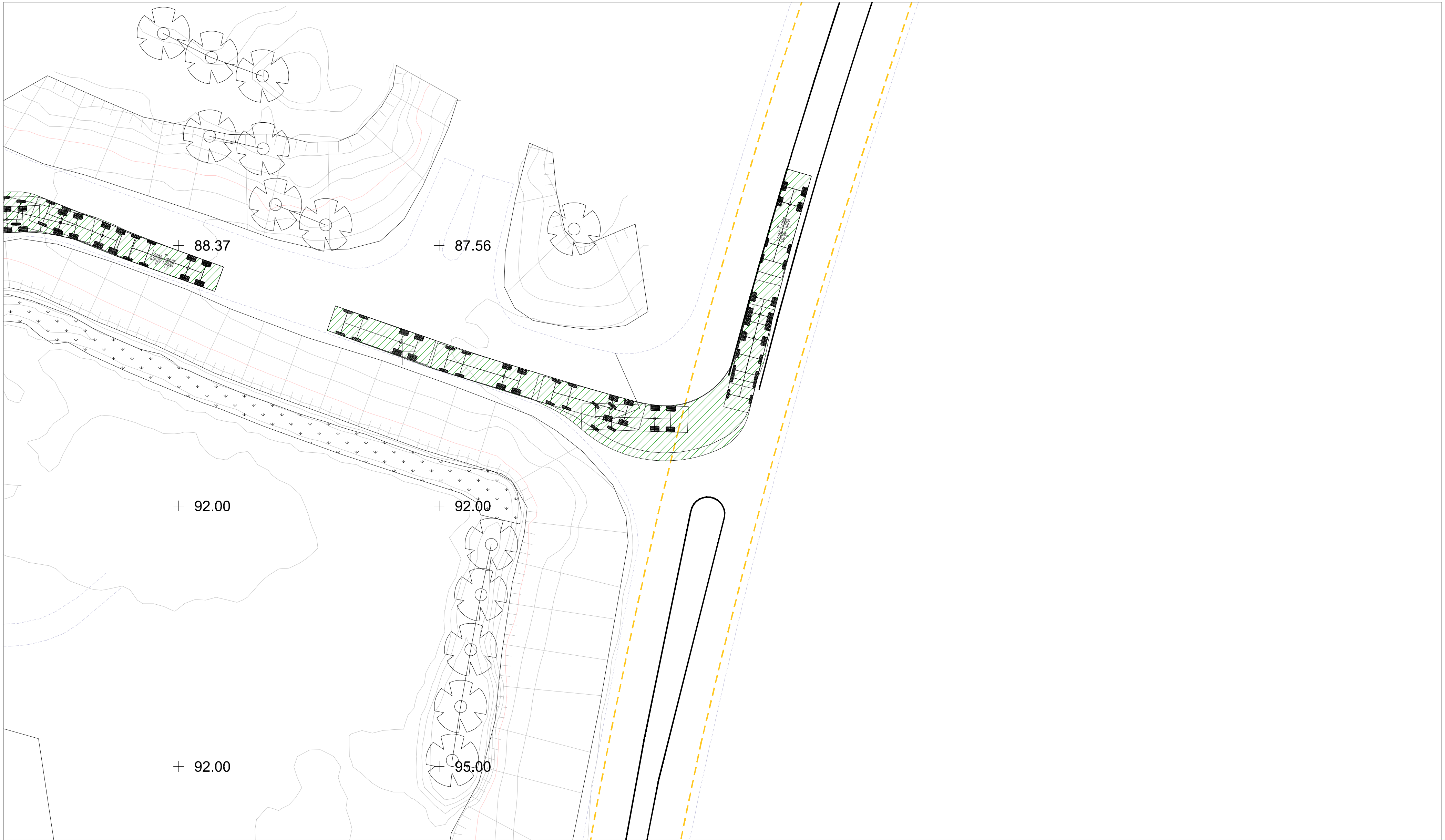
Figure 12.7 With development traffic flows, AM & PM peak hours, year 2008



NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Figure 12.8 Location 1 - autotrack assessment - N81 / L6026 junction

PROJECT:	Roscat Pit, Tullow, County Carlow		
CLIENT:	Kilcarraig Quarries Ltd	SCALE:	1:500
PROJECT NO: 7150	DATE: 02.12.18	DRAWN BY:	AL

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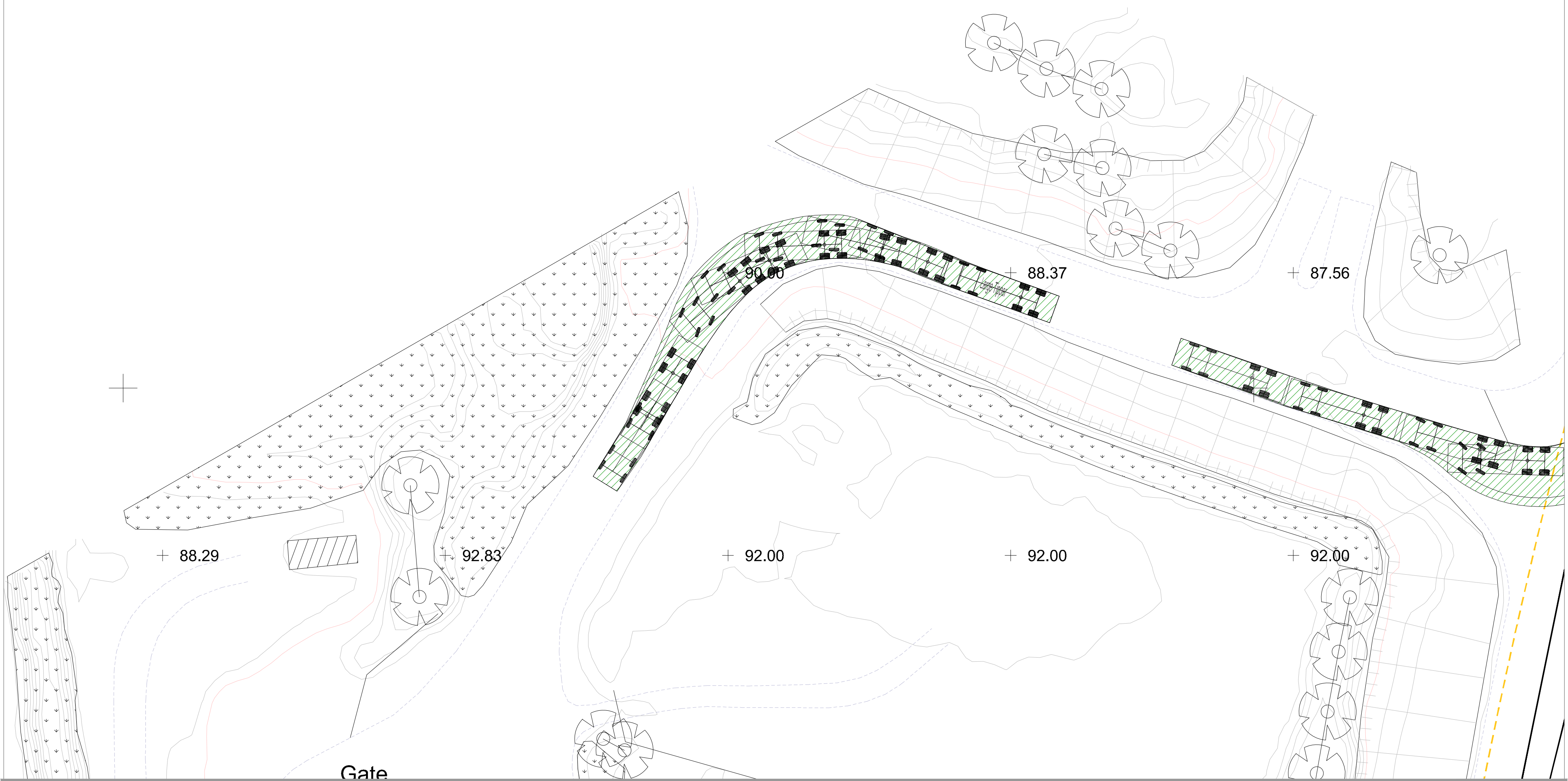

NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Figure 12.9 Location 2 - autotrack assessment - L6026 / local road junction

PROJECT:	Roscat Pit, Tullow, County Carlow		
CLIENT:	Kilcarraig Quarries Ltd	SCALE:	1:500
PROJECT NO: 7150	DATE: 02.12.18	DRAWN BY:	AL

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NOTES:	Figure 12.10 Location 3 - Autotrack assessment - existing access junction on local road
PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES	PROJECT: Roscat Pit, Tullow, County Carlow
	CLIENT: Kilcarraig Quarries Ltd — SCALE: 1:500
	PROJECT NO: 7150 — DATE: 02.12.18 — DRAWN BY: AL

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13.0 LANDSCAPE AND RESTORATION

13.1 Introduction

This chapter of the remedial EIAR assesses the landscape and visual impact associated with the historic development on the surrounding landscape in the vicinity of the sand and gravel pit site. Methodologies used to assess the landscape and visual impacts are outlined and measures are proposed where required to offset any impacts identified. A landscaping and restoration plan is proposed which will be implemented subject to granting Substitute Consent.

A landscape and visual impact assessment combines the magnitude of change with the sensitivity of the landscape to the development, which provides a measure of the significance of the historical impact. The acceptability of a 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 prior to the existence of the development determines the sensitivity of that landscape to accommodate change that would have occurred through development. 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.

Figures 13.1 to 13.3 presented at the end of this chapter details an existing layout and a proposed layout and sections of the application site.

13.2 Methodology

A detailed landscaping assessment was undertaken to assess the impact of the historical 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
- Satellite imagery (1995 – latest available)
- Carlow County Development Plan 2015 – 2021

The following methodologies for the assessment of landscape character, landscape sensitivity and visual impact have also been used in the preparation of this report:

- Department of the Environment (2000) Landscape and Landscape Assessment Guidelines.
- Landscape Institute and the Institute of Environmental Management and Assessment (2002) 'Guidelines for Landscape and Visual Impact Assessment' by the (Second Edition).

- Landscape Institute and the Institute of Environmental Management and Assessment (2013) Guidelines for Landscape and Visual Assessment (Third Edition).
- CAAS Ltd. (2015) Carlow County Landscape Character Assessment and Schedule of Protected Views. Produced for Carlow County Council.
- EPA (2017) Draft Guidelines on the Information to be contained in Environmental Impact Assessment Reports (EIAR).

Field observations were undertaken to assess the landscape character and structure of the pit and its surroundings. A visual impact assessment of the pit was undertaken from publicly accessible viewpoints in the vicinity during May 2018. The Landscape Assessment of County Carlow was also consulted as part of the assessment. The county assessment is utilized during the decision making process in relation to development to ensure that protection of the environment, natural resources and heritage.

13.2.1 Landscape Assessment Criteria

When assessing the potential impacts on the landscape resulting from a development, the following criteria are considered:

- Landscape character, value and sensitivity
- Magnitude of likely impacts
- Significance of landscape effects

The sensitivity of the landscape to change is the degree to which a particular landscape receptor (Landscape Character Area (LCA) or feature) can accommodate changes or new features without unacceptable detrimental effects to its essential characteristics. Landscape Value and Sensitivity is classified following the criteria outlined in Table 13-1.

Table 13-1: Landscape Value and Sensitivity

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 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 13-2).

Table 13-2: Magnitude of Landscape Impacts

Magnitude of Impact	Description
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.

The significance of a landscape impact is based on a balance between the sensitivity of the landscape receptor and the magnitude of the impact. The significance of landscape impacts is arrived at using the matrix in Table 13-3.

Table 13-3: Landscape Impact Significance Matrix

Magnitude of Landscape Resource Change	Landscape Sensitivity		
	Low	**Medium**	**High**
No Change	No Change	No Change	No Change
Low	Slight	Slight/Moderate	Moderate
Medium	Slight/Moderate	Moderate	Moderate/Substantial
High	Moderate	Moderate/Substantial	Substantial

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 (Imperceptible).

13.2.2 Visual Impact Assessment Criteria

As with the landscape impact, the visual impact of the development is assessed as a function of sensitivity versus magnitude. In this instance the sensitivity of the visual receptor, weighed against the magnitude of the visual effect.

13.2.2.1 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 e.g. hill walkers verses commuters (Table 13-4). 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 13-4: Examples of Visual Receptor Sensitivity at Various Levels

Sensitivity	Examples
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	• Outdoor sports or recreation pass-times which do not offer or focus attention on landscape • Occupiers of residential properties with a medium level of visual amenity
Low	• Regular commuters • People at place of work • Occupiers of residential properties with a low level of visual amenity

13.2.2.2 Magnitude of Visual Impact

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 13-5).

Table 13-5: 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.
No Change	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.

13.2.2.3 Significance of Visual Impact

As stated above, the significance of visual impacts is a function of visual receptor sensitivity and visual impact magnitude. This relationship is expressed in the significance matrix in Table 13-6 below.

Table 13-6: Visual Impact Significance Matrix

Magnitude of Visual Resource Change	**Visual Sensitivity**		
	Low	**Medium**	**High**
No Change	No Change	No Change	No Change
Low	Slight	Slight/Moderate	Moderate
Medium	Slight/Moderate	Moderate	Moderate/Substantial
High	Moderate	Moderate/Substantial	Substantial

13.2.2.4 Assessments of Impacts

The classification of an impact results from assessing the following parameters:

- The scale and nature of any visual impact;
- The visibility of any visual impact;
- The potential number of receptors affected (i.e. residences, roads, tourists, etc.).

The assessment of visual impacts of the existing development/Substitute Consent application area can be determined by studying photographs of current views from the main road and also the by-roads around the development, observing the surrounding landscape and its form, and the examination of the local land use and location of local residences.

The vegetative visual impact on the surrounding countryside is affected by:

- The scale and outline of the development.
- The exposure and appearance of the sand and gravel pit and its interaction with its environment.
- The scale and character of stockpile areas.

13.2.2.5 Zone of Visual Influence

The ZVI is the area within which views of the development can be obtained. The extent of the ZVI is determined primarily by the topography of the area. The ZVI is refined by field studies to indicate where relevant buildings, woodlands, berms, hedges or other local features obscure visibility from the main roads, local viewpoints/landmarks, settlement, etc. It is through such field studies that prediction of visual impacts takes place within the ZVI. A series of representative viewpoints were selected within the ZVI to illustrate typical views towards the existing development.

13.3 Landscape Appraisal

County Carlow contains significant areas of landscape importance, which are important not only for their intrinsic value as places of natural beauty but also because they provide a real asset for residents and visitors alike in terms of recreation, tourism and other uses.

The National Landscape Strategy for Ireland 2015-2025 promotes the sustainable protection, management and planning of the landscape. By increasing understanding of landscape and its dynamic interactive characteristics, the Strategy aims to deal with competing objectives while improving the decision-making process. The implementation of the National Landscape Strategy saw Landscape Character Assessments being prepared at local and intra-local authority level, using the Landscape Character Assessment Guidelines. These regional and local landscape character assessments inform and guide landscape policy, action plans and local authority development plans.

13.3.1 Carlow County Landscape Character Assessment

Carlow County Landscape Character Assessment and Schedule of Protected Views (CAAS, 2015) was commissioned by Carlow County Council for incorporation into the County Development Plan Review with a renewed emphasis on the significance and sensitivity of landscape resources. The report is an amalgamation and revision of the previously prepared *Carlow Landscape Character Assessment* (Locii and Cregan 2008) and an associated *Schedule of Views, Prospects and Scenic Routes* (Cregan 2008). These were prepared in 2008 and adopted in 2009 as part of the two Carlow County Development Plans which have been published since that time (2009-2014 and 2015-2021).

The Landscape Character Assessment categorises Carlow into the following four Landscape Character Areas (LCA):

- Blackstairs and Mount Leinster Uplands;
- Central Lowlands;
- River Slaney – East Rolling Farmland;
- Killeshin Hills.

One of the aims of the Landscape Character Assessment was to integrate these components so that Landscape Character Areas for the County could be defined. A Landscape Character Area (LCA) is defined as: “Units of the landscape that are geographically specific and have their own character and sense of place. Each LCA has its own distinctive character, based upon patterns of geology, landform, landuse, cultural, historical and ecological features.”

The Substitute Consent application area is situated within the “Central Lowlands” LCA (Plate 13-1).

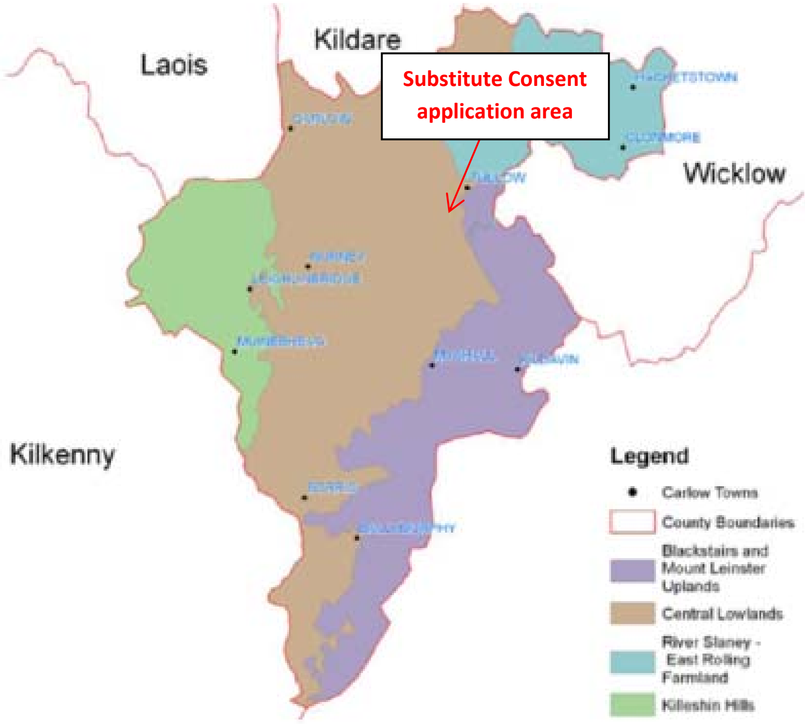

Plate 13-1: Principle Landscape Character Areas in County Carlow relative to the approximate location of the Substitute Consent application area (Source: CAAS, 2015).

These LCAs were subject to more detailed analysis that identified the following 6 Landscape Types Plate 13-2:

- Built Up Areas;
- Farmed Lowland;
- Broad River Valley;
- Farmed Ridges;
- Narrow River Valley;
- Rolling Rough Grazing;
- Uplands.

These were intended to provide a more specific basis to assist development management by recognising specific features such as river valleys and transitional mid slope areas. This is good practice because these smaller features often contain some of the more significant and sensitive landscape that are highly valued for scenery and amenity.

The Substitute Consent application area is situated within the Landscape Type categorised as "Farmed Lowland" (Plate 13-2).

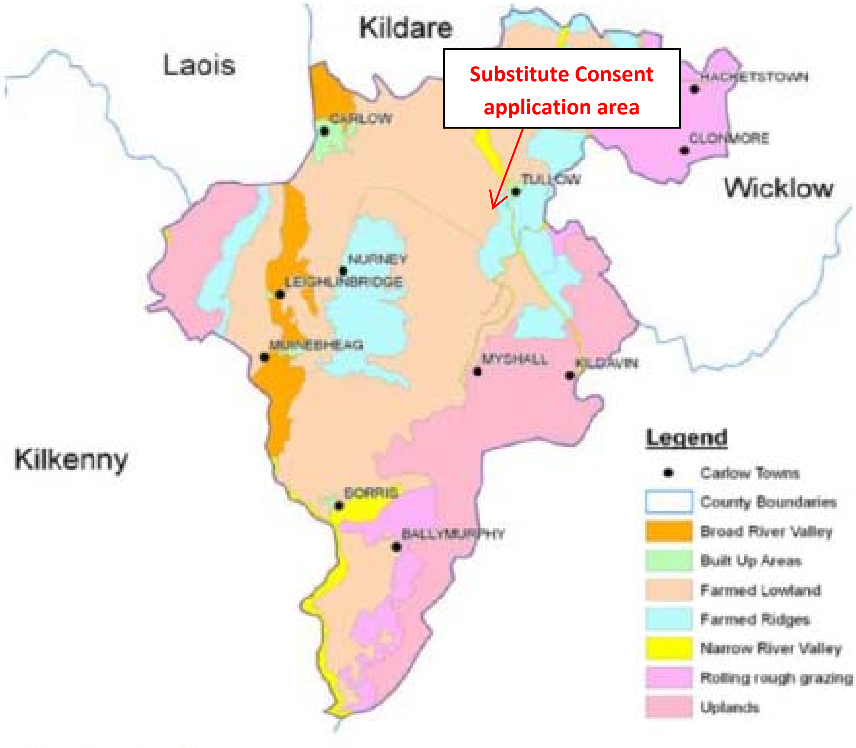

Plate 13-2: Carlow Landscape Types relative to the approximate location of the Substitute Consent application area (Source: CAAS, 2015).

13.3.1.1 Central Lowlands Character Area

13.3.1.1.1 <u>Key Characteristics</u>

The central plain landscape character area occupies a substantial portion of the County and includes the County's major settlements. The landscape is primarily rural, with medium to quite large fields defined by well maintained and generally low hedges and occasional to frequent hedgerow trees. Since the 1950's field enlargement has been taken place to accommodate larger farm machinery, and has involved the removal of hedges and trees.

The boundary of the area is based on soil types and topography. Its historically determined land uses derive from the high fertility of the soil and the gentle topography.

A dense network of local roads traverses the area in addition to the N80, N81 and the M9. There are isolated gravel and quarry workings in the area. Extraction of sand and aggregate has been taking place for some time in the area.

The following Landscape Types are in the Character Area:

- Broad and narrow river valleys;
- Farmed lowlands;
- Farmed ridges.

The key characteristics of the county Carlow Central Lowlands LCA are as follows:

- Most of the County lies within this character area;
- Landscape is level to gently rolling;
- Predominantly fertile agricultural lands with medium to large fields defined by low trimmed hedgerows and occasional to frequent mature hedgerow trees;
- Open views and vistas, notably on ridge farmland;
- Low vegetation – grassland and long distant views with a limited capacity to absorb developments unobtrusively;
- Extensive road network penetrating the character area;
- The character area contains most of the County’s designated habitats and listed buildings.

13.3.1.1.2 Geology, Soils and Topography

The topography is underlain by limestone in the western portion of the area (flanking the Barrow River), and by granite in the east.

The limestone is generally pure and bedded, but some units of impure bedded limestone and muddy, often cherty limestones occur. The limestone rarely crops out in the character area and is blanketed by thick tills or stratified sands and gravels, as well as peat and alluvial sediments.

The area within the slightly higher, eastern portion of this landscape area is underlain by granite bedrock. This often results in rounded hills characterising the landscape, such as around Nurney, and at Ballon Hill. With respect to subsoils, till derived from Lower Carboniferous limestone dominates the lowlands in the Barrow Valley area.

This till is basic in reaction and found over all the lowland undulations which are subglacial landforms. It is generally stony and blue-grey in colour, reflecting its source in the pure limestone rocks.

Till derived from granite occurs in the area east of this and in the region of the proposed application area, blanketing the area with granite bedrock. This deposit is generally yellowish in colour, being heavily oxidized, and sandy in texture. It forms an acidic deposit.

13.3.1.1.3 Landcover

The area is primarily a rural landscape. Landcover is intensively agricultural with a mix of grassland pasture and tillage. Shelterbelts as mature trees and copses are a common feature around farm buildings and when viewed from a distance the landscape can present the appearance of being well-wooded.

Many fields in the area have been enlarged by the removal of internal boundary hedges. Both the loss of hedgerows and field enlargement represents a decline in landscape condition.

Views within and from the Character Area are generally open and expansive except where restricted by buildings, plantations or ridges. Distant views include the Blackstairs, the Wicklow Mountains, the Castlecomer Plateau/ Western Uplands and Brandon Hill.

13.3.1.1.4 Settlements

60% of the County's population lives in the northern portion of the Character Area. The County's major settlements are also located in the Character Area. They include Carlow town, Tullow, Muine Bheag and Leighlinbridge.

Patterns of settlements and one-off houses in the rural areas are visible along roads leading out of Carlow and notably to the east and the south of Carlow Town.

Tullow and Muine Bheag are showing signs of poorly structured suburban expansion. There are also a number of compact villages in the area, which, in some instances, are showing signs of economic stagnation.

13.3.1.1.5 Ecology and Habitats

The majority of the County's designated habitats are in this LCA including Ardristan Fen, which is adjacent to the Substitute Consent application area.

13.3.1.1.6 Historical Landscapes

The majority of the County's important monuments are located in this LCA including a Standing Stone in Ardristan, which is adjacent to the Substitute Consent application area.

13.3.1.1.7 Tourism

The County Tourism Development Strategy locates the area for the purpose of tourism planning in the Carlow Urban Development Sub-Zone.

Most of the County's tourism infrastructure is located in the area. It lies within an easy day trip distance of Dublin and in the future may become part of the planned hinterland of the Greater Dublin Area particularly with the upgrading of the N9. It is considered for tourism purposes to be suitable for higher intensity developments combining recreational activities such as golf (with accommodation), conference facilities and shopping. The focus of the development would be concentrated on improving the attractiveness of Carlow Town.

Carlow Leader and Carlow County Council have jointly produced a feasibility study of Heritage Drives in the County. Three drives are proposed and two of them pass through the Central Lowlands. These are ‘a Megalithic Heritage Drive’ visiting resources in Tullow, Nurney and other locations, and ‘a Barrow Heritage Drive’ that would visit resources in Carlow Town, Old Leighlin, Leighlinbridge, Borris and Muine Bheag.

13.3.1.1.8 Key Issues

The Carlow County Landscape Character Assessment (CAAS, 2015) identified the following key issues and pressures relating to the general character of the landscape across the county:

- Development pressure on the countryside particularly in the vicinity of Carlow Town and the other centres. Impact on water supplies;
- Degrading of the typical landscape character through the removal of internal hedgerows.
- Over management of roadside hedges;
- Degrading of the typical landscape character through the construction of modern one-off houses in the countryside, many of them two storied with prominent elements in an open landscape and lacking any connection to the characteristic styles of rural houses in the County;
- Erosion of the landscape setting of existing settlements by inappropriate developments;
- Tourism and recreation pressure.

13.3.1.1.9 Recommendations

The Carlow County Landscape Character Assessment (CAAS, 2015) also lists the following recommendations relating to the general character of the landscape across the county:

- Maintain the existing grain of the landscape with its well-developed pattern of fields, hedgerows, trees and shelterbelts;
- Review the hedge maintenance regime. Overcutting reduces species richness and consequently, their contribution to biodiversity;
- Discourage the replacement of hedgerow boundaries with wire fences;
- Encourage the use of native and indigenous planting in new developments to integrate buildings into the surrounding landscape. Compile a list of suitable trees and shrubs for planting in the County;
- Small villages and scattered residences and farm buildings are the typical rural settlement pattern. New development should be monitored to protect the integrity of the settlement pattern. Continuous ribbon development along the roads leading into the major settlements should be discouraged. Likewise scattered small clusters of residential developments in rural areas should be discouraged. The expansion of villages by

developments on their edges or by sporadic development should be discouraged as they erode the integrity and character of the villages;

- The use of traditional styles, materials and colours in new developments should be encouraged;
- New developments should not be sited in prominent locations such as ridges and areas with open exposed vistas;
- Infrastructure for tourism should be carefully sited and in sympathy with the character of the landscape.

The above lists are not intended to be comprehensive lists of all the factors/sensitivities that should be taken into account in the design and assessment of any development (as there may be other site specific factors which will influence the design and siting of a particular development) but these will be particularly used as an assessment tool in any application for permission.

The overall aim of this chapter is to outline the key considerations that should have been taken into account in order to ensure the adequate protection and management of the key features that make up each of these varying landscape areas within the County.

13.4 Existing Environment

The sand and gravel pit is situated in a semi-rural area with the predominant land use of the study area consisting of agricultural land located in the vicinity of the pit. Settlement patterns in the area consist of one off housing and farmsteads located along local and regional roads in the vicinity of the pit. The nearest urban centre is the town of Tullow located approximately 2.5km to the northeast of the pit.

13.4.1 Landscape Value

Communities and individuals will credit their surrounding landscape with certain values. These values have environmental and cultural benefits. These attributes can be derived from images of the landscape as already described in the landscape character assessment. A number of single dwellings form part of the local landscape. There are 56 residences within 1km of the existing site.

13.4.2 Landscape Sensitivity

Any development will change the landscape character and values attributed to a site. The sensitivity of a landscape measures its ability to accommodate that change, with minimal intrusion of the visual and characteristic elements of that site.

Extraction activities were previously undertaken at the site between 1987 and 2008 (approx.). The operators have taken various measures to screen the site from the surrounding landscape such as constructing berms on either side of the main entrance and planting these with native trees.

13.5 Impact Assessment

13.5.1.1 Vantage Point Photographic Survey

The vantage points were chosen to give a representative sample of views of the existing development within the landscape. A total of 6 vantage points (VPs) were identified surrounding all boundaries of the Substitute Consent application area. All VPs are illustrated on Plate 13-3. Each vantage point is detailed below (Plates 13-4 – 13-9) with a brief description of the view from each location.

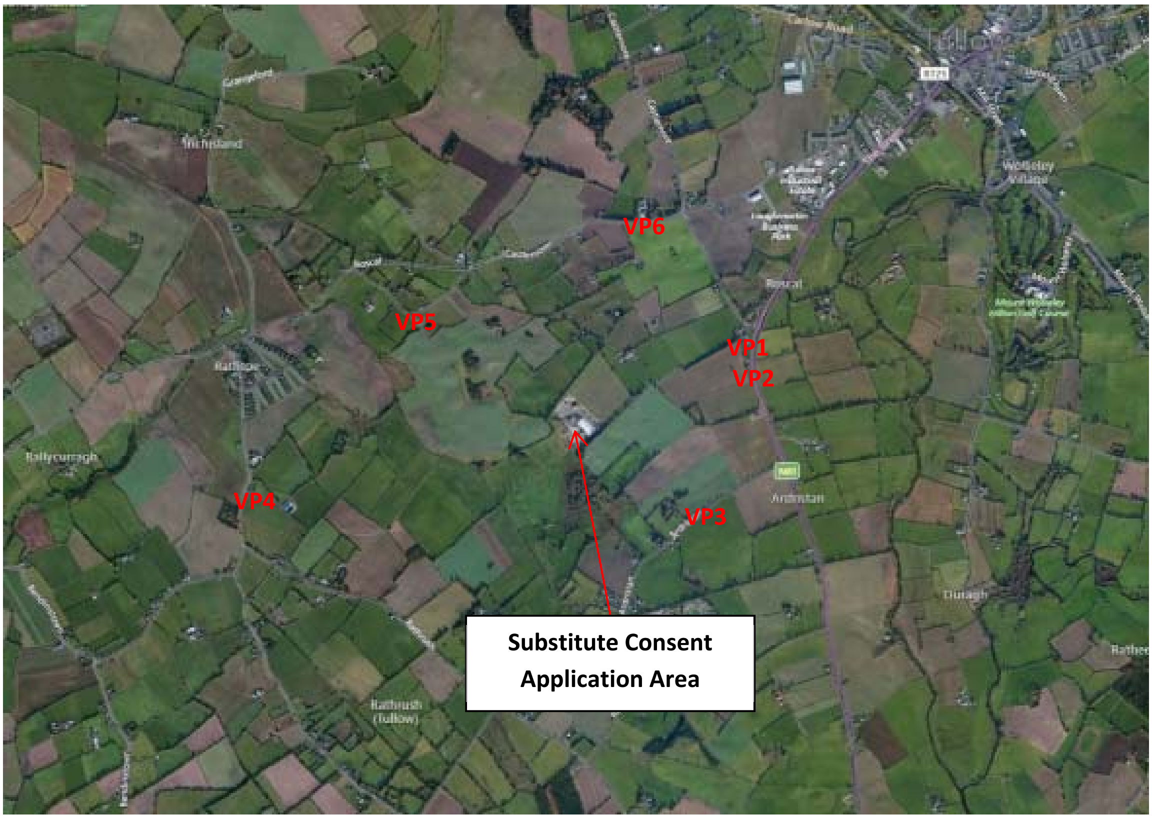

Plate 13-3: Visual impact assessment vantage points surrounding Kilcarrig's Sand and Gravel Pit at Roscat, Tullow, Co. Carlow.

Plate 13-4 shows the view from VP1 at the main site entrance. A vegetated berm is visible on the lefthand side of the image with a line of native trees planted as screening along this section of the access road immediately inside the boundaries of the site. The Substitute Consent application area is not visible from this location.

Plate 13-4: Vantage Point 1 – Westward view of the main entrance to the Substitute Consent application area.

The view from a private dwelling approximately 200m to the south of the of the main entrance to the site is presented in Plate 13-5. As evident in Plate 13-5, given that the local topography is flat and that the south-eastern boundary of the Substitute Consent application area is screened by a row of mature deciduous trees, the Substitute Consent application area is not visible from this location.

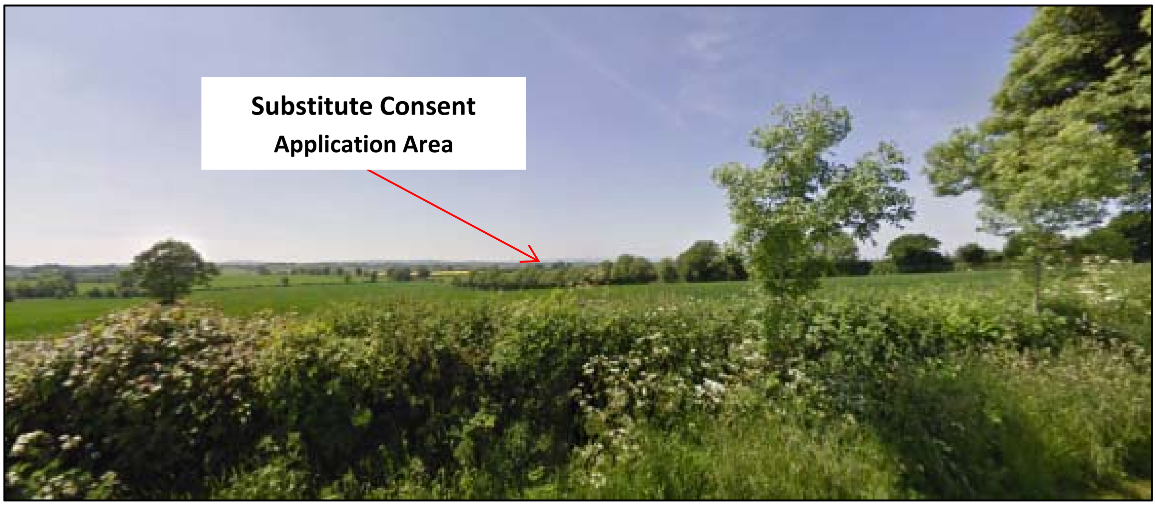

Plate 13-5: Vantage Point 2 – Westward view from the unnamed local road approximately 200m to the south of the main entrance to the pit, in front of a private dwelling and approximately 800m east the Substitute Consent application area.

Plate 13-6 shows that, from Vantage Point 3, the flat topography and natural mature deciduous treeline surrounding the application site screens the site from the local road L6040 which runs approximately 780m to the south east of the southern boundary through the townland of Ardristan. As such, the pit is not visible from this location.

Plate 13-6: Vantage Point 3 – Northward view from the local road L6040 approximately 780m to the south of the Substitute Consent application area.

Vantage Point 4 is approximately 1.8km to the west of the Substitute Consent application area along the local road L7113 to the south of the village of Rathoe (Plate 13-7). As with the other VPs, as a result of the flat topography and natural screen of mature deciduous trees, the Substitute Consent application area is not visible from this location.

Plate 13-7: Vantage Point 4 – Eastward view from the local road L7113 approximately 1.8km to the west of the Substitute Consent application area.

Vantage Point 5 is located approximately 930m to the northwest of the application area along the local road L10244 in the townland of Roscat. The site is not visible from this location owing, again, to the flat topography of the landscape surrounding the Substitute Consent application site (Plate 13-8).

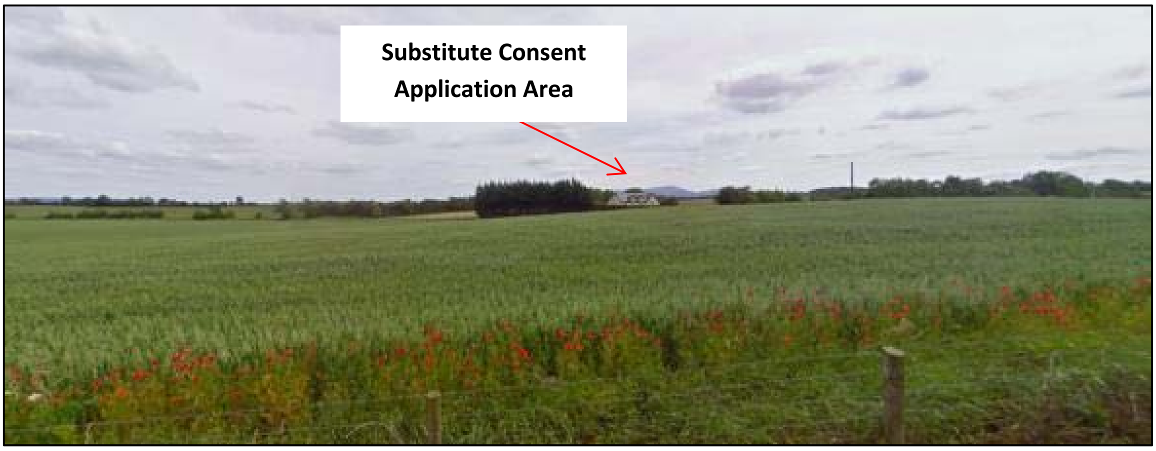

Plate 13-8: Vantage Point 5 – South-eastward view from local road L10244 approximately 930m to the northwest of the Substitute Consent application area.

Vantage Point 6 is located approximately 900m to the northeast of the Substitute Consent application area along the L1024 to the west of Castlemore Cross Roads. Again, owing to the flat topography, the application area is not visible from this location.

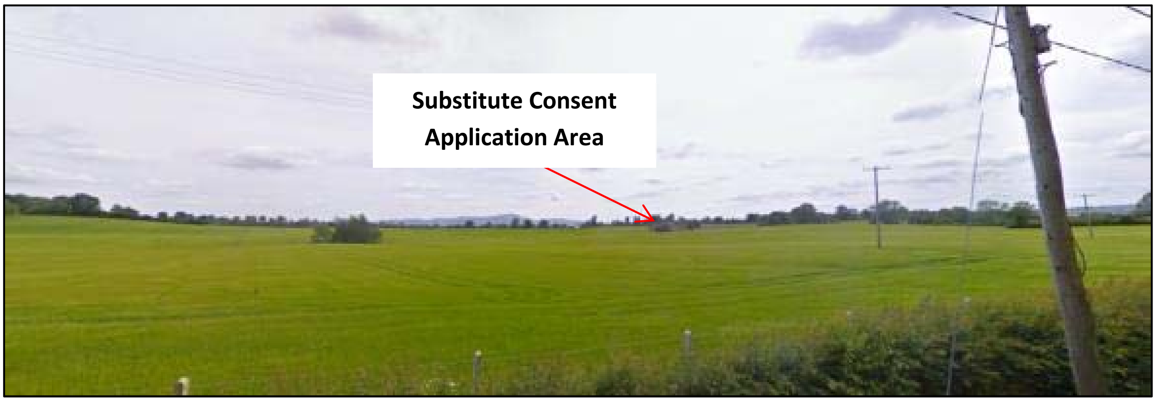

Plate 13-9: Vantage Point 6 – South-westward view from the local road L1024 approximately 900m to the northeast of the Substitute Consent application area.

13.5.2 Landscape Impact Assessment

Based on the field survey and reference to the Carlow County Development Plan 2015-2021 and the Carlow County Landscape Character Assessment, the landscape value of the study area has been given a rating of 'Medium'.

While sand and gravel extraction operations at the pit to-date have altered the landform and vegetation cover, the magnitude of change in the landscape as a result of the Substitute Consent development has been assessed as 'Medium'. As defined by Table 13-3, the significance of landscape impacts of the development is assessed as 'Moderate'. The losses of existing vegetation as a result of extraction of sand and gravel will be offset by the proposed landscape and restoration plan for the pit.

13.5.3 Visual Impact Assessment

The visual assessment shows that the application site is extremely well screened due to existing hedgerows, field boundaries and the topography of the study area.

Based on the visual impact assessment criteria detailed above, an assessment of each vantage point location was undertaken which is summarised below. The significance of visual impact from extraction activity to date has resulted in 'No Change' at all of the vantage point locations as the existing pit site is screened from the surrounding landscape by existing vegetated berms.

As illustrated in Table 13-7, the assessment of the significance of visual impacts on the vantage point is based on a combination of the visual sensitivity and magnitude of visual changes to the viewpoint. While sand and gravel extraction has altered the landscape to date, the assessment of the existing visual environment and the impact of extraction of the Substitute Consent application site and its various component parts on visual receptors have been assessed.

The historic sand and gravel extraction did not result in a significant increase in visibility of the pit. For example, the increase in footprint area of the pit did not result in an increase in visual impact at the various viewpoints; therefore the magnitude of visual impact is assessed as 'Low'.

Table 13-7: Visual Impacts with Mitigation

VP No.	Viewpoint Sensitivity	Magnitude of Visual Impact	Visual Impact Significance	Mitigation Measures
1	Low	No Change	No Change	None
2	Low	No Change	No Change	None
3	Low	No Change	No Change	None
4	Low	No Change	No Change	None
5	Low	No Change	No Change	None
6	Low	No Change	No Change	None

13.5.4 Tourism, Recreation and Amenity

As stated in the visual assessment, the Substitute Consent development did not result in a significant increase in visibility of the pit above that already experienced. The existing development is not visible from any vantage point. Therefore, it is concluded that there was no impact on amenity or tourism of the area as a result of the existing development.

13.6 Landscaping and Restoration Measures

A landscape and restoration plan has been compiled for the existing pit. The following matters were taken into consideration as part of the restoration plan:

- Habitat type and species local to the site.
- Planning requirements and applicable legislation.
- Interaction with the surrounding environment.
- Health and safety considerations.
- Nature and extent of aggregates extracted.
- Availability of suitable restoration materials.

This section outlines the work to be carried out in a phased programme to ensure that the restoration of the sand and gravel pit lands will be implemented in accordance with the landscaping proposals. The restoration of the pit is divided into the following 3 phases:

- Phase I – Landscaping of berms.
- Phase II – Restoration of side slopes.
- Phase III – Final restoration of areas.

The following drawings relating to landscaping and restoration of Roscat Pit are available at the end of this chapter:

- Figure 13.1 – Existing site layout
- Figure 13.2 – Proposed final restored sections
- Figure 13.3 – Proposed final restoration layout

13.6.1 Phase I – Landscaping of Berms

Berms have already been formed in areas along boundaries of the extraction area and on either side of the site entrance gate using the overburden and waste material from processing of aggregate. All materials used for the construction of the berms have been sourced within the curtilage of the site.

Areas of the inner and outer faces of the berm have recolonised with native field plants and grasses where there is sufficient soil content to allow vegetation to grow. Ash (*Fraxinus excelsior*) and scrub exists along much of the outer face of the berm along the L7062 local road which borders the eastern and northern boundaries of the site. As outlined in the photographic survey and visual impact assessment, the vegetation on the existing berms along the L7062 road act as a screen for the existing pit. Landscaping of berms will be undertaken where required.

13.6.2 Phase II – Restoration of Side Slopes

Side slopes will be restored where possible using the following management measures that are proven to be of significant benefit to breeding Sand Martins (Rodriguez, 2016):

- The top 2 meters of the internal face of the side slopes of the perimeters of the pit will be treated using an excavator, so that they are as close to vertical as possible (70-75°). This will be undertaken where possible;
- The bottom 6 meters of the face will be sloped at approximately 60° for stability of load bearing material;
- A 50m buffer zone will be in place along each of the permanent side slopes during the breeding season in which no works will take place in order to avoid disturbance to the breeding birds;

13.6.3 Phase III – Restoration of Pit Floor

The restoration of the pit floor will consist of the following:

1. Stock piled aggregate material will be removed from the application site.
2. Plant and machinery will be removed from the application area.
3. All site boundaries will be secured.
4. The pit excavation area will be levelled out, covered with a layer of top soil, harrowed and seeded with perennial grass-seed so as to restore it for use as agricultural grassland.
5. The existing berms and planted areas will be retained.

The above restoration will ensure that the site sets back into the landscape reducing the impact associated with extraction of sand and gravel tom date.

13.6.4 Additional Measures

The perimeter vegetation around the Substitute Consent application area 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. The landscaping measures have been designed to conceal the site, as much as possible, screening it from outside views. These measures will reduce as much as possible, any visual impact resulting from ongoing development of the site.

As part of the Substitute Consent application, measures will be put in place to reduce loss of biodiversity and enhance the conservation value of the area and reduce environmental impacts of extraction activity on the surrounding area. These include the following:

- The use of native species will support a wider range of insects and animals and will contribute more to the ecology of the region.
- This added vegetation will also enhance the local wildlife corridor, connecting the site with the surrounding landscape.

- Using plants adapted to or tolerant of the existing site conditions will reduce the need for expensive remedial measures (such as replacing failed plants).
- Hedgerows and tree lines along the site perimeter will be retained.
- Planting of trees and shrubs where required to replace dead plants 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.
- No herbicides, pesticides or fertiliser will be applied to the berm.
- Ensuring the site perimeter side slopes remain in a condition suitable for breeding Sand Martin as outlined above in Section 13.6.2.

13.7 Remedial Measures

The land landscape and restoration plant will serve to offset the impact associated with previous activity at the pit and will be implemented on granting of substitute consent.

13.8 Monitoring

A designated person from the project management team will have overall responsibility for ensuring that all landscape and restoration operations are carried according to an agreed landscape and restoration plan.

13.9 Decommissioning and After Use

The main feature of the worked out area will be an agricultural grassland field and all preparations for the formation of the agricultural grassland are designed to make it support plant and animal life along its perimeters.

Habitats and species that are attracted to a site should be reflective of the local habitat and species in order to restore a natural ecological balance. When creating habitats, it is beneficial to create a new habitat block close to a similar habitat as this will assist colonisation by desirable species and will allow larger populations to inhabit the area.

13.10 Residual Impacts

The proposed landscaping and restoration works will further reduce the visibility of the application site from the receiving environment and offset the impact associated with sand and gravel extraction activities.

13.11 Technical Difficulties

No technical difficulties were encountered.

13.12 References

CAAS (2015) Carlow County Landscape Character Assessment and Schedule of Protected Views. A report produced for Carlow County Council.

Carlow County Council (2015) Carlow County Development Plan 2015 – 2021.

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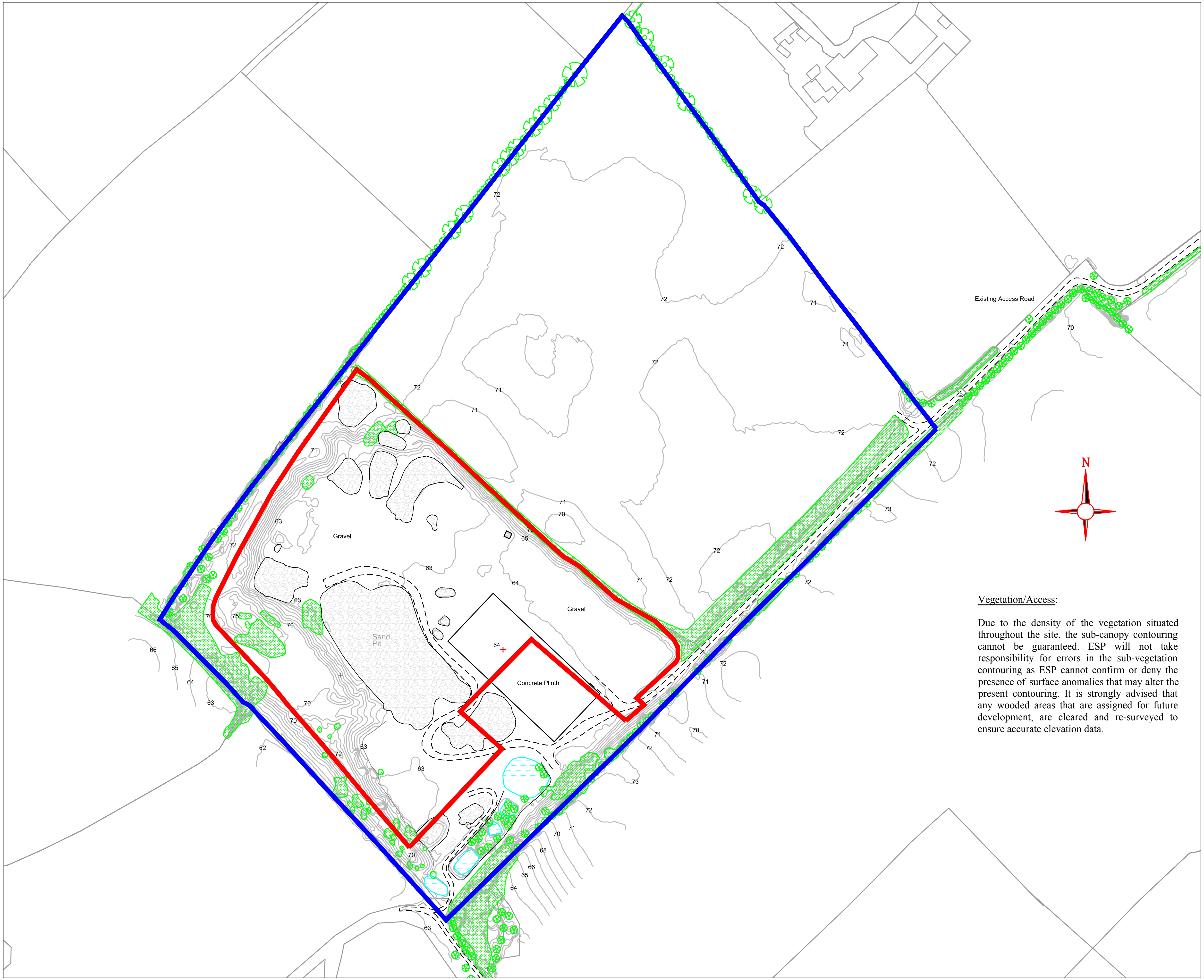
Department of the Environment, Heritage and Local Government, (2004) Quarries and Ancillary Activities - Guidelines for Planning Authorities, Dublin: Stationary Office.

Landscape Institute with the Institute of Environmental Management and Assessment (2002) Guidelines for Landscape and Visual Impact Assessment (Second Edition)

Landscape Institute with the Institute of Environmental Management and Assessment (2013) Guidelines for Landscape and Visual Assessment (Third Edition)

Rodríguez, Z. R. (2016) Guide for the Management of Sand Martins (*Riparia riparia*) in Gravel Pits. Available at: https://www.quarrylifeaward.com/projects/spain/guide-management-sand-martin-populations-riparia-riparia-gravel-pits
[Accessed on: 27/11/2018]

Figures



Vegetation/Access:

Due to the density of the vegetation situated throughout the site, the sub-canopy contouring cannot be guaranteed. ESP will not take responsibility for errors in the sub-vegetation contouring as ESP cannot confirm or deny the presence of surface anomalies that may alter the present contouring. It is strongly advised that any wooded areas that are assigned for future development, are cleared and re-surveyed to ensure accurate elevation data.

Legend

Ownership Boundary

Application Area
Area = 4.7 Ha

Aggregate Stockpile

Water

Vegetation

Access Road/Track

Tree Cover

All Levels Relative to Ordnance Datum

O.S. Map Ref No. 4475 - B

ITM Coordinates: 683027 E, 670998 N

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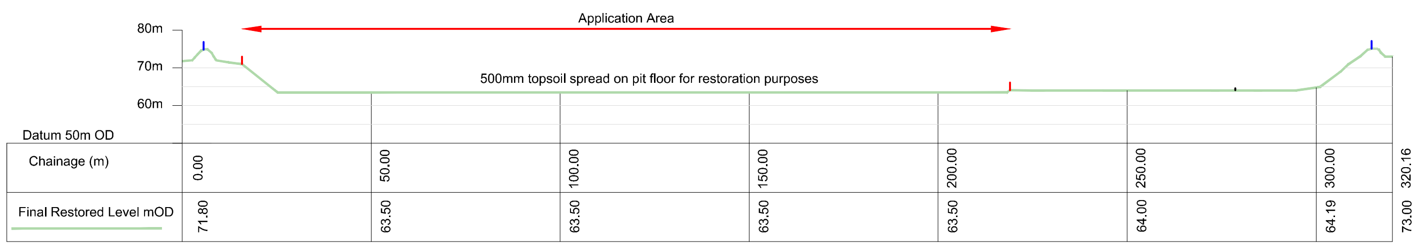
Client: Kilcarrig Quarries Ltd.	
Project: Remedial Environmental Impact Assessment Report to Accompany a Substitute Consent Application for a Sand & Gravel Pit Located at Roscat, Tullow, Co. Carlow	
Title: Existing Site Layout Map	
Drawn By: Sean O' Donnell	
Checked By: Patrick O' Donnell	
Scale: 1 : 2,500 @ A3	Date: Apr. 2019
Job No: EI061	Rev: 0

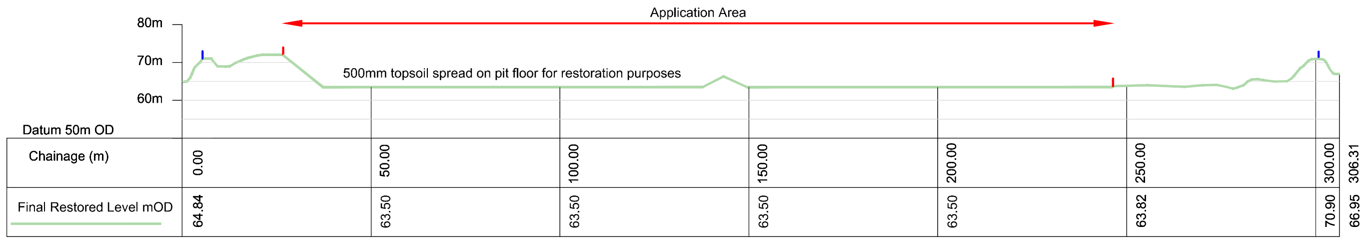
Figure 13.1

N



Chainage (m)	0.00	50.00	100.00	150.00	200.00	250.00	300.00	320.16
Final Restored Level mOD	71.80	63.50	63.50	63.50	63.50	64.00	64.19	73.00

Section A - A Scale 1:2,000



Chainage (m)	0.00	50.00	100.00	150.00	200.00	250.00	300.00	306.31
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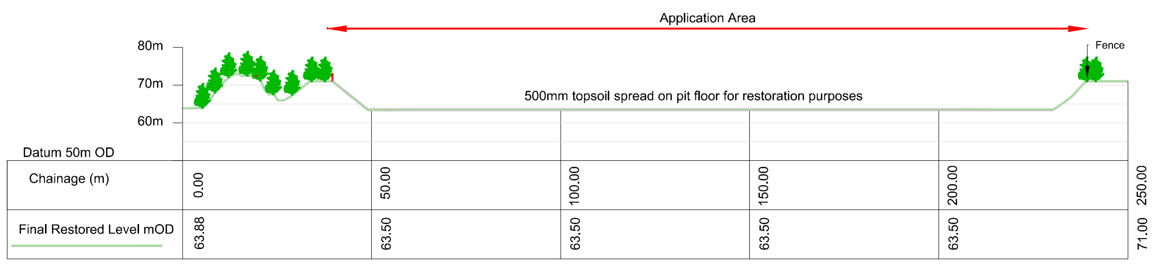
Section B - B Scale 1:2,000



Chainage (m)	0.00	50.00	100.00	150.00	200.00	250.00
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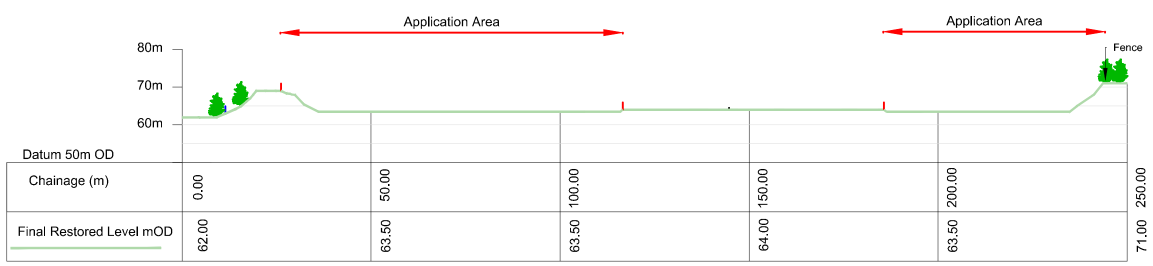
Section C - C Scale 1:2,000



Chainage (m)	0.00	50.00	100.00	150.00	200.00	250.00
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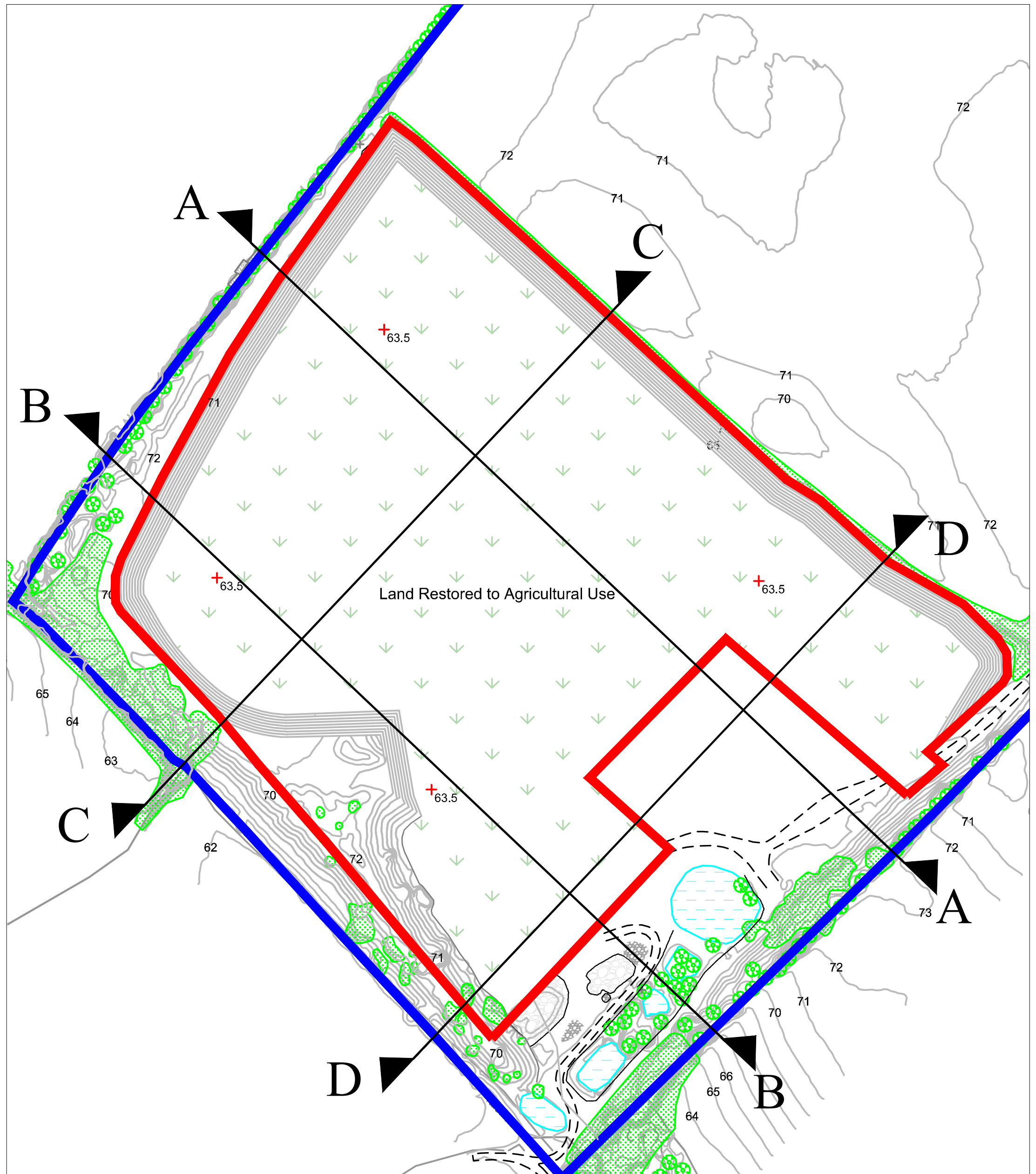
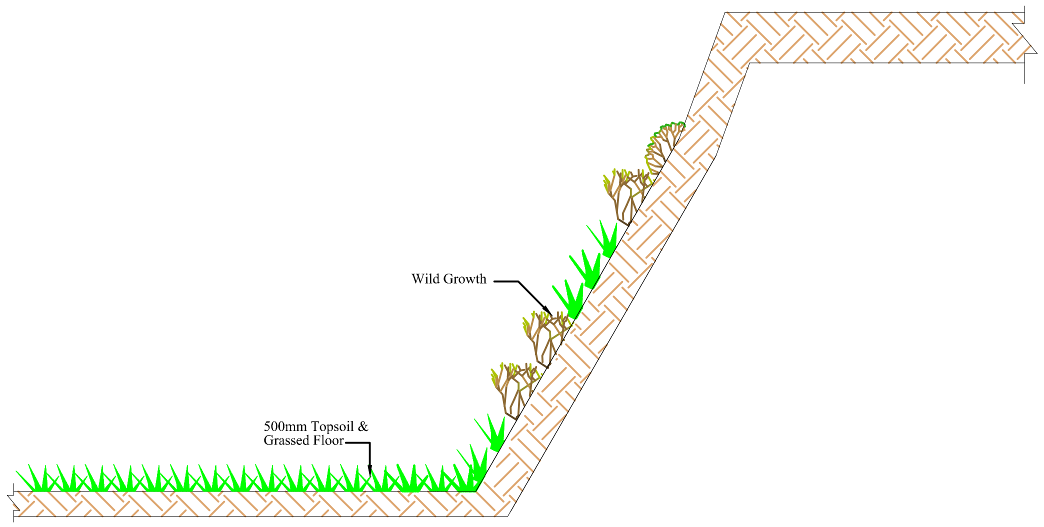
Section D - D Scale 1:2,000



Key Plan NTS



Side Slope Detail (NTS)

Legend

- Ownership Boundary
- Application Area — Area = 4.7 Ha
- Final Restored Level
- Spot Level — 63.5
- Water
- Vegetation
- Access Road/Track
- Tree Cover

All Levels Relative to Ordnance Datum

O.S. Map Ref No. 4475 - B

ITM Coordinates: 683027 E, 670998 N

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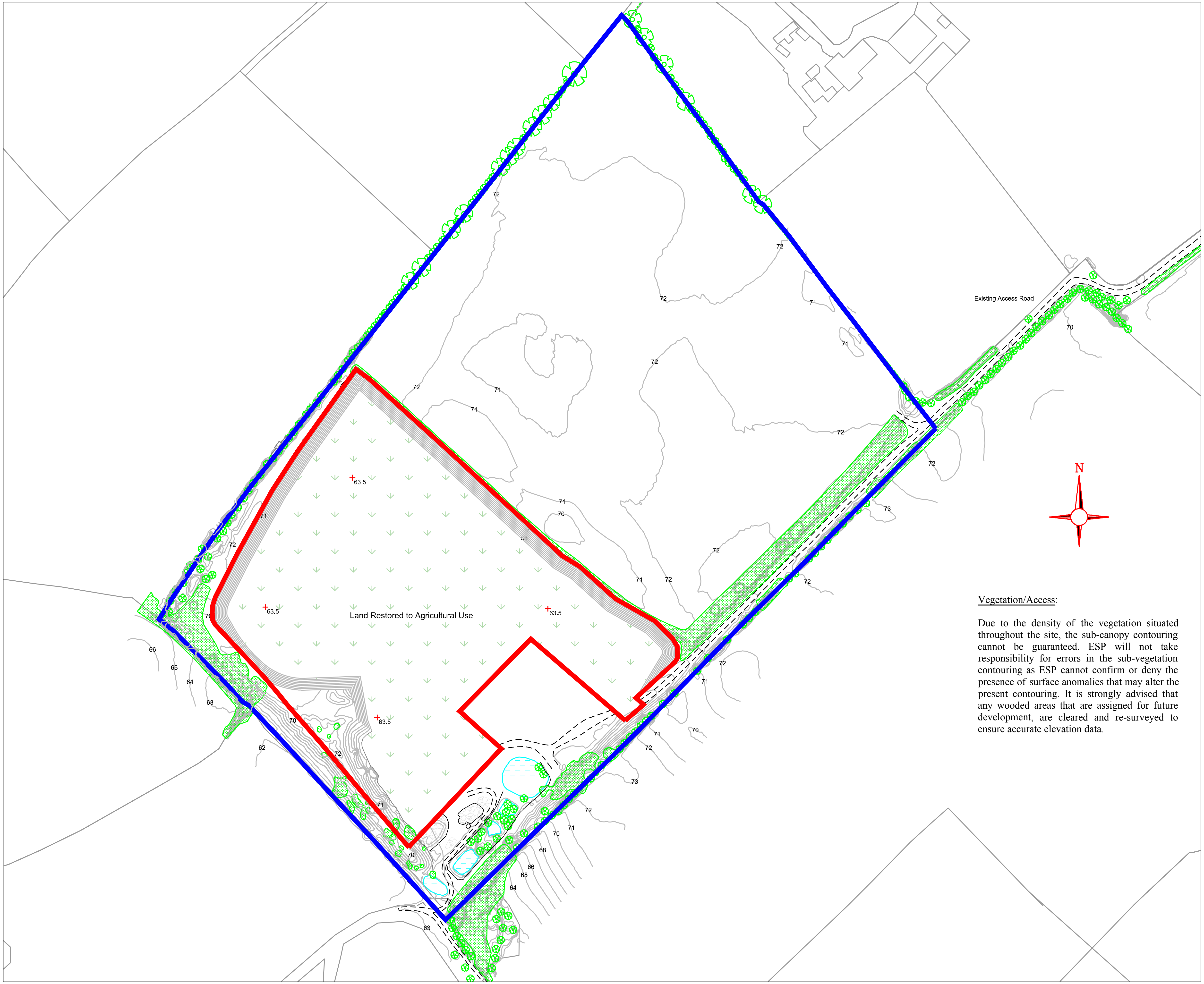
Client: Kilcarrig Quarries Ltd.	
Project: Remedial Environmental Impact Assessment Report to Accompany a Substitute Consent Application for a Sand & Gravel Pit Located at Roscat, Tullow, Co. Carlow	
Title: Proposed Final Restored Sections	
Drawn By: Sean O' Donnell	
Checked By: Patrick O' Donnell	
Scale: 1 : 2,000 @ A3	Date: Apr. 2019
Job No: EI061	Rev: 0

Figure 13.2



Vegetation/Access:

Due to the density of the vegetation situated throughout the site, the sub-canopy contouring cannot be guaranteed. ESP will not take responsibility for errors in the sub-vegetation contouring as ESP cannot confirm or deny the presence of surface anomalies that may alter the present contouring. It is strongly advised that any wooded areas that are assigned for future development, are cleared and re-surveyed to ensure accurate elevation data.

Legend

Ownership Boundary

Application Area
Area = 4.7 Ha

Spot Level 63.5

Aggregate Stockpile

Water

Vegetation

Access Road/Track

Tree Cover

All Levels Relative to Ordnance Datum

O.S. Map Ref No. 4475 - B

ITM Coordinates: 683027 E, 670998 N

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Client: Kilcarrig Quarries Ltd.

Project: Remedial Environmental Impact Assessment Report to Accompany a Substitute Consent Application for a Sand & Gravel Pit Located at Roscat, Tullow, Co. Carlow

Title: Proposed Final Restoration Layout

Drawn By: Sean O' Donnell

Checked By: Patrick O' Donnell

Scale: 1 : 2,500 @ A3	Date: Apr. 2019
Job No: EI061	Rev: 0

Figure 13.3

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14.0 MATERIAL ASSETS

14.1 Introduction

This chapter of the remedial EIAR addresses the impacts of the existing development on the material assets located in the vicinity of Roscat Sand and Gravel Pit. Material assets are defined in the EPA “Draft Advice Notes for preparing an EIAR” (2017) 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 development’s 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 have been used in a sustainable manner with respect to the existing development and to propose measures, where necessary, to ensure that they are used in a sustainable manner.

14.2 Methodology

The information for the assessment of the impacts of the application site was obtained from:

- Guidelines on the Information to be contained in Environmental Impact Statements Environmental Protection Agency (2002);
- Advice Notes on Current Practice in the Preparation of Environmental Impact Statements Environmental Protection Agency (2003);
- 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);
- Draft Guidelines on the Information to be contained in Environmental Impact Assessment Reports (EIAR) (EPA, August 2017);
- Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment (DHP&LG, August 2018)
- Carlow County Development Plan 2015 – 2021;
- Site visits.

The material assets, which have been identified as being within and adjacent to the sand and gravel pit and which may be directly affected by the activities undertaken are addressed below. 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
- Designed Landscape
- Natural Resources of Economic Value
- Buildings and Structures

- Monuments/Features
- 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:

- Built services
- Roads and 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 Draft Guidelines on the Information to be contained in an Environmental Impact Assessment Report (2017) state that built services, roads and traffic, and waste management should be assessed.

There is an element of crossover between this chapter and certain other chapters. Some of the items listed above have been dealt with under the relevant chapters of the rEIAR. For instance, impacts on geological heritage have been dealt with under Chapter 7.0 Land, Soils and Geology, designed landscape is dealt with under Chapter 13.0 Landscape and Restoration, and archaeological heritage, folklore, architecture and monuments have all been dealt under Chapter 15.0 Cultural Heritage.

14.3 Existing Environment

The Substitute Consent application area is located in the townland of Roscat approximately 3 km south west of Tullow and 2 km east of Rathtoe. The N81 national road which connects Tullow with the N80 at Ballon passes in a north-south direction 1.5 km east of the site. Vehicular access is off a local road and via a c.1km long gated laneway that provides access to the pit and surrounding lands. The site is surrounded by agricultural fields and a farm is located nearby.

The Substitute Consent application area is comprised of an existing 4.7ha sand and gravel pit which forms part of an existing pit area of approximately 6 hectares. Topography in the existing pit has been lowered by up to 7 m below surrounding land. The current floor of the existing pit is reasonably level with elevations generally between 62 – 64mOD.

The site is situated on the eastern side of a minor valley which is defined by a small north-south trending ridge that peaks at 94 mOD, 1 km northeast of the site at Ellengrove Crossroads, and a wider area of raised ground which reaches 93 mOD, 1.8 km southwest of the site. This valley flattens out to less than 70 mOD a short distance southwest of the site. OS Discovery maps indicate the site elevation to be in the range 68 – 74 mOD. The material assets that have been identified within proximity of the application site and in the surrounding landscape are listed below:

- Residential buildings
- Geological resource
- Land resource
- Roads and traffic
- Public utilities
- Groundwater and water supplies
- Scenic routes and views
- Tourism
- Archaeology
- Waste

14.3.1 Residential Buildings

The local residences within 1km of development are shown on Figure 5.1 (available for reference at the end of Chapter 5.0 – Population and Human Health). The potential impacts on residences associated with sand and gravel pits are in relation to landscape, noise, vibration, dust and traffic as a result of the day to day activities.

14.3.2 Geological Resource

Reference was made to Gardiner and Radford (1980) and Teagasc soil maps which show that the agricultural soils which originally overlaid the pit consisted principally of shallow, well-drained mineral soils with alkaline signature (Figure 7.1 presented at the end of Chapter 7.0 – Land, Soils and Geology).

Soils of County Carlow (Conry and Ryan, 1967) show that soils at the site belong to the shallower sub-group Broughillstown Complex Series. These have developed on esker hummocks and are described as gravelly sandy (coarse) loams, classified as Brown Earths. The profile is characterised by a dark greyish-brown, friable and crumb-structured upper horizon of depth 150 – 250 mm, which passes directly into the coarse-texture, calcareous parent material. These soils are shown to have a wide-use range but are best suited to tillage. They exhibit moderate to rapid permeability which can develop a moisture deficit during dry periods, resulting in crops maturing unevenly, as evidenced in the summer of 2018.

Extraction of sand and gravel requires the stripping/removal and storage of soils. Soils observed in-situ over exposed faces were noted as being thin. Soils have been stripped in order to facilitate extraction of overburden during previous activities. This stripped material has been stockpiled and formed into earthen bunds which partly define the site boundary. This soil will be utilised during site rehabilitation.

14.3.3 Land Resource

The site is located in the townland of Roscat approximately 3 km south west of Tullow and 2 km east of Rathtoe. The N81 national road which connects Tullow with the N80 at Ballon passes in a north-south direction 1.5 km east of the site.

In terms of regional topography, lands within a 6 km radius of the site form part of a broad valley partially confined by the following features:

- a narrow north-south trending ridge 7km to the west, that peaks locally at 195 mOD;
- the southern extents of the Wicklow Mountains 11.5 km to the east, which peak locally to the east at Aghowle Upper (420 mOD);
- to the northeast by lands which rise gradually through Tullow and Rathvilly;
- the northern limits of the Blackstairs Mountains 13 km to the south which peak locally at Croaghaun (455 mOD). Another small hill is noted 5 km south of the site at Ballon (131 mOD)

At a more local scale the site is situated on the eastern side of a minor valley which is defined by a small north-south trending ridge that peaks at 94 mOD, 1 km northeast of the site at Ellengrove Crossroads, and a wider area of raised ground which reaches 93 mOD, 1.8 km southwest of the site. This valley flattens out to less than 70 mOD a short distance southwest of the site. OS Discovery Series maps indicate the site elevation to be in the range 68 – 74 mOD.

Topography in the existing pit has been lowered by up to 7 m below surrounding land. The current floor of the existing pit is reasonably level with elevations generally between 62 – 64mOD.

The closest dwelling with an accompanying farmyard is located 328m northeast of the application site. Within a 500m radius of the site is a relatively low density of dwellings with farmyards. Beyond this, dwellings tend to be present in linear clusters along roads.

14.3.4 Roads and Traffic

The existing sand and gravel pit is located in a semi-rural setting with the road infrastructure typical consisting of regional roads and local roads, however it is also in close proximity to national roads, particularly the N81 which runs to the east of the site. The pit generates a number of traffic movements based on the transport of products to market.

14.3.5 Public Utilities and Access

The pit has no ESB and telecommunications connection.

14.3.6 Groundwater and Water Supplies

It is understood that drinking water for the temporary office/canteen was previously supplied from a water bowser.

Groundwater elevation contours have been superimposed on Figure 8.6 (available at the end of Chapter 8.0 – Water), from which groundwater flow direction is inferred as being in a general northeast to southwest direction. This is broadly in line with local topographical patterns i.e. falling from the ridgetop at Ellengrove Crossroads to the Roscat Stream.

There has been no pumped discharge of groundwater from the site in the past. Hence past activities had no influence on groundwater levels or flow patterns in the area.

14.3.7 Scenic Routes and Views

The photographic visual impact assessment undertaken and presented in Chapter 13 – Landscape and Restoration concludes that given the extensively flat topography of the surrounding landscape and presence of the existing mature treeline/hedgerow which acts as a natural screen around the site, the Substitute Consent application area is not visible within the surrounding landscape.

14.3.8 Tourism

Tourism is a major industry in County Carlow and it attracts thousands of people on an annual basis which is recognised in the County Development Plan. There are a number of tourist attractions in the Carlow region as detailed in Section 5.0.

14.3.9 Archaeology

There are no Recorded Monuments situated within the application area (see Figure 15.1 1 at the end of Chapter 15.0 – Cultural Heritage).

There are no undesignated monuments listed in the Sites and Monuments Record situated in the application area.

The review established that there are no structures listed in the Record of Protected Structures situated within the application area.

14.3.10 Waste

All material extracted from the pit had a use. Overburden was used construct berms and will be used for landscaping and restoring areas around the pit. All material designated as waste, such as canteen waste, scrap metal, etc. was collected by an appropriately licenced contractor and recycled or disposed of at an appropriate facility. An emphasis was placed on recycling where possible.

14.4 Characteristics of the Proposed Development

The application site consists of an existing 4.7ha pit area which forms part of a total pit area of 6 hectares. The historical activity included the removal of overburden and extraction of underlying sand and gravel. The existing pit was deepened to from approximately 70mOD to approximately 63mOD.

Material was extracted by excavators and processed on site or exported to a processing plant offsite. Material was processed into various grades depending on market demand for aggregate and was stockpiled at designated stockpiles.

Plant and machinery which operated in the application area consisted of tracked excavators, wheel loaders, dump trucks and mobile processing plant. Ancillary plant such as a water bowser for dust suppression was deployed where required.

14.5 Impact Assessment

14.5.1 Residential Buildings

Existing and proposed remedial measures in relation to sand and gravel extraction activities are listed in various chapters of the rEIAR. These measures will aid in reducing any potential impacts of the existing development. Environmental monitoring including noise, dust and vibration monitoring will be undertaken in order to ensure that the pit is compliant with standard published guidelines.

14.5.2 Geological Resource

Sand and gravel extraction is an established activity in the study area with the existing site dating back to 1987 and continued to approximately 2008 as a result of the continued demand for aggregate at that time.

The use of a geological resource has result in a significant impact which is permanent in duration as the natural topography has been changed as a result of extraction of materials. However, the extracted material has been used to supply the local, national and international markets, thereby contributing to the local, regional and national economy. The proposed landscape and restoration plan will serve to reduce the impact associated with extraction activity to date and going forward.

14.5.3 Land Resource

The application area was used as agricultural tillage production prior to its development as a sand and gravel pit. As agriculture is a significant land use in the wider area, this has not resulted in a significant loss of land resource.

The assessment of the Natura 2000 sites and nationally designated sites in the area and the related conservation objectives found that the historical operation of the development did not result in significant effects on the conservation objectives of the designated sites.

14.5.4 Roads and Traffic

The historical project did not significantly increase levels of traffic on the road infrastructure in the vicinity of the pit.

Inspections were carried out to ensure roads are clean and tidy of any debris and to ensure that no debris or mud was transported onto the public road. Road sweeping was undertaken as required.

14.5.5 Public Utilities and Access

As mentioned above, the previous extraction of sand and gravel did not result in an increase in traffic levels on the local road infrastructure as the applicant. There has been no impact on the quality or availability of public utilities of the study area. There is no public access to the application site. All visitors reported to the site office before entering the site.

14.5.6 Groundwater and Water Supplies

As all historical works were of a dry process nature and as such, there were no potential impacts on groundwater and water supplies in the surrounding area.

14.5.7 Scenic Routes and Views

The visual impact assessment undertaken concluded that owing to the extensively flat topography of the landscape, the existing pit is not visible from public roads. Therefore, there were no significant impacts on scenic routes and views as a result of the existing development.

14.5.8 Tourism

Sand and gravel extraction activity in the area is an established land use and has not impacted on tourism in the past.

14.5.9 Archaeology

No impact on archaeology or cultural heritage is anticipated.

14.5.10 Waste

Overburden was used construct berms or for landscaping and restoring areas around the pit. All material designated as waste, such as canteen waste, scrap metal, etc. was collected by an appropriately licenced contractor and recycled or disposed of at an appropriate facility. As such, there was no potential for significant impacts on the local environment as a result of waste generated from the existing development.

14.5.11 Unplanned Events

The various chapters of the rEIAR have assessed the potential impacts associated with unplanned events occurring where relevant and have included measures or procedures to follow should such events occurs.

14.6 Remedial Measures

Measures are discussed in the relevant chapters where required to ameliorate any impacts identified.

14.7 Residual Impacts

Historical sand and gravel extraction activity resulted in the loss of a geological resource and this will be permanent in duration. The proposed landscape and restoration plan will offset the impact in so far as possible with the creation of new habitats.

14.8 Technical Difficulties

No technical difficulties were encountered during the completion of this assessment.

14.9 References

Carlow County Council (2015) Carlow County Development Plan 2015 – 2021.

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

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

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

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

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

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

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

EPA (2017) Draft Guidelines on the information to be contained in Environmental Impact Assessment Reports (EIAR)

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Tables

Figures

15.0 CULTURAL HERITAGE

15.1 Introduction

This Remedial Environmental Impact Assessment Report (rEIAR), prepared by Earth Science Partnership on behalf of Kilcarrig Quarries, has been undertaken to assess the significant effects, if any, on the archaeology, cultural heritage and architecture which have occurred or are occurring or can reasonably be expected to occur because of sand and gravel quarrying carried out by the applicant on land in the townland of Roscat, Co. Carlow. A wide variety of paper, cartographic, photographic and archival sources was consulted. All the lands of the substitute consent area were visually inspected.

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 have occurred or are occurring or can reasonably be expected to occur because of quarrying carried out in the substitute consent 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 twenty 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.

15.2 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 and 2003).

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 Figure 15.1 at the end of this chapter. This area was examined using information from the following sources:

- Record of Monuments and Places (RMP) of County Carlow;
- The Sites and Monuments Record;
- The Carlow County Development Plan 2015-21 including the Record of Protected Structures;

- The National Inventory of Architectural Heritage;
- Aerial photographs;
- Excavation reports;
- Cartographic and
- Documentary sources.

A field assessment was carried out on the 15th June 2018 to identify and assess any known archaeological sites and structures and previously unrecorded features, possible finds and structures within the application area.

15.3 Existing Environment

15.3.1 The Landscape

The Substitute Consent application area is situated in north County Carlow, c.3km south-west of the town of Tullow and c.1km south-west of the N81 road. It is situated in flat to undulating lowland with a surface level between 60-90m OD.

15.3.2 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 Substitute Consent application area is situated in the townland Roscat, the parish of Ardristan and the barony of Rathvilly. Note the spellings of place names varied throughout history, the historical spellings are used here.

15.3.2.1 Prehistoric Period

Prehistoric activity in the study area is indicated in Ardristan townland to the east of the application area by the presence of two standing stones in Ardristan townland (RMP CW013-012---- and RMP CW013-013----) and a Fulacht fia (RMP CW013-082----).

15.3.2.2 Early Medieval Period

In the early medieval period the study area formed part of Fortharta Fea the cantred of Fothryd (Onolan) which were ruled by the Uí Nualláin from the ninth century (MacCotter 2008, 127). 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 ringforts known from the study area in Ardristan townland (RMP CW013-029----) and a possible example in Rathtoe townland (SMR CW013-123----) that indicate significant settlement in the study area in the early medieval period.

15.3.2.3 The Later Medieval Period

Following the loss of the Kingdom of Leinster in 1166 Diarmait Mac Murchade regained the Kingdom in 1169-70 with the aid of Anglo-Norman mercenaries. He paid them with land grants and promised the succession of Leinster and his daughter to their leader Richard fitz Gilbert de Clare. On the death of Diarmait Mac Murchade in 1171 Leinster duly passed to de Clare, who became the first Anglo-Norman Lord of Leinster. Following his acquisition of Leinster de Clare rewarded his soldiers by granting them substantial lands throughout Leinster to hold as fiefs. The Fotheret Onolan incorporating the study area was granted to Raymond le Gros (MacCotter 2008, 127).

The process of Norman infeudation is normally associated with the construction of timber castles, known as Motte and Baileys. However, there are no Motte castles known from the study area although there are examples in Co. Carlow. 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. However, there are no moated sites in the study area although there are examples in Co. Carlow.

The inquisition ordered by King Edward 1 to ascertain the Irish possessions of Roger Le Bygod, Earl of Norfolk, and Lord of Carlow, who died in 1306 records that in 1307 Ardristan and Roscat were held by John de Valle (The Calendar of Justiciary Rolls of Ireland, 1305-1307, 35th Edward I).

15.3.2.4 The Post-Medieval Period

In 1558 Queen Elizabeth granted Edward Moore Arbistell and Ruskogh at a rent of sixteen shillings (Ryan 1833, 122). The Down Survey records that in 1641 Roscat, which was part of Ardristan, was held by the Earl of Ormond and it was held in 1670 by James Butler Earl of Ormond (http://downsurvey.tcd.ie). In the early-nineteenth century Roscat formed part of the estate of the Eustace family until Hardy Eustace was forced to sell the lands by Commissioners for the Sale of Incumbered Estates in Ireland in June 1851.

15.3.3 Buildings

15.3.3.1 Field Inspection

On the 15th of June 2018 fieldwork was carried out to identify any additional non-designated structures of heritage interest in the vicinity of the Substitute Consent application area. This involved assessing all upstanding structures that are marked on the 1939 edition of the six-inch Ordnance Survey mapping within 300m of the application area (see Figure 15.1 at the end of this chapter).

15.3.3.2 Designated Structures

The Carlow County Development Plan 2015-21 was examined as part of the baseline study for this section of the rEIAR. The review established that there are no structures listed in the Co. Carlow

Record of Protected Structures situated within the Substitute Consent application area. There is one Protected Structure situated in the study area (Tables 15-1 – 15-5).

Table 15-1: Details of Protected Structure No. CW470 as per the Record of Protected Structures

Item	Details
No.	CW470
Structure type	Farm House
Townland	Roscat
Designation	Protected Structure
Data source	Carlow Co. Development Pan 2015-21
Perceived significance	Regional
Type of impact	None
Significance and quality of impact	None
Description	A five-bay, single-storey, gable-ended cottage (originally three bays) with rough-cast walls and a square-headed, granite doorcase. The windows have modern uPVC glazing and the roof has asbestos slates. The house has been added to at the rear in recent times.
Mitigation proposal	No mitigation required
Illustration	-

This building is situated more than 1km north-east of the application area and is considered to be too far distant to have been impacted by the development.

15.3.3.3 Non-Designated Structures

The National Inventory of Architectural Heritage (NIAH) which is maintained by the Department of Culture, Heritage and the Gaeltacht was examined as part of the baseline study for this section of the rEIAR on 14 June 2018. The review established that there are no additional structures listed in the NIAH situated within the application area or the study area.

15.3.4 Archaeological Assessment

15.3.4.1 Field Inspection

On the 15 of June 2018 fieldwork was carried out to identify any additional non-designated structures of heritage interest in the vicinity of the substitute consent area. This involved assessing all upstanding structures that are marked on the 1908 edition of the six-inch Ordnance Survey mapping within 100m of the application area . There are no upstanding structures situated within this area.

The Substitute Consent area is the existing area of extraction and processing that has been extracted to subsoil levels. There is no visible indication of any cultural heritage material.

*15.3.4.2 **Recorded** Monuments*

There are no Recorded Monuments situated within the Substitute Consent area (see Appendix XIII). The closest Recorded Monument externally CW013-012----a Standing stone in Ardristan townland, is situated 0.97km to the north-east of the application area and is considered too far distant to be impacted. The remaining Recorded Monuments in the study area and are considered too far distant to have been impacted by the development.

15.3.4.3 Undesignated Monuments

A review of the Sites and Monuments Record which is maintained by the Department of Culture, heritage and the Gaeltacht at http://webgis.archaeology.ie/historicenvironment/ on 13 June 2018 indicated that there is one additional site listed in the study area (see Appendix XIII). This site CW013-123---- is the cropmark of a curvilinear enclosure defined by a fosse in Rathtoe townland. This site is situated 0.78km to the south-west of the application area and is considered too far distant to have been impacted by the development.

15.3.4.4 Cartographic Sources

The Ordnance Survey 1st and 3rd edition six-inch maps of the area were examined. This analysis did not indicate any previously unrecorded archaeological sites or monuments.

15.3.4.5 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 Place-names Database of Ireland. The analysis did not indicate any additional cultural heritage material in the application area.

Table 15-2: Place-names and their meanings in the vicinity of the Substitute Consent application area.

Place Name	Meaning
Ardristan	Hill of the brambles
Castlemore	Great castle
Rathrush	Ringfort of the wood
Rathtoe	North fort
Roscat	Wood of the cats
Tullowbeg	Small hillock

15.3.4.6 Aerial Photographs

Examination of the Ordnance Survey 1995, 2000 and 2005 imagery as well as Google Earth imagery from 2003, 2007, 2009, 2013 and 2015 and Bing maps imagery from 2011 did not indicate any additional cultural heritage or archaeological sites.

15.3.4.7 Other Sources

Examination of archaeological corpus works on prehistoric artefacts (Harbison 1969, Eogan 1965, 1983, 2000, Kavanagh 1991, Simpson 1990), and pottery (O' Ríordáin and Waddell 1993) and Iron Age material (Raftery 1984) did not reveal any additional material in the study area.

15.3.4.8 Excavations

Examination of the Excavations Bulletin www.excavations.ie indicated that there have been no archaeological excavations carried out in the application area or the study area.

15.4 Potential Effects of the Existing Development

15.4.1 Direct Effects

There are no direct effects on any known items of cultural heritage, archaeology or buildings of heritage interest in the Substitute Consent area or the vicinity.

15.4.2 Indirect Effects

There are no indirect effects on any known items of cultural heritage, archaeology or buildings of heritage interest in the Substitute Consent area or the vicinity

15.4.3 Interaction with Other Effects

No interaction with other any other impact has been identified.

15.4.4 Do Nothing Scenario Effects

No "do nothing" scenario effects have been identified.

15.4.5 Worst Case Scenario Effects

No worst case scenario has been identified.

15.5 Remedial Measures

15.5.1 Direct Effects

No direct effects warranting specific remedial measures were identified during the course of the cultural heritage assessment and no mitigation measures are required.

15.5.2 Indirect Effects

No indirect effects warranting specific remedial measures were identified during the course of the cultural heritage assessment and no mitigation measures are required.

15.5.3 Residual Impacts

No residual impacts have been identified.

15.6 Conclusions and Recommendations

There are no known items of cultural heritage, monuments or buildings of heritage interest known from the Substitute Consent area or vicinity. There are no direct or indirect impacts on any known items of cultural heritage, archaeology or buildings of heritage interest in the substitute consent area or the vicinity and no remedial measures are required.

15.7 References

Carlow County Council 2015. County Development Plan 2015-21.

DAHGI 1995. Recorded Monuments Protected under Section 12 of the National Monuments (Amendment) Act, 1994. County Carlow

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Figures

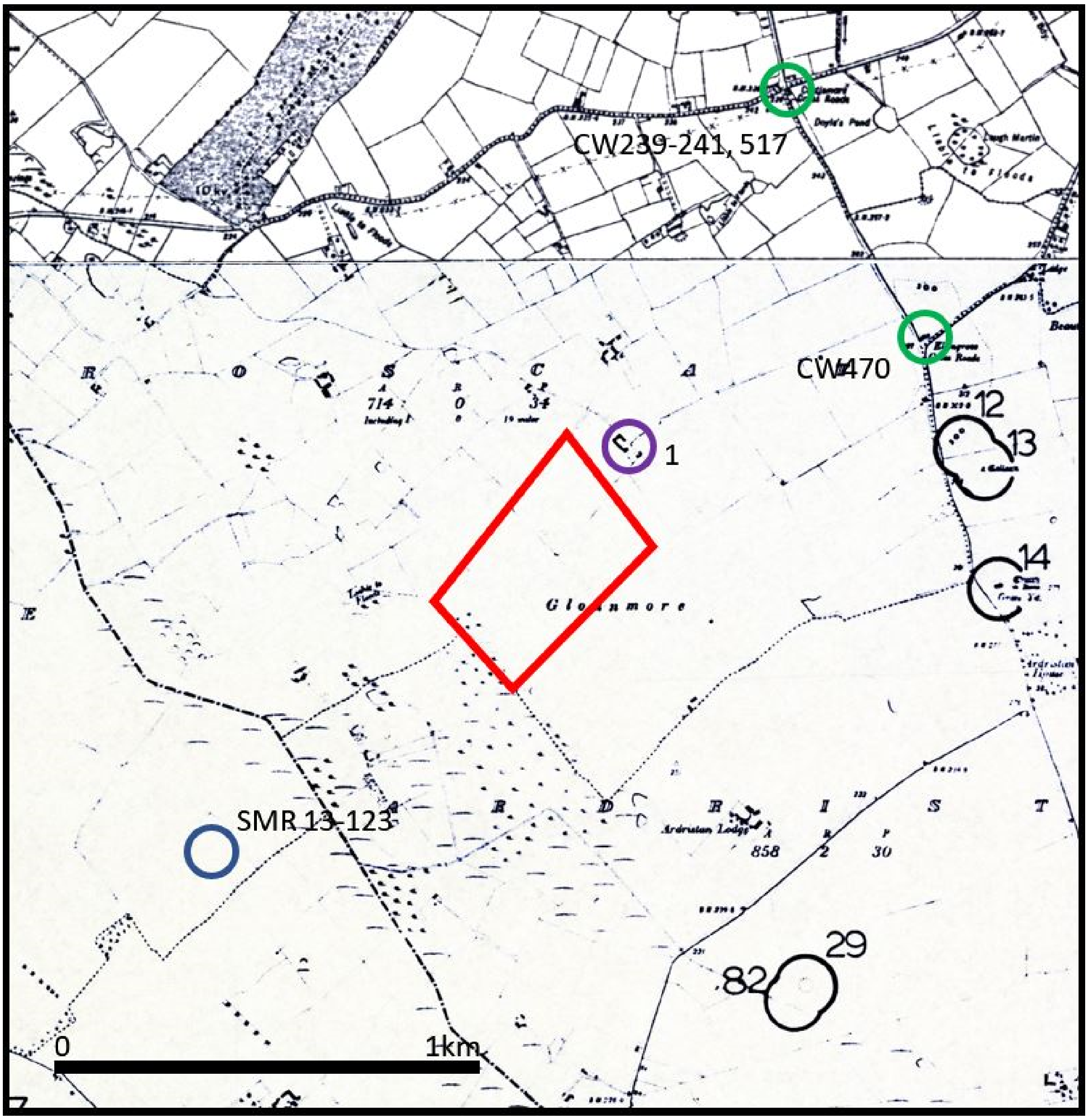

Figure 15-1: The assessment study area superimposed on the Record of Monuments for Co. Carlow. The application area is outlined in red. Recorded monuments are indicated with black circles. The site in the SMR is indicated with a blue circle. The structures in the Record of Protected Structures are indicated with green circles. The structures within 100m of the application area are indicated with a purple circle.

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Tables

16.0 INTERACTIONS

16.1 Introduction

This chapter addresses the potential cumulative effects, indirect effects and main interactions between different aspects of the environment that may have been affected as a result of the existing 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.

16.2 Interactions

Inter-relationships concern the interactions between potential effects which may have occurred within a project and the interactions between potential effects identified under one topic with effects identified under another topic. Each of the various environmental and related topics have been discussed separately in the preceding chapters of the rEIAR and the major interactions between the recorded environmental impacts are assessed within the individual chapters of the rEIAR. In examining the interactions of the potential effects of this development, one must investigate the combined physical, environmental, visual and socio-economic effects of the existing development on the receiving environment. Table 16-1 illustrates the interaction of effects assessed for this project.

Table 16-1: Interactions of potential effects assessed for this project.

Factors	Pop. and Human Health	Biodiversity	Land, Soils and Geology	Water	Climate	Air	Noise and Vibration	Traffic	Landscape and Restoration	Material Assets	Cultural Heritage
Pop. and Human Health											
Biodiversity											
Land, Soils and Geology		x									
Water	x	x	x								
Climate	x										
Air	x	x		x	x						
Noise and Vibration	x	x									
Traffic	x					x	x				
Landscape and Restoration	x	x	x								
Material Assets	x		x				x	x	x		
Cultural Heritage											

16.2.1 Population/Human Health and Water

Contaminants or leakages from plant and vehicles could have potentially leaked into groundwater which had the potential to impact on water quality. There were no visual signs of hydrocarbon contamination during site visits and during site investigation works and water monitoring.

As such, there were no potential interactions between population and human health and water as a result of the existing development.

16.2.2 Population/Human Health and Climate

Plant associated with the operation of the development resulted in emissions to air associated with the day to day operations undertaken at the pit which were difficult to eliminate. Due to the low level of activity undertaken, it is unlikely that there would have been an impact on climate as a result of previous activities undertaken.

As such, there were no potential interactions between population and human health and climate as a result of the existing development, which could have caused significant effects on either of these environmental factors.

16.2.3 Population/Human Health and Air

The primary interaction between air and humans would have related to potential dust emissions associated with extraction, processing and transport of material around and off-site. Exhaust emissions from vehicles and plant were also a source of air pollutants. Dust deposition monitoring was not undertaken during the operation of the pit, however, modelling was undertaken to calculate PM10, PM2.5 and dust levels associated with the previous development. It is unlikely that there would have been an impact on population/Human Health and Air as a result of previous activities undertaken.

16.2.4 Population/Human Health and Noise/Vibration

Activities undertaken at the pit generated noise and vibration associated with the extraction, occasional processing, loading of vehicles and transportation of material within and off site. Various measures were in place to ensure noise levels were not elevated.

A noise and vibration assessment undertaken of the pit showed that the previous operation of the development did not result in an increase in noise levels above recommended guideline values. As such, there were no potential interactions between population/ human health and noise as a result of the existing development, which could have caused significant effects on either of these environmental factors.

16.2.5 Population/Human Health and Traffic

The transport of pit aggregate to market generated a number of traffic movements on the local road infrastructure; however the retrospective traffic assessment concluded that this increase was not significant.

As such, there were no potential interactions between population and human health and traffic as a result of the existing development, which could have caused significant effects on either of these environmental factors.

16.2.6 Population/Human Health and Landscape/Restoration

The extraction of material at the application site has resulted in the creation of a void. This will be restored once extraction activity ceases.

The existing extensively flat topography and vegetation aid in screening the pit. The proposed landscape and restoration plan will offset the impact associated with extraction of sand and gravel in so far as possible.

16.2.7 Population/Human Health and Material Assets

Extraction of sand and gravel has resulted in the loss of a geological resource which cannot be replaced. The proposed landscape and restoration plan will aid in reducing the impact associated with extraction activity. The material extracted would have served the demand for construction materials in the locality which is considered to have had a positive impact.

16.2.8 Biodiversity and Land/Soils/Geology

The historical operation of the pit resulted in the agricultural tillage land of the application site being stripped of overburden and extracted down to the existing pit floor level. This resulted in the direct loss of the agricultural tillage land to a sand and gravel pit. This habitat is of low ecological value. The proposed restoration plan will offset any effect of excavation activity and has the potential to increase the biodiversity of the site.

As such, there were no potential interactions between biodiversity and land, soils and geology as a result of the development, which could have caused significant effects on either of these environmental factors.

16.2.9 Biodiversity and Water

Contaminants or leakages from plant and vehicles could have potentially leaked into groundwater which could have impacted on water quality. There were no visual signs of hydrocarbon contamination during site visits, during site investigation works and water monitoring undertaken at the site.

16.2.10 Biodiversity and Air

Activities undertaken at the pit had the potential to create windblown dust which had the potential to affect the biodiversity of the local environment. Due to the low level of activity associated with the sand and gravel pit and due to the majority of activities being undertaken below ground level it is unlikely that dust blow was a significant issue.

16.2.11 Biodiversity and Noise/Vibration

Extraction of the resource material and related traffic had the potential to lead to noise emissions. Noise levels at sand and gravel pits may have affected some bird and mammals species, particularly those sensitive to noise.

Given the low level of traffic, the work methods that were employed at the pit, it is unlikely that previous extraction activities lead to a negative impact on the biodiversity in the vicinity of the working pit.

16.2.12 Biodiversity and Landscape/Restoration

A landscape and restoration plan is proposed, which will lead to a positive impact on the biodiversity of the area. The final restoration of the site will enhance the biodiversity of the area generating a positive effect.

16.2.13 Land/Soils/Geology and Water

The removal of overburden and bedrock had the potential to increase the risk of contamination of groundwater in the event of accidental spillages occurring. There were no visual signs of hydrocarbon contamination during site visits, during site investigation works and water monitoring undertaken at the site.

16.2.14 Land/Soils/Geology and Landscape

Extraction to date at the application area has resulted in the removal of overburden and sand and gravel resulting in the creation of a void. Existing stockpiled material will be used for restoring the pit. The impact on the geology and landscape will be mitigated in the longer term by the proposed landscape and restoration plan.

16.2.15 Land/Soils/Geology and Material Assets

The geological resource extracted from the application site has resulted in a void. Sand and gravel extracted from the pit was used as a raw material in the construction industry which is seen as a beneficial use.

16.2.16 Water and Air

Dust associated with sand and gravel extraction activities had the potential to contaminate surface water and groundwater. Due to the area of the pit and low level of activity, it is unlikely that there would have been significant dust blow generated.

16.2.17 Climate and Air

Plant and machinery operating at the pit resulted in emissions to air and climate associated with the operation which is difficult to mitigate against. Energy conservation measures and good management practices would have served to reduce the missions in so far as is possible.

16.2.18 Air and Traffic

The transport of pit aggregate to market generated a number of traffic movements on the local road infrastructure; however the retrospective traffic assessment concluded that this increase was not significant therefore unlikely to have generates excessive emissions.

16.2.19 Noise/Vibration and Traffic

Traffic associated with the development generated noise and a minor source of vibration. The development did not result in an increase in pit traffic on the local road infrastructure.

16.2.20 Landscape/Restoration and Material Assets

The visual impact assessment undertaken shows that the existing sand and gravel pit is not visible from any of the surrounding vantage point locations.

As such, there were no potential interactions between landscape and restoration and material assets as a result of the existing development, which could have caused significant effects on either of these environmental factors.

16.3 Conclusion

It has been concluded that there were no significant interactions between any of the various environmental factors as a result of previous operations within the Substitute Consent application area, existing authorised pit area and surrounding study area.

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17.0 REMEDIAL MEASURES AND MONITORING SUMMARY

17.1 Introduction

This chapter of the rEIAR provides a summary of the remedial measures proposed in order to avoid, reduce or remedy the potential impacts identified at the existing pit and a summary of monitoring proposed to ensure that remedial measures are effective.

17.2 Population and Human Health

17.2.1 Remedial Measures

No remedial measures other than those detailed in sections in this rEIAR are required in relation to population and human health.

Chapter 8.0 – Water
Chapter 9.0 – Climate
Chapter 10.0 – Air
Chapter 11.0 – Noise and Vibration
Chapter 12.0 – Traffic
Chapter 13.0 – Landscape and Restoration

17.2.2 Monitoring

Environmental monitoring will be carried out in accordance with the requirements of the conditions attached to the grant of Substitute Consent permission.

17.3 Biodiversity

17.3.1 Remedial Measures

The following primary measures will be implemented:

- Increase permeability on the pit floor by mechanical ripping to a depth of 0.5 m. This will decrease the amount of surface runoff being diverted towards the ponds, and subsequently the fen, and will restore substrate permeability characteristics closer to that of pre-works, prior to raising the floor by deposition of screenings.
- Overburden stored on site will be spread on the pit floor to reduce the vulnerably of the floor beneath.
- Slide slopes will be restored to accommodate breeding sand martins.

17.3.2 Monitoring

A designated person from the project management team will have overall responsibility for ensuring that all landscape and restoration operations are carried out in such a way as to minimise potential impacts to hydrological and hydrogeological receptors. This person will also have responsibility of monitoring the performances of any pollution control measures adopted.

17.4 Land, Soils and Geology

17.4.1 Remedial Measures

The implementation of the proposed landscape and restoration plan will offset the impact associated with extraction to date in so far is possible. The following measures will be practiced during the Landscape and restoration phase.

- Soils retained on site shall be used in rehabilitation. The site will be capped with a layer of topsoil in order to restore the back to agricultural use.
- Landscape & restoration works shall not be carried out during excessively dry or wet weather.
- Post-completion contours should be such that there are no direct pathways for suspended solids from exposed subsoils to leave the site via runoff.
- Material shall be deposited in layers not exceeding 300 mm, with the objective being to achieve extensive and vertical infiltration of precipitation.
- Fuelling and lubrication will be in a designated area, or where possible off-site, and not within 30 m of drainage ditches or surface waters. There will be no storage of fuels on site.
- An adequate supply of spill kits and hydrocarbon absorbent packs shall be stored in this area and staff shall be trained in the appropriate use of same.

17.4.2 Monitoring

No monitoring is proposed.

17.5 Water

17.5.1 Remedial Measures

The following primary measures relating to hydrology and hydrogeology will be implemented:

- The landscape and restoration plan for the pit will be implemented.
- The permeability on the pit floor will be increased by mechanical ripping to a depth of 0.5m. This will decrease the amount of surface runoff being diverted towards the ponds, and subsequently the fen, and will restore substrate permeability characteristics closer to that of pre-works, prior to raising the floor by deposition of screenings.
- A layer of overburden will be placed on the pit floor to allow vegetation to establish and to provide a level of protection to groundwater.

17.5.2 Monitoring

Monitoring of surface water and groundwater quality will be undertaken during the restoration phase of the development.

17.6 Climate

The following measures will be practiced during any future work undertaken at the pit associated with landscaping and restoration.

- Strict adherence to 'good site/engineering practices' (e.g. all vehicles and plant were be switched off when not in use) which would have minimised the generation of any unnecessary air emissions.
- Plant was serviced regularly to ensure efficient fuel consumption.
- Energy audits were undertaken at the pit in order to reduce energy requirements.
- When purchasing plant, preference was given to plant which have low emissions.

17.7 Air

17.7.1 Remedial Measures

The following measures should be practiced during landscape and restoration works undertaken at the pit.

- Vehicles using site roads shall have their speed restricted, and this speed restriction must be enforced rigidly.
- During very dry periods, dust emissions from heavily trafficked locations should be controlled by spraying surfaces with water.
- Inspection of the work area should be undertaken on a daily basis to ensure that there is no dust blow.
- Restored areas should be seeded as soon as possible after grading.

17.7.2 Monitoring

Dust deposition monitoring will be undertaken during the restoration phase of the development

17.8 Noise and Vibration

17.8.1 Remedial Measures

The following measures are proposed as part of any future works associated with landscaping and restoration:

- Reversing beeper on mobile plant can be replaced with 'white noise beepers' which is not audible to any receptors.
- All motors and pulleys will be maintained to a high standard with regular maintenance so as to avoid any tonal or impulsive components in the emission.
- Machinery will be throttled down or turned off when not in use.

17.8.2 Monitoring

Monitoring of noise levels will continue at 3 locations (N1, N2 & N3) as shown on Figure 11.1 on an annual basis to ensure that noise levels are below the recommended guideline values.

17.9 Traffic

17.9.1 Remedial Measures

No measures are proposed.

17.9.2 Monitoring

No monitoring is proposed.

17.10 Landscape and Restoration

17.10.1 Remedial Measures

The land landscape and restoration plant will serve to offset the impact associated with previous activity at the pit and will be implemented on granting of substitute consent.

17.10.2 Monitoring

A designated person from the project management team will have overall responsibility for ensuring that all landscape and restoration operations are carried according to an agreed landscape and restoration plan.

17.11 Material Assets

17.11.1 Remedial Measures

Remedial measures are discussed in the relevant chapters where required to ameliorate any impacts identified.

17.11.2 Monitoring

No monitoring is proposed.

17.12 Cultural Heritage

17.12.1 Remedial Measures

No direct or indirect effects warranting specific remedial measures were identified during the course of the cultural heritage assessment and no remedial measures are required.

17.12.2 Monitoring

No monitoring is proposed.