Property

Resource Planning Management & Development

OCTOBER 2017 | Project No. 33.1.13.39.2015.02&10

REMEDIAL ENVIRONMENTAL IMPACT ASSESSMENT REPORT (rEIAR)

For a quarry and associated processing plant and welfare facilities over a total site area of 81 hectares.

To accompany substitute consent applications for:
a *plant area* following under An Bord Pleanála Ref. 01.LS.0019 (SH 01.SH.0236), and
a *quarry area* under An Bord Pleanála ref. 01.LQ.0001 (01.SH0.235)

Clonmelsh & Garyhundon,
Nurney,
Co. Carlow

On behalf of

Dan Morrissey Ireland Ltd. (In Receivership)

List of Figures

List of Tables

ACRONYMS & ABBREVIATIONS GLOSSARY

AA	Appropriate Assessment
AADT	Annual Average Daily Traffic
ABP	An Bord Pleanála
ACA	Architectural Conservation Area
AOD	Above Ordnance Datum
ARV	Annual Rate on Valuation
ASI	Archaeological Survey of Ireland
BAT	Best Available Techniques
CIE	Coras Iompair Éireann
CFRAM	Catchment Flood Risk Assessment and Management
CORINE	COoRdinate INformation on the Environment
CSO	Central Statistics Office
DMIL	Dan Morrisey Ireland (In Receivership)
ED	Electoral Division
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report (rEIAR remedial Environmental Impact Assessment Report)
EIS	Environmental Impact Statement (rEIS remedial Environmental Impact Statement)
EPA	Environmental Protection Agency
EU	European Union
FRA	Flood Risk Assessment
GSI	Geological Survey Ireland
ha	hectares (1 ha. = 10,000 m^2)
IPCC	Integrate Polluation control
ITM	Irish Transverse Mercator
JOTT	Jont Option to Tax
Km	kilometres
LVIA	Landscape and Visual Impact Assessment
m^2	square metres (also: sqm)
NAV	Net Annual Value
NHA	Natural Heritage Area (pNHA proposed Natural Heritage Area)
NIAH	National Inventory of Architectural Heritage
NIS	Natura Impact Statement (rNIS remedial Natura Impact Statement)
NPWS	National Parks and Wildlife Service
NRA	National Road Authority (Now TII Transport Infrastructure Ireland)
pa	per annum (per year)
PCVE	Pre-contract VAT enquiries
TOB	Transfer of Business
RMP	Record of Monuments & Places
SAC	Special Area of Conservation (cSAC candidate Special Area of Conservation)
SA	Small Area
SAPS	Small Area Population Statistics
SPA	Special Protection Area (pSPA proposed Special Protection Area)
SMR	Sites and Monuments Record
EIAR	Environmental Impact Assessment Report (rEIAR Remedial Environmental Impact Assessment Report)
P&D Act	Planning & Development Act, 2000 as amended

1.0 INTRODUCTION

This Remedial Environmental Impact Assessment Report [rEIAR] has been prepared to accompany a pair of concurrent substitute consent applications for consent for an existing quarry and associated plant development over approximately 81 hectares [ha.] at Clonmelsh & Garyhundon, Nurney, Co. Carlow.

This rEIAR is submitted on instruction of Mr. Paul McCann & Mr. Stephen Tennant of Grant Thornton, 24-26 City Quay, Dublin 2 receivers of the entire assets and undertakings of Dan Morrissey (Irl) Limited appointed by Allied Irish Banks plc by deed of appointment dated the 18th June 2014.

This rEIAR is therefore on behalf of Dan Morrissey (Irl) Limited (In Receivership) [DMIL] as the owner and / or occupier of lands located at Clonmelsh and Garyhundon, Powerstown, Co. Carlow which extend to over 210 ha., a significant proportion of which are in use for aggregate extraction, namely sand and gravel and limestone.

The extraction lands the subject of this rEIAR [the subject lands] extend to approximately 81 ha. at the centre of this landholding. The subject lands occur in 2 no. land units described in this rEIAR as *Clonmelsh* to the north and *Garyhundon* to the south after the townlands within which they occur.

1.1 Requirement for rEIAR

This rEIAR is submitted alongside a remedial Natura Impact Statement [rNIS], both directed to be supplied to support substitute consent applications granted leave to be made by An Bord Pleanála.

In July 2015 a single application for leave for substitute consent was made under ref. PL19.0019 for 81 ha. of land constituting a quarry with associated processing plant over a total site area of 81 ha. in two land parcels. During the currency of consideration of that application for leave for substitute consent it was determined that the lands constituted two distinct but cooperating units. By orders dated 7th April 2017 under:

01.LS.0019 (SH 01.SH.0236) leave for application for substitute consent was granted for a **plant area** at the above address following consideration under S.177(D), and

01.LQ.0001 (01.SH0.235) application for leave for substitute consent was granted for a **quarry** under S.261A(24)(a).

The orders granting leave for substitute consent application specified that the same remedial Environmental Impact Statement (rEIS) and remedial Natura Impact Statement (rNIS) be used for both applications. Copies of the orders are at Appendix 1.1.

Figure 1.1 provides a depiction of the substitute consent application areas and the lands the subject of the rEIAR and rNIS.

1.2 Structure & Content of rEIAR

The rEIS directed to be submitted to accompany the applications for substitute consent is presented here as an rEIAR for reason of government provision and guidance for the transposition of the 2014 EIA Directive into Irish Law.

The following subsections outline the evolution of EIS Directives and their interpretation in the Irish jurisdiction in order to define the purposes and content of the rEIAR.

Please note that in this rEIAR, in keeping with the precautionary approach, latest commensurate government advice and guidance in respect of the implementation of the 2014 EIA Directive has been followed as explicit transposing statutory provision is currently being formulated.

1.2.1 EIA Directives & Transposition

The requirement for an Environmental Impact Assessment [EIA] process arises from European Union [EU] Directives required to be adhered to by member States and transposed into national laws.

The original EIA Directive 85/337/EEC has been amended and superseded by Directives 97/11/EC, 2003/35/EC, 2009/31/EC to Directive 2011/92/EU.

Having regard to the transposition of the original environmental assessment Directive into Irish Law it is determined by reference to the Planning and Development Act, 2000 as amended [P&D Act] that appointed day at which the requirement for same arose is the 1st of February 1990.

On 16th April 2014 Directive 2011/92/EU was amended by Directive 2014/52/EU of the European Parliament and of the Council [2014 EIA Directive].

The amending 2014 EIA Directive consists of 16 no. Articles and 5 no. Annexes that define EIA and the supporting information and processes available and required for EIA determination in the form of reasoned conclusion by the competent authority.

This is the environmental impact assessment report [EIAR] by the developer defined at Article 1 and required under Article 3 in order EIA, may be undertaken. This report relates to lands the subject of extraction with a site area of 81 ha. and attracts the requirement for EIA as an Annex 1 project and is therefore subject to an assessment in accordance with articles 5 through 10.

Article 5 of the 2014 EIA Directive sets down the minimum information to be supplied in an EIAR including those matters at Annex IV as follows;

a) a description of the project comprising information on the site, design, size and other relevant features of the project;

(b) a description of the likely significant effects of the project on the environment;

(c) a description of the features of the project and/or measures envisaged in order to avoid, prevent or reduce and, if possible, offset likely significant adverse effects on the environment;

(d) a description of the reasonable alternatives studied by the developer, which are relevant to the project and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the project on the environment;

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

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

The 2014 EIA Directive required that *"Member States shall bring into force the laws, regulations and administrative provisions necessary to comply with this Directive by 16 May 2017."*

The requirement for the current rEIAR arises as a result of grant of leave for substitute consent under the Planning and Development Act, 2000 as amended [P&D Act]. Therefore the competent authority undertaking EIA is An Bord Pleanála.

1.2.2 Statutory Provisions

As stated above the requirement for the current rEIAR arises as a result of grant of leave for substitute consent under the Planning and Development Act, 2000 as amended [P&D Act]. Therefore the planning and development statutes and related policy and guidance are relied upon to contextualise and define this report.

The report of the assessment of environmental effects to be prepared and submitted by a developer is referred to as an Environmental Impact statement [EIS] in the current planning and development statutes pending the full transposition of the 2014 EIA Directive.

In this instance the development to which this report refers is that which has been already undertaken and thus this report is of experienced effects hence its definition as a *remedial* report.

The P&D Act defines an rEIS to be submitted in instances of substitute consent application at S.177F(1) as follows;
"A remedial environmental impact statement shall contain the following:
(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".

Regulations have been made to administer EIA. For the purposes of this rEIAR and the statutes under which the requirement for its preparation has arisen the following Statutory Instruments are relevant and have informed this report:
European Communities (Environmental Impact Assessment) Regulations, as amended (1989-2006)
Planning and Development Regulations, 2001 – 2015

1.2.3 Guidance

Under the P&D Act the minister may make regulations and issue guidance. Summarily, Sections 28 and 29 of the P&D Act require that planning authorities and An Bord Pleanála have regard to guidelines and comply with policy directives, respectively in the performance of their functions.

In addition, the minister may issue clarifications of certain procedural matters in the form of Circulars to planning authorities. **Circular PL1/2017** 15th May 2017 issued by the minister for Housing, Planning Community & Local Government [HPC&LG] is entitled *"Implementation of Directive 2014/52/EU on the effects of certain public and private projects on the environment (EIA Directive)".* This Circular advice to "*consider*" assessing planning applications with the 2014 EIA Directive requirements under from 16 May 2017.

Whilst the determination for the requirement for EIA and NIS was made in the orders granting leave for subsite consent in this instance, the applications arising are made subsequent to 16th May 2017 and thus they will "*…fall to be dealt with in accordance with Directive 2014/52/EU."*

Thus in deference to the required transposition of the 2014 EIA Directive into Irish Law and advices from the minister in Circular 01/2017 the rEIS required by the granting of leave for substitute consent orders that his report accompanies is prepared as an EIAR in accordance with the provisions of the 2014 EIA directive and more particularly article 5 and Annex IV of that Directive.

The structure and content of this rEIAR is in accordance with the following guidance:

Guidelines issued by the Housing, Planning Community & Local Government Department

- 2013 March *Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment,* Department of the Environment, Community and Local Government
- 2012 July *Section 261A of Planning and Development Act, 2000 and related provisions Supplementary Guidelines for Planning Authorities,* Department of the Environment, Community and Local Government
- 2012 January *Section 261A of Planning and Development Act, 2000 and related provisions Guidelines for Planning Authorities,* Department of the Environment, Community and Local Government
- 2009 December (revision February 2010) Appropriate Assessment of Plans and Projects in Ireland**,** Department of Environment, Heritage and Local Government
- 2009 November The Planning System and Flood Risk Management G*uidelines for Planning Authorities,* Department of Environment, Heritage and Local Government
- 2004 April *Quarries and Ancillary Activities Guidelines for Planning Authorities*, Department of the Environment, Heritage and Local Government

Guidance issued by the Environmental Protection Agency [EPA]

- August 2017 *DRAFT Guidelines on the Information to be Contained in Environmental Impact Assessment Reports* [Draft 2017 EPA Guidance which updated that Draft Guidance of May 2017]
- September 2015 *DRAFT Revised Guidelines on the Information to be Contained in Environmental Impact Statements*
- September 2015 *DRAFT Advice Notes For Preparing Environmental Impact Statements*
- 2006 *Environmental Management Guidelines, Environmental Management in the Extractive Industry (Non-Scheduled Minerals)*
- 2003 September *Advice Notes On Current Practice In The Preparation Of Environmental Impact Statements*
- 2002 March *Guidelines On The Information To Be Contained In Environmental Impact Statements*

1.2.4 Purpose & Content of rEIAR

Taking the definition of an rEIS as in the Planning & Development Act 200, as amended together with that by reference to Articles 3 and 5 of the 2014 EIA Directive this rEIAR is:

A remedial environmental impact assessment report of the direct and indirect 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. The report is prepared to aid An Bord Pleanála in environmental impact assessment.

In addition to the aforementioned Directives, statutory provisions and guidance the contents of this rEIAR including baseline data, then anticipated potential environmental effects and mitigation measures have been fully informed by preceding and subsequent planning and license applications and outcomes related to the subject lands.

The rEIAR has been prepared in a 'Grouped Format' structure having regard to the prescribed environmental factors of the EIA Directive and the 2017 EPA Guidance; "*Population and Human Health; Biodiversity, Land & Soils, Water, Air, Climate,*

Material Assets, Cultural Heritage, Landscape, Interactions."

In this way each aspect of the environment is presented as a separate section referring to the environment as it existed before development commenced, the existing development, experienced and / or likely impacts, and employed / proposed mitigation measures.

The rEIAR has therefore been systematically organised to provide the following Information:

Section 1 Context and Requirement for rEIAR	1.0 Introduction
Section 2 A description of the existing environment.	2.0 Description of the Site & Receiving Environment
Section 3 A description of the project.	3.0 Description of the Project
Sections 4 to 13 Identification of experienced / likely significant impacts during construction and operation of the development and a description of the measures employed / envisaged in order to avoid, reduce and, if possible, remedy significant adverse impacts.	4.0 Population & Human Health 5.0 Biodiversity 6.0 Land, Soils & Geology 7.0 Water & Hydrogeology 8.0 Air & Climate 9.0 Noise 10.0 Material Assets & Traffic 11.0 Cultural Heritage 12.0 Landscape
Section 14 Sets down the cumulative and in combination significant effects of the project and considers expected / experienced effects deriving from the vulnerability of the project to risks of major accidents and/or disasters that are relevant to the project concerned.	13.0 Interactions

Table 1.1 Summary Information contained within an EIAR & Chapter Headings of this rEIAR

Alternatives are examined by reference to locations, designs and processes, as appropriate.

Likely and significant impacts arising from the existence of the development, its use of natural resources, the emission of pollutants and, the creation of nuisances are identified, described as direct, indirect, secondary, cumulative; by duration short, medium and long-term, permanent and temporary; and by type positive and negative, as appropriate.

1.3 Summary description of development the subject of rEIAR

The lands the subject of this rEIAR [the subject site] extend to approximately 81 ha. at the centre of a landholding in the control of the applicant of under 170 ha. The subject site occurs in 2 no. land units named after the townlands within which they occur consisting of generally excavated land described in this rEIAR as; *Clonmelsh* to the north (54 ha.) that includes the plant area and *Garyhundon* to the south (27 ha.).

The purpose of the rEIAR is to support two applications for substitute consent for a quarry and a plant area, both already in existence thus development here considered is retrospective.

In summary **the extant plant area the subject of the substitute consent application consists of:**

A plant area over about 3.22 ha. containing; Readymix concrete batching plant (110 sqm) & shed (1,224 sqm); Mobile canteen (container) (27 sqm); Demountable Readymix concrete plant (219 sqm); Shipping Office (103 sqm) Container 1 (storage) (14.5 sqm); Container 2 (mobile office) (29 sqm); Weighbridge (53 sqm) originally permitted under Reg. Ref. 2981; Demountable asphalt production plant (Amman) (847 sqm) the subject of APL10/01 & control room (66.5 sqm); ESB Substation (50.6 sqm); Bunded fuel tanks (168 sqm) & Pumphouse (34.56 sqm); and Workshop (180 sqm). The development also holds supporting infrastructure consisting of; entrance onto the L3050 and water management system including septic

tank; water holding tanks; well; settlement pond; discharge license DL7/233 and ancillary site works including aggregate and precast, concrete and cold asphalt product storage areas.

In summary **the extant quarry area the subject of the substitute consent application consists of:**

a quarry over two areas; 51 ha. in Clonmelsh to an average depth of approximately 25AOD and 27 ha. in Garyhundon to an average depth of approximately 57AOD. The development also holds supporting infrastructure consisting of; existing entrance to the L3045 at Garyhundon permitted under Reg. Ref. 2979; asphalt plant permitted under Reg. Ref. 92/137; 2 no. aggregate processing plants permitted under Reg. Refs. 76/3642 and 76/3842. Ancillary site development includes; water management system consisting of settlement ponds, mobile pump and underground pipeline crossing associated plant area at Garyhundon, mobile aggregate processing plant, storage containers and haul routes.

The two substitute consent application areas in pure volumetric terms at approx. 3.22 ha. for the plant area and 51 and 27 ha. for the quarry area together at 81.22 ha. slightly exceed the stated 81 ha. measurement for the rEIAR area for reason of part of the quarry infrastructure (water drainage pipe) crossing the plant area.

1.3.1 Development of Subject Site from Baseline to Current Time

Section 3.6.1 of the 2017 Draft EPA EIAR Guidance states that together: the description of the project *"...the description of the baseline scenario is the second of the two factual foundations of the EIAR."*

In this instance an rEIAR is presented and thus relates to development already undertaken. For this reason the base*line scenario* required to be described has passed.

In deference to the requirement for Environmental Impact Assessment arising since the 1st February 1990 we have set the baseline of this rEIS at that appointed day.

The reader is minded that extraction of the subject lands evidenced in previously submitted registration and application material to have begun in the 1947.

In order to retrospectively build a narrative of the development of the subject lands over their extraction life time we have reviewed and primarily rely upon publicly available resources; historic mapping and photography; permitting and licensing histories; and historic monitoring records.

1.4 Limitations & Difficulties in Compiling the Specified Information (Schedule 6 of SI 600 of 2001, as amended)

Limitations and difficulties encountered in preparing this rEIAR having regard to the Planning and Development Regulations and Section 3.7.2 of the 2017 EPA Guidelines relate to the lack of monitoring and survey data from the period that the subject lands were excavated and material processed. The Receiver has allowed full access to all records held by DMIL, including access to personal computers on site and at head office.

Historic planning application and license files were inspected. Notwithstanding, consistent topographical survey and monitoring data for the subject lands from years preceding about 2002 does not exist.

All operations on the subject site and associated plant were suspended upon the appointment of the receivers in June 2016. Within 24 hours, the company entered examinership which reinstated operations. By August 1st the examinership was discharged and the receivers reinstated whereupon operations at the subject site were again suspended. Within 30 days the subject lands quarrying and processing activities had been reinstated upon the granting of license to operate to Plazamont Ltd. Plazamont Ltd. at this time continue to operate the subject lands for the purposes of quarrying and processing of aggregate.

The licensee is required to operate the subject lands in compliance with all planning permission, licenses and permits and therefore monitoring data for the license period and access to the site for the purposes of the preparation of this rEIAR has been possible.

In this instance the subject lands and processing plant have variously been the subject of, or part of previous planning applications, an EIS and NIS which themselves contain monitoring, impact and mitigation analyses which are relied upon to discern the environmental impact of development on the subject lands before, during and after their extraction phases.

Notwithstanding that parts of the subject lands and processes thereon, including extraction operate without planning permission there exists historic grants of planning permission and licenses that together have allowed for a compilation of emission thresholds. Throughout this rEIAR, monitoring and survey data and analysis, previously submitted in earlier planning applications, or monitoring records held by DMIL the 'developer' for the purposes of this rEIAR and the company in receivership are relied upon to model the subject site throughout its lifetime and discern impacts on the environment of the subject site.

1.5 rEIAR Contributors

In the interests of consistency and the leveraging of existing specialist knowledge of the subject site, competent experts have been retained to compile and review this rEIAR. Wherever possible and practicable those experts were drawn from the extant group of earlier EIS or have been retained by DMIL for site protection and investigation works.

Aspect of the Environment	rEIS Specialist Contributors
1. Introduction	Property Resource Planning Management & Development
2. Description of the Site & Receiving Environment	Property Resource Planning Management & Development & All
3. Description of Development	Property Resource Planning Management & Development
4. Population & Human Health	Property Resource Planning Management & Development & All
5. Biodiversity	Golder & Associates
6. Land, Soils & Geology	Golder & Associates
7. Water & Hydrogeology	Golder & Associates
8. Air & Climate	Golder & Associates
9. Noise	Golder & Associates
10. Material Assets & Traffic	Property Resource Planning Management & Development & PCME
11. Cultural Heritage	Stephenson Halliday
12. Landscape (& Visual Assessment)	John Purcell
13. Interactions	All (considered throughout & incorporated into rEIAR – sections 4 to 12)

Table 1.2 Specialist Contributors

1.6 The Applicant/Developer

The developer for the purposes of this rEIAR and applicant for the purposes of substitute consent is Dan Morrisey Ireland Ltd. (In Receivership). Mr. Paul McCann & Mr. Stephen Tennant of Grant Thornton, 24-26 City Quay, Dublin 2 receivers of the entire assets and undertakings of Dan Morrissey (Irl) Limited [DMIL] appointed by Allied Irish Banks plc by deed of appointment dated the 18th June 2014.

DMIL operated a number of quarries and related activities in County Carlow and surrounding counties with the lands the subject of this rEIAR being their inaugural site, continually in DMIL, or predecessors, ownership and operation since 1947.

This quarry and associated plant was the largest of the DMIL operational sites and the most sophisticated having regard to the range of construction products being produced on the site; asphalt, concrete, blocks, tiles, pre-cast products and derivatives.

The Receivers recognise the importance of this quarry unit with processing capabilities to DMIL and as an employer to the county. The Receivers are is responsible for recovering the best possible value for the subject site and as such is cognisant of the goodwill and local market share achieved by DMIL and the absolute necessity of securing the status of the subject site and associated lands as a quarry and processing facility albeit one which at this time and since coming into Receivership operating at minimal levels of production commensurate with the downturn in construction witnessed over the last 10 years.

The receivers recognise their responsibility to establish and maintain the planning compliant status of the quarry and processing complex and to that end in July 2015 sought application for leave for substitute consent for the lands, granted in April 2017 (ref. LS.0019). The Receivers have instructed that this remedial EIAR be prepared and submitted to support applications for substitute consent in the interests of securing planning compliance of the subject lands and aiding in the setting down of a clear and ordered monitoring schedule for the lands that any operator will be required to adhere.

As stated at section 1.3. the Receivers have had full access to the subject site, offices and records, including access to former employees of DMIL in order to perform their duties, including the preparation of this rEIAR.

1.7 The Need for the Development and Consideration of Alternatives

1.7.1 Introduction

The sand & gravel and limestone rock reserve at the subject location, as evidenced by their long term presence, is of a proven good quality capable of being used as aggregate fill and for further processing to concrete and asphalt products. Therefore, the material assumed to be present at the subject site and now extracted provided suitable aggregates for construction purposes. In addition it necessary provided a supply to the existing plant at Clonmelsh.

As with all aggregate development the nearer the supply of aggregate to the market the more economically viable it is and given the nature of aggregate deposits, quarries can only be worked where the sediments occur. Aligned to this economic situation is the environmental and social preferability of locally sourced aggregates. Aggregates sourced close to their market is preferable to that sourced at more remote locations as it lessens road traffic and associated environmental impacts and economic costs. Socially, the local sourcing of construction aggregate strengthens the local economy through job provision and associated spending and exploits advantages and opportunities inherent in local supply chains.

Aggregates are an essential material for the construction industry and are used in all major development plans (housing, road surfacing, infrastructure etc). As such, they are of major significance to the overall growth of the county and an important economic resource despite the current low levels of construction confined to agricultural and domestic construction works in the main with some committed infrastructural and maintenance works.

The purpose of this rEIAR is to assess the site with regard to experienced / potential impacts on the environment, and to recount / propose measures to avoid, reduce or remedy undesirable potential impacts, as appropriate.

In this case, the subject site is part of an asset of a company that is in Receivership. The aim of the receivership process is to maintain and realise the value of this asset which only lies in maintaining the subject site and associated lands status as a quarry notwithstanding that remaining reserve extraction will be contingent on a greater improvement in the construction market that has begun to occur. This outlook is also contingent on further planning permission to secure future reserve especially as the substitute consent process is restricted to extant development. The reader is minded that concurrent applicaiton with EIAR and NIS will be submitted for lands to the immediate south of the Clonmelsh rEIAR unit

in order to secure the quarry land use and future reserve.

Maintaining the subject site and adjacent lands as a viable quarry with associated processing plants will ultimately realise the sustainable extraction potential of the subject lands and maintain those jobs which existed at the time of administration (2014) when the reduced demand for aggregate and aggregate products had already seen a reduction in the number of direct jobs.

1.7.2 Site Selection

In this instance the rEIAR has arisen as a direct requirement of an application for leave for substitute consent. In other words, the subject site is not a proposed site but rather an existing extraction and processing site. In view of the retrospective nature of the substitute consent process we cannot point to a site selection methodology employed in choosing the subject site. As such site selection is outside the control of the developer having originated from the purchase of extant quarry land in the 1940s and 1950s and the expansion of same to today

The existence of the established quarry and processing complex suggests that the persistent, continuous use of the subject lands for a quarry was more feasible, in environmental and economic impact terms, than developing a new greenfield quarry.

1.7.3 Alternative Designs Considered at the Subject Site

In common with the Site Selection methodology alternative design proposals are precluded due to the retrospective nature of the rEIAR. A review of historic aerial photography suggests that the subject lands were extracted in a north to south direction and we know from survey data that the depth of extraction is to approximately two benches in Clonmelsh and west to east to a depth of 5m at Garyhundon. It is assumed that the direction of extraction workings was dictated by the proximity of processing and direction of deposit. As such, the subject site now has an established form and layout and the sole proposal contained within this rEIAR is the restoration of this area to have regard to EIA requirement for mitigation of foreseeable impacts.

2.0 DESCRIPTION OF THE SITE AND THE RECEIVING ENVIRONMENT

This Remedial Environmental Impact Assessment Report [rEIAR] has been prepared to accompany a pair of concurrent substitute consent applications for consent for an existing quarry and associated plant.

The extraction lands the subject of this rEIAR [the subject lands] extend to approximately 81 ha. at the centre of this landholding. The subject lands occur in 2 no. land units described in this rEIAR as *Clonmelsh* (55 ha.) to the north and *Garyhundon* (27 ha.) to the south after the townlands within which they occur.

The pair of substitute consent applications that this rEIAR supports consists of; A plant area over about 3.22 ha. at *Clonmelsh* (AP Ref. SH 01.SH.0236) and a quarry (ABP ref. 01.SH0.235) over two areas; 51 ha. in *Clonmelsh* to an average depth of approximately 25AOD and 27 ha. in *Garyhundon* to an average depth of approximately 57AOD.

2.1 Location of Subject Site

The townlands of Clonmelsh and Garyhundon are located within the Electoral Division of Nurney, Co. Carlow alongside 13 no. other townlands.

The site the subject of this rEIAR is centrally located at ITM and 52°46'19.5"N 6°56'01.7"W approximately 7km directly south of the centre of Carlow town and a little over a kilometre north west of junction 6 of the M9. See Figure 2.1.

2.2 Site Context & Landscape Character

The Clonmelsh lands the subject of this rEIAR are roughly rectangular in shape with a south to north orientation. The lands are bounded by public roads on their northern (L3050), western (L3044) and eastern (L3045) boundaries and open agricultural lands to the south. The lands to the south are currently under crop but are part of the ownership of DMIL and are the subject of the next phase of planned extraction. The Clonmelsh land unit contains the processing plant area in its north western quadrant where the main entrance to the quarry is centrally located on this boundary onto the L3050. It is though this entrance that all traffic generated on the entire of the rEIAR lands use to access the public road network.

The larger and deeper of the excavations (54 ha.) the subject of this rEIAR is located in Clonmelsh townland and is the overriding, persistent landscape feature of that townland since the 1940s now at a depth of 25 AOD. Review of historic mapping indicate that the lands were under grass prior to their extraction.

The smaller of the excavations (27 ha.) the subject of this rEIAR is located in Garyhundon townland and consists of a sand and gravel pit to a depth of about 57 AOD. This site does not hold permanent plant but relies on the Clonmelsh plant area for the processing and on selling of product recovered at this location transported through the centrally located entrance onto the L3045. In common with the Clonmelsh land unit Garyhundon pit is a persistent feature of the landscape since the 1940s.

Both Clonmelsh and Garyhundon extraction areas have been continuously commercially worked since the 1940s and 1950s respectively.

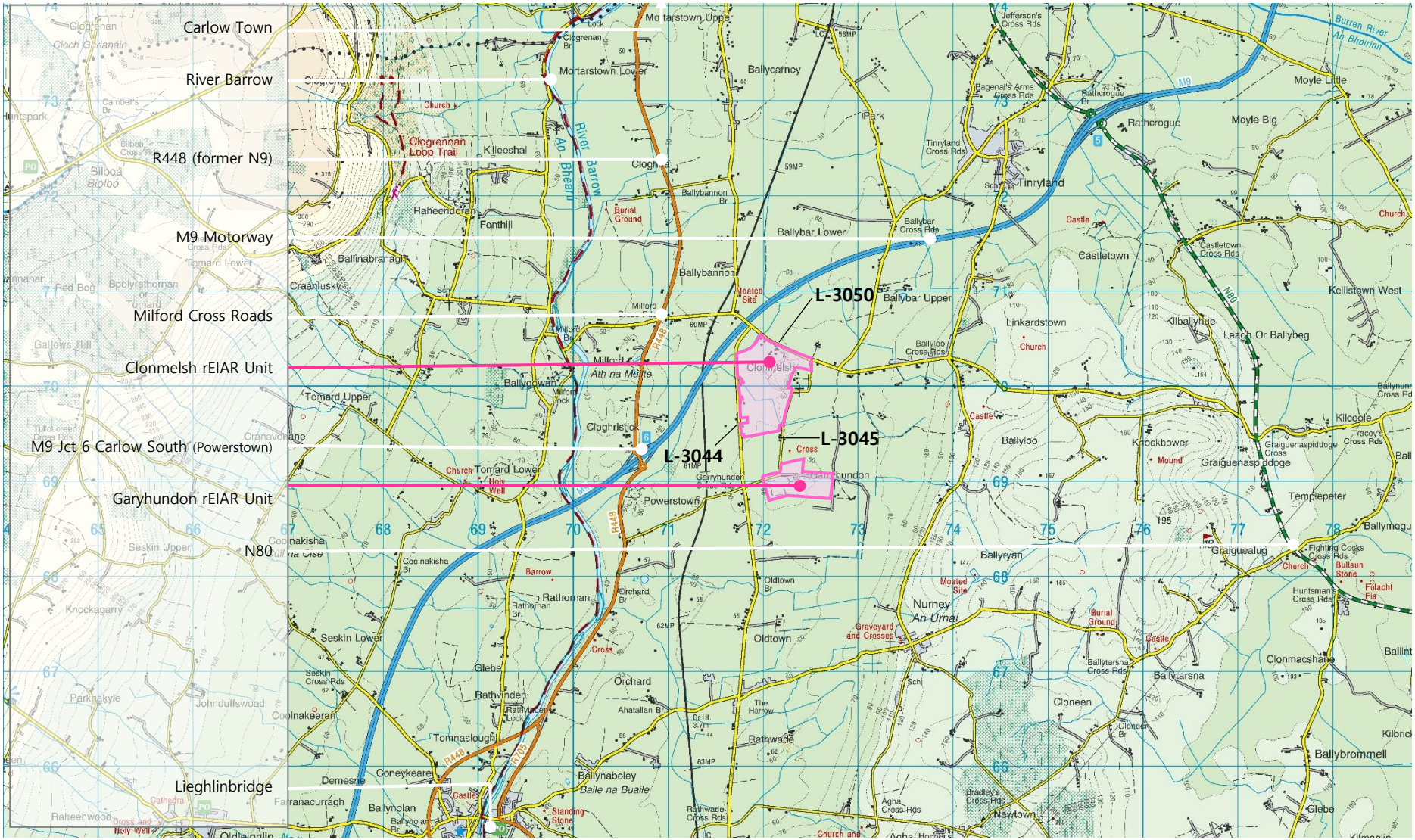
The lands surrounding the rEIAR site are largely agricultural either grassland or arable and dispersed roadside ribbon development housing is evident. In the immediate vicinity of the subject site. Notable non-agricultural land uses consist of further sand and gravel pits and quarries; 2 no. pits within DMIL control at Powerstown, an extraction and processing site operated by Kilcarrig Quarries at Powerstown and a municipal landfill at Powerstown.

It is noted that the subject site is proximate to a motorway (the M9) about 1km north west of the site and running alongside its western boundary and the Dublin-Waterford rail line to the west of the Motorway. The aggregate and

aggregate product produced at the rEIAR site are transported by road only. The evolution of transport infrastructure around the site and in the vicinity is set out in the traffic section of this rEIAR at Chapter 10. The transformation of the landscape of the subject site as extraction progressed from the EIA appointed year (baseline) of 1990 is set out in the Landscape and Visual Impact Assessment at Chapter 13 of this rEIAR.

Having regard to the objective of the rEIAR at Chapter 1 and its role to support applications for substitute consent set out below is a summary description of the lands the subject of this rEIAR (subject site) at the current time and at baseline in 1990.

Figure 2.1 Site Location Map (On Discovery Series Tile OS2616_D) Ordnance Survey Ireland Licence No. EN0086117 © Ordnance Survey Ireland / Government of Ireland



2.3 Development of Subject Site from Baseline to Current Time

Section 3.6.1 of the 2017 Draft EPA EIAR Guidance states that together: the description of the project *"...the description of the baseline scenario is the second of the two factual foundations of the EIAR."*

In this instance an rEIAR is presented and thus relates to development already undertaken. For this reason the base*line scenario* required to be described has passed.

In deference to the requirement for Environmental Impact Assessment arising since the 1st February 1990 we have set the baseline of this rEIAR at that appointed day. For this reason the drawings submitted in support of the substitute consent identify the site as it existed circa 1990 and today.

The reader is minded that extraction of the subject lands evidenced in previously submitted registration and application material to have begun in the 1947.

2.3.1 Sources of Information & Methodology

In order to retrospectively build a narrative of the development of the subject lands over their extraction lifetime we have reviewed and primarily rely upon publicly available resources; historic mapping and photography; permitting and licensing histories; and historic monitoring records.

Information submitted in previous planning applications on lands associated with the subject site; in particular we rely on an EIS prepared in 2010 for the continuation and extension of the extraction operations over the subject lands and contiguous lands under the control of DMIL (Reg. Ref. CCC Reg. Ref. 10/130 & ABP PL01.238679). An application for retention and permission for items in an area nearly contemporaneous with that now presented as the substitute consent application site area from 2012 was also relied upon (Reg. Ref. 12/240 & ABP PL01.242648).

The planning and related licensing history of the subject site and the surrounding quarry complex is imperative to an

understand the evolution of the quarry complex and the subject site and allows for the identification of the actual or likely year that a particular item of plant was erected on site. (See table 2.1)

Environmental Monitoring records available in the offices of DMIL and undertaken by the licensee to be submitted to the local authority. It is of note that the interval for which environmental monitoring was carried out and reported regularly for the quarry unit was from 2008 to 2010 and 2014 to 2017. Various contributors have we extrapolated these results, relative to the level and location of extraction and processing to assesses the retrospective impact of development.

Information including, maps, raster data and aerial photography in respect of ground levels, ground cover and development available from Ordnance Survey Ireland [OSI]. OSI data updates for the subject site is scant for reason of the area in which it sits being remote from an urban area and therefore was not subject to regular update).

Site surveys submitted with previous planning applications updated by topographical surveys commissioned by the Licensee.

A review of historic OSI ortho photographs is possible back to 1995 which is fairly contemporaneous with baseline year and indicates that the subject lands were being quarried by at that time. Although these are orthophotographs only an approximation of depth from these sources is possible (see figure 1.2).

The subject lands are in a rural area and was first mapped by the Ordnance Survey in 1906 and levelled in 1940 on their 25" series of maps. We have purchased this historic map and present it as figure 1.3. In order to supply credible baseline data we have purchased the 1995 and 2010 aerial photography for the subject lands. Contemporaneous baseline ordnance survey mapping data was not available i.e. there was no updates or levelling of surveys of the area in the 1990s and the latest georeferenced OSI mapping available is from 2011 and 2015 which coincide with detailed contemporaneous extraction and production data for the lands as submitted in the accompanying substitute consent applications and this

rEIAR.

As such, the underlying ordnance survey map data submitted as part of the substitute consent application to represent the baseline is the original 6" historic map surveyed in 1906 and levelled in 1940 with an estimation, from orthophotograph from 1995, of the extant of void and plant at 1990. The current site layout representing the site levels today is a copy of an up to date site survey set into OSI georeferenced basemap.

Table 2.1 Summary of planning & licensing history of the subject lands

Reference [1] CCC Carlow County Council ABP An Bord Pleanála	Development	Submission Date	Decision Date
CCC Reg. Ref. 1509	Install portable plant for washing chippings at Clonmelsh	02 January 1970	09 March 1970 (grant)
CCC Reg. Ref. 2981	Erection of 60 tonne weighbridge at Clonmelsh	21 January 1974	13 February 1974 (grant)
CCC Reg. Ref. 2979	Erection of gate entrance at Garyhundon	21 January 1974	13 February 1974 (grant)
CCC Reg. Ref. 3842	Extension of Plant at Clonmelsh	12 April 1976	02 June 1976 (grant order)
CCC Reg. Ref. 92/137	Construction of asphalt plant at Clonmelsh	21 April 1992	17 July 1992 (grant)
CCC QY/25	Section 261 Registration of 323 ha. site area and extraction area of 85 ha.	27 April 2005	26 April 2006 (planning application & EIS required)
CCC DL7/233 & **ABP** 01.WW.0371	Discharge License	04 October 2007	25 June 2008 (grant) & 05 June 2009 (amend condition no. 4.8)
CCC APL 10/01 & **ABP** 01.LA.0085	Air Pollution License	29 January 2010	13 July 2010 (grant) & 25 February 2011 (amend conditions)
CCC Reg. Ref. 10/130 & **ABP** PL01.238679	*"…continued use and development of the quarry (extraction area 123.8 hectares) within an application area of 167.2 hectares. The proposed quarry floor level will be at –75 mOD. This application is submitted in accordance with the requirements of Section 261 of the Planning & Development Act, 2000 (Quarry Ref. No. 25)."*	28 April 2010	23 February 2011 (notification of grant) 27 May 2013 (appeal refusal)
CCC QY12/25	Section 261A review of S.261 map noted a boundary of 316.29 ha.	n/a	23 August 2012 (no further action)
CCC Reg. Ref. 12/240 & **ABP** PL01.242648	Retention of certain processing plant and buildings and permission for replacement for new offices and wastewater treatment system.	22 October 2012	14 October 2013 (notification of grant) 17 November 2014 (appeal refusal)
CCC SEC5/13/13	the quarry and quarrying use of lands comprising registry folios CW2075F (part) in the townlands of Clonmelsh, Powerstown, and CW6086F in the townland of Garyhundon, Powerstown is exempted development. Sought by DMIL	05 July 2013	01 August 2013
CCC SEC5/13/16 & **ABP** RL01.3149	related to quarrying activity taking place on land comprising folio CW2075F in the townlands of Clonmelsh, Powerstown, County Carlow (the "CW2075F lands"). This declaration raised eight specific questions which Garyhundon Residents Association requested the Council to determine.	09 August 2013	04 September 2013 & 15th January 2015
CCC SEC5/13/17 & **ABP** RL01.3148	related 8 queries in relation to quarrying activity taking place on land comprising land registry folio CW6086F in the townland of Garyhundon, Powerstown, County Carlow (the "CW6086F lands"). Also by Garyhundon Residents Association.	09 August 2013	04 September 2013 & 15th January 2015
ABP LS01.LS0019	Application for leave for substitute consent in respect of a quarry of 81 hectares (ha.) in extent over two benches to a depth of 25aOD located on lands at Clonmelsh and Garyhundon, Co. Carlow. Leave to apply for substitute consent is also sought for the associated plant located within the 81ha quarry site occupying comprised of: weighbridge office and welfare facilities contained in an existing portacabin (109m2), an ESB substation (50.6m2), bunded fuel tanks and pumphouse (202.2m2), workshop (180.3m2), a demountable asphalt production plant (84.7m2), a demountable readymix plant (219m2), concrete batching plant (110m2) and associated precast product shed (1244m2) and an existing septic tank.	06 July 2015	07 April 2017 (grant of leave for plant area 01.LS.0019 & grant of leave for quarry area 01.LQ.001)

NOTE 1: Reg. Ref. = Planning Application Register Reference Number under Planning & Development Acts
SEC = Section 5 Declaration under Planning and Development Act, 2000 as amended
LS = Leave for substitute consent application under Planning & Development Act, 2000 as amended
DL = Discharge License under Water Pollution Acts, 1977 - 2007
APL = Air Pollution License under Air Pollution Act 1987

2.3.2 Site Development Progression

Taking the information above together; we can collate as comprehensive as possible set of facts occurrences on or around the site, including depth and extent of extraction that allows for the estimation of rate of extraction and likely traffic flows generated over the lifetime of the development.

In order to present this information at a single location we have complied Appendix 2.1 that sets out a master table of the principal occurrences on an around the subject site. This master table sets down the planning and licensing history of the site, the depths and extents of extraction to generate likely extraction and traffic rates in order to build a profile of the development subject site over its lifetime.

Information presented in the master table at Appendix 2.1 is here set out to describe principal events at the subject site.

2.4 Description of Subject Site

Appendix 2.1 sets down key events, extraction rates and traffic generation of for the subject site. The table at Appendix 2.1 also sets down a timeline in order to present the progression of the subject site in a coherent order. Here we have identified the start of operations as 1947 through to 2017. Whilst substitute consent cannot seek permission for any future development we have projected expected extraction and demand to 2021 in order that mitigation measures could be identified to accord with the requirements of EIA and allow for the identification of mitigation measures to ameliorate anticipated effects.

In the intervening years and the context of the requirement for EIA February 1990 is identified as a key event year for reason of that being the appointed time from which EIS (now EIARs) have been required. 1997 is similarly identified as the appointed year for the performance of AA. this rEIAR is accompanied by a rNIS.

In order to provide a description of the subject site and development over the identified timeline internals between the key dates above have been chosen in order that intervals are at no more than 10. No. years.

2.3.1 Site & Development Key Occurrences

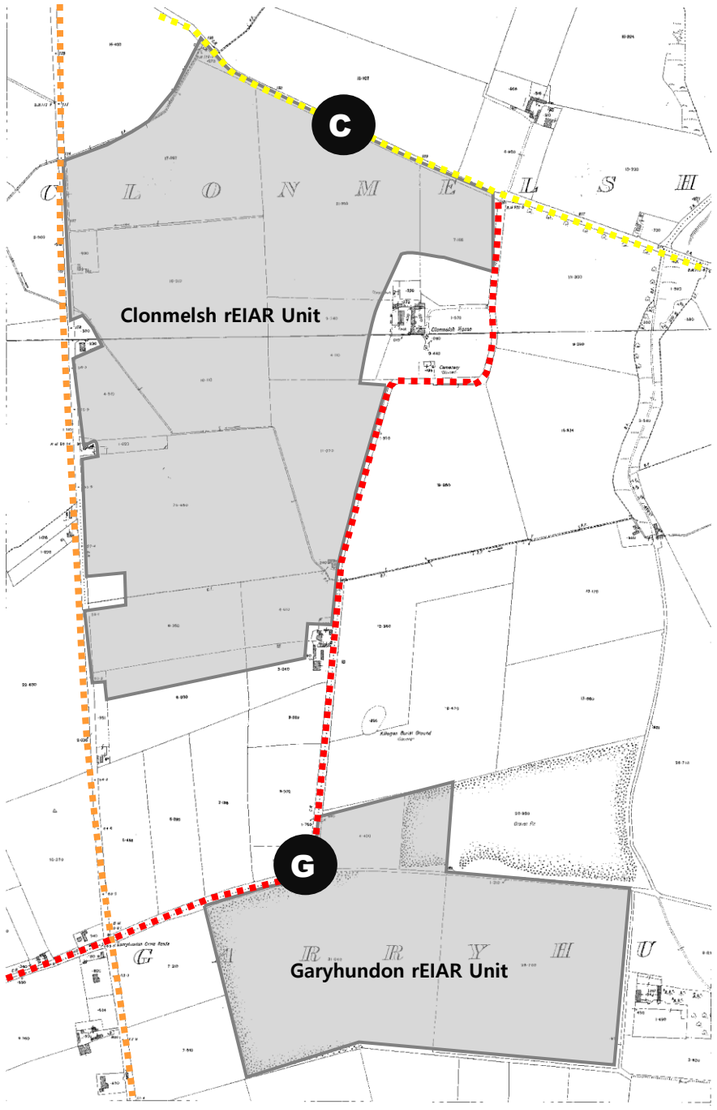
Table 2.2 extracts the principal events from the master table at Appendix 2.1. The key events identified to have taken place on the subject site are here joined by the principal projects in the vicinity of the site in order to allow for a description of the development of the site context.

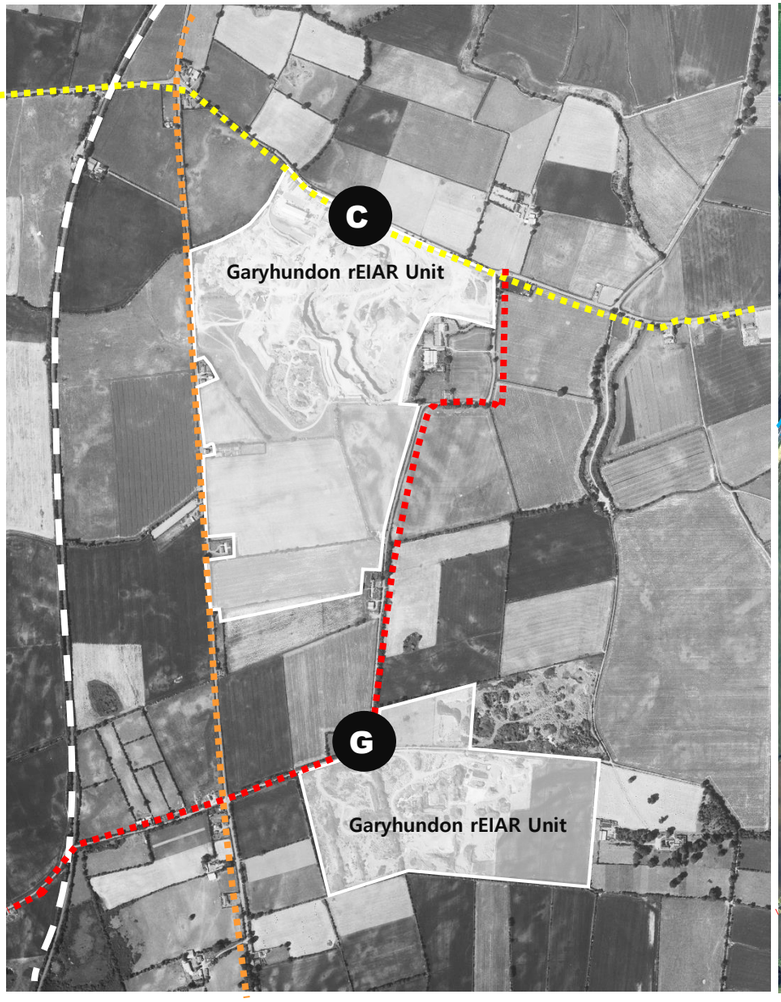
Having regard to the EIAR requirement to assesses in-combination and cumulative effects we have similarly tracked significant projects in the area and their permitting timelines and, where possible, reviewed the information submitted with those applications, their considerations and decisions to further aid in building a profile of the development subject site over its lifetime.

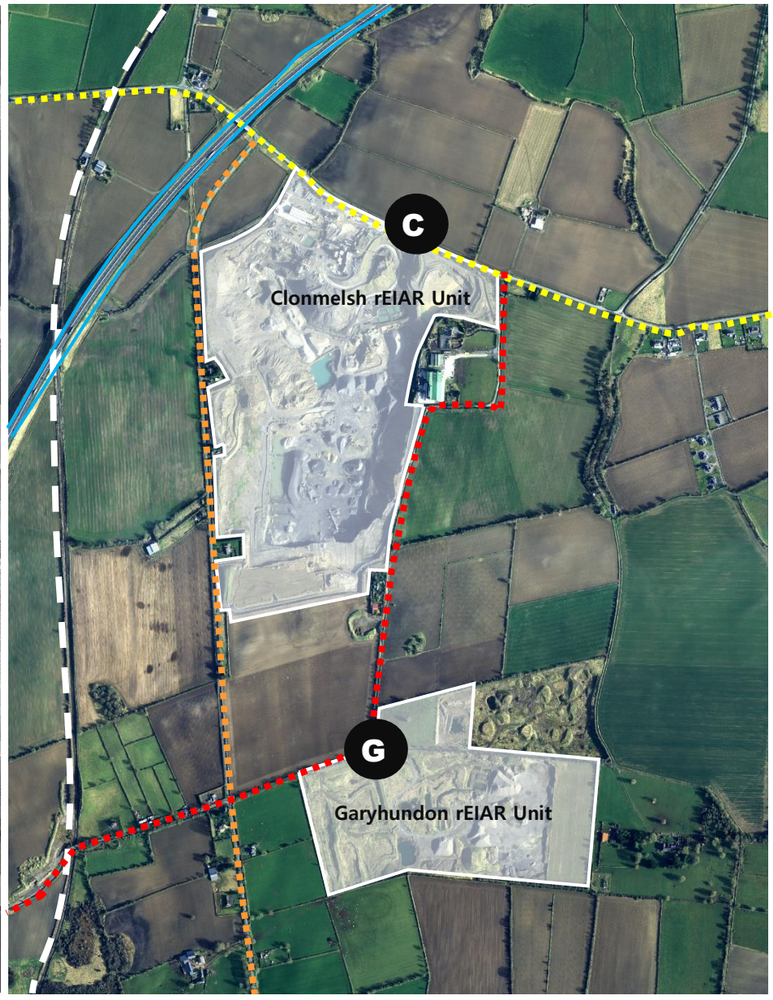
Table 2.2 Summary of key events on subject site and surrounding lands.

TIME		EVENTS	
YEAR	EVENT YEAR	rEIAR SITE EVENT	PRINCIPAL PROJECTS
1947	1947	Extraction began	[1] Extraction in Clonmelsh declared to be began circa. 1945 [2] stated extraction commencement year 1947
to 1955	1955		[1] Sand & gravel extraction began in Garyhundon by the Conran family
	1963		Dan Morrissey (DMIL) purchase of Garyhundon pit from Corcorans
to 1964			
	1963 Jan.		Milford Station closed to passengers & goods. station closed (opened 24.07.1848)
	1964 Oct.		Local Government (Planning and Development) Act, 1963 commencement
	1967		[1] Clonmelsh lands purchased by Dan Morrissey (DMIL) from a Mrs. Kelly
	1970 after Mar.	Chip washing plant installed at Clonmelsh Reg. Ref. 1509	
to 1973			
	1974 after Feb.	Weighbridge at Clonmelsh Reg. Ref. 2981	
	1974 after Feb.	Entrance gate at Garyhundon Reg. Ref. 2979	
	1975		Powerstown landfill began operations. Became known as 'Phase 1' (the 'old landfill')
	1976 Jun.		Closure of Carlow Rail station to Goods (except cement & fertilizer) (originally opened 1848).
	1976 after Jun.	Extension of processing plant at Clonmelsh Reg. Ref. 3842	
to 1982			
to 1990	1990		Powerstown landfill 'Phase 1' ceased ("*an unlined landfill which was developed in a spent sand and gravel quarry and operated as a 'dilute and disperse' type landfill. It has an area of approximately 3.7 hectares (9.2 acres) and contains an estimated 130,000 tonnes of municipal solid waste (MSW)*)". [3]
	1991		'Phase 2 of landfill continued *"Phase 2 of the landfill is located within the north western portion of the site. It has an area of approximately 4.5 hectares and consists of 13 no engineered landfill cells. Cells 1 -13 were constructed over a number of years"* [1991-2006]. [3]
	1992 after July	Asphalt plant at Clonmelsh	
to 1997			
	2000 Mar		Waste license granted to Powerstown landfill for 40,000 tonnes p.a. under ref. No. 25/1
	2004 Jan.		Extension of existing landfill at Powerstown for 6 years (236m^3) into an area of 13.5 ha. in addition to extant total 10.4 ha. (total capacity 315,000 tonnes with annual intake of 27,000 tonnes p.a., 60,000 tonnes capacity remaining approved with modifications under PL01.EL2020
	2004 Jun.		N9/N10 Kilcullen to Waterford Scheme-Kilcullen to Powerstown approved with modifications under PL09.ER2027
	2004 April		Planning and Development Act, 2000 as amended (commencement of S.261)
	2005 April		Powerstown landfill granted revised waste license Reg. No. W0025-02
	2005 April	Section 261 Registration of 323 ha. site area and extraction area of 85 ha. Ref. QY/25	
	2006 April	Section 261 requirement for continuation of application & EIS Ref. QY/25	
	2006		Powerstown landfill 'Phase 1' capping complete (in accordance with waste license) 'Phase 2' of landfill ceased 'Phase 3' of landfill making of cells 15 – 18 and site welfare works *"...providing and estimated void space of 240,000m^3"* [3]
	2005 Nov.		N9/N10 Kilcullen to Waterford Scheme - Waterford to Powerstown approved with modifications under PL10.ER2039
to 2007	2007 Apr		Determination that EIS not required Powerstown Landfill - Waste Intake Intensification under PL01.JD0001.
	2007 Oct.	Discharge License application Ref. DL7/233	
	2008 May		M9 Kilcullen to Waterford Scheme (P1): Carlow bypass opens
	2008 Jun.	Discharge Licence grant from council DL7/233	
	2008 July		S.I. 279 of 2008 Declaration of Motorways Order 2008 (Jcts 1 to 6 of the N9) [4]
			Powerstown landfill Phase 2 capping complete
	2009 Jun.	Discharge Licence amended conditions DL7/233 (ABP 01.WW.0371)	
	2009 July		S.I. 255 of 2009 Declaration of Motorways Order 2009 (Jcts 10 to 6 of the N9) [5]
	2009 Dec.		M9 Kilcullen to Carlow Scheme (P3): Kilcullen to Carlow
	2009 Dec.		Powerstown waste license reviewed and ecame IED license under European Union (Industrial Emissions) Regulations 2013, S.I. No. 138 of 2013 Reg. NO. W0022-03
	2009		Carlow County Development Plan 2009 - 2015
to 2010	2010 Jan.	Air Pollution License application Ref. APL 10/01	
	2010 Mar.		M9 Kilcullen to Waterford Scheme (P2): Waterford to Knocktopher (Jct 2 to 10)
	2010 April	S.261(7) application for continuation of quarrying & extension of site to a depth of -75mOD over an application 167.2 ha. Reg. Ref. 10/130	
	2010 Jul.	Air Pollution Licence grant from council APL 10/01	
	Sept 2010		M9 Kilcullen to Waterford Scheme (P4): Carlow (Powerstown) to Knocktopher (Jct 6 to 10) officially opened
	2011 Feb.	Air Pollution Licence amended conditions APL 10/01 (ABP 01.LA.0085)	
	2011 Nov.		Planning and Development Act, 2000 as amended (commencement of S.261A)
	2012 July		*"Retention of agricultural storage sheds, storage tanks, mobile generators and a mobile fuel tank. Retention and completion of a water storage tank. Permission for 8 bunded storage tanks and seed"* was upheld by the board under Reg. Ref. 11/301 and PL01.240883 in July 2012.
	2012 Aug.		Powerstown Landfill: Continued operation of landfilling activities and an increase in waste acceptance approved with conditions inc. ending in Aug. 2018 under PL01.JA0032.
	2012 Aug.	Section 261A review of S.261 map noted a boundary of 316.29 ha. No further action QY12/25	
	2012 Oct.	Retention of certain processing plant and buildings and permission for replacement for new offices and wastewater treatment system Reg. Ref. 12/240	
	2012		Planning and Development Act, 2000 (as amended by 2010 Amendment Act). S.261A review of quarries commenced
	2013 Oct.	Retention and permission for plant area notification of grant. Reg. Ref. 12/240	
	2014 Jun.	Receivers appointed / examinership begins	
	2014 Aug.	License to operate site by Plazamont Ltd.	

Figure 2.2 Receiving environment reflective of beginning of extractive land use, baseline year 1990 and today







6" OSI Map (Surveyed 1906, revised 1960s, levelled 1940s)

OSI Aerial Image June 1995

OSI Aerial Image April 2010

KEY (Areas shown shaded correspond with Clonmelsh and Garyhundon rEIAR land units)

- L3050
- L3044
- L3045
- M9
- Dublin – Waterford Intercity rail line

C Approximate location of main *Clonmelsh* entrance

G Approximate location of main *Garyhundon* entrance

TIME		EVENTS	
YEAR	EVENT YEAR	rEIAR SITE EVENT	PRINCIPAL PROJECTS
	2014 Nov.	Appeal of retention and permission for plant area notification decision to refuse ABP PL01.242648.	
	2013 Aug.	S.5 Declaration to DMIL that quarrying on lands in folios CW2075F & CW6086F is exempted development. SEC5/13/13	
	2013 Sept.	S.5 Declaration to DMIL that quarrying on lands in folios CW2075F & CW6086F is exempted development. SEC5/13/16 & SEC5/13/17	
to 2014			
	2015 Jan.	SEC5/13/16 & SEC5/13/17 Declarations appealed to DMIL that quarrying on lands in folios CW2075F & CW6086F is exempted development. RL01.3149 & RL01.3149	
	2015 July	Application for leave for substitute consent in respect of a quarry of 81 hectares (ha.) in extent over two benches to a depth of 25aOD located on lands at Clonmelsh and Garyhundon, Co. Carlow. ABP ref. LS01.LS0019	
	2015 Oct.		Powerstown landfill & recycling centre granted revision to IED license for increased annual intake from 40,000 to 50,000 tonnes p.a. under Reg. No. W0025-04.
	2015		Carlow County Development Plan 2015 -2021
to 2017	2017 April	Leave for substute consent granted. grant of leave for plant area 01.LS.0019 & grant of leave for quarry area 01.LQ.001.	

NOTES:

[1] 2011 April 21st: First party response to 3rd party appeal of Reg. Ref. 10/130 assigned appeal ref. PL01.238679. See Appendix 2.2 for repeat of relevant section of that response and associated appendix. In summary it attests to extraction in Clonmelsh beginning in 1947 by predecessors of DMIL and extraction in Garyhundon beginning in 1955 by predecessors.

[2] 2005 April 27th: S.261 Registration Form. See Appendix 1.3.1.

Please be minded that the developer in this instance is DMIL In Receivership and has only made substitute consent application for part of the lands shown on the quarry registration: Lands Registered under Section 261 was c. 323 hectares and under Reg. Ref. 10/130 the Planning Application covered c. 167.2 hectares.

[3] Information on phasing of Powerstown landfill form EIS supporting application for extension to landfill approved under PL01.JA0032

[4] S.I. No. 279 of 2008 ROADS ACT 2007 (DECLARATION OF MOTORWAYS) ORDER 2008 N9 — Kilcullen to Powerstown 17 July 2008. *"The section of the proposed N9 between its junction with the N78 at Knockbounce in County Kildare and its junction with the existing N9 at Cloghristick in County Carlow, via the townlands of Yellowbogcommon, Baronsland, Blackrath, Mullamast, Ballyvass, Prumplestown Lower and Ballyhade in County Kildare and Russelstown, Johnstown and Rathcrogue in County Carlow."*

[5] S.I. No. 255 of 2009 ROADS ACT 2007 (DECLARATION OF MOTORWAYS) ORDER 2009 N9 — Waterford to Powerstown (also known as the N9/N10 Killcullen to Waterford Scheme) 02 July 2009. *"The section of the proposed N9 between its junction with the existing N9 at Cloghristick in the county of Carlow and its junction with the N25 at Granny in the county of Kilkenny via Seskin Lower, Moanduff and Moanmore in the county of Carlow; Shankill, Jordanstown, Ballyquirk, Rathcash West, Clifden, Kilree, Danesfort, Stonecarthy West, Knocktopher Commons, Kilkeasy, Garrandarragh, Ballykeoghan and Dunkitt in the county of Kilkenny."*

2.3.2 Estimated Reserve Recovered from subject site from Baseline to Current Time

The single most significant impact of the development the subject of this rEIAR is that it consists of a quarry and therefore there has been movement of soils and subsoils and extraction of aggregate beneath over the void areas. Table 2.3 provides an estimate of the amount of reserve recovered from the subject lands over time by combining total void size, estimate of reserve recovered therefrom tested against statements of extraction rates provided in planning and permitting history files.

Se out below is the methodology used to estimate the total volume of material extracted from the rEIAR area. In the interests of conservatism and a precautionary approach please note that no wastage has bene allowed and therefore we expect that the calculated estimated total volume extracted will be higher than was actually observed being processed and leaving the site i.e. we here calculate an estimate of total extracted volume.

Estimate of total volume of aggregate recovered from *Clonmlesh* to today.

- Estimated pre extraction ground levels (estimated from OSI historic map at figure 12.2) identified to be 55m AOD in the northern part of Clonmelsh and 60m AOD in the southern part of Clonmelsh. This is an average of 57.5m AOD.
- Current floor of Clonmelsh excavation at about 25m AOD
- Average overburden (soils & subsoils) depth assumed at an average of 5.75m after table 5.1 of 2010 EIS (Reg. Ref. 10/130) that recorded borehole findings from 2007.
- Sand and gravel average depth of 5m assumed after observed depth of sands and gravels at Garyhundon (difference between estimated original ground level and current ground level).
- Rock assumed to constitute entirely of material below overburden and sand and gravel.
- Making allowances for materials not extracted under plant area and sides of excavations lateral extents to calculate total extracted volumes were calculated to $m^{3.}$ The m^3 total extracted volume was converted to tonnes using 1.8 weight for sand and gravel and 2.5 for rock.
- These calculations result in an estimation of a total extraction of nearly 21 million tonnes of aggregate (over M tonnes sand & gravel and about 18M tonnes rock) from Clonmelsh since it began extraction.

Estimate of total volume of aggregate recovered from *Garyhundon* to today.

- Currently recorded difference between surrounding ground levels and base of Garyhundon where there has bene some restoration is recorded at an average of 5m.
- No evidence of large scale rock extraction at Garyhundon.
- In view of part restoration and precautionary approach assumed '0' depth of overburden over extracted area.
- Therefore sand and gravels extracted assumed to have bene at an average depth of 5m.
- These assumptions result in a total estimated extraction of sand and gravels from Garyhundon of nearly 2.5 million tonnes of sand and gravel.

Estimate of total volume of aggregate recovered from *Garyhundon* to today.

- Together these calculations result in an estimation of a total extraction of nearly 24 million tonnes of aggregate (nearly 6M tonnes sand & gravel and 18M tonnes rock) from the rEIAR area since it began extraction.

- Having regard to the requirement to identify baseline at 1990 for the purposes of EIA we note that the total estimated extracted volume from Clonmelsh in the early 1990s was approximately 5.4M tonnes (about 1.6M tonnes sand and gravel and 3.8M tonnes rock) over a lateral area of about 18.4 ha.
- The total estimated volume of sand and gravel extracted from Garyhundon in the early 1990s was about 2.1M tonnes over a lateral area of 24 ha.

2.3.3 Summary of Progression of Extraction from Subject Site; Baseline to Current Time

The amalgamation of historic mapping, current surveys and aerial photographs has provided a credible estimation of total volumes extracted from the site at 1990 and today. In order to augment these findings and provide an estimation of the rate of progression of extraction to date during intervening where historic mapping and photography is not available we have reverted to historic planning and licensing submitted information. Key findings from this review are:

- S.261 registration from submitted for the subject lands stated at 2005 an extraction rate of 1M tonnes
- From description of development in 2010 EIS for deepening and extension of extraction site; *"... commenced operation in the 1940's. It currently extracts c. 1,000,000 tonnes of limestone and sand & gravel aggregates per year depending on market demand."*
- By 2013 the rate of extraction and thus traffic generation has fallen significantly away as noted in the Traffic an Transportation Review submitted as response to request for further information under Reg. Ref. 12/240.
- Fluctuations in extraction rate are expected do not match market demand that was unprecedented over 2001 – 2008 and fell sharply away from 2010 to today where conservative recovery in markets is observed.
- Since the licensee has been operating the subject lands (rolling August 2014 to September 2017) the rate of extraction from the lands has been observable by the Receivers.
- We assume in the future a much slower extraction rate than previously requested under Reg. ref. 10/130 (1M tonnes extracted per year) for reason of an observed and anticipated market demand.

Table 2. 3 Calculated (discerned / estimated) & Predicted Extraction Volumes from the rEIAR unit 1947 - 2021

TIME		**EXTRACTION**			
YEAR	NO. OF INTERVENING YEARS	APPROX. TOTAL AREA EXTRACTED (HA.)	TONNES OF MATERIAL EXTRACTED & PROCESSED OVER PERIOD	AVERAGE TONNES OF MATERIAL EXTRACTED PER ANNUM OVER PERIOD	CALCULATED ESTIMATED TOTAL EXTRACTED TONNES AT KEY YEARS
1947					
to 1955	**6**		120,000	20,000	
to 1964	**9**		540,000	60,000	
to 1973	**9**		1,260,000	140,000	
to 1982	**9**		2,340,000	260,000	
to 1990	**8**	42.44	3,400,000	425,000	7,650,812
to 1997	**7**		3,500,000	500,000	
to 2007	**10**		8,500,000	850,000	
to 2010	**3**		1,950,000	650,000	
to 2014	**4**		1,200,000	300,000	
to 2017	**3**	64.03	450,000	150,000	
		Totals	**23,260,000**		**23,898,851**
Forecast					

2021	**4**		720,000	180,000	

2.3.4 Future Extraction

This rEIAR support two applications for substitute consent and therefore does no conceive of future extraction as subsittute consent may only apply to development that has taken place.

As stated at the outset of this section however, some forecasting of expected extraction rates has been undertaken in deference to EIA requirement for anticipating effects and identifying mitigation measures.

It is the applicant's intention to submit a concurrent applicant under S.37L of the Planning and Development Act, 2000 for extraction of lands bounding the south of the Clonmelsh void to the same depth as that void over an area of about 17.2 ha. The rates of extraction predicted as part of that application, which will be accompanied by EIAR and NIS, are based on the forecast rates here set out.

2.4 Summary

This rEIAR together with an rNIS is required as to support two applications for substitute consent allowed following application for leave for same under (ref. SH 01.SH.0236) for a plant area and 01.SH0.235) application for leave for substitute consent was granted for a quarry).

It is understood that extraction from on the rEIAR lands began in the 1940s in Clonmelsh and 1950s at Garyhundon. It does not appear that any extraction of rock has taken place from Garyhundon with the entire of the excavation being for the recovery of sand and gravel. Extraction at Clonmelsh has been to recover rock sitting under sand and gravel.

Peak attested (2005 and 2010) extraction rates at the site were 1M tonnes per year. That peak has dropped to around 150,000 tonnes per year over the licensee period (Augsut 2014 – September 2017).

It is understood that the entire of the material recovered on site has been old form that site as processed aggregate or used to make secondary products in the plant area at Clonmelsh.

The subject site has existed primarily as a void and plant area since baseline (1990) to today (2017) and thus the subject site is a brownfield site for the purposes of description and is the overriding feature of the subject site appearance.

There has been little alteration to the use of surrounding lands over the period baseline (1990) to today (2017) with the lands being predominately in agricultural use with dispersed settlement in the form of one off houses. Notable in the vicinity of the subject site area other sand and gravel pits (Kilcarrig Quarries Powerstown, 2 no. DMIL pits also in Powerstown) and Powerstown landfill. From around 2008-2011 it seems that there was a biofuel plant located in the agricultural shed to the immediate east of the Clonmelsh void but that use cease din or around 2011 and the plant sold and removed in 2016.

The most notable alteration in the vicinity of the site over the period baseline to today has been the construction of the M9 and its replacement of the N9 (now the R458) in 2009.

The next section of the rEIAR describes the development at baseline and today.

3.0 DESCRIPTION OF THE PROJECT

3.1 Introduction

This Section provides a more detailed description of the development and is supported by drawings submitted as part of the applications for substitute consent that include a site layouts from the baseline year and the site layout as they exist today. Sections are also provided as part of the drawings suite.

3.2 Nature & Extent of Development

This Section provides a more detailed description of the development and is supported by drawings submitted as part of Summary description of development is provided at Section 1.3 of this rEIAR and is here repeated:

The lands the subject of this rEIAR [the subject site] extend to approximately 81 ha. at the centre of a landholding in the control of the applicant of under 170 ha. The subject site occurs in 2 no. land units named after the townlands within which they occur consisting of generally excavated land described in this rEIAR as; *Clonmelsh* to the north (54 ha.) that includes the plant area and *Garyhundon* to the south (27 ha.).

The purpose of the rEIAR is to support two applications for substitute consent for a quarry and a plant area, both already in existence thus development here considered is retrospective.

In summary **the extant quarry area granted leave for substitute consent application under ref. 01.SH0.235 consists of:**

a quarry over two areas; 51 ha. in Clonmelsh to an average depth of approximately 25AOD and 27 ha. in Garyhundon to an average depth of approximately 57AOD. The development also holds supporting infrastructure consisting of; existing entrance to the L3045 at Garyhundon permitted under Reg. Ref. 2979; asphalt plant permitted under Reg. Ref. 92/137; 2 no. aggregate processing plants permitted under Reg. Refs. 76/3642 and 76/3842. Ancillary site development includes; water management system consisting of settlement ponds, mobile pump and underground pipeline crossing associated plant area at Garyhundon, mobile aggregate processing plant, storage containers and haul routes.

In summary **the extant plant area granted leave for substitute consent application under ref. SH 01.SH.0236 consists of:**

A plant area over about 3.22 ha. containing; Readymix concrete batching plant (110 sqm) & shed (1,224 sqm); Mobile canteen (container) (27 sqm); Demountable Readymix concrete plant (219 sqm); Shipping Office (103 sqm) Container 1 (storage) (14.5 sqm); Container 2 (mobile office) (29 sqm); Weighbridge (53 sqm) originally permitted under Reg. Ref. 2981; Demountable asphalt production plant (Amman) (847 sqm) the subject of APL10/01 & control room (66.5 sqm); ESB Substation (50.6 sqm); Bunded fuel tanks (168 sqm) & Pumphouse (34.56 sqm); and Workshop (180 sqm). The development also holds supporting infrastructure consisting of; entrance onto the L3050 and water management system including septic tank; water holding tanks; well; settlement pond; discharge license DL7/233 and ancillary site works including aggregate and precast, concrete and cold asphalt product storage areas.

The two substitute consent application areas in pure volumetric terms at approx. 3.22 ha. for the plant area and 51ha. and 27 ha. for the quarry area together at 81.22 ha. slightly exceed the stated 81 ha. measurement for the rEIAR area for reason of part of the quarry infrastructure (water drainage pipe) crossing the plant area.

3.3 The Substitute Consent Application Quarry Area

Chapter 2.0 describes the site the subject of this rEIAR. The overriding features of the subject site is the fact that it consists

of stripped lands, mostly excavated at both baseline (1990) and current (2017) years.

The quarry development consists of the following:

***Clonmelsh* rEIAR area**

- 51 ha.
- Stripped overburden (soils & subsoils) estimated at a depth of 5.75 m at Chapter 2 over entire. Material used as screening berms on western, southern, eastern and part of northern boundaries.
- Original (pre-extraction) ground level estimated at 55 AOD in northern portion and 60 AOD in southern portion resulting in an average ground level of 57.5m at chapter 2.
- At baseline (1990) the active void covered an area of about 18.4 ha. and was worked to a depth of about 40AOD over 1 to 2 benches
- Currently the active void area occupies an area of about 37.25 ha. the centre of the subject lands with the rEIAR void lands to the north east of the void not actively extracted nor those under which the plant area sits. The void is at an average depth of about 25m AOD over 1, 2 and 3 benches.
- The material being extracted is limestone rock and no overlying sand and gravel remains in the Clonmelsh rEIAR area.
- The plant site is located in the north west of the Clonmelsh rEIAR area.

***Garyhundon* rEIAR area**

- 27 ha.
- Stripped overburden (soils & subsoils) estimated at a depth of 0 m at Chapter 2. Any visible overburden stored in stockpiles on site.
- Original (pre-extraction) ground level estimated at around 60 AOD over entire.
- At baseline (1990) the active void covered an area of about 24 ha. and was worked to a depth of about 56AOD.
- Currently the active void area occupies an area of just over 26 ha.. The void is at an average depth of about 55 AOD and is part naturally restored.
- The material being extracted sand and gravel with no evidence of rock having been extracted from the area.
- There is no permanent plant on this land.

3.2.1 Method & Direction of Working

***Clonmelsh* rEIAR area**

- This is a limestone rock quarry and therefore material is extracted by blasting.
- Blasting practices used over the licensee period accord with best industry practice and are carried out by independent, licensed contractors Irish Industrial Explosives (IIE) who also monitor and report each blast Chapter 9 of the rEIAR considers noise and vibration. It is noted that the 2010 EIS with Reg. ref. 10/130 noted employment of a dedicated blasting team which is no longer the case, nor was their duration of employment known.
- This material is then crushed via mobile primary plant at the face and transported to other mobile crushing, screening and chipping plant at the centre of the void for on ward processing.
- Material processed via mobile plant is brought by internal haul route to the plant area for sale or onward processing in the plant area.
- The subject site is excavated to an average depth of 30 metres below original ground levels and all slopes do not generally exceed 1:10 and are therefore stable. As the shape of the subject lands has not altered since 2010 when extraction ceased and no further new extraction is to take place the slope stability should remain unchanged.
- A review of the historic mapping and aerial photography associated with the lands is indicative of the quarry beginning extraction works close to its main entrance onto the L3050, located centrally in the northern boundary of the land unit. The quarry likely obtained close to its current 25m AOD depth in the early 2000s largely within the lateral extents achieved by the 1990s and then moving in a southern direction at that depth.

- The quarry is currently worked below water table and therefore pumps water via pipeline from the void northwards across the plant area to discharge at a point close to the site office. Chapter 7 of this rEIAR sets out water management arrangements and effects.

***Garyhundon* rEIAR area**

- This is a sand & gravel pit and therefore material primarily extracted by backhoe/loading shovel.
- In addition to this area not holding any permanent plant it currently does not hold any mobile plant with all material recovered from these lands being transported by public road to the Clonmelsh plant area for onward sale or processing.
- It is noted that the planning permission for the entrance to Garyhundon dates from 1974 that coincides with weighbridge at Clonmelsh in the same year and thereafter permissions and licenses are concentrated in the Clonmelsh. This is indicative of the material being extracted at Garyhundon being brought to Clonmelsh for processing and the concentration of processing plant at Clonmelsh.
- A review of the historic mapping and aerial photography associated with the lands is indicative of the quarry beginning extraction works close to the local road (L3040) and moving in an easterly direction to achieve nearly full lateral extent by the 1990s to 24 ha. and the current average 5m depth as at today over the slightly larger area of just over 26 ha. today.

Due to the predominance of the processing abilities and larger, more intensively worked Clonmelsh rEIAR area the majority of mobile and permitted plant lies within the identified quarry area application site. Table 3.1 sets out the plant and ancillary site works and storage items indicated in the quarry substitute consent application area site layouts using the code numbers assigned.

QUARRY AREA SUBSTITUTE CONSENT PLANT & FACILITATING INFRASTRUCTURE ITEMS			
No.	**Name**	**Area (sqm)**	**Information provided with applications / rEIAR**
Q1	Asphalt Plant (Reg. Ref. 92/137)		No individual drawing, indicated on site layout only
Q2	Processing Plant (Reg. Ref. 76/3642)		No individual drawing, indicated on site layout only
Q3	Processing Plant (Reg. Ref. 76/3842)		No individual drawing, indicated on site layout only
Q4	Container/portacabin 1	n/a	No individual drawing, mobile, temporary and moving within site, photograph only.
Q5	Container/portacabin 2	n/a	No individual drawing, mobile, temporary and moving within site. Indicated on site layout and by photograph only.
Q6	Mobile processing plant	n/a	No individual drawing, mobile plant, temporary and moving within site, photographs only.
Q7	Entrance (Reg. Ref. 74/2979)	n/a	Principal dimensions indicated for information on same drawing as Clonmelsh entrance at Traffic section of rEIAR.
Q8	Settlement Ponds & pipeline	6,413	No individual drawing, indicated on site layout only

Table 3.1 Quarry Area Substitute Consent Plant & Facilitating Infrastructure Items

Table 3.2 sets out the plant and ancillary site works and storage items identified in the quarry substitute consent application area at table 3.1 as they or similar existed at baseline according to aerial photography at 1995.

QUARRY AREA SUBSTITUTE CONSENT PLANT & FACILITATING INFRASTRUCTURE ITEMS AS AT BASELINE		
No.	**Name**	**Information provided with applications / rEIAR**
Q1	**Asphalt Plant (Reg. Ref. 92/137)**	In existence at current position.

Q2	**Processing Plant (Reg. Ref. 76/3642)**	In existence at current position.
Q3	**Processing Plant (Reg. Ref. 76/3842)**	In existence at current position.
Q4	**Container/portacabin 1*** **	Multiple mobile containers visible within quarry area in Clonmelsh but none discernible for individual uses.
Q5	**Container/portacabin 2*** **	Multiple mobile containers visible within quarry area in Clonmelsh but none discernible for individual uses.
Q6	**Mobile processing plant**** **	Visible to the south west of the plant area.
Q7	**Entrance (Reg. Ref. 74/2979)**	In existence at current position.
Q8	**Settlement Ponds & pipeline*** **	1 no. settlement pond visible on site in the north of Clonmelsh. Limited to about 250 sqm in lateral area and thus smaller than that in existence currently.

***** denotes element existed but in a different format/position than current**

Table 3.2 Quarry Area Substitute Consent Plant & Facilitating Infrastructure Items as at Baseline (1990s)

3.3 The Substitute Consent Application Plant Area

As stated in section 3.2 the plant area is located within the Clonmelsh rEIAR land unit. The substitute consent application area is 3.22 ha. to include those items of plant and their facilitating water management facilities. Retention for these items for these items of plant on a smaller area, excluding water management arrangements was sought as part of a retention and permission application under Reg. Ref. 12/240.

Table 3.3 sets out the plant and ancillary site works and storage items indicated in the plant substitute consent application area site layouts using the code numbers assigned.

PLANT AREA SUBSTITUTE CONSENT PLANT & FACILITATING INFRASTRUCTURE ITEMS			
No.	**Name**	**Area (sqm)**	**Information provided with applications / rEIAR**
P1	Readymix concrete batching shed &	1244	Scale 1:200, principal dimensions indicated.
P2	Readymix concrete batching plant	110	
P3	Mobile canteen (container)	27	Scale 1:200, principal dimensions indicated.
P4	Demountable Readymix concrete plant	219	Scale 1:200, principal dimensions indicated.
P5	Shipping Office	103	Scale 1:200, principal dimensions indicated.
P6	Container 1 (storage)	14.5	Scale 1:200, principal dimensions indicated.
P7	Container 2 (mobile office)	29	
P8	Weighbridge (originally permitted Reg. Ref. 2981)	53	Scale 1:200, principal dimensions indicated.
P9	Demountable asphalt production plant (Amman) (Air Pollution License) APL 10/01 &	847	Scale 1:200, principal dimensions indicated.
P10	control room	66.5	Scale 1:200, principal dimensions indicated.
P11	ESB Substation	50.6	Scale 1:200, principal dimensions indicated.
P12	Bunded fuel tanks	168	Scale 1:200, principal dimensions indicated.

P13	Pumphouse	34.56	
P14	Workshop	180.3	Scale 1:200, principal dimensions indicated.
P15	Septic tank	By volume	Scale 1:200, principal dimensions indicated.
P18	Holding tanks (water)	By volume	Scale 1:200, principal dimensions indicated.
P19	Well	n/a	No individual drawing, indicated on site layout only
P16	Entrance	n/a	Principal dimensions indicated for information on same drawing as Garyhundon entrance at Traffic section of rEIAR.
P17	Settlement Pond	1,500	Scale 1:500, principal dimensions indicated for information
	Discharge point (Discharge License DL7/233)	n/a	No individual drawing, indicated on site layout only

Table 3.3 Quarry Area Substitute Consent Plant & Facilitating Infrastructure Items

Table 3.4 sets out the plant and ancillary site works and storage items identified in the quarry substitute consent application area at table 3.3 as they or similar existed at baseline according to aerial photography at 1995.

PLANT AREA SUBSTITUTE CONSENT PLANT & FACILITATING INFRASTRUCTURE ITEMS AS AT BASELINE		
No.	**Name**	**Baseline situation**
P1	**Readymix concrete batching shed &**	As at baseline with exception of hardstand area around shed having been reformed (to the south and south west upon alteration to settlement pond.
P2	**Readymix concrete batching plant**	
P3	Mobile canteen (container)	Not visible. Mobile containers visible within quarry area in Clonmelsh but none discernible as mobile canteen.
P4	**Demountable Readymix concrete plant**	In existence at current position.
P5	**Shipping Office**	In existence at current position.
P6	Container 1 (storage)	Not visible. Mobile containers visible within quarry area in Clonmelsh but none discernible as mobile canteen.
P7	Container 2 (mobile office)	
P8	**Weighbridge (originally permitted Reg. Ref. 2981)**	In existence at approximate current position.
P9	Demountable asphalt production plant (Amman) (Air Pollution License) APL 10/01 &	Not in existence until 2010.
P10	control room	
P11	**ESB Substation**	In existence at current position.
P12	**Bunded fuel tanks**** &	Bunded fuel tank area is smaller than currently. Current bunded fuel tank area 168 sqm. Estimated area at baseline approximately 100 sqm.
P13	**Pumphouse**	
P14	**Workshop**	In existence at current position.
P15	**Septic tank**	In existence at current position.
P16	**Entrance***	In existence at current position. In addition there appears a second vehicular entrance/exit to the immediate north of

		the office.
P17	**Settlement Pond*** **	In existence at approximate current position covering an area approximately double that it laterally covers currently (approximately 3,000 sqm at baseline).
P18	Holding tanks (water)	Not visible and assumed not in existence for lack of requirement for discharge from quarry
P19	**Well**	In existence at current position.
	Discharge point (Discharge License DL7/233)	Not in existence until 2007.

***** denotes element existed but in a different format/position than current**

Table 3.4 Plant Area Substitute Consent Plant & Facilitating Infrastructure Items as at Baseline (1990s)

3.4 Traffic Control

All traffic occurring within the Clonmelsh rEIAR unit is internal traffic using internal short informal haul routes. Once excavated rock leaves the Clonmelsh void it is imported to the Clonmelsh plant area (via internal haul route) by truck for storage and on selling or processing in the plant area.

All traffic arising from the Garyhundon rEIAR unit consists of trucks transporting sand and gravel to the Clonmelsh plant area for storage as aggregate for on selling or for processing.

The Traffic section of this rEIAR sets down a description of the traffic arising on site as function of the estimated extracted material at the master timeline table at Appendix 2.1 set against declared traffic levels in historic planning applications.

It is of note that the Clonmelsh entrance to the rEIAR lands is the primary entrance for the development thus caters for all employees, visitors and aggregate products and materials (import/export).

Furthermore an 80:20 west:east split of all traffic was recorded in historic applications and can be discerned today. i.e. 80% of traffic arising on the subject site is west of the Clonmelsh entrance accessing the M9 and R428 from the L3050 and 20% arises east of the entrance to the N80 form the L3050.

3.5 Hours of Operation

Declared on the S.261 Registration Form for the site QY25 were plant and loading hours of: 0600 to 900 Monday to Friday and 0600 to 1700 Saturdays. It further declared 24/7 operations from time to time. This remained the declared and proosped operating hours for an application for continuation and extension of extraction area under Reg. Ref. 10/130.

The notification of decision to grant planning permission for continuation and extension of the quarry unit under Reg. Ref. 10/130 by condition no. 3 set down operating hours of 0700 to 1900 Monday to Friday and 0800 to 1400 Saturdays. This decision was overturned on appeal.

The notification of decision to grant planning permission for retention of plant and permission of new office, wastewater treatment and other plant under Reg. Ref. 12/240 by condition no. 4 set down operating hours of 0730 to 1800 Monday to Friday and 0730 to 1400 Saturdays. This decision was overturned on appeal.

Having regard to the above and observed operational practices n site over the licensee period, those operational hours declared and requested at S.261 registration and deepening and extension of the quarry remain: 0600 to 900 Monday to Friday and 0600 to 1700 Saturdays. It further declared 24/7 operations from time to time. No working on Sundays or bank holidays.

3.6 Employment

Over the licensee period and equivalent of 12 no. full time site staff working in the office, maintenance shed or with plant are attributable to the rEIAR area.

There are other effective employees in the form of hauliers but they do not have their permanent work place on site. The 12 no. employees with these hauliers and other contractors and service employees generate secondary employment of a further 20 no. fulltime equivalents.

It is noted that at peak; a work force of 60 to 80 personnel was declared in the 2010 EIS for the Clonmelsh quarry extension and deepening including direct employees, sub-contractors, hauliers, maintenance contractors, material suppliers etc.

3.7 Fuel & Chemical Storage

Fuel storage is in bunded fuel tanks in the plant area (P12 on site layouts submitted with substitute consent application for plant area). Remaining oils, chemicals and admixtures are ordered and used as needed used oil and chemical containers are separately stored within the maintenance shed for disposal by licensed contractor. Bunded admixture tanks are stored on the blockyard and disposed of via licensed waste contractor.

3.8 Waste Management

The waste arising on site is municipal waste from staff welfare activities and is disposed of via domestic waste collection. Similarly, scrap metal arising on site is stored within a designated area at the site prior to collection by a licensed waste contractor.

Where returned concrete or asphalt product arises it is recycled.

3.9 Waste Water

There exists a septic tank on site of sufficient capacity to cater for the PE equivalent of the 12 no. full time site employees and additional visitors. Chapter 7 of this rEIAR describes this system. Under Reg. ref. 12/240 a replacement proprietary wastewater treatment system was proposed but at that time it was envisaged that all DMIL back office operations would relocate from a location at Bennekerry, Co. Carlow to an enlarged upgraded office building at Clonmelsh and a workforce of 60 to 80 was posited.

3.10 Potable, Surface and Groundwater

There is a well in the plant area (P12 on site layouts submitted with substitute consent application for plant area) from which water is drawn. In addition bottled water is supplied in the offices. The well appears to pre-date the 1990s.

Chapter 7 of this rEIAR performs a water balance for the substitute consent quarry and pant areas in order to demonstrate the ability of the existing settlement ponds in the quarry area (Q8 on site layouts submitted with substitute consent application for quarry area) and that in the pant area (P17 on site layouts submitted with substitute consent application for plant area) together with the discharge point licensed in 2010 under (Carlow County Council DL7/233 & ABP 01.WW.0371) are capable of manging surface and groundwater arising on site.

There is no below groundwater table working in Garyhundon nor areas of hardstanding upon which increased surface

water arisings will be generated.

It appears that there was no below watertable working at baseline.

3.11 Power Supply & Telecommunications

Power is supplied to the subject lands via the electricity network. The rEIAR areas are not traversed by public power lines. There is a substation in the plant area (P11 on site layouts submitted with substitute consent application for plant area) that has been in existence on site since before 1990.

3.12 Safety & Security

The subject site is required to meet conditions of existing planning permissions, licences and permits and certain statues. In particular, the relevant Health & Safety legislation (*Safety, Health & Welfare at Work Act, 2005*, the *Mines and Quarries Act, 1965)* and subsequent Quarries Regulations relating to safety health and safety, training, appropriate site management etc. will be complied with in that main quarry complex. Amongst these regulatory requirements are the need to keep on site and up to date Health and Safety File which records safe procedures, deviations from those procedures and accident reports.

Compliance with these requirements was a condition of license occupation 2014 – 2017 and is assumed to have been a contemporaneously complied with throughout the life of the operations to date. operator will be required to keep such a file and organise annual site inspections and audits for geotechnical stability etc.

Each of the rEIAR units is fully fenced with any agricultural entrance permanently closed and locked. The only two vehicular entrances in operation are that from the L3050 to Clonmelsh which is observed by the shipping office and that onto the L3040 to Garyhundon which permanently closed and locked and only opened by site staff in the vent of wishing to collect some material.

The lands are remotely secured via CCTV cameras with 24 hour monitoring. There is no requirement for lighting outside of the subject lands but within the lands, certain working hours (after dark in winter periods) necessitate lighting that is extinguished when the site is closed thus causing no external light pollution.

3.13 Rehabilitation

Although it is recognised that substitute consent applications cannot propose works a Restoration Plan has been prepared to accompany this rEIAR in view of the EIA requirement to identify effects and mitigation measures. This restoration plan is described at Chapter 12 and in summary consist of the flooding of the Clonmelsh unit with the creation of beach and other habitats to encourage greater biodiversity. Garyhundon lands are proposed to be restored using available material.

As noted at Chapters 1 and 2 it is intended to submit a concurrent application for extraction of lands to the south of the subject site. The restoration plan proposed under that EIAR and application will be cognisant of the approach here presented.

3.14 Site Management

Any future operator of the quarry unit will also be responsible for the management of the subject site and will therefore be subject to the conditions existing on all planning permissions, licences and / or permits existing for the quarry and plant complexes

4.0 POPULATION & HUMAN HEALTH

4.1 Introduction

This chapter of the rEIAR assesses the likely felt and ongoing effects of the quarry and plant land uses consisting this rEIAR land area on population and human health.

Ultimately, all the effects of a development on the environment will impinge upon human beings, directly and indirectly, positively and negatively.

Direct effects may include such matters as safety, air and water quality, noise landscape quality and road traffic. Indirect effects pertain to such matters as flora, fauna, heritage and archaeology. These matters form discreet sections of this EIAR in their own right and corresponding mitigation measures are comprehensively provided in those sections.

4.2 Methodology

Regard has been had to the Draft guidelines on the Information to be contained in Environmental Impact Assessment Reports, EPA, August 2017 updated those adopted for EISs in 2002 and those draft published in May 2015. The draft EIS Guidance at May 2015 suggest that the following topics be used for the purposes of the description and identification of potential impacts on 'Population and Human Heath: *"Economic Activity; Land-use; Employment; Settlement Patterns; Social Patterns; Human Health (considered with reference to other headings such as air quality and the landscape)."*

Those Draft Guidelines for Information to be contained in an EIA suggest the following sub headings under which to arrange issues; *"Employment, Human Health (considered with reference to other headings such as water and air), Amenity (e.g. effects on amenity uses of a site or of other areas in the vicinity – may be addressed under the factor of Landscape)."*

Having regard to the above guidance; particularly the 2017 EPA draft guidance on the information to be contained in EIAR; the characteristics and context of the lands the subject of this rEIAR; and the retrospective nature of the development at issues this rEIAR chapter aims to identify the likely significant impacts that the development has and may have on Land-use, Settlement Patterns, Employment, and Human Health for population groups identified as relevant to the lands.

The description of the receiving environment for this retrospective EIAR is set out under the above headings at the current time and at baseline 1990. Sources of information used consist of site visits, observations of the site under the licensee period 2014 – 2017, inspection of the surrounding area in July 2017 augmented with a desktop review of previous assessments of the development in historic planning applications, government surveys and local authority plans.

In regard to Human Health the reader is minded that other chapters of this rEIAR assess effects and set down mitigation measures for other environmental factors that ultimately require emission regulation by national/internal standard or specific planning / licensing condition for reason of protection of human health and the environment. Those assessments are referenced in this chapter to address felt and potential anticipated Human Health impacts in accordance with EPA draft guidance on the information to be contained in EIAR*; "In an EIAR, the assessment of impacts on population & human health should refer to the assessments of those factors under which human health effects might occur, as addressed elsewhere in the EIAR e.g. under the environmental factors of air, water, soil etc. The Advice Notes* [Advice Notes on Current Practice (in the preparation of Environmental Impact Statements, Sept. 2003] *provide further discussion of how this can be addressed."*

Two population groups have been identified as having experienced or are likely to continue to experience effects from the quarry and plant area land-uses the subject of this rEIAR:

1. The local non-rEIAR population. This is the existing and planned population of the area including residents and related groups having a connection to the area by occasional or habitual presence e.g. workers, students and visitors.

In order to build the population profile of the immediate area containing the rEIAR lands Small Area Population Statistics (SAPS) compiled by the Central Statistics Office (CSO) are relied upon. The latest census year for which figures are available is 2016 and are reported here alongside analysis and government surveys at county, regional or national level. These are considered reasonable indicators of the up to date profile of the resident population in the immediate vicinity of the subject ands. Wherever possible, profile data provided for the latest 2016 census year is provided alongside that for census year 1991 being that closest to the baseline EIA year of 1990.

2. The rEIAR population. This is the non-indigenous population consisting of the employees and related service providers of the lands the subject of this rEIAR. existing and planned users of the M3 who currently use the roadway and are to be served by the proposed service area. This population group includes the employees and related service providers.

Potential likely significant felt / anticipated effects of the rEIAR development on each of the receiving environment headings are then set out, followed by a description of mitigation measures proposed in order to avoid, reduce, and if possible, remedy significant adverse impacts where those effects are identified to be negative.

4.3 Receiving Environment

The subject site's receiving environment is occupied by identified resident and working existing populations described here at baseline and today. The receiving environment at baseline and today is then described under each of the following topic headings 4.3.2 Land Use, 4.3.3 Settlement Patterns, 4.3.4 Employment, and 4.3.5 Human Health for each of the population groups identified.

4.3.1 Population

According to historic census data the population of the State was at 2,955,107 in 1946 (the closest census year to the beginning of extraction at Clonmlesh in 1947). This had fallen to 2,898,264 at 1956 a year after exaction at Garyhundon is recoded as beginning. At 1971 total of 4,053,187 persons in the State, decreased to 3,525,719 in 1991 and increased to 4,757,976 in 2017.

rEIAR site population (workers): The lands the subject of this rEIAR do not hold a resident population. The lands hold sessional population in the form of workers described at 4.3.4 Employment.

Local population: the subject site is located within the Electoral Division (ED) of Nurney and further within the Small Area (SA) of Nurney census ID 017036002 (area of 14.02 km^2) with a recorded population of 314 in 2016 at a population density of 22.39 per km^2. This SA also contains part of the M9 and lands in Milford and Powerstown south and west of the subject lands. The townland of Clonmlesh (census ID 10193) was recorded at 1.540 ha. and that of Garyhundon (Garryhundon) (census ID 12275) at 3.204 ha. in 2016.

This SA population represents 0.55% of the county in the same year (56,932). This information reflects the rural nature of the area within which the site is located. In turn, the county of Carlow accounted for 1.2% of the country's population in 2016.

Small Area Population Statistics have only been tracked since 2011. Census data is available back to 1971 but only reliably i.e consistently at county level. Using table E1011 from the CSO 'Private Households in Permanent Housing Units 1971 to 2016 (Number) by Persons per Household, County, Aggregate Town or Rural Area and Census Year' it is possible to set down the occupation rate of households, albeit only private, in the county of Carlow relative to the site and further the difference in those rates between aggregate rural and aggregate town areas. This site is within a rural area.

Table 4.1 below uses this source information to provide a rendition of total persons in private households in Carlow as a percentage of total persons in private households in the State. The rate was 1.2 in 2016, consistent with total population expressed as a percentage of the total population. Since 1971 the rate, indicative of Carlow's population generally following national trends, has remined consistent.

	1971	1981	1991	2002	2006	2011	2016
Expressed as 0.00	1.16	1.16	1.17	1.18	1.19	1.20	1.21
Expressed as 0.0	1.2	1.2	1.2	1.2	1.2	1.2	1.2

Table 4.1 Total persons in private households in Carlow as a % of total persons in private households in the State

We further note that indicative household formation rate has remined consistently higher in Carlow than the State over the same period, generally indicative of a younger population and larger family size. It is possible to express aggregate town and aggregate rural area private household formation size that has been generally dropping over the same period. The site is within a rural area that throughout the state, since 1981 consistently shows higher household formation rates than urban areas. Household formation rates in both the urban and rural areas of Carlow has been higher than the State generally and in turn rural households are larger than urban ones in the county.

	1971		1981		1991		2002		2006		2011		2016	
	State	**Carlow**	**State**	**Carlow**	**State**	**Carlow**	**State**	**Carlow**	**State**	**Carlow**	**State**	**Carlow**	**State**	**Carlow**
Occupation rate of private households (all areas)	3.9	4.2	3.7	3.9	3.3	3.6	2.9	3.0	2.8	2.9	2.7	2.8	2.7	2.8
Occupation rate of private households (aggregate town area)	4.0	4.2	3.6	3.8	3.3	3.4	2.9	2.8	2.7	2.7	2.6	2.6	2.7	2.6
Occupation rate of private households (aggregate rural area)	3.9	4.1	3.7	4.0	3.5	3.7	3.1	3.2	3.0	3.1	2.9	3.0	2.8	2.9

Table 4.2 Private household formation rates in the State and Carlow over census ears 1971 – 2016.

Accessing Pobal geo-profiling and mapping resources sets out a composite score as measure of socioeconomic, education and family formation factors called the deprivation index. The country average is rated at 0 at each census year. These resources reveal that the deprivation score for Carlow has only been measured since the 2006 census when it was at -2.8; 2011 at -3.41 and -3.66 at 2016.

The deprivation score for Nurney ED within which the site occurs was worse when first recorded relative to the county at -3.55 in 2006. It then improved relative to the county to -2.29 in 2011 and -1.86 in 2016.

The deprivation score for the SA within which the site occurs is improved relative to the county and more in line with country averages, and now exceeds the rate of the county at -4.60 in 2006; 0.40 in 2011 and -0.44 in 2016.

According to the 2016 Pobal HP Deprivation Index for Small Areas (SA) Conceptual Basis, Haase & Praatschke, August 2017 *"The most basic pattern of affluence and disadvantage has remained broadly intact over this 15-year period: affluence is highest in the urban peripheries and gradually declines as one moves towards more rural locations."* With this in mind it

is likely that the SA within which the site occurs is more affluent than most rural areas given its deprivation score so close to the national average. This extrapolation is borne out by a review of unemployment rates by Pobal over the period 2006 to 2011 for the SA relative to the county that indicates the SA has a better employment rate than the county.

	2006		2011		2016	
	Male	**Female**	**Male**	**Female**	**Male**	**Female**
Co. Carlow	17.65	16.85	26.47	19.04	9.07	9.63
Carlow Average	8.83		13.24		4.54	
SA ID 017036002	8.33	15	14.1	6.5	6.6	22.2
SA Average	4.17		7.05		3.30	

Table 4.3 Unemployment rates (%) in Small Area within which site occurs relative to Co. Carlow 2006, 2011, 2016

In order to compare the area closer to baseline (1990) we reviewed the Quarterly National Household Survey (QNHS) that provides benchmark estimates of employment and unemployment for each quarter for the State since the beginning of 1998. To correct for typical seasonal patterns, the data series included have been concurrently seasonally adjusted. The latest month for which unemployment figures are available is August. Figure 4.1 indicates that Carlow unemployment rate at table 4.3 is consistent with the national average.

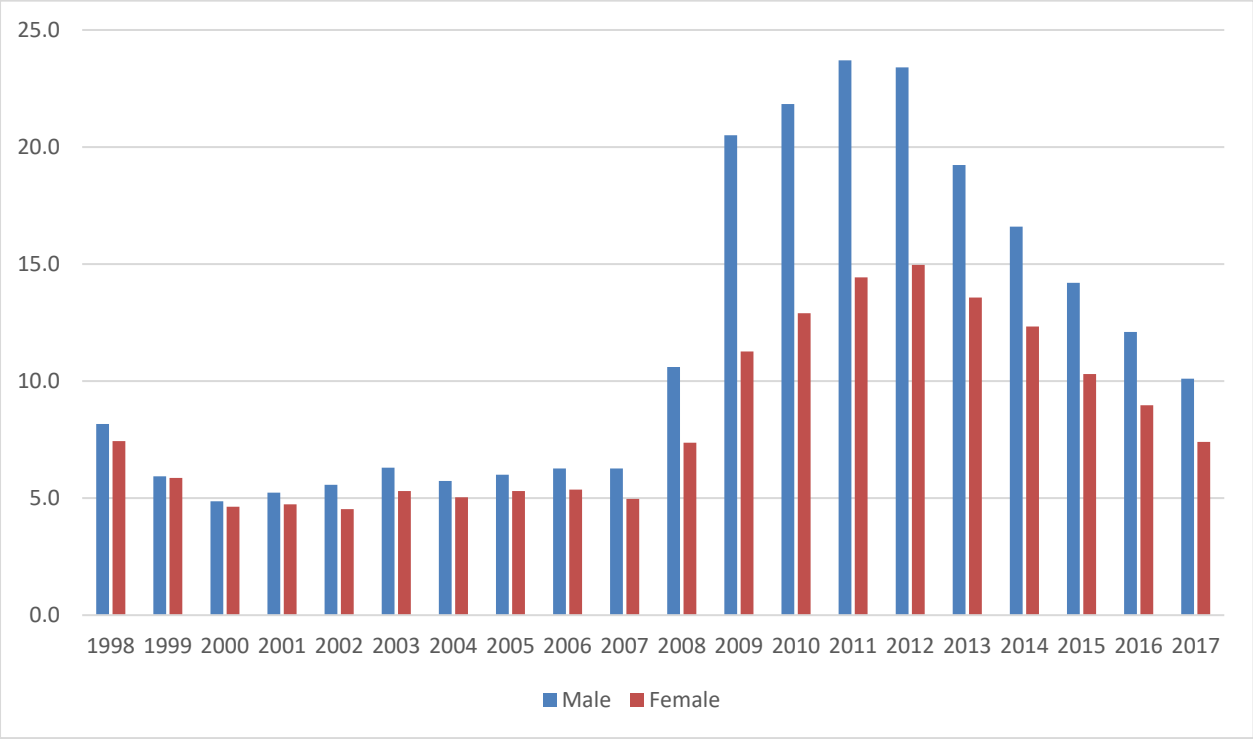


Figure 4.1 Seasonally Adjusted Monthly National Unemployment Rate (%), August 1998-2017 from QNHS

4.3.2 Land Use & Settlement Patterns

The development the subject of this rEIAR consist of a quarry over two land units and processing plant. This is a persistent land use originating in the 1940s and 1950s. According to Appendix 2.1 the land use reached its peak production levels in the late 1991s to mid 2000s when all plant was installed and the lateral extent of the voids appears much as they do today. Please refer to Chapter 6.0 Land, Soils & Geology for a rendition of effect of the land use in removing land but

retaining soils and subsoils to be used in restoration. Please also refer to Chapter 12.0 Landscape & Visual assessment for a rendition of the effect of the land use on the landscape of the area, including topography which is noted at Chapter 6.0 also.

The landscape around the subject lands is characterised by low density, once off ribbon development as indicated by a review of local population.

There are no dwellings within the rEIAR lands. Within the lands in the control of the developer; just over 196 ha. as compared to the rEIAR lands at 81 ha., there exists 7 no. dwellings extant since baseline (1990). 3 no. of these are habitable but only one currently occupied by DMIL staff. All dwellings immediately contiguous with the rEIAR site in the ownership of the developer save for 2 no. located;

- on the immediate western side of the Clonmelsh rEIAR that is in the ownership of a former DMIL manager and excluded from this rEIAR and the lands now in control of DMIL indicated thus ■ on figure 4.2; and
- another on the south eastern corner of the Clonmelsh rEIAR unit.

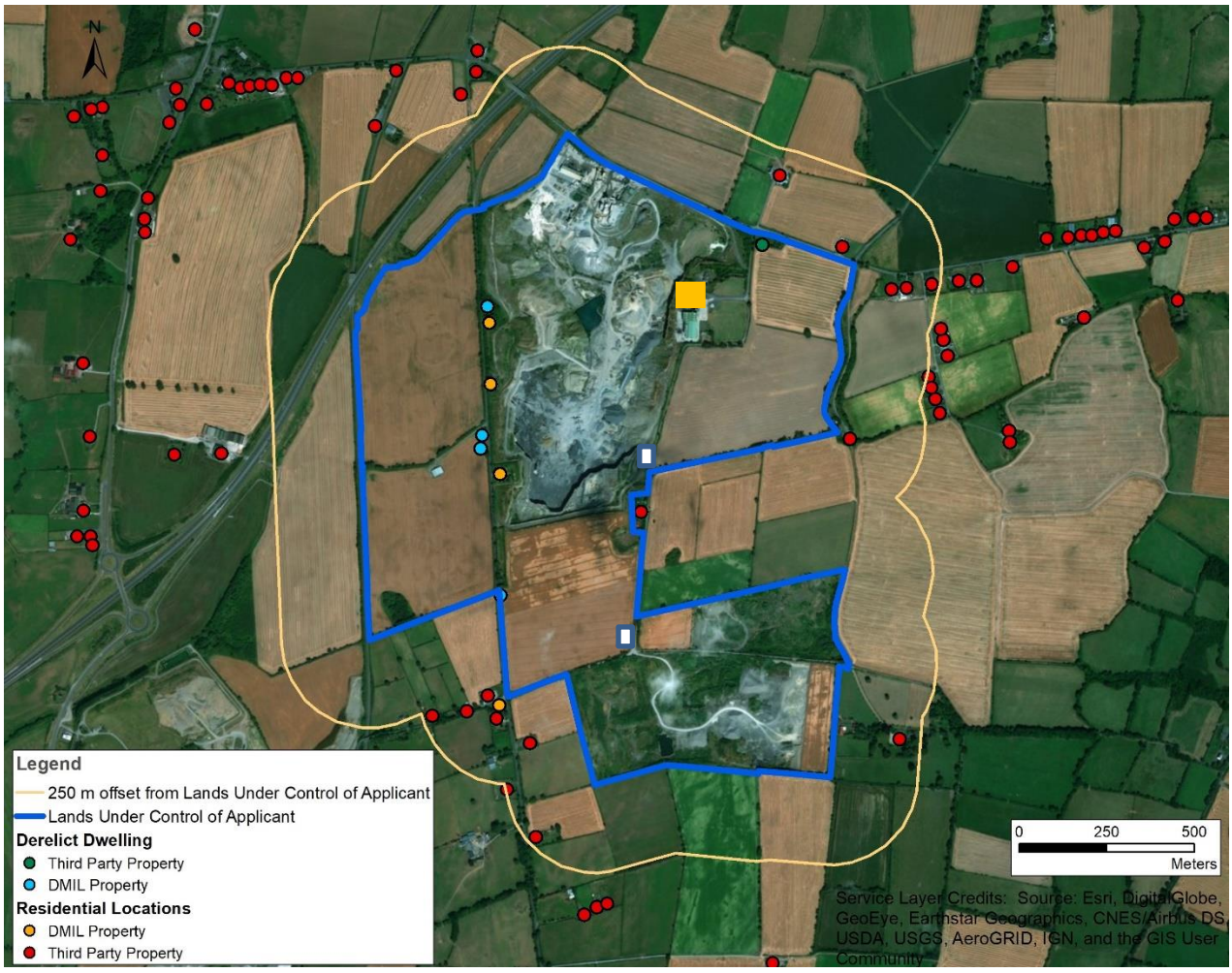


Figure 4.2 Dwellings in the vicinity of the rEIAR site.

A review of the historic OSI map originating from the 1940s ahead of development indicates that 2 no. dwellings within the lands in the control of the developer and their ownership have been removed in the course of the development of the subject lands indicated thus ■ on figure 4.2. A review of aerial photography from 1995 indicates that the southern dwelling was removed pre-baseline by the northern post-baseline (1990)

The future direction of settlements and land use patterns are guided by planning policy currently set down in Carlow County Development Plan 2015 – 2021 that promotes sustainable development and is supported by an SEA. The lands for the purposes of the Plan are considered *agricultural*.

The other notable land uses, besides agriculture and low density housing are other extraction sites in the vicinity of the subject lands at Powerstown.

4.3.3 Amenity

The subject lands does not offer amenity opportunities for the public being a private commercial enterprise. Please refer to Chapter 12.0 Landscape & Visual assessment for a rendition of the effect of the land use on the landscape of the area, including conceptual restoration plan proposing increased land cover type areas around a waterbody.

Within the area controlled by the developer but excluded is an historic graveyard just south of ■ on figure 4.2. This is owned and maintained on behalf of visiting members of the public and is noted as recorded monument CW012-024003- at Chapter 11 of this rEIAR.

Just south west of the area controlled by the developer is the municipal landfill and amenity (recycling) centre owned and operated by Carlow County Council. Table 2.1 of this rEIAR sets out 'principal' projects in the vicinity of the subject lands and notes that the landfill began operating in 1975 and thus has operated in tandem with the subject lands.

Infrastructure to the benefit of a wider population in the form of an upgraded M9 and the commuter Dublin – Waterford Rail line have been in place since 2009 and the 1800s respectively and are described at Chapter 10.

4.3.4 Employment

Currently the site generates the equivalent of 12 no. full time staff.

There is no direct information as to employment generation capability of the lands in the past beyond 2010 for reason of the lands not being the subject to dedicated economic or environmental review.

We submit that that the site generated 20 no. full time jobs, at peak extraction and production rates over 1997 to 2007, as evidenced by traffic data submitted in historic planning applications (see table 12.3 of this rEIAR).

By reference to the information submitted in support of Reg. Ref. 12/240 we further submit that at least double that estimated full time worker equivalent to 40 to 60 jobs was predicted to be secured by way of upgrade of the site office to a larger facility to hold back office DMIL group activities by relocation from other sites. Reg. ref. 12/240 proposed the retention of plant area items and planning permission for the demolition and upgrade of the site offices and replacement, enlarged wastewater treatment system. This proposal was ultimately refused on appeal and never taken up. The entering of DMIL into receivership meant that the requirement for a group office no longer existed.

As such it is estimated that the lands the subject of the rEIAR directly support 12 no. fulltime jobs and are capable of supporting 20 no. full time jobs at historic peak extraction and production levels.

The drop in direct jobs over the period is reflective of general recession, reduced demand for product and the status of the applicant company.

4.4 Impacts of the Development

The effects of the project can be positive, neutral or negative. Likely significant impacts are here described by their significance to the existing environment:

- imperceptible, not significant, slight, moderate, significant, very significant and profound;

and their duration:

- momentary (seconds to minutes), brief (less than a day), temporary (less than 1 year), short term (1 to 7 years), medium term (7 to 15 years), long term effects (15 to 60 years), permanent (over 60 years).

The felt and predicted impacts of the proposed scheme on Population and Human Health have been assessed in other Chapters of this rEIAR:

Chapter 5 – Biodiversity

Chapter 6 – Land, Soils & Geology

Chapter 7 – Water & Hydrogeology

Chapter 8 – Air Quality & Climate

Chapter 9 – Noise (and vibration)

Chapter 10 – Material Assets & Traffic

Chapter 11 – Cultural Heritage

Chapter 12 – Landscape & Visual Assessment

4.4.1 Human Health

The companion chapters of this rEIAR define and asses the predicted impact of the development and set out mitigation measures from the perspective of discreet environmental factors and include matters of cultural, archaeological and natural heritage. Where it is determined that the assimilative capacities of those environmental factors including air, water, geology, soils and landscape are sufficient, with mitigation measures, to accommodate the development without significant negative impacts it is considered that the human health will be protected. However, for this assumption to be drawn the mitigation measures set out in each chapter of the EIS must be implemented.

4.4.2 Land Use & Settlement Patterns

The removal of lands constituting the rEIAR units is a direct, negative, permanent and profound impact in removing the original agricultural use of those lands.

Due to the lands note being identified for planned settlement the effect on settlement patterns is direct, neutral, permanent and not significant.

The quarrying land use has necessitated the removal of 2 no. dwellings (at figure 4.2) which is a direct, negative, permanent and slight.

4.4.3 Amenity

The removal of lands constituting the rEIAR units is a direct, negative, permanent and profound impact in removing the original agricultural use and appearance of those lands.

The cumulative impact of traffic the rEIAR land uses and those other quarrying land uses in Powerstown with the municipal landfill also in Powerstown have a cumulative, indirect, negative, long term effect on the local road network.

4.4.4 Employment

Loss of agricultural lands employment equivalent is a direct, negative, permanent and not significant.

Creation and suiting of employment at the subject lands is a direct, positive, long term, significant effect on the site working and local populations. There is an associated indirect, positive, long term, slight effect in the land use and jobs on site supporting other services employment.

4.5 Mitigation Measures

As set out at section 4.4 the felt and predicted impacts of the development on Population and Human Health have been assessed at succeeding Chapters 5 to 12 of this rEIAR for reason of all impacts ultimately affecting humans and accepted industry standards or parent and license conditions are to protect human health and the sustainable development of an area.

4.6 Residual Impacts

The removal of the site from agricultural land to a quarry and processing lad use is the major adverse impact. The working of an economic reserve at this location in terms of employment is a positive long term impact. A conceptual restoration plan is provided at Chapter 12 in order to mitigate the residual impact of the removal of land arising from development.

5.0 BIODIVERSITY -ECOLOGICAL IMPACT ASSESSMENT

5.1 Introduction

This retrospective assessment presents a summary of ecological features which were likely, or had the potential to be, residually affected by the legacy of extractive works at the Clonmelsh Quarry and Lands at Garyhundon site (collectively referred to as the 'Site'). It evaluates the importance of the ecological resources past and present and defines the degree of significance of potential impacts resulting from the historic development through until the present day. The report also identifies appropriate mitigation measures and defines residual impacts should they be identified.

This Biodiversity impact assessment uses a 'greenfield' baseline of the Site (pre the present level of sand and gravel extraction), which is based upon information from historical maps. A walkover survey of the Site was undertaken in July 2017 and this was compared to the Ordnance Survey Ireland (OSI) maps for the Site prior to the existence of the current workings. Following on from this an impact assessment was carried out to establish any impacts of quarrying related activities on habitats, flora and fauna (biodiversity features).

5.2 Assessment Methodology

Given that this is an assessment of the baseline conditions prior to the existence of the Site in its present condition, the assessment is based upon a combination of historical information and the Site walkover which included comparative notes on the surrounding landscape.

5.2.1 Desktop Survey

A desktop review was conducted of available published and unpublished information, including a review of data available on the National Parks and Wildlife Services (NPWS) and National Biodiversity web-based databases. This work was conducted in order to identify key habitats and species that may be present, particularly those protected by legislation. The designated search area was 5 km from the Site for Natural Heritage and proposed Natural Heritage sites.

5.2.2 Designated Nature Conservation Site Assessment

Sites of international importance including Special Areas of Conservation (SACs) and Special Protection Areas (SPAs) are collectively known as Natura 2000 sites. These sites contain examples of some of the most important natural and semi-natural ecosystems in Europe. Designated sites, which also include Natural Heritage Areas (NHA's) and proposed Natural Heritage Areas (pNHA's) were also identified within the proposed development's area of influence. The designated search area was 15 km from the Site for Natura 2000 sites.

In the subsequent analysis of designated sites, particular attention was given to potential for the Site operations to influence a designated site. In other words, potential current and historical ecological pathways were identified, these pathways can be hydrological, physically overlapping or exhibiting habitat and species synergies that could result in temporary or residual effects being afforded to a designated site.

5.2.3 Ecological Survey

A walkover survey of the Site was conducted on the 12th July 2017 to record the habitats currently present on, and adjacent to, the Site. Habitats are named and described following Fossitt (2000). Habitat Assessment follows the Joint Nature Conservation Committee (JNCC) Phase One Habitat Survey methodology (JNCC, 1990, revised 2010). Additionally, aerial

photographs (satellite imagery) and Site mapping (including surface water) assisted the habitat survey.

An assessment of hedgerow quality was made based upon a truncated version of the Hedgerow Appraisal System (Foulkes, et al, 2013). The objective of the methodology is to record the extent (i.e. quantitative survey), and floristic composition, context, physical structure, condition, and management of hedgerows (i.e. qualitative survey) in any given locality, County or region of Ireland using a semi-random sample selection (Foulkes, et al, 2013). Only hedgerows that would be afforded likely residual ecological impact via historical and present day Site operations were assessed.

Other additional flora and fauna information was provided within a flora and fauna chapter for an Environmental Impact Statement (EIS) prepared to accompany a planning application for the quarry development at Clonmelsh & Garyhundon, Co. Carlow submitted to Carlow County Council by Dan Morrissey Ireland Ltd. and prepared by SLR Consulting Ireland (SLR, 2010) for Dan Morrissey Ltd., in compliance with the notice received from Carlow County Council under Section 261, Planning and Development Act, 2000.

5.2.4 Impact Assessment Method

Habitats and species were assessed in accordance with the guidance contained in the document Guidelines for Ecological Impact Assessment for the United Kingdom and Ireland (CIEEM, 2016) which recommends that the value of an ecological resource be determined within a defined geographical context (Figure 5.1).

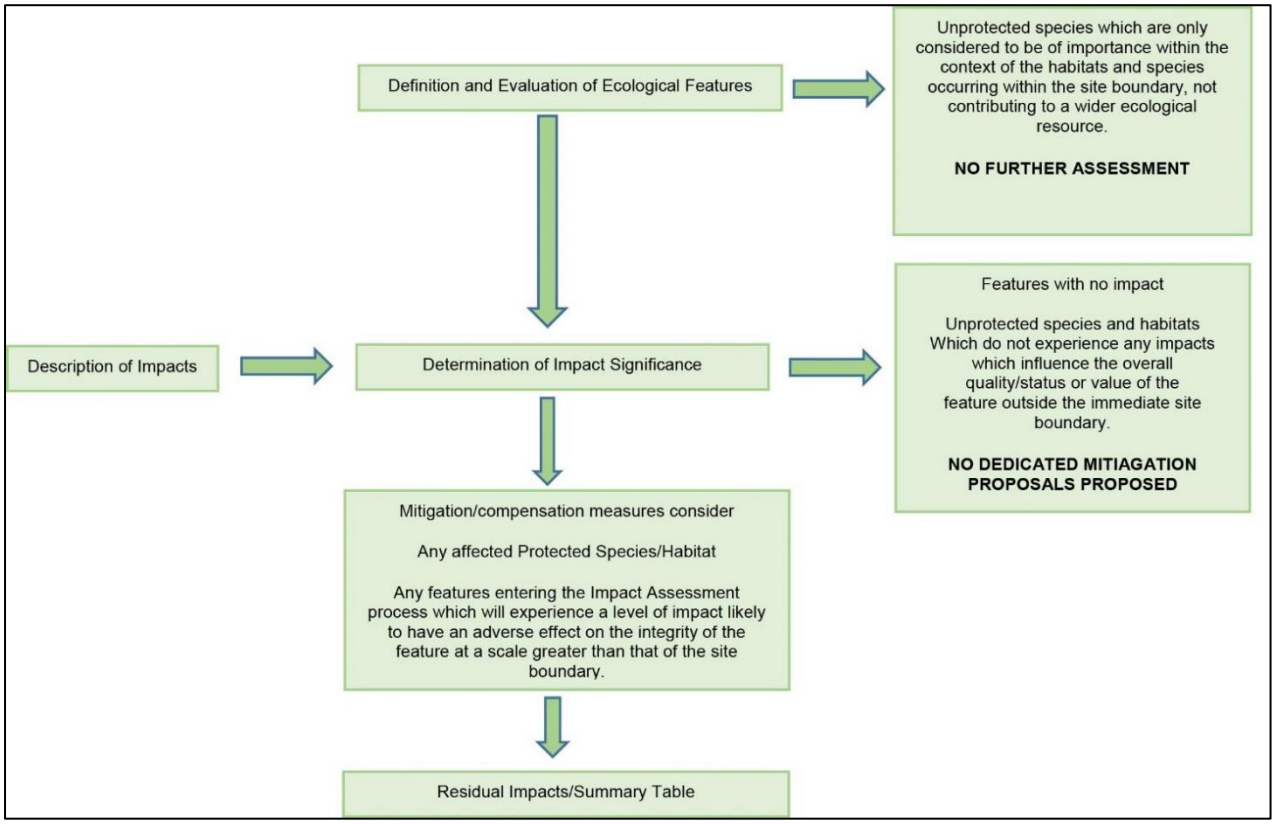


Figure 5.1: Impact Assessment Method

Defining importance: The relative importance of each ecological feature has been defined on a geographical scale, from international importance, to having relevance only in the context of the Site boundary. The definitions employed for the basis of the evaluation are presented in Table 5.1. It should be noted that professional judgement has been employed in the allocation of a level of importance to each feature **as it occurs on the Site**. In other words, the value of the feature is presented in the context of its actual status within the Site. **Therefore a single individual of a species which is**

protected under the EU Habitats Directive would not automatically be considered to be of European (international) Importance, but would be evaluated in the context of its relationship to the overall population.

Defining impact: The impacts to ecological features are defined by their geographical significance in terms of the likely effect and the defined importance of the feature being affected. It is not possible in this system to have an impact greater than the overall geographical importance of the feature (e.g. the maximum possible impact to a feature of regional importance would be one which is of regional significance). Impacts which do not have significance beyond the immediate area (the Site) will be managed through the implementation of construction and habitat management plans. One exception to this is the case of impacts on Protected Species, where any impact would result in the implementation of mitigation measures.

Defining Magnitude of Change: Considering the potential for impacts as defined above, an assessment of the magnitude of change is arrived at. This is based on the table below and relies on professional subjective judgement in deciding the level of magnitude of change.

Impact Level	Description
Severe Impact	Ecological effects of a scale or magnitude which would result in permanent, total loss of an irreplaceable species or habitat of international or national importance (occasionally of local importance), or which would result in the substantial loss of a protected/rare habitat or a population of a protected/rare species. They represent key factors in the decision-making process. Typically, mitigation measures would be unlikely to remove such effects.
Major Impact	These effects are likely to relate to permanent impacts at a regional or local level, or temporary impacts at an international or national level, and could be potential concerns to the project depending upon the relative importance attached to the issue during the decision making process. The effects are likely to be large in scale or magnitude, and result in substantial medium term loss of protected/rare species or habitats. Mitigation and detailed design work are unlikely to entirely eliminate all ecological effects.
Moderate Impact	These effects are usually only at local or regional level, and may be short or medium term only, or temporary impacts on a small part of an international site. However, the cumulative effects of such issues may lead to an increase in the overall effect on ecological features. They represent issues where effects will be experienced, but mitigation measures and detailed design work may ameliorate/enhance some of the consequences upon affected interests, but some residual effects will still arise.
Minor Impact	These effects are likely to be local issues only; or small magnitude impacts at the regional and national level, they are usually temporary, and are unlikely to be of importance in the decision making process. However, they are of relevance in enhancing the subsequent design of the development and consideration of mitigation measures.
Not Significant / No Impact	No perceivable impacts on ecological features (habitat or species). Impacts may be beneath levels of perception, within normal bounds of variation, within the margin of forecasting error, or impacting on exceptionally poor baseline conditions.
Beneficial / Positive Impact	These effects are those, which through implementation, would be anticipated to benefit the ecology of the Site. They may advance the objectives of local, national or international species or habitats.

Table 5.1: Criteria for Assessing Magnitude of Change

Outlining mitigation, compensation and enhancement measures: Receptors subject to significant impacts (those which have the potential to affect the ecological resource outside of the immediate Site boundary) are the focus of provision of mitigation measures which have been formulated according to the mitigation hierarchy (avoid, reduce / minimise, compensate). All proposed mitigation measures follow industry best practice. Those for protected species follow the prescribed regulatory protocols.

Defining residual impact: Following the application of mitigation measures, impacts to each ecological feature are reassessed, and any residual impacts are reported.

As stated by the CIEEM (2016), 'the value or potential value of a feature/receptor should be determined within a defined geographical context'. Accordingly, each feature has been assessed based on the scale described in Table 5.2.

Importance	Ecological Valuation
International	Sites, habitats or species protected under international legislation e.g. Habitats and Species Directive. These include, amongst others: SAC's, SPA's, Ramsar Sites, Biosphere Reserves, including sites proposed for designation, plus undesignated sites that support populations of internationally important species.
National	Sites, habitats or species protected under national legislation e.g. Wildlife Act 1976 and amendments. Sites include designated and proposed NHAs, Statutory Nature Reserves, National Parks, plus areas supporting resident or regularly occurring populations of species of national importance (e.g. 1% national population) protected under the Wildlife Acts, and rare (Red Data List) species.
Regional	Sites, habitats or species which may have regional importance, but which are not protected under legislation (although Local Plans may specifically identify them) e.g. viable areas or populations of Regional Biodiversity Action Plan habitats or species.
Local/County	Areas supporting resident or regularly occurring populations of protected and red data listed-species of county importance (e.g. 1% of county population), Areas containing Annex I habitats not of international/national importance, County important populations of species of habitats identified in county plans, Areas of special amenity or subject to tree protection constraints.
Local	Areas supporting resident or regularly occurring populations of protected and red data listed-species of local importance (e.g. 1% of local population), Undesignated sites or features which enhance or enrich the local area, Sites containing viable area or populations of local Biodiversity Plan habitats or species, local Red Data List species etc.
Low Local	Undesignated sites or features, which enhance or enrich the wildlife resource at a Parish or neighbourhood level.
Within Site	Very low importance and rarity. Ecological feature of no significant value beyond the Site boundary.

Table 5.2: Criteria for Establishing Receptor Sensitivity/Importance

5.3 Baseline Ecology

5.3.1 Designated Nature Conservation Sites

There are three (3) Natura 2000 sites located within 15 km of the Site (refer Figure 5.2 below):

- River Barrow and Nore SAC;
- Black Mountains SAC; and
- Slaney River Valley SAC;

The closest Natura site is the River Barrow and Nore SAC which is ca. 900m west of the Application Site. The Slaney River Valley SAC is ca. 12 km east of the Application Site and the Black Mountains SAC is ca. 15 km to the south east.

The following summary of the River Barrow Nore SAC is included verbatim from the National Parks and Wildlife service website .

"This site consists of most of the freshwater stretches of the Barrow/Nore River catchments. The Barrow is tidal

as far upriver as Graiguenamanagh while the Nore is tidal as far upriver as Inishtioge. The site also includes the extreme lower reaches of the River Suir and all of the estuarine component of Waterford Harbour extending to Creadan Head. The larger of the many tributaries include the Lerr, Fushoge, Mountain, Aughavaud, Owenass, Boherbaun and Stradbally Rivers of the Barrow and the Delour, Dinin, Erkina, Owveg, Munster, Arrigle and King's Rivers on the Nore. Both rivers rise in the Old Red Sandstone of the Slieve Bloom Mountains. They traverse limestone bedrock for a good proportion of their routes, though the middle reaches of the Barrow and many of the eastern tributaries run through Leinster Granite. A wide range of habitats associated with the rivers are included within the site, including substantial areas of woodland (deciduous, mixed), dry heath, wet grassland, swamp and marsh vegetation, salt marshes, a small dune system, biogenic reefs and intertidal sand and mud flats. Areas of improved grassland, arable land and coniferous plantations are included in the site for water quality reasons.

The site supports many Annexed habitats including the priority habitats of alluvial woodland and petrifying springs. Quality of habitat is generally good. The site also supports a number of Annex II animal species - Salmo salar, Margaritifera margaritifera, M.m. durrovensis, Alosa fallax fallax, Austropotamobius pallipes, Petromyzon marinus, Lutra lutra, Lampetra fluviatilis and L. planeri. Annex I Bird species include Anser albifrons flavirostris, Falco peregrinus, Cygnus cygnus, Cygnus columbianus bewickii, Limosa lapponica, Pluvialis apricaria and Alcedo atthis. A range of rare plants and invertebrates are found in the woods along these rivers and rare plants are also associated with the saltmarsh."

The site is a Special Area of Conservation (SAC) selected for the following habitats and/or species listed on Annex I / II of the E.U. Habitats Directive (* = priority; numbers in brackets are Natura 2000 codes):

- Estuaries [1130];
- Mudflats and sandflats not covered by seawater at low tide [1140];
- Reefs [1170];
- Salicornia and other annuals colonising mud and sand [1310];
- Atlantic salt meadows (Glauco-Puccinellietalia maritimae) [1330];
- Mediterranean salt meadows (Juncetalia maritimi) [1410];
- Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation [3260];
- European dry heaths [4030];
- Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [6430];
- Petrifying springs with tufa formation (Cratoneurion) [7220];
- Old sessile oak woods with Ilex and Blechnum in the British Isles [91A0];
- Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae) [91E0];
- Vertigo moulinsiana (Desmoulin's Whorl Snail) [1016];
- Margaritifera margaritifera (Freshwater Pearl Mussel) [1029];
- Austropotamobius pallipes (White-clawed Crayfish) [1092];
- Petromyzon marinus (Sea Lamprey) [1095];
- Lampetra planeri (Brook Lamprey) [1096];
- Lampetra fluviatilis (River Lamprey) [1099];
- Alosa fallax fallax (Twaite Shad) [1103];
- Salmo salar (Salmon) [1106];
- Lutra lutra (Otter) [1355];
- Trichomanes speciosum (Killarney Fern) [1421]; and
- Margaritifera durrovensis (Nore Pearl Mussel) [1990].

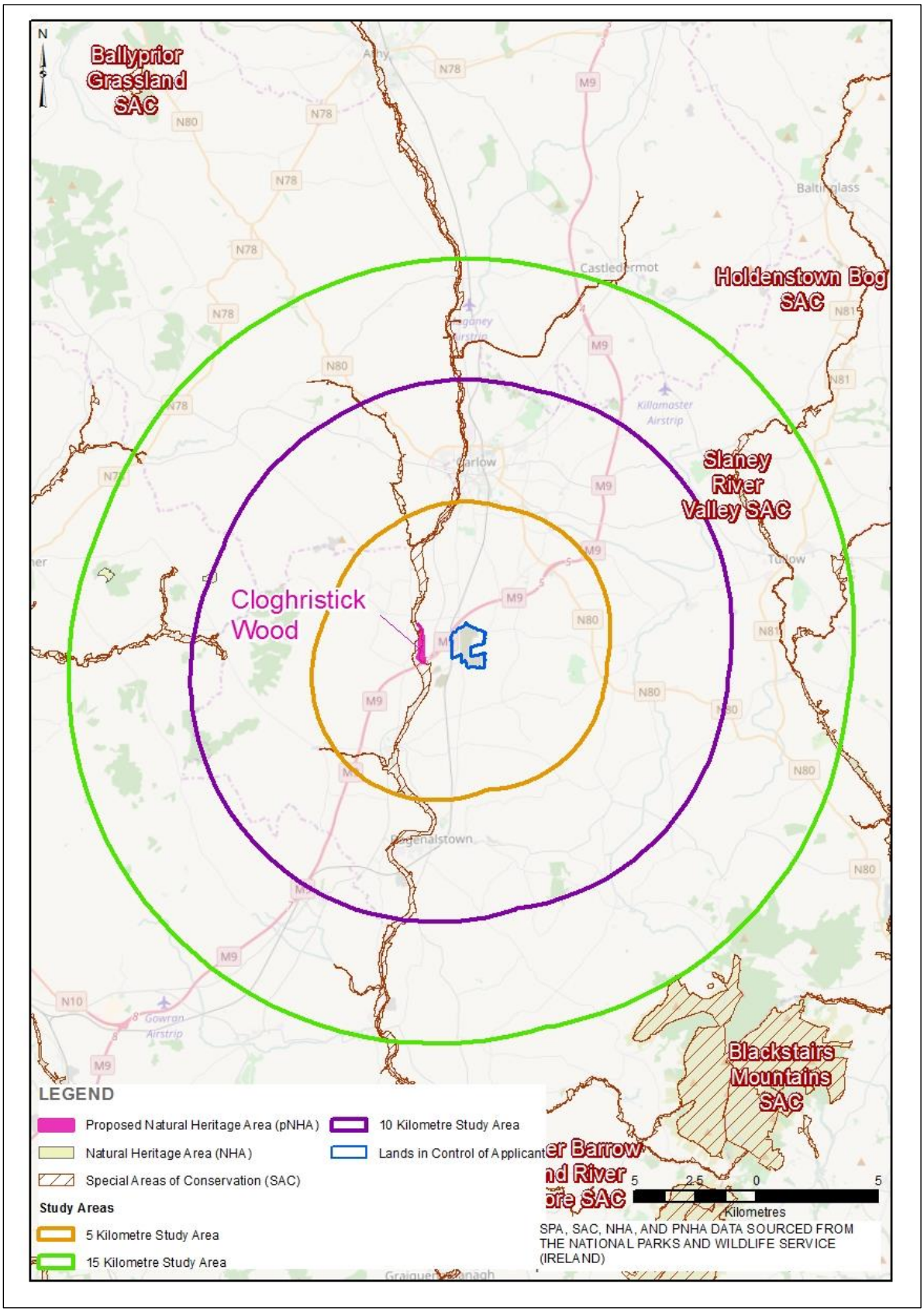


Figure 5.2: Natura 2000 and Nationally Protected sites (NPWS, 2012) within 15km and 5km of the Site respectively.

No NHA's were identified within the desk study area. However, a single pNHA was identified within 5 km of the proposed Site (Figure 5.2). The Clog wood pNHA is situated ca. 1.1 km from the Site. It contains examples of Oak Quercus spp., Beech Fagus sylvatica and Hazel Corylus avellana woodland, although Willows Salix spp. are the dominant species. The ground flora comprises a range of wetland and woodland species. The wood is of value as it is typical and, by standards prevailing in County Carlow, quite large.

In terms of assessing the potential for ecological pathways it is important to note that there is no hydrological or obvious terrestrial connectivity from the Site to this pNHA. Furthermore, the surface water regime for the Site will remain unchanged with no elevations in total suspended sediments, changes to water quality or quantity to receptors (Chapter 7.0). Cumulatively, it is considered that no residual effects would be afforded to the pNHA detailed above and it is no longer discussed within this report.

5.3.2 Habitat Assessment

The OSI maps of the early 20th Century indicate the Site comprised of agricultural fields. Quarrying works within the Site, albeit fairly modest in scale, commenced around the 1940's (refer Chapter 2 Site and Receiving and Chapter 3 Project descriptions).

The Site is almost entirely comprised of active quarry and flora assemblages are impoverished by virtue of the active extractive nature of the Site. However, early floral colonisers have established within the Site periphery and especially in the Garyhundon Site which has clearly not experienced the levels of recent disturbance exhibited at the Clonmelsh Site. The habitat map of the Site and surrounds is presented in Drawing 5.1 at the end of this section.

Habitat	Habitat code	Location and prevalence
Active Quarry	ED4	The land holding is dominated by this habitat type within the Site.
Recolonising Bare Ground	ED3	Parts of the Site that are exposed to less anthropogenic disturbance have begun to re-vegetate creating a relatively diverse flora in some circumstances.
Scrub	WS1	Noted within the Site periphery and associated with standing water (artificial pond) habitat.
Artificial Pond	FL8	Throughout the Site ponds have been created and used to manage water balance and quality. Aquatic and emergent plants such as sedges and rushes add to the biodiversity value of the Site.
Hedgerows	WL1	Species-poor intact and defunct hedgerows occur on many field boundaries.
Drainage Ditch	FW4	A single on-Site drainage ditch was recorded at the South of the Clonmelsh Quarry.
Arable Crops (Cultivated Land)	BC1	This habitat was noted adjacent to the Site. It is ubiquitous at the Site, local, regional and national scale.

Table 5.3 : Habitats Recorded on Site (Fossitt, 2000)

Active Quarry ED4

Whilst the vast majority of the active quarry footprint is sterile in terms of species presence and composition some peripheral development of flora was noted. The steep quarry faces preclude vehicular disturbance and pioneering species such as greater plantain Plantago major and pineappleweed Matricaria discoidea were recorded.

Figure 5.3: Active quarry, looking North Westerly

Recolonising Bare Ground ED3

Much of the Site that has historically been afforded anthropogenic disturbance has been left fallow for some years. The absence of regular vehicular traffic has allowed floral development. In many cases, the exposed sub-soils and nutrient poor strata have allowed a diverse flora to develop. Typical colonisers noted during the field assessment and by SLR (2010) included spear thistle Cirsium vulgare, hedge mustard Sisymbrium officinale, dyer's rocket Reseda luteola, rose-bay Chamerion angustifolium and white campion Silene latifolia. Additionally, other species such as scentless mayweed Tripleurospermum inodorum coltsfoot Tussilago farfara coltsfoot, ragwort Senecio jacobaea and beaked hawksbeard Crepis vesicaria were recorded or referenced.

Figure 5.4: Recolonising Bare Ground at the Garyhundon Site.

Scrub WS1

Scattered and dense scrub occurs frequently at hedge junctions on fallow ground throughout the Site. Species composition includes blackthorn Prunus spinosa, hawthorn Crataegus monogyna, brambles, gorse, willow Salix spp., cleavers Galium aparine, dog-rose Rosa canina. The scrub transitional habitat includes; gorse Ulex europaeus, brambles Rubus fructicosus agg, Yorkshire fog Holcus lanatus, cocksfoot Dactylis glomerata, creeping buttercup Ranunculus repens and creeping thistle Cirsium arvense.

Figure 5.5: Scrub and pioneer plant succession on the Site periphery.

Artificial Ponds FL8

Excavation of the Site over the decades has resulted in a number of standing water bodies as illustrated in Drawing 5.1. These ponds are likely to be ephemeral in nature and are also affected by pumping regimes in some circumstances in accordance with prevailing rainfall. Vegetation establishment within and adjacent to these features was apparent and aquatic species such as broad-leaved pondweed Potamogeton natans, stonewort Chara species and water plantain Alisma plantago-aquatica were recorded. In a marginal context, toad rush Juncus bufonius, self-heal Prunella vulgaris and hoary willowherb Epilobium parviflorum are abundant. The transitional zones between aquatic and terrestrial habitat were dominated by reedmace Typha latifolia, greater horsetail Equisetum telmateia hard rush Juncus inflexus and canary reed grass Phalaris arundinacea.

Figure 5.6: Artificial Ponds within the Site

Hedgerows WL1

Hedgerows were recorded adjacent to the quarry workings on the periphery of the Site. These hedgerows are generally species-poor. However, many of the hedgerows also exhibit associated features such as standard trees and connecting hedges that provide ecological connectivity. Frequent standard trees include ash and elder Sambucus nigra. Other woody species include blackthorn and privet Ligustrum vulgare. The scramblers, bramble Rubus fructicosus and dog rose rosa canina are also frequent. A review of historical mapping indicates that the Site would have exhibited hedgerows within what is now the Site quarry footprint.

Drainage Ditch FW4

At the southern boundary of the Clonmelsh Quarry within the Site a surface water ditch flows in an easterly to westerly direction before being diverted northerly off Site (Drawing 5.1). This feature appeared dry at the time of survey. However, the floral assemblages recorded within indicates that this feature is periodically inundated in accordance with the seasons and water management of the Site. Water mint Mentha aquatica, watercress Rorippa nasturtium-aquaticum and great willowherb Epilobium hirsutum were evident and symptomatic of seasonally wet conditions.

Arable BC1

Arable habitat is present on the Site periphery. This cropping regime, by definition, creates a monoculture of species-poor habitat of negligible biodiversity value. However, the arable field margins are considered to be of biodiversity interest. Species, considered to be weed flora in these margins include forget-me-not Myosotis arvensis, corn marigold Chrysanthemum segetum, field pansy Viola arvensis and fool's parsley Aethusa cynapium as recorded by SLR (2010).

Figure 5.7: Arable Habitat (carrots) situated between the Clonmelsh and Garyhundon Site

5.3.3 Flora and Fauna Assessment (Desk Study)

The National Parks and Wildlife Service (www.npws.ie mapviewer) do not hold records of protected and notable species within the desk study search area (15 km grid square). However, the freely available desk study results should not be considered definitive data sets for the desk study area. An absence of desk study data does not necessarily correspond that a Site is absent of notable flora or fauna.

5.3.4 Fauna Assessment

The presence, or potential presence, of species on the Site at present and since the early 20th Century was identified from the desk study, use of historical maps and Phase 1 Habitat survey. Table 5.4 lists the species which were considered likely to occur within the Site, on the basis of the presence of suitable habitat and/or the occurrence of recent records in the vicinity. The species, together with its legislative designation is listed. The source(s) of information relating to each species could include:

- Existing records from desk study;
- Presence of suitable habitat identified during the Phase 1 survey; and / or
- Direct observation.

For each species with the potential to occur on Site now, or in a historical context, the final column of Table 5.4 presents a brief summary of the status of the species in relation to the Site itself. If the survey fails to record the species and the

habitats are unsuitable, then it is concluded that the species is unlikely to occur and it is not considered further within the assessment. If a species is confirmed as present, an indication of the likely population size/status within the Site is provided. This information is used in the evaluation presented in Table 5.5.

Species/ Group	Protection Status	Source	Summary of status on site
Badger	Wildlife Acts (1976 – 2010)	Survey (suitability)	The Site is suitable for foraging and hedgerows may be suitable for sett building.
Fox	-	Survey (suitability)	Likely to occur within the Site.
Rabbit	-	Survey (suitability)	Likely to occur within the Site.
Irish Hare	Wildlife Acts (1976 – 2010)	Survey (suitability)	Potential to occur within the Site.
Stoat	Wildlife Acts (1976 – 2010)	Survey (suitability)	Potential to occur within the Site
Hedgehog	Wildlife Acts (1976 – 2010)	Survey (suitability)	Potential to occur within the Site
Red Squirrel	Wildlife Acts (1976 – 2010)	Sub-optimal - Survey (suitability)	No available resource (mixed woodland). Not considered further within this assessment.
Pygmy Shrew	Wildlife Acts (1976 – 2010)	Survey (suitability)	Potential to occur within the Site.
Bats	Wildlife Acts (1976 – 2010) – EU Habitat Directive.	Survey (suitability – Foraging only)	Some foraging habitat was observed within the Site. Trees on the Site periphery may exhibit low (Collins, 2016) bat roosting potential.
Breeding Birds	Wildlife Acts (1976 – 2010), EU Birds Directive and Birds of Conservation Concern (BoCC[1], Ireland).	Survey (suitability) Phase 1 habitat survey (direct observation)	Common and widespread species such as magpie *Pica*, rook *Corvus frugilegus* and wren *Troglodytes* were recorded on Site. No Annex 1 (EU Birds Directive) species were recorded. The Site, in particular the sand stock piles (sand martins), peripheral hedgerow systems, offer a plethora of nesting, foraging and commuting habitat for bird species.
Other Taxa	Lepidoptera / Odonata	Sub-optimal - Survey (suitability)	Available resource situated within the application Site boundary (water bodies). However, unlikely to be adversely affected by current operations. Not considered further within this assessment.

Table 5.4: Species Recorded

5.3.5 Natura 2000 and Protected Sites

The potential impact of the project on Natura 2000 sites is dealt with in the accompanying retrospective Natura Impact Assessment.

5.3.6 Evaluation

The evaluation of ecological features (sites, habitats and species) which could be affected by the Project proposals is presented in Table 5.5. The table includes:

Any statutory designated areas, with the exception of Natura 2000 sites, which are situated within 5 km of the Project Site that have potential ecological connection (s) with the Site;

[1] Colhoun, K. & Cummins, S. (2013) Birds of Conservation Concern in Ireland 2014–2019. Irish Birds 9: 523–544.

- Any surface or groundwater bodies that have hydrological connectivity with the Site;
- Any habitat type recorded within the Site; and
- Any species of conservation importance which has been confirmed as occurring within the Site.

The value of the feature is based upon how important the feature is in relation to its geographical context. In other words, at what level of geographical resolution would the feature contained within the Site (Designated Area, habitat or species) be recognised as contributing to biodiversity to a significant degree. The evaluation takes into account any statutory or non-statutory conservation status, its extent (or population size) within the Site compared to the resource elsewhere and whether it has characteristics which either elevate or depress its importance in comparison with a 'typical' example (for example, whether a habitat is particularly species rich, or depleted in species).

Common and widespread species or habitats, therefore, only have a level of importance in respect to the biodiversity of their immediate area (taken in this case to be represented by the boundary of the Site). Such features are not considered further within the Impact Assessment. Some protected species may, under certain circumstances (such as a single example occurring within the Site, as part of a much larger local population) be considered to only be of importance within the Site itself. Such species, on the basis of legal and planning regulation compliance, are included within the Impact Assessment and, (if necessary) dedicated impact mitigation measures are provided. Table 5.5 presents each feature occurring, together with the rationale for its evaluation.

Key Ecological Features	Importance	Rationale
Habitats		
Active Quarry	Site	Active quarry habitat has been created on Site in accordance with the function of the working quarry. This feature has the potential to develop into recolonising bare ground through natural succession. As such, a level of incidental biodiversity gain can be achieved when compared to the ca. 1940 (pre-workings) baseline of the Site. Not considered further in this assessment.
Recolonising Bare Ground	Site	Recolonising bare ground habitat has been created on Site in accordance with the function of the working quarry. This feature has inherent biodiversity value and is created as an incidental outcome of the quarry operation. As such, a level of incidental biodiversity gain can be achieved when compared to the 1940's baseline of the Site. Not considered further in this assessment.
Scrub	Site	Permanent land take is likely to have occurred to this habitat. However, this type of habitat is considered to be ubiquitous and not inherently biodiverse or rare in accordance with ecological value based upon the criteria defined by Ratcliffe (1977), namely: naturalness, size, rarity and diversity. Not considered further in this assessment.
Artificial Pond	Site	Artificial ponds have been created on Site in accordance with the needs of the working quarry. These features are considered to be an incidental net gain for biodiversity at the Site level. Not considered further in this assessment.
Hedgerows	Local	Hedgerow habitat has been residually affected by the legacy of quarrying at the Site. This feature is considered further in this assessment.
Drainage Ditch	Site	Drainage ditch habitat has been created on Site in accordance with the needs of the working quarry. This feature is considered to be an incidental net gain for biodiversity at the Site level. Not considered further in this assessment.
Arable Crops (Cultivated Land)	Site	Permanent land take has occurred to this habitat between 1940 and the present day. However, this type of habitat is considered to be ubiquitous and not inherently biodiverse or rare in accordance with ecological value based upon the criteria defined by Ratcliffe (1977), namely: naturalness, size, rarity and diversity. Not considered further in this assessment.
Species		

Key Ecological Features	Importance	Rationale
Badger	Site	The Site would have formally supported suitable foraging and sett building habitat. The permanent loss of pasture and hedge lines over the decades has residually affected this species in terms of Site level habitat suitability. This feature (species) is carried forward into the design mitigation and impact assessment sections.
Irish Hare	Site	The quarrying footprint within the Site does not afford Irish hare any optimal or indeed sub-optimal habitat. It is likely that the pre-quarrying baseline afforded some optimal habitat for this species group. The Site periphery exhibits some sub-optimal foraging and commuting habitat. This feature (species) is carried forward into the design mitigation and impact assessment sections.
Small Mammal Group	Site	The quarrying footprint within the Site does not afford small mammals any optimal or indeed sub-optimal habitat. It Is likely that the pre-quarrying baseline afforded some sub-optimal habitat for this species group. The peripheral Site at the present day supports suitable foraging and commuting habitat. This feature (species group) is carried forward into the design mitigation and impact assessment sections.
Bats	Site[2]	The Site supports suitable foraging and commuting habitat. It is likely that hedgerows and pasture within the Site has been lost over the decades and this has limited the commuting value of the Site for bat species. Some low potential roosting habitat may still be available on the Site periphery (mature trees). Quarrying at the Site has resulted in a mosaic of habitats being formed including the creation of standing water bodies. These features could encourage species such as the Daubenton's bat to forage on Site. This feature (species group) is carried forward into the design mitigation and impact assessment sections.
Breeding Birds	Site	Common and widespread breeding birds will have used the Site before extractive works were undertaken at the Site. Some breeding bird habitat will have been permanently lost in congruence with quarrying footprints increasing over the decades. Conversely, the effects of quarrying have also created habitat for breeding birds. Sand stock piles have been colonised by breeding sand martins and the diversity of habitats now exhibited at the Site may have contributed to a net gain in terms of providing increases in biodiversity value. This feature (species group) is carried forward into the design mitigation and impact assessment sections.

Table 5.5: Classifying the Geographical Importance of Key Ecological Features

5.4 Design Mitigation

This section describes the mitigation measures that have been implemented in congruence with official statutes pertaining to environmental working best practice. Additional mitigation measures not incorporated at the design stage are considered in relevant sections throughout the rEIAr. The ecologists and the Project design team have devised a number of measures to mitigate the residual impacts likely to have occurred since quarrying operations commenced on the ecological environment at the Site:

All Site operations will continue to be undertaken in accordance with industry best practice and adhere to the HSA's 'Guidelines to the Safety, Health and Welfare at Work (Quarries) Regulations 2008');

Vegetation clearance will continue to be undertaken outside of the bird nesting season (March to August) or under the supervision of a suitable qualified ecologist; and

Lighting will be minimised and will not illuminate peripheral natural vegetation to maintain dark skies to benefit bat and other nocturnal species.

[2] Whilst bats are internationally protected, individuals on Site that are part of a much wider population cannot be reasonably considered to be of 'international' significance.

5.5 Impact Assessment

Impacts associated with the legacy of quarrying have been defined and their significance assessed in relation to their implications on ecological features in a historical context up to the present day, they are defined in terms of their geographical extent (Table 5.5).

The key operational impacts assessed are:

- Disturbance to habitats and species;
- Habitat loss;
- Species loss;
- Impacts of dust and Site runoff as a result of extraction and restoration activities;
- Potential for suspended within the quarry to be discharged into the Powerstown Stream; and
- Impact on the water environment from quarrying related activities arising from accidental spillage of fuels or oils to the groundwater environment during refuelling operations. This potential impact is likely to occur if contaminants are allowed to infiltrate to ground during refuelling operations.

5.5.1 Hedgerow

A review of historical mapping does not provide a clear indication as to the scale of likely hedgerow loss attributed to quarrying operations. However, it is likely that the field boundaries that historically existed were reasonably frequent as fields were generally modest compared with the present day. For the purposes of the impact assessment it is assumed that hedgerow loss was relatively significant at the Site level. However, this loss of hedgerow will have occurred over many decades which will have mitigated effects.

Characterisation of Unmitigated Impact

Habitat removal or modification will have afforded a negative impact. In the absence of mitigation nesting, foraging and commuting habitat will have been restricted during the operational life of the quarry.

Rationale for Prediction of Effect

Losses of foraging habitat and potential habitat severance is less likely to cause stress to species associated with hedgerow habitat given the abundance of optimal habitat within the local setting. On a precautionary basis, it is considered certain that this impact will have negatively affected the conservation status of these linear landscape features.

Effect without Mitigation

The unmitigated effect to this Site has resulted in a minor permanent impact to habitat of local sensitivity and importance.

5.5.2 Irish Hare and Badger

The potential for ecological impact to Irish hare and badger, in the absence of mitigation focuses on the following factors:

- Operational noise disturbance;
- Vegetation removal/soil stripping; and
- Dust deposition and subsequent changes in habitat composition (changes to structural, foraging and commuting habitat).

Irish hare Lepus timidus hibernicus and badger Meles meles are mobile species and badger in particular display a level of

resilience to anthropogenic pressure. Operational impacts attributed to land take, noise, vegetation/soils removal and dust deposition must be considered.

Effects likely to have been afforded to hare and badger include displacement owing to land take, potential mortality owing to vehicular movements, severance of commuting habitat and operational noise disturbance. Noise effects associated with the operation of the quarry will have been temporary during diurnal parts of the day and no nocturnal noise effects would have been experienced. Losses of sett and form habitat have been permanent. Effects experienced with operational noise were temporary and reversible.

Characterisation of Unmitigated Impact

Owing to the relative mobility of these species it is considered unlikely that habitat removal or modification would have afforded a negative impact. Noise effects associated with the operation of the quarry would have been temporary during diurnal parts of the day and no nocturnal noise effects would be experienced. In the absence of mitigation sett and form building habitat, foraging and commuting habitat may be restricted during the operational life of the quarry.

Rationale for Prediction of Effect

The variable effects associated with land take, operational noise and habitat severance and loss at different distances from the source of disturbance, are very little understood for small to medium mammals. Habitat loss would be likely to afford a level of perceived stress and possible mortality, dependent on species mobility, though this is not certain.

Minor losses of foraging habitat and habitat severance is less likely to cause stress to these species given the abundance of optimal habitat (hedgerow, scrub, arable and pasture) within the local setting. On a precautionary basis, it is considered likely that this impact would have negatively affected the conservation status of the hare and badger population at the Site level.

The rationale for effect to hare and badger considers that habitat loss and disturbance will have occurred over the operational life of the Quarry. However, it is also acknowledged that these species are mobile and the habitat that they favour are ubiquitous at the Site, Local and National scale.

Effect without Mitigation

The unmitigated effect to these species is likely to have resulted in a minor permanent impact to species of Site level sensitivity and importance. Mammals such as hare are protected under the Wildlife Acts (1976-2010). Badgers are protected under the Wildlife Acts (Wildlife Act, 1976; Wildlife Amendment Act, 2000), and in Northern Ireland under the Wildlife (N.I.) Order of 1985. Also protected under Appendix III of the Berne Convention.

5.5.3 Feature Small Mammal Group Including Bats

The likely ecological impact afforded to the small mammal group, in the absence of mitigation focuses on the following factors:

- Operational noise disturbance;
- Vegetation removal/soil stripping (land take/modification); and
- Dust deposition and subsequent changes in habitat composition (changes to structural, foraging and commuting habitat).

The small and medium mammal group includes stoat Mustela erminea, pygmy shrew Sorex minutus, and hedgehog Erinaceus europaeus.

Although this group of species are generally fairly mobile, operational impacts attributed to noise, vegetation/soils removal and dust deposition must be considered. Dust which settles on plants, can affect the plants' transpiration, respiration and

other metabolic activity, by clogging pores and damaging waxy cuticles on the leaves, and by reducing available light. Dust can alter soil and water chemistry, structure and trophic status which may have impacts on the composition of plant and invertebrate communities. Dust can have direct impacts on insect and other invertebrate populations. Impacts on plant and invertebrate communities may result in effects further up the food chain (small mammals).

Potential effects to bat species include roost loss, a negative biophysical effect to scrub and peripheral habitat which may inhibit bat commuting value. Linear landscape features, such as hedgerows and tree lines, are important habitats for bats, providing flight paths between roosts and foraging sites and as foraging habitats (e.g. Verboom & Huitema 1997, Oakeley & Jones 1998, Russ & Montgomery 2002).

In addition, low level effects attributed to minor to negligible foraging habitat loss and operational noise may be afforded. Noise effects associated with the operation of the quarry would be temporary during diurnal parts of the day and no nocturnal noise effects will have occurred. Losses of roosting habitat are unlikely as historic mapping indicates a lack of trees or buildings within the Site footprint. Effects associated with operational noise will have been temporary and reversible. The loss of foraging habitat would be temporary within the life of the quarry. Commitments defined within the design mitigation section to negate Site lighting will ensure dark skies are preserved.

Characterisation of Unmitigated Impact

Owing to the relative mobility of these species it is considered unlikely that habitat removal or modification would have afforded a negative impact. Noise effects associated with the operation of the quarry would have been temporary during diurnal parts of the day and no nocturnal noise effects would have occurred. In the absence of mitigation foraging and commuting habitat may have been restricted during the operational life of the quarry.

Rationale for Prediction of Effect

The variable historical effects associated with operational noise and habitat severance and loss at different distances from the source of disturbance, are very little understood for small to medium mammals. Habitat loss would be likely to afford a level of perceived stress and possible mortality, dependent on species mobility, though this is not certain.

Losses of foraging habitat and habitat severance is less likely to cause stress to this species group given the abundance of optimal habitat (hedgerow, scrub and pasture) within the local setting. On a precautionary basis, it is considered likely that this impact could negatively affect the conservation status of the local small mammal population.

The rationale for effect to bat species considers that no bat roosts will have been affected by the quarrying operation at the Site. Losses of foraging habitat are unlikely to cause stress to this species group given the abundance of habitat (mature trees, ditch networks, hedgerow and pasture) within the local setting. On a precautionary basis, it is considered likely that this temporary impact could negatively affect the conservation status of the bat population.

Effect without Mitigation

The unmitigated effect to this development would result in a minor permanent impact to species of low local sensitivity and importance. Small mammals such as stoat are protected under the Wildlife Acts (1976-2010). All bat species are protected under the Irish Wildlife Acts (1976 – 2012) and they are also listed on the EU Habitats Directive. As such, there is an identified, albeit low, potential for a breach of relevant legislation.

5.5.4 Breeding Birds

Ecological impact to the breeding bird group, in the absence of mitigation focuses on the following factors:

- Operational noise disturbance including blasting;
- Vegetation and soil removal; and
- Dust deposition and subsequent changes in habitat composition (changes to structural, foraging and commuting

habitat);

Effects to bird species include a negative biophysical effect to scrub and hedgerow availability which may have disturbed breeding birds and minimally reduced available forage such as hawthorn berries.

Noise effects associated with the operation of the quarry have been temporary during diurnal phases and this has the potential to affect avian behaviour. Ground nesting bird species such as skylark Alauda arvensis could have been disturbed, killed or injured during scrub clearance and soil strip in the absence of mitigation. The effects of increased noise during operation would are temporary and reversible.

Characterisation of Unmitigated Impact

Losses of available nesting habitat as a result of the quarry expansion over the years has been relatively discrete when considering the available habitat at the Site and local level. In the context of the available nesting habitat at the Site and local level it may be considered negligible.

Noise effects associated with the operation of the quarry have been temporary and reversible. The minor loss of foraging habitat can be seen to be temporary within the life of the quarry subject to restoration proposals being implemented at closure.

Rationale for Prediction of Effect

The rationale for effect to bird species considers that losses of available scrub and hedgerow nesting habitat will have occurred. However, the Site footprint is considered to be generally sub-optimal in terms of foraging and ground nesting value and any effects to scrub habitat have been discrete and are wholly reversible. Losses of foraging and breeding habitat are unlikely to cause stress to this group given the abundance of habitat (mature trees, ditch networks, hedgerow and pasture) within the local setting. On a precautionary basis, it is considered likely that this impact will have negatively affected the conservation status of the bird population.

Effect without Mitigation

The unmitigated effect to this feature has resulted in a minor permanent impact to species of low local sensitivity and importance. The majority of bird species are protected under the Wildlife Acts (1976 – 2012) where it is an offence to hunt, interfere with or destroy their breeding or resting places unless authority is obtained via statutory licence provision.

5.6 Mitigation, Compensation and Enhancement Measures

Committed mitigation, compensation and enhancement measures are undertaken to remove and reduce any potentially significant impacts on the surrounding habitats and species in the vicinity of the Site. Mitigation measures in place at the Site are in accordance with the "best practice/possible mitigation measures" as set Quarries and Ancillary Activities: Guidelines for Planning Authorities, DoEHLG (2004) and the discharge licence requirements set out in DL7/233 (granted in 2009).

It is proposed that the following mitigation measures will continue to be adhered to at the Site to ensure that no adverse environmental impacts will occur to the habitats, species hydrology and underlying hydrogeology as a result of the present activities. These are provided as follows:

Habitat Clearance

As defined within the design mitigation section vegetation clearance will continue to be undertaken outside of the bird nesting season (March to August inclusive) or under the supervision of a suitable qualified ecologist.

Hydrocarbons/Chemicals

Mitigation measures that are already implemented at the existing quarry site are as follows:

- All plant and machinery will continue to be regularly serviced before being used on Site;

- Refuelling will be completed in a controlled manner using drip trays at all times;
- Only designated trained operators will be authorised to refuel mobile plant on Site; and
- An emergency spill kit with oil boom, absorbers etc. will be kept on-Site for use in the event of an accidental spill in the quarry floor.

Potential Release of Dust Suppression

Dust suppression will continue to be implemented in accordance with best practice guidance (Environmental Management in the Extractive Industry (2006), and Quarries and Ancillary Activities Guidelines for Planning Authorities (Department of Environment, Heritage and Local Government, 2004)).

Surface Water Monitoring

The following measures will be undertaken:

- As part of the compliance with the discharge licence for the quarry (DL7/233), regular water quality monitoring of the discharge and the Powerstown and Clonmelsh Streams takes place, with results being submitted to Carlow Co. Council;
- The quarry discharge considerably dilutes the levels of nitrate in the Powerstown Stream (Chapter 6.0). This is considered to be a positive impact;
- Surface water channels constructed within the quarry to collect surface water runoff and any perched groundwater seepage. These channels are cleaned out regularly, with the fine materials used on site in remediation works;
- Measures implemented within the quarry to ensure that adequate settlement time is available to discharge water to mitigate against an excessive suspended solids load;
- All soil / overburden stockpiles to be covered (i.e. vegetated) to minimise the risk of rain / wind erosion and reduce TSS;
- Restoration with topsoil and overburden will be carried out on an 'rolling-basis' (on-going basis) to reduce the vulnerability of the bedrock aquifer to possible contamination;
- Most mobile plant will use the existing concrete apron at the current quarry garage for refuelling. Static plant or tracked excavators will refuel over a drip tray with an absorbent mat;
- Any processing plant and/or mobile plant on the Application Site will be regularly maintained, and where plant is damaged or leaking it will be fixed or replaced immediately, as part of the ongoing operational management of the quarry to reduce the risk of leaks;
- Drainage from the smaller roofs of the proposed office, the existing workshop, and ESB sub-station will be / is channelled into the overall site drainage system for the site facilities area; and
- The water management system set out under the existing discharge licence (DL7/233) includes provision for settlement ponds and provides for a hydrocarbon interceptor.

Groundwater Monitoring

Ongoing monitoring of groundwater levels in the vicinity of the proposed development will continue on a regular basis from monitoring wells installed on the Application Site. In addition:

- The developer has provided an undertaking to carry out appropriate remedial measures to restore water well supplies in the event that it is demonstrated that quarry operations are having an adverse impact on private wells;
  - Data loggers (divers) will be placed in selected monitoring boreholes and private wells to monitor fluctuations in groundwater levels on an ongoing basis;
  - Data loggers will also act as an early warning system should a dramatic drawdown in groundwater levels occur;

- No excavation shall take place below +25 m OD; and
- Monthly monitoring of quarry specific groundwater monitoring boreholes and private wells within a 500 m wide radius to monitor possible drawdown and groundwater quality will occur.

Habitat Creation

Extant permissions for the Site do not contain references or commitments for habitat creation at restoration. However, the post-closure condition of the Site will include the provision of freshwater habitats, marginal aquatic plants and shallow drawdown areas. These marginal aquatic and terrestrial transitional habitats will be planted with native hedgerows to compensate for the historical losses if these features. Within the Garyhundon are of the Site the original field boundaries will be reinstated but at the levels they are now at (ca. 5m below original pre-extractive levels).

5.7 Residual Impacts

In the absence of mitigation, compensation and enhancement detailed within Section 5.6 Minor effects to features of Local, Low Local and Site value were realised. However, consideration of the measures outlined in Section 5.6 has resulted in residual effects being considered to be Not Significant. In essence this can be described as having no perceivable impacts on ecological features (habitat or species). Impacts may be beneath levels of perception, within normal bounds of variation, within the margin of forecasting error, or impacting on exceptionally poor baseline conditions.

5.8 Cumulative Impacts

A review of the relevant County Council planning website was undertaken for details of other developments in the area which may lead for the potential for cumulative impacts to arise. Proposed developments identified were mainly for dwelling or extension/alterations to dwellings, a landfill and light industrial infrastructure development. As such, it is considered that no cumulative impacts will be derived from this application and subsequent implementation.

5.9 Conclusions

When cumulatively considering the mitigation, compensation and enhancement measures outlined within this section it is considered that a net gain for biodiversity will be afforded over the long term (closure and post closure life of the quarry). Many new species may appear during the evolution and eventual closure of the Site. As natural succession and planned restoration takes place, a variety of different habitats will occur. This will provide important habitat for a variety of species. Peripheral woodland and scrub will eventually develop adjacent to large waterbodies providing structural ecological connectivity.

5.10 References

CIEEM (2016) Guidelines for Ecological Impact Assessment in the United Kingdom. CIEEM, 26 June 2006.

Fossitt, J.A. (2000). A Guide to Habitats in Ireland. The Heritage Council, Kilkenny.

Foulkes, N., Fuller, J., Little, D., McCourt, S. and Murphy, P. (2013). Hedgerow Appraisal System - Best Practise Guidance on Hedgerow Survey, Data Collation and Appraisal. Woodlands of Ireland, Dublin. Unpublished Report [pdf].

Joint Nature Conservation Committee (2010) Handbook for Phase 1 Habitat Survey: A Technique for Environmental Audit. Revised reprint 2010.

Marnell, F., Kingston, N. & Looney, D. (2009). Ireland Red List No. 3: Terrestrial Mammals, National

Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin, Ireland.

Ratcliffe, D.A. (1977). A Nature Conservation Review. Cambridge: Cambridge University Press.

Russ JM, Montgomery WI (2002). Habitat associations of bats in Northern Ireland: implications for conservation. Biological Conservation 108: 49-58.

SLR (2010) Flora and Fauna (Chapter 4) DAN MORRISSEY (IRL) LTD. SLR CONSULTING IRELAND CLONMELSH QUARRY, CO. CARLOW.

LEGEND

- Lands in Control of Applicant

Fossitt Habitat Classification

- FW4 Drainage Ditch
- WC1 Hedgerow
- Building
- BC1 Arable
- ED3 Recolonising Bare Ground
- ED4 Active Quarry
- FL8 Artificial Pond
- WS1 Scrub

NOTES

1. HABITAT CLASSIFICATION CARRIED OUT ACCORDING TO FOSSITT 2000 GUIDE TO HABITATS

REFERENCE

COORDINATE SYSTEM: IRENET95 IRISH TRANSVERSE MERCATOR

400 200 0 400
Metres

1:10,000

CLIENT
Dan Morrissey Ireland Ltd. (In Receivership) [DMIL]

PROJECT
ENVIRONMENTAL IMPACT ASSESSMENT

TITLE
HABITAT MAP (ACCORDING TO FOSSITT 2000)

CONSULTANT
Golder Associates

YYYY-MM-DD	2017 AUG 29
PREPARED	LD
DESIGN	LD
REVIEW	FB
APPROVED	FB

PROJECT No.	CONTROL	REV	DRAWING
1784075	500-EIA-007	B.0	**5-1**

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: 25mm 0

Path:\\vdc1-v-gis40\1\data\PlanerKCa\nbw\99_PROJECTS\1784075_AA_and_EIA\500\02_PRODUCTION\MXD\1784075-500-EIA-007-02-1-HabitatAreas.mxd

6.0 LAND, SOILS & GEOLOGY

6.1 Introduction

This Chapter of the rEIAR considers and assesses any potential impacts resulting from quarrying related activities that have been carried out at the Site on the surrounding land, soils and geology. Information for this assessment was obtained through a desk based review of site specific studies carried out to support previous planning applications on site, and publicly available information from the Geological Survey of Ireland (GSI) and the Environmental Protection Agency (EPA). It is noted that activity at the Site involves limestone extraction. Blasting activities are currently carried out at this Site. Current extraction activities in the Clonmelsh rEIAR unit take place below the water-table.

6.6.1 Land

According to the EPA 2017 EIA Draft Guidleines in refericn gna ddescing 'land' it is calrifeid that The amended Directive introduces Land as a prescribed environmental factor. Recital 9 gives context to this addition, showing that it relates to the issue of 'land take'. This change aligns the Directive with proceedings of the United Nations Conference on Sustainable Development (Rio de Janeiro, 2012) and with Commission strategy."

The Environment Directorate-General of the European Commission sets down policies in relation to myriad enviontal factors including 'land' opening as follows;

*"**Land is a finite resource**. It is subject to competing pressures from urbanisation, infrastructure, increased food, feed, fibre and fuel production and the provision of key ecosystem services.*

*But it's also a **shrinking resource**. Almost 1000 km2 of agriculture or natural land disappears every year in the EU, as it is converted into artificial areas. More EU land is affected by **degradation** all the time, and **ecosystem services** are lost as a result.*

*This is a **global problem**. The EU contributes to land degradation in third countries, as we are a net "importer" of land embedded into imported products. Demand for areas to settle, grow food and biomass is rising around the world, and climate change is likely to impact on land demand, availability and degradation.*

*But the EU is taking action. The 2011 Road Map for Resource-Efficient Europe, part of Europe 2020 Strategy has the following aim: "By 2020, EU policies take into account their direct and indirect impact on land use in the EU and globally, and the rate of land take is on track with an aim to achieve **no net land take by 2050**"."*

The single greatest impact of the development the subject of this this rEIAR is the removal of geological reserve for the purposes of providing construction inputs. This is removal of part of 'land' as the overlying soils and subsoils have bene retained on site. In order to capture the and land take as a result of this development this rEIAR Chapter quantifies land take at baseline (1990) and today.

6.2 Methodology

The EPA provide policy and information resources in relation to EIA and SEA. They provide information in relation to 'Land' as part of 'Land & Soils'. In this regard there exists resources to track land take in the form of the then updated CORINE landcover Europe-wide resource (2012) that is integrated into the EPA Geoportal Site.

The geological information described in this Chapter is based primarily on data gleaned from the Geological Survey of Ireland (GSI) interactive special data resources map database (www.gsi.ie). Additional data has been taken from an EIS previously undertaken at the Site (2010). This EIS included resultant data from trial pitting undertaken in 2005, and a drilling program carried out at the Site in 2007; both assessments were performed by SLR Consulting Ltd. The trial pitting aimed to examine the content of the overburden in detail, and the drilling programme assess the rock quality and thickness

of the overburden present across the Site. Three trial pits were conducted within the southern area of the Site boundary and a further twelve in the adjacent lands to the south. The drilling programme was conducted in the lands surrounding the Site boundary with BH08 located within the Garyhundon Site to the south-east.

In order to assess impacts on the soil and geology, 'Guidelines for the Assessment of Geology, Hydrology and Hydrogeology for National Road Schemes' published by the National Roads Authority (2009) and 'Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements' published by the Institute of Geologists of Ireland (2013) have been consulted.

Figure 6.1 Corine landcover data, 1990, 2000, 2006, 2012 (extracted from EPA, Ireland, Maps)

KEY

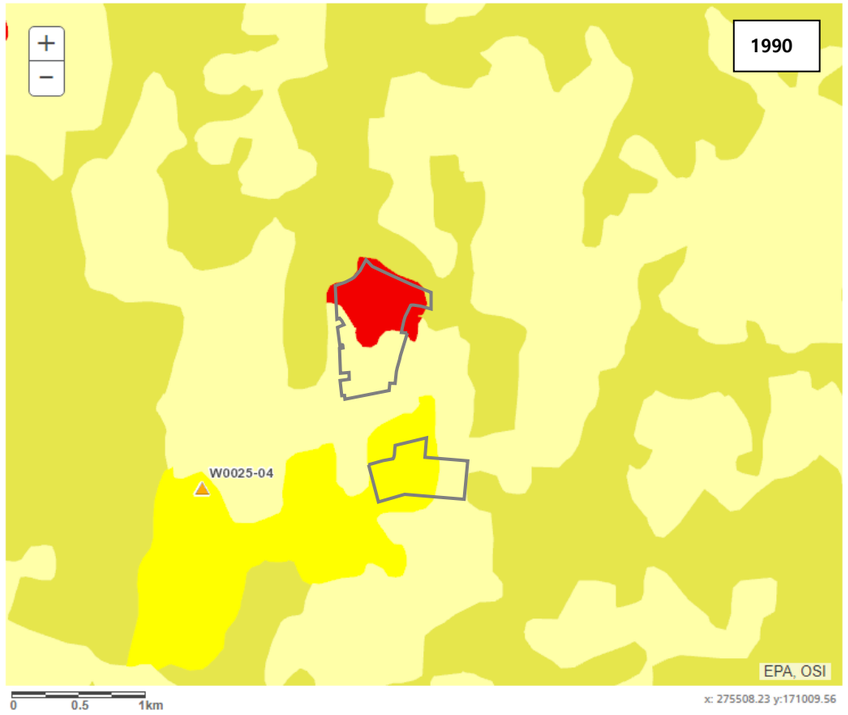
Subject rEIAR site shown outlined in grey approximately located on landcover map thus

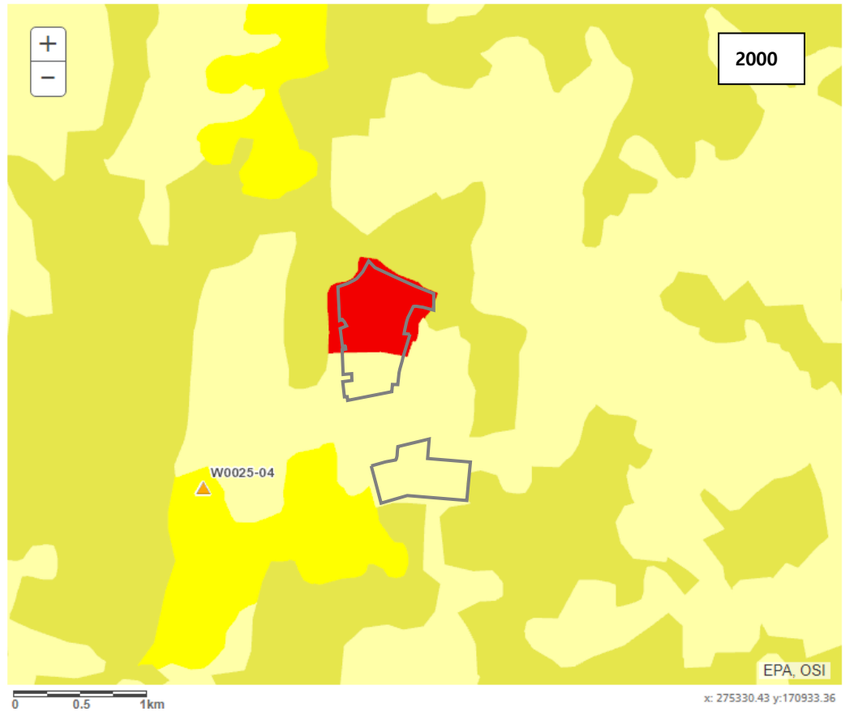
Clonmelsh rEIAR Unit

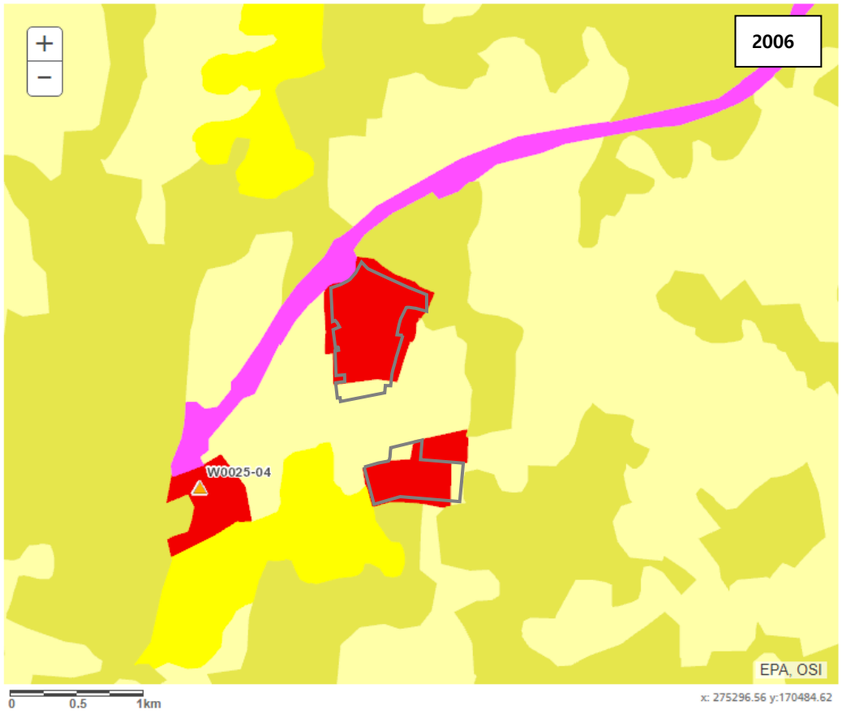
Garyhundon rEIAR Unit

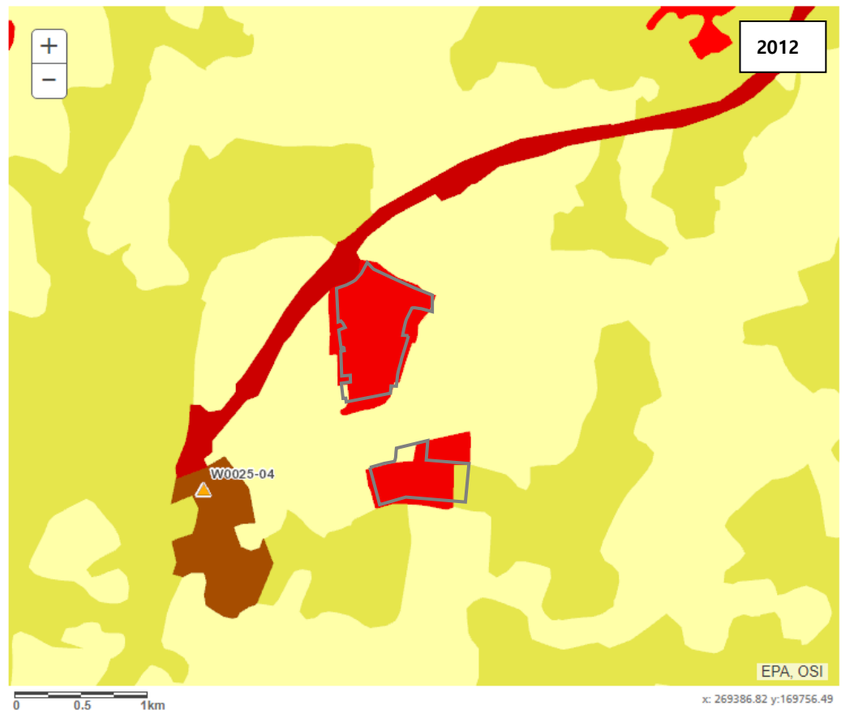
CORINE Land Cover Key

- 111 Continuous urban fabric
- 112 Discontinuous urban fabric
- 121 Industrial or commercial units
- 122 Road and rail networks
- 123 Sea ports
- 124 Airports
- 131 Mineral extraction sites
- 132 Dump
- 133 Construction sites
- 141 Green urban sites
- 142 Sport and leisure facilities
- 211 Non-irrigated land
- 222 Fruit trees and berry plantation
- 231 Pastures
- 242 Complex cultivation patterns









6.3 Receiving Environment

6.3.1 Topography

The area west and east of the Site is dominated by an agricultural landscape. Land use to the south of the Site is agricultural with residential ribbon development along the roads. The M9 Motorway runs north-east to south-west approximately 150m at it's closest point.

The elevation of the Site varies from 60 mAOD to north of the Garyhundon site the lowest point of the Clonmelsh site which is approximately 25 mAOD (the current quarry floor). The Site also includes an area of sand and gravel/limestone extraction at Garyhundon, located to the south of the main extraction area at Clonmelsh, with a floor level of ca. +10 m OD.

Please refer to Chatper 12 for a restorspecitv eLandscpe and Visual Impact Assesment and indcaitve restoion plan for assement of impacts to the removal of roignal topghy form the rEIAR lands and mitigation in restoration.

6.3.2 Land

The EPA mapping resource shows the subject rEIAR site categorised under Corine 2012 as '1*31 mineral extraction sites'* the remaining lands within the control of the Receiver are indicated as "211 Non-irrigated land". The lands to the immediate east and south of Garyhundon are recorded as '*231 pastures".*

Powerstown landfill to the south west of the subject lands and lands immediately contiguous to it appear as '132 dump'

The M9 appears on the Corine landcover map as '*122 Roads and rail networks'.*

The Corine 2006 data records the same general land uses save for the replacement of the now M9 as *'121 industrial or commercial works'.* It is noted too that the extracted art eat Clonmelsh *"131 mineral extraction sites"* is not extended as far southward as on the 2012 data.

Corine 200 does not record any works associated with the M9, does not recognise Garyhundon and records just less than half of the Clonmelsh land unit as '*131 mineral extraction sites'.*

Corine 1990 is like the 2000 landcover data in that Garyhundon as an extraction site is not recorded albeit it exited as an active sand & gravel pit. Clonmelsh rEIAR land unit is mostly recorded as a void but a smaller void than is visible today. Allowing for scale and data interpretation it is considered that the site layout baseline submitted in support of the quarry area substitute consent provides a more reflective over view of land cover at baseline (1990).

A review of the historic ordnance survey map of the rEIAR lands at figure 2.2 indicates that the lands were in agricultural use prior to extraction. Currently lands within the control of the developer and not part of the rEIAR (indicated in succeeding figures in this Chapter via blue outline) are in economic agricultural use as arable and grazing lands.

Please also refer to Chapter 5 Biodiversity for a record of removed, instated and proposed reinstated / instated landcover and resultant ecological impacts. Proposed reinstatement to be read in conjunction with Chapter 12 where a conceptual restoration plan is presented.

6.3.3 Soils

The majority of the soils around the Site are defined by the GSI as shallow well drained materials (BminSW) in the Renzinas, Lithosols Soil Group. Their parent group has been identified as limestone sands and gravels. The northern plant area has been designated as Made Ground, (Figure 6.2).

Sols on the rEIAR lands have been stripped and are stored on the margins of the lands for visual screening and eventual restoration.

6.3.4 Subsoils

The GSI define subsoils in the northern section of the Site as Made Ground. Areas to the south Glaciofluvial sands and gravels derived from a limestone material (Gls) (Figure 6.3). Previous trial pitting noted variable overburden thicknesses (4 m to > 12 m) in the lands around and in the vicinity of the Site.

Subsoils consisting of sand and gravels have bene rem oved from the rEIAR land unit. Overlying subsoils have been stripped from the lands and are stored under the stripped soils for visual screening and eventual restoration.

6.3.5 Bedrock Geology

The GSI bedrock 1:500,000 map (www.gsi.ie) show that the regional geology of the area is mainly comprised of marine shelf and ramp facies; argillaceous bioclastic limestone and subsidiary shale (Figure 6.5).

The local geology 1:100,000 map (Figure 6.4) shows that the site area is underlain by The Ballysteen Formation, which is described as a dolomitised dark-grey muddy limestone. The lithology of the formation in this area notes that much of the Ballysteen Formation in Carlow and mid-Kilkenny is dolomitised. The dolomitisation has not destroyed the original limestone fabrics.

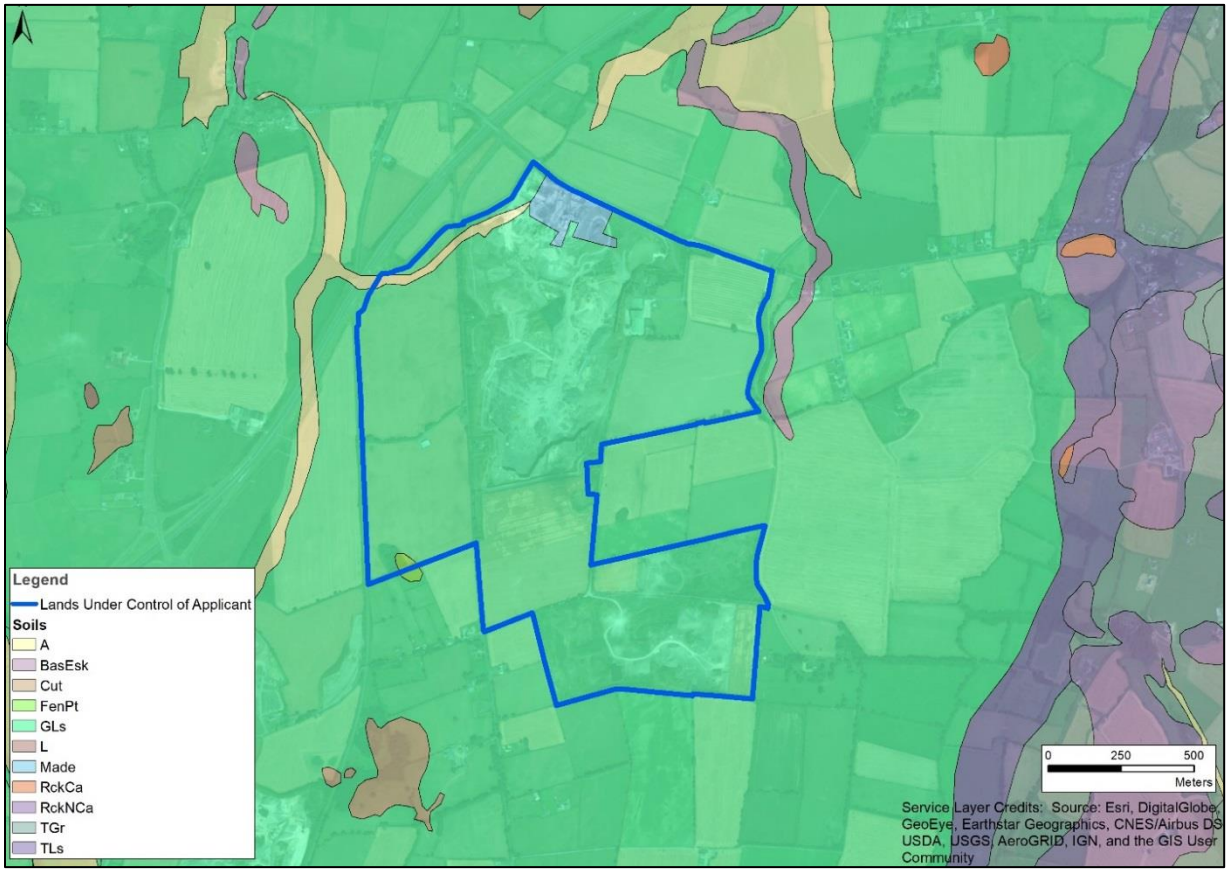


Figure 6.2 Underlying Soils at the Site, (GSI)

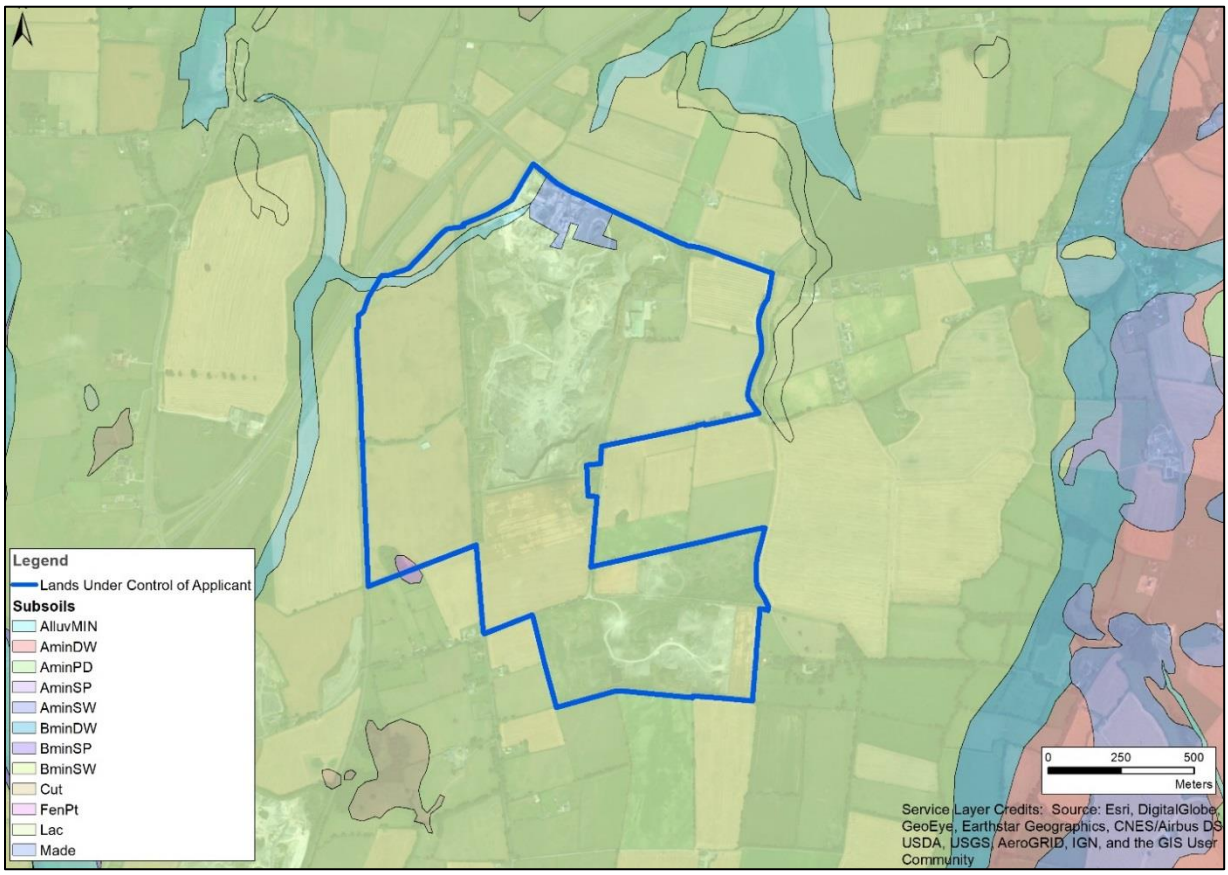


Figure 6.3 Underlying Subsoils at the Site, (GSI)

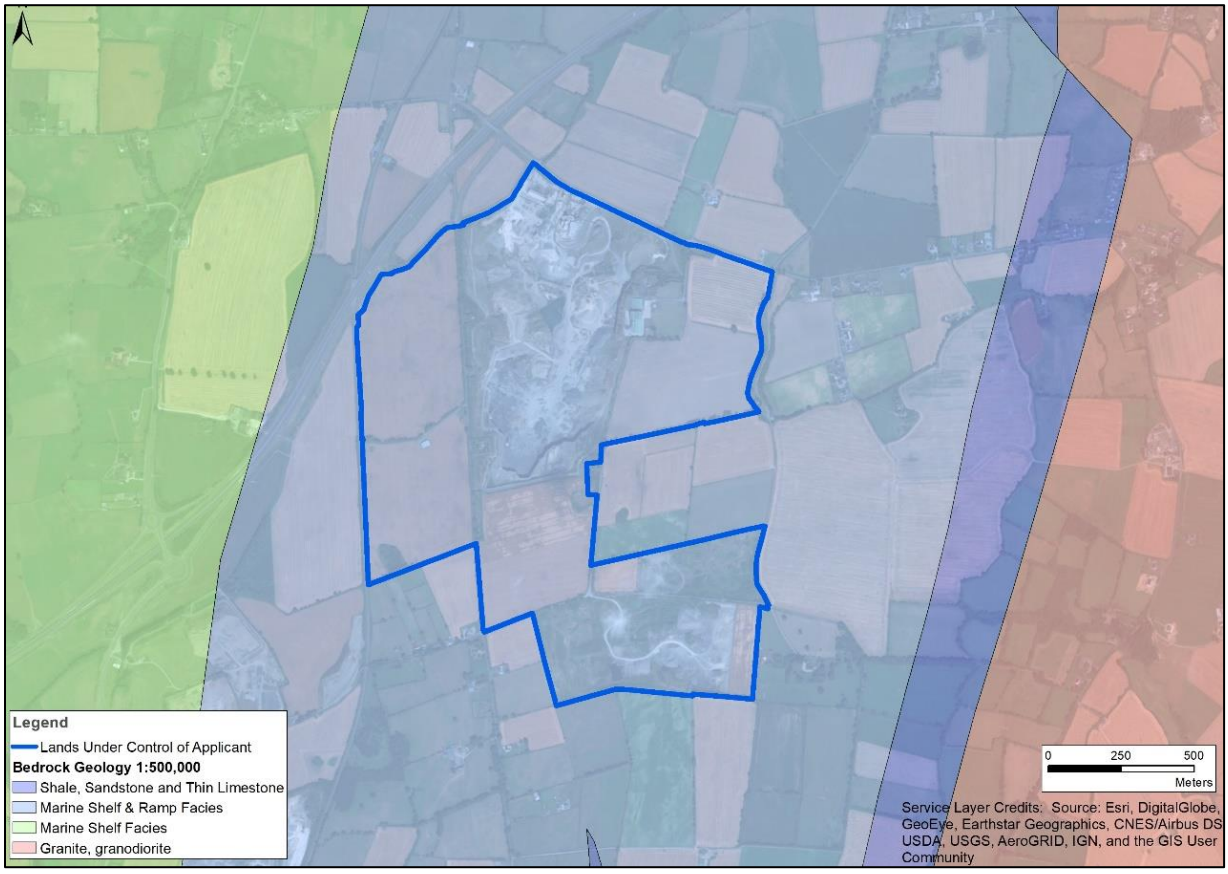


Figure 6.4 Underlying 1:500,000 Bedrock geology at the Site, (GSI)

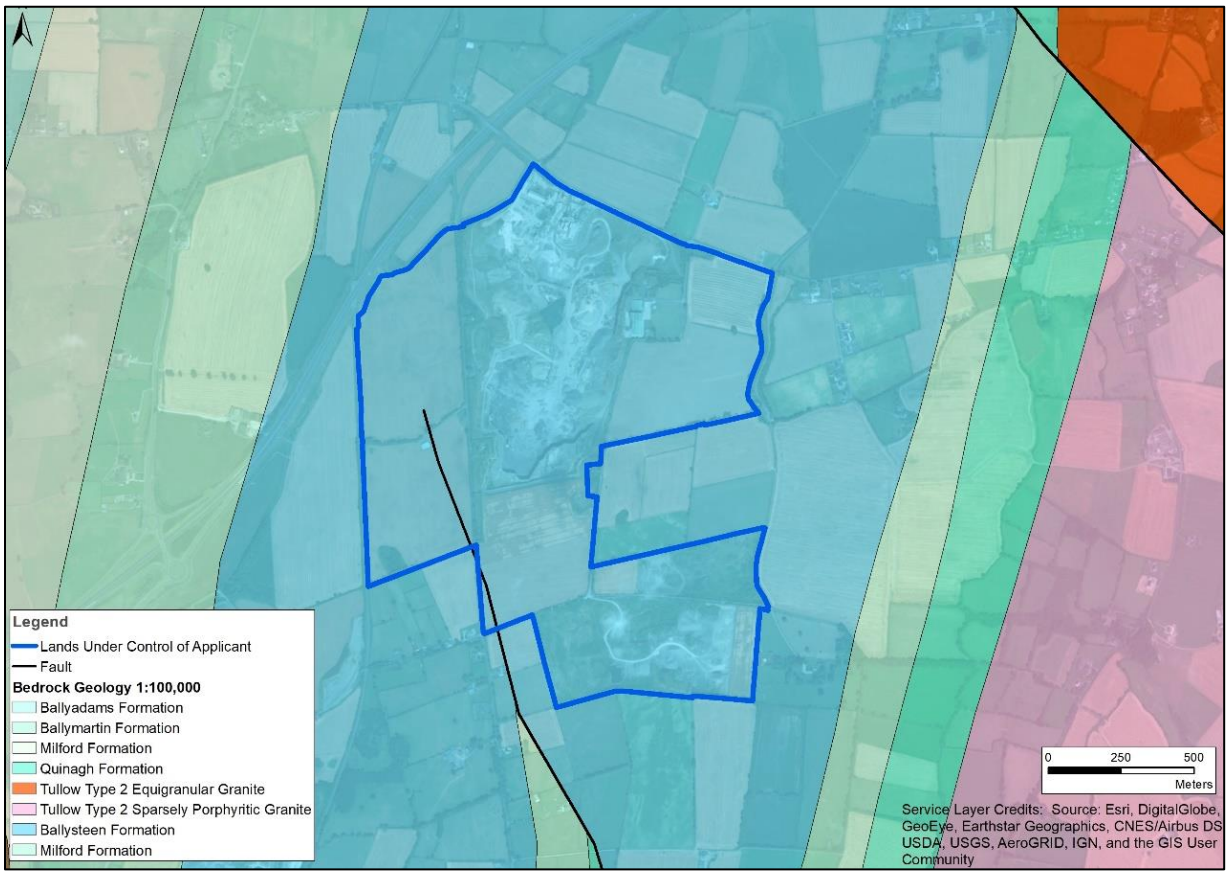


Figure 6.5 Underlying 1:100,000 Bedrock Geology at the Site, (GSI)

6.3.6 Structural Geology

The major sub surface structures of the regional and local geology are shown in Figures 6.3 and 6.4. The regional structures identified by the GSI on the 1:100,000 GSI bedrock geology are in an approximate north-west to south-east trending orientation. A north-south orientated fault directly south-west of the Site internally offsets the Ballysteen Formation. Previous geological assessments of the Site have noted that bedrock has a 10° westerly dip and are not cut by major faults; GSI mapping confirms that no major structures intersect the proposed development area itself. The SLR 2009 EIS identified that the minor faults were encountered in the existing quarry but have had little effect on quarrying operations in the past.

6.4 Previous Reviews

Previous works performed in the vicinity of the Site which describe the baseline geological conditions include boreholes drilled in 2007 and trial pits dug in 2005. The locations of these works (performed by SLR Consulting Ltd) are shown on Figure 6.6. Three of the trial pits excavated are within the Clonmelsh Site boundary, (TP1, TP2 and TP3), whilst BH08 was drilled in the Garyhundon Site.

The 2007 boreholes were drilled to assess the overburden depth and stripping ratios for the quarry, and to assess the lateral continuity and quality of the bedrock. The 2007 boreholes were designed to assess the limestone resource across the quarry development area. It was noted in this study that the limestone bedrock present over the survey area was identical to that exposed in the existing Clonmelsh quarry faces and in the sand and gravel quarry areas to the south. This is shown in detail in Bedrock Geology section below.

The SLR trial pit and borehole logs are included in Appendix 6.1. These note the composition of overburden in the trial pits within the south of the Clonmelsh boundary to be variable. The trial pit in the south-west identified clay-rich gravel to 4.4 m with a poorly cohesive sandy till underneath. Trial pit number two (TP2) found the clay rich gravel to 2.9 m with a thick (3.5 m) layer of limestone gravel before the sandy till was encountered at 6.4 m. TP3 was predominantly composed of the limestone gravel with a thin layer of clay rich gravel towards the top of the trial pit.

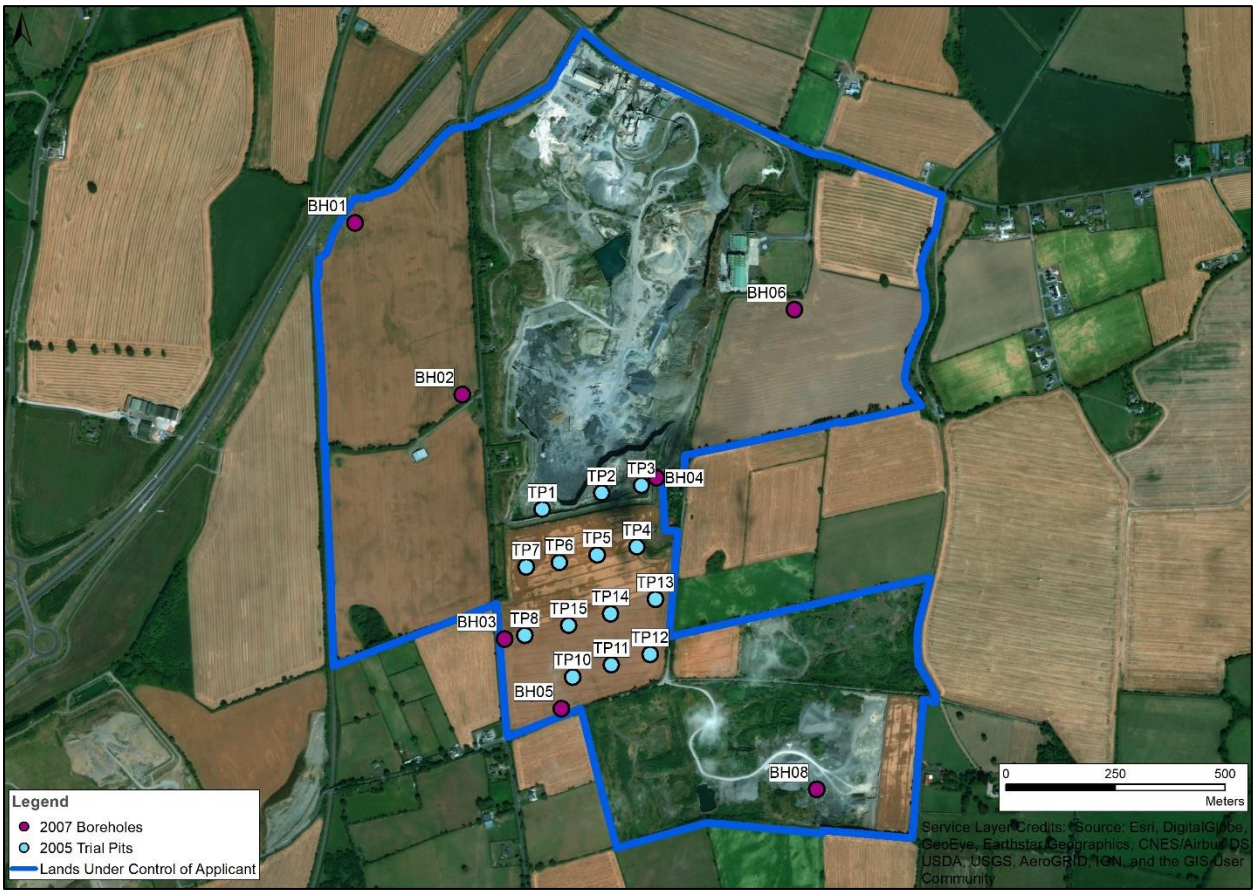


Figure 6.6 Location of Trail Pits and Boreholes on the Site

6.5 Assessment

The evaluation of impacts on the soils and geology at and in the vicinity of the Application Site is based on a methodology similar to that outlined in the 'Guidelines for the Assessment of Geology, Hydrology and Hydrogeology for National Road Schemes' published by the National Roads Authority (2009) and 'Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements' published by the Institute of Geologists of Ireland (2013).

A rock quarry has been gradually excavated at Clonmelsh site since 1947. Since 1990 the Clonmelsh excavation foot print has grown from ca. 18.4 ha to its current total area of 51 ha and an active extraction void of just over 37 ha. The depth of the workings over this same period has deepened from 40 mAOD to 25 mAOD. Soils and subsoils have been used to enhance the screening of the Site. The Garyhundon and gravel pit footprint has expanded from about 24 ha. in 1990 to 26 ha. today to a depth of about 5m.

During the assessment period the Clonmelsh Site has been deepened and worked in a southerly direction while the Garyhundon Site has been worked in an easterly direction.

As rock has been removed, moderate adverse impacts have occurred on the bedrock environment, however this is a localised impact which occurs at the point of extraction. This localised impact is mitigated through the future restoration

of the Site, which will return areas back to agricultural, thereby having an overall negligible impact.

The importance of soil and geology attributes both existing and over the assessment as identified above is assessed in Table 6.1 below.

Attribute	Status	Importance
Geohazards	Blasting of bedrock and removal of topsoil.	High
Geological Heritage	According to the Geological Survey of Ireland Spatial Resources the quarry itself is a Geological Heritage area, as the carboniferous limestones of the Ballysteen Formation are well exposed at the quarry.	High
Economic Geology	Economic extraction at the pit and existing quarry.	High
Agricultural Soils	Productive soil previously removed and stockpiled at the Application Site. Other soil in vicinity of Site used for agricultural activities including grazing and tillage. Overburden is glacial till and is common.	Low
Made Ground	Made ground in the northern portion of the Site.	Low
Soil and Subsoil Contamination	Potential for oil and chemical leakages or spillages to migrate down and contaminate soils, subsoils and groundwater.	Moderate

Table 6.1: Importance of Geological Attributes in Vicinity of Application Site

The significance of the impacts on the soils and geology attributes is assessed in Table 6.2 below.

Attribute	Status	Magnitude of Impact
Geohazards	Geotechnical assessments have been conducted during extraction life and incorporated into the design of the Site.	Small Adverse
Geological Heritage	Prior consultation with the GSI for this site has noted that the exposure of the Ballysteen Limestone in this part of Ireland significantly added to the knowledge and geological understanding of the area.	Moderate Beneficial
Economic Geology	The Site has facilitated the extraction of limestone at the Site.	Major Beneficial
Agricultural Soils	Soil cover has not been restored in the extraction areas of the Site. Drainage measures have been put in place to avoid pollution to groundwater from activities. Topsoil and subsoil removed have been reused in the creation of berms and landscaping elsewhere on the Site.	Small Adverse
Made Ground	No impact	None
Soil and Subsoil Contamination	Management practices controlling the use and storage of chemicals at the site have reduced the risk of spillages over the assessment period. On site fuelling takes place on hardstanding surfaces or upon spill trays or matting. There is no know contamination at the Application Site.	None, low probability

Table 6.2: Significance of Impacts on Soil and Geology

6.6 Residual / Likely Significant Effects

The materials extracted have been used as raw materials in the construction industry, which is considered an acceptable use of the resource. The extraction of the limestones on the Site are an important aggregate resource but not an unusual geological unit and no geological importance or heritage value is attributed to them.

Previous blasting and bedrock removal may have caused unstable rock faces, this would have been a temporary impact at the Site.

There has been no deleterious effects on the remaining bedrock and groundwater in the quarry. In the long term, residual effects will be reduced significantly with the final restoration of the site using stockpiled soils and subsoils.

6.7 Cumulative Impacts

As a result of the mitigation measures implemented at the Application Site, it is considered that any impacts associated with the quarrying related activities undertaken at the Application Site have not and shall not contribute to the cumulative impacts of any surrounding developments in the area. Potential cumulative impacts on other environmental elements such as surface water quality, ecology, noise and dust are examined in other chapters of this rEIAR.

6.8 References

Geological Survey of Ireland website, www.gsi.ie; online mapping services (Accessed: 18/07/2017).

Institute of Geologist of Ireland (2013). Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements.

National Roads Authority (2009). Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes.

7.0 WATER & HYDROGEOLOGY

7.1 Introduction

This chapter assesses the impacts which the extraction and processing of aggregates has had on the hydrological and hydrogeological environment surrounding the development. The development extracts limestone rock from below the water-table, over an area (Clonmelsh) of ca. 54 ha, to a depth of ca. +25 m OD, and sand and gravel over an area (Garyhundon) of ca. 27 ha, to a depth of +10 m OD.

Hydrogeological aspects considered within this chapter include the underlying hydrogeology of the Site, groundwater vulnerability, and aquifer status and groundwater quality. The potential hydrogeological impacts have been assessed for quarrying activities (i.e. extraction) at the Site that consist of 2 no. extracted land units, Clonmelsh and Garyhundon (collectively referred to as the Site). Appropriate mitigation measures are presented to offset any possible negative impacts associated with activities on the Site.

The impact of the development on the hydrology of the Site is also discussed in this chapter.

7.2 Study Methodology

The hydrogeological and hydrological impacts associated with the development at the Site were assessed by means of a desk study of the Site (review of available information), a site visit, a number of freely available technical references (e.g. Geological Survey of Ireland (GSI) on-line publications) and consultations with statutory bodies. A list of the information referenced as part of the desk study is presented in Section. 7.11.

7.3 Existing Environment

Quarry related activities have been undertaken at the Site since the 1940s. The lands surrounding the Site can be characterised as rural in nature, with land uses in the area being generally agricultural and single-house residential. The lands contiguous to the boundaries of the Site are in agricultural use, predominantly arable lands. The M9 motorway runs north-east to south-west immediately adjacent to the west of the Site.

The main extraction area at Clonmelsh is a large operational limestone quarry within a landholding of ca. 54 ha in size, and a floor level of ca. +25 m OD. The quarry is below the water-table, with water being pumped from a low point (Quarry Sump) of ca. +15 m OD (base of sump). Water is discharged to a local stream (the Powerstown Stream) under a discharge licence (DL7/233 (Appendix 7.1). The Site also includes an area of sand and gravel/limestone extraction at Garyhundon, located to the south of the main extraction area at Clonmelsh, with a floor level of ca. +10 m OD.

Sub-soils

The GSI define subsoils in the northern section of the Site as Made Ground, with areas to the south comprising Glacio-fluvial sands and gravels derived from a limestone material (Gls). Locally the sand and gravel is typically between 4 to 12 m in thickness, thickening westwards towards the River Barrow.

Bedrock

The local geology 1:100,000 map (Figure 6.4) shows that the Site is underlain by the Ballysteen Formation, which is described as a dolomitised dark-grey muddy limestone. The lithology of the formation in this area notes that much of the formation in Carlow and mid-Kilkenny is dolomitised. However, from mapping and drilling information, the bedrock exposed in the quarry is only locally dolomitised. It dips to the west at ca. 10°.

The rockmass exposed within the quarry is a well bedded and jointed limestone, with most joints being generally tight, although some joints appear washed-out close to the surface. Permeability of the bedrock is fracture-fissure controlled

(i.e. secondary permeability), and decreases with depth. Weathering rarely occurs more than 20 m below ground level. No karst features have been noted in the quarry except for a thin layer of epikarst which extends ca.1 m into the rock.

7.3.1 Surface Water – Hydrology

The Site is located in the catchment area of the River Barrow, in a valley that lies between the foothills of the Leinster Mountains to the east and the Castlecomer Plateau to the west.

From Carlow to beyond Bagenalstown, the valley is ca. 6.5 km wide, with natural ground levels at the Site varying from between 55 and 65 m OD. The Site itself undulates gently towards the River Barrow (to the west), which flows in a southerly direction towards Waterford Harbour.

The Site is located within the South-eastern River Basin District, Hydrometric Area 17. Within the well-drained superficial deposits of the Site, there are four significant drainage features (streams) within the vicinity of the Site (Figure 7.1).

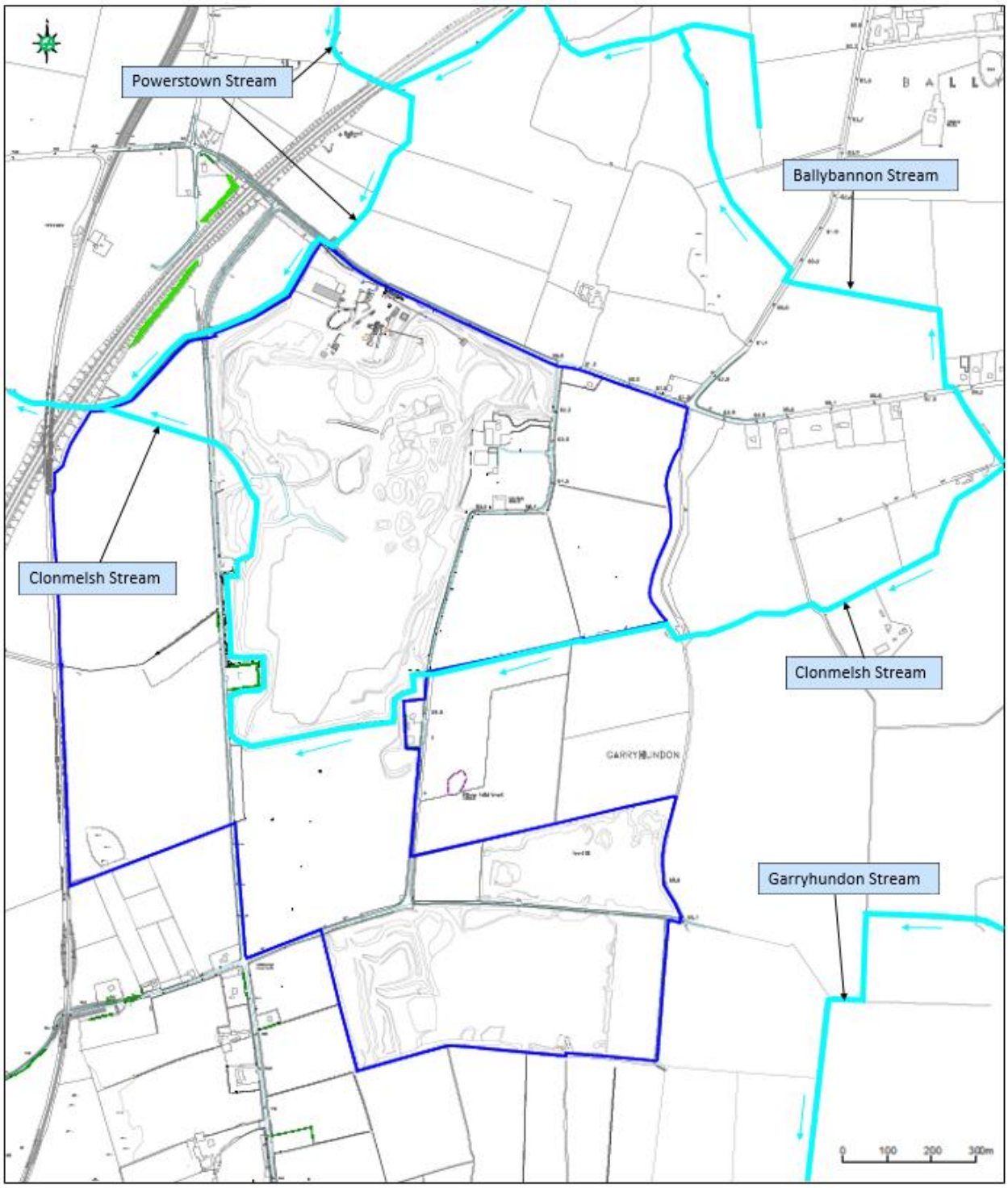


Figure 7.1: Main streams in proximity to the Site

The Ballybannon Stream flows in a north-westerly direction to join the Powerstown Stream to the north of the Site (just east of the M9 motorway);

The Powerstown Stream flows in a southerly direction along the north-western edge of the Site boundary before crossing back under the motorway and continuing south to join the River Barrow. The Clonmelsh Stream (also known as Nurney 14) joins the Powerstown Stream just before the Powerstown Stream leaves the boundary of the Site and flows under the motorway (at SW02). This stream receives discharge waters from the Site under licence (DL7/233) at DW01, via a drainage channel;

The Clonmelsh Stream is an ephemeral stream which flows westwards around the southern edge of the main quarry excavation, before continuing in a northerly direction along the western edge of the excavation. It joins the Powerstown Stream to the west of the quarry excavation at SW02. The Clonmelsh Stream has been diverted from its original course due to the extraction activities at the quarry. Much of the upper reaches of this stream (to the east of the Site) have been drained to provide improved farmland; and

The Garyhundon Stream flows in a westerly direction before turning abruptly south to the southeast of the Site and continuing on to the River Barrow.

The Clonmelsh Stream is the only stream of the four described above that has been diverted due to quarrying activities at the Site. Future development at the Site will necessitate the re-routing of the Clonmelsh Stream in an anti-clockwise direction around the Site to join the Powerstown Stream upstream of where the two stream currently meet. Re-routing (and lining) of part of the Clonmelsh Stream away from the quarry void will help to provide increased biodiversity, and ensure that quality and quantity of flow be maintained to the Powerstown Stream.

The thick deposits of relatively unconsolidated sands and gravels overlying the Site and its surrounding environment, coupled with a shallow groundwater table enables water to drain slowly, thereby providing high baseflows to the four streams surrounding the Site.

A number of residences are located within 500 m of the development, a number of which have private wells (surveyed in 2010). Wastewater discharging from local residences is treated in septic tank systems and soak pit/percolation areas.

Surface Water Quality

Surface water monitoring locations SW01, SW02 and SW03 are located on the Clonmelsh Stream, with SW04 being located on the Garyhundon Stream (no discharge takes place into this stream) as a baseline reference (Figure 7.2). Surface water quality at the quarry is monitored on a quarterly basis at SW01, SW02, SW03 and SW04 as part of the quarry's discharge licence monitoring regime (DL7/233). Discharge Licence limits include 25 mg/l for both nitrates and suspended solids, and a limit of 2,000 m3/d for flow.

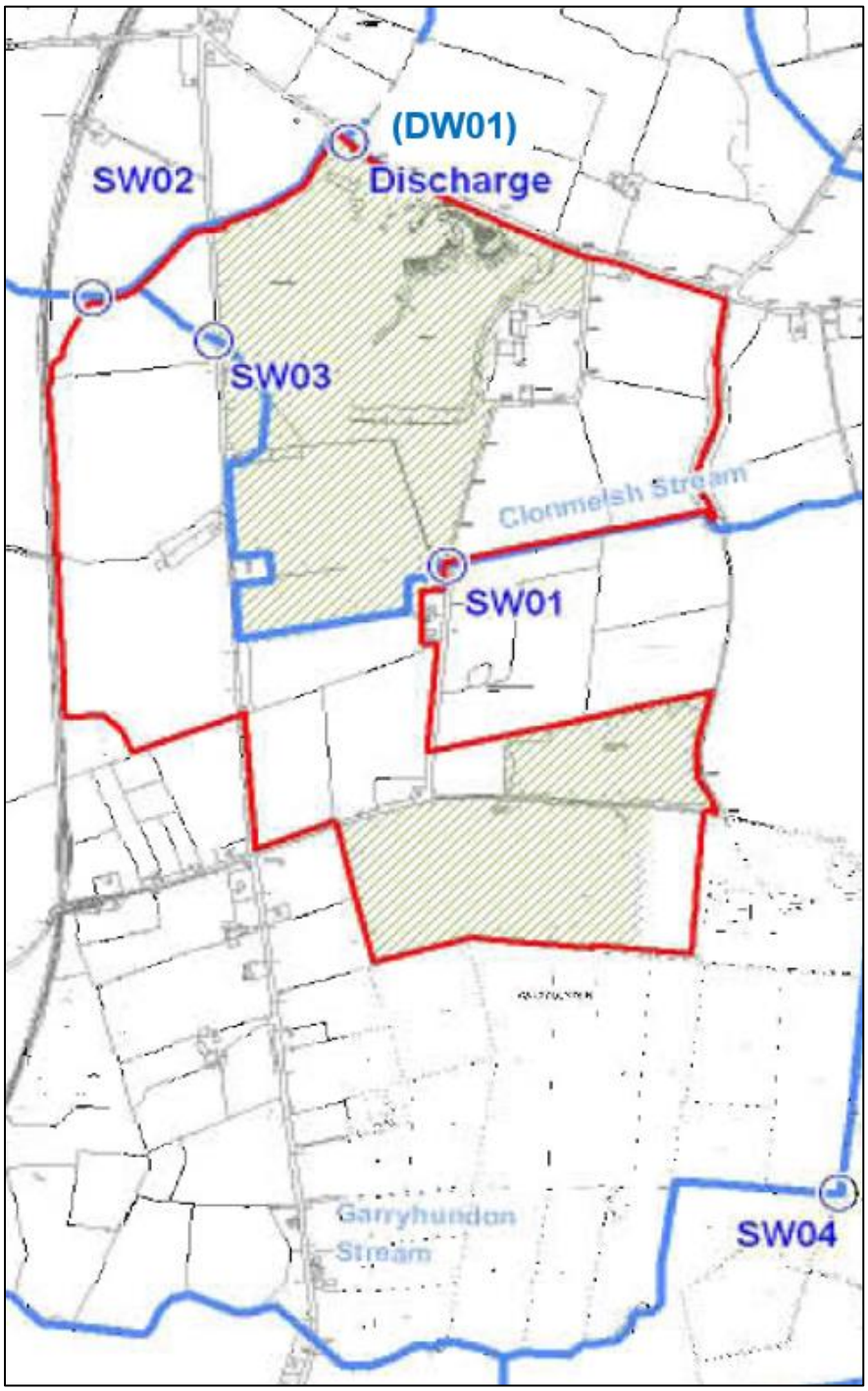


Figure 7.2: Surface water monitoring locations (SW01 to SW04)

SW01 is located upstream of the discharge point (DW01), while SW02 is located downstream of the discharge point (SW03 is an intermediate point upstream of the discharge). Surface water monitoring results from 2007 indicate elevated nitrate and ammonia levels for SW01 and SW03, probably due to agricultural activities (Table 7.1). More recent results taken in 2012 and the first 6 months of 2017 for SW01 and SW02 (Table 6.2) indicate similar elevations likely from agricultural sources.

Discharge water quality (Table 7.3) from the Site measured in 2009 - 2010 indicates slightly elevated sulphate and magnesium levels in the discharge when compared to the stream water, possibly due to the effect of mineralized groundwater. Suspended solids levels were elevated primarily in times of heavy rainfall. Elevated nitrate levels during the same period show a correlation with increased surface run-off in times of wet weather.

Table 7.1a: Surface Water Quality Monitoring at SW01

Parameter	Unit	8/8/2007	16/1/08	8/5/08	11/3/09	6/5/09	5/8/09	22/9/09	20/10/09	16/12/09	11/3/10
Lab pH	**pH Units**	7.86	8.32	-	8.14	8.38	8.29	8.11	8.14	8.59	8.5
Ammonical Nitrogen	**mg/l NH_3**	<0.2	<0.04	-	<0.2	<0.2	<0.2	<0.2	<0.2	0.37	0.146
Total Suspended solids	**mg/l**	<10	9	<10	<10	<2	22	9.5	20	4	<6
BOD	**mg/l**	<2	-	<2	2	-	1.1	1.21	3.08	-	<1
COD	**mg/l**	-	-	-	22	7.72	14.8	14.1	30.7	13	7.66
Total Phosphorus	**mg/l**	-	-	-	<0.05	0.0683	0.0562	0.0517	0.361	0.018	0.039
Orthophosphate	**mg/l PO_4**	0.1	<0.08	-	0.5	<0.08	<0.08	<0.08	0.102	40.3	<0.026
Nitrate	**mg/l NO_3**	81.9	85	-	62.3	59.4	53.2	37.1	40.3	52.8	54.1
Temperature	**ºC**	-	8.4	-	7.79	11.62	15.05	13.38	-	7.31	-
Total Petroleum Hydrocarbons	**µg/l**	<10	-	-							
Conductivity	**µS/cm**	708	648	714							
Field Conductivity	**µS/cm**		770	-							
Calcium	**mg/l**	117.1	126	-							
Magnesium	**mg/l**	11.15	12.3	-							
Potassium	**mg/l**	4	3.28	-							
Sodium	**mg/l**	11	10.9	-							
Chloride	**mg/l**	19	21.2	-							
Sulphate	**mg/l**	29	26.8	-							
Nitrite	**mg/l NO_2**	<0.05	0.05	-							
Dissolved Iron	**mg/l**	0.114	<0.025	-							
Manganese	**mg/l**	0.01	0.007	-							
Alkalinity	**mg/l $CaCO_3$**	360	247	-							
Hardness	**mg/l**	-	366	-							
Total Organic Carbon	**mg/l**	5	3.84	-							
Mineral Oil	**µg/l**	<10	-	<10							
Dissolved Oxygen	**% Sat.**	-	89.5	-							

Table 7.1b: Surface Water Quality Monitoring at SW02

Parameter	Unit	5/7/07	16/1/08	8/5/08	11/3/09	6/5/09	5/8/09	22/9/09	20/10/09	16/12/09	11/3/10
Lab pH	pH Units	7.77	8.5	-	7.77	8.07	8.18	8.09	8	8.22	8.1
Ammonical Nitrogen	mg/l NH_3	<0.01	<0.04	-	<0.2	<0.2	<0.2	<0.2	<0.2	0.162	0.12
Total Suspended solids	mg/l	67	37	<10	29	<2	4	2	8.5	4.5	96
BOD	mg/l	2	-	<2	<2	-	1.54	1.45	<1	-	<1
COD	mg/l	-	-	-	<15	8.03	<7	<7	12.4	<7	7.9
Total Phosphorus	mg/l	-	-	-	<0.018	<0.018	<0.018	<0.018	<0.018	<0.018	<0.0063
Orthophosphate	mg/l PO_4	0.13	<0.026	-	0.35	<0.026	<0.026	<0.026	<0.026	<0.026	<0.026
Nitrate	mg/l NO_3	25	29.3	-	33.8	6.7	17.6	9.8	19.9	32.2	28.6
Temperature	ºC	-	7.6	-	10.67	13.07	17	14.88	-	7.68	-
Total Petroleum Hydrocarbons	µg/l	<10	-	-							
Conductivity	µS/cm	826	855	742							
Field Conductivity	µS/cm	864	649	-							
Calcium	mg/l	107.7	146	-							
Magnesium	mg/l	33.26	41.9	-							
Potassium	mg/l	3	3.31	-							
Sodium	mg/l	10	12	-							
Chloride	mg/l	27	25.9	-							
Sulphate	mg/l	203	250	-							
Nitrite	mg/l NO_2	0.11	0.07	-							
Dissolved Iron	mg/l	-	<0.025	-							
Manganese	mg/l	-	0.003	-							
Alkalinity	mg/l $CaCO_3$	167	221	-							
Hardness	mg/l	-	538	-							
Total Organic Carbon	mg/l	-	1.62	-							
Mineral Oil	µg/l	<10	-	<10							
Dissolved Oxygen	% Sat.	104.5	88.9	-							

Table 7.1c: Surface Water Quality Monitoring at SW03 and SW04

Parameter	Unit	SW03	SW04
Lab pH	**pH Units**	**8/8/2007**	**8/8/2007**
Ammoniacal Nitrogen	**mg/l NH_3**	8.	8.
Total Suspended Solids	**mg/l**	<0.2	<0.2
BOD	**mg/l**	<10	<10
COD	**mg/l**	<2	<2
Total Phosphorus	**mg/l**	-	-
Orthophosphate	**mg/l PO_4**	-	-
Nitrate	**mg/l NO_3**	<0,03	0.03
Temperature	**^0C**	82.	32.
Total Petroleum Hydrocarbons	**µg/l**	-	-
Conductivity	**µS/cm**	<10	<10
Field Conductivity	**µS/cm**	793	639
Calcium	**mg/l**		
Magnesium	**mg/l**	90.	97.
Potassium	**mg/l**	11.	9.
Sodium	**mg/l**	4.	2.
Chloride	**mg/l**	12.	11
Sulphate	**mg/l**	19	14
Nitrite	**mg/l NO_2**	33	19
Dissolved Iron	**mg/l**	0.25	0.1
Manganese	**mg/l**	0.219	0.046
Alkalinity	**mg/l $CaCO_3$**	0.011	0.006
Hardness	**mg/l**	290	310
Total Organic Carbon	**mg/l**	-	-
Mineral Oil	**µg/l**	5	5
Dissolved Oxygen	**% Sat.**	<10	<10

Table 7.1a: Surface Water Quality Monitoring at SW01 (2012)

Parameter	Unit	SW01	SW01	SW01	SW01	SW01	SW01	SW01
		26/1/12	28/2/12	27/3/12	26/4/12	23/5/12	21/6/12	17/7/12
pH	**pH Units**	7.24	8.3	7.8	8.1	8.01	7.9	8.1
Ammoniacal Nitrogen as N	**mg/l N**	1	1.6	0.05	0.44	<0.2	0.14	0.04
Total Suspended Solids	**mg/l**	<5	6	16	<5	7	<5	<5
BOD Unfiltered	**mg/l**	<4	<1	9	4	-	<4	<4
COD Unfiltered	**mg/l**	4.1	5	76	6.1	<7	3	20
Total Phosphorus	**mg/l P**	0.04	<0.02	<0.2	<0.2	<0.02	<0.2	<0.1
Orthophosphate	**mg/l PO_4**	0.12	0.062	0.12	0.11	0.054	0.32	0.16
Nitrate mg/l	**mg/l NO_3**	58	95	64	67	70.6	60	17
Temperature (field)	**mg/l**	6.17	10.23	14.6	8.61	13.72	12.18	14.66

Table 7.2b: Surface Water Quality Monitoring at SW02 (2012)

Parameter	Unit	SW02	SW02	SW02	SW02	SW02	SW02	SW02
		26/1/12	28/2/12	27/3/12	26/4/12	23/5/12	21/6/12	17/7/12
pH	pH Units	7.24	8.1	7.6	8	7.41	8	8.3
Ammoniacal Nitrogen as N	mg/l N	1.4	2.4	0.04	0.13	<0.2	0.1	<0.01
Total Suspended Solids	mg/l	<5	20	<5	10	<2	<5	<5
BOD Unfiltered	mg/l	<4	<1	15	<4	-	<4	<4
COD Unfiltered	mg/l	4.1	5	75	3.2	<7	<2	15
Total Phosphorus	mg/l P	<0.02	<0.02	<0.2	<0.2	<0.02	<0.2	<0.1
Orthophosphate	mg/l PO_4	<0.02	0.061	0.065	0.09	<0.05	0.042	0.08
Nitrate mg/l	mg/l NO_3	16	37	21	17	17.5	12	6.7
Temperature (field)	mg/l	7.26	10.36	11.97	10.5	13.67	13.91	15.96

Table 7.2c: Surface Water Quality Monitoring at SW01 (2017)

Parameter	Unit	SW01	SW01	SW01	SW01	SW01
		10/01/2017	08/02/2017	08/03/2017	04/04/2017	04/05/2017
pH	pH Units	8.25	8.28	8.17	8.24	8.31
Ammoniacal Nitrogen as N	mg/l N	0.0341	0.0457	0.0339	0.0485	0.0684
Total Suspended Solids	mg/l	8.54	<9	5.6	12.4	15.1
BOD Unfiltered	mg/l	<1	<1	<1	<1	<1
COD Unfiltered	mg/l	15.2	7.43	12.7	10.1	11.4
Orthophosphate	mg/l PO_4	0.07	0.053	0.062	0.074	0.075
Phosphorus	mg/l	0.0554	0.0504	0.0339	0.0573	0.0705
Nitrate mg/l	mg/l NO_3	56.8	58.5	68.5	58.1	56.5
TPH/ Oil & Greases	mg/l	<1				<1

Table 7.2d: Surface Water Quality Monitoring at SW02 (2017)

Parameter	Unit	SW02	SW02	SW02	SW02	SW02
		10/01/2017	08/02/2017	08/03/2017	04/04/2017	04/05/2017
pH	pH Units	8.06	7.94	7.89	7.85	8.07
Ammoniacal Nitrogen as N	mg/l N	0.0165	0.01 87	0.01 92	0.039	0.0613
Total Suspended Solids	mg/l	<4	<6	<2	<2	<9
BOD Unfiltered	mg/l	<1	<1	<1	<1	<1
COD Unfiltered	mg/l	10.4	<7	8.28	12.8	7.18
Orthophosphate	mg/l PO_4	<0.05	<0.05	<0.05	<0.05	<0.05
Phosphorus	mg/l	<0.02	<0.02	<0.02	0.0287	<0.020
Nitrate mg/l	mg/l NO_3	15.1	17.4	21.6	20.2	18.1
TPH/ Oil & Greases	mg/l	<1				2.07

Table 7.2a: Discharge Water Quality Monitoring (2009 - 2010)

Parameter	Unit	Discharge Limit	Average Value (2009-2010)	EC Environmental Objectives (Surface Waters) Regulations 2009		
				Good		High
pH	pH Units	6-9	8.02		6-9	
Ammoniacal Nitrogen	mg/l N	0.3	<0.2	<0.065		<0.04
Total Suspended Solids	mg/l	25	33	-		-
BOD Unfiltered	mg/l	5	<1.3	<1.5		<1.3
COD Unfiltered	mg/l	5	<10	-		-
Total Phosphorous	mg/l P	0.1	<0.02	-		-
Ortho-phosphate	mg/l P	0.03	<0.026	<0.035		<0.025
Nitrate	mg/l NO_3	25	22	-		-
Temperature	°C	25	11.3	-		-
Total Hydrocarbons	µg/l	1000	<10 (median)	-		-

Table 7.3b: Discharge Water Quality Monitoring (2012, 2016 - 2017)

Parameter	Unit	ELV	26/01/2012	28/02/2012	27/03/2012	26/04/2012	23/05/2012	21/06/2012	17/07/2012	29/08/2012	26/09/2012	27/11/2012	-
pH	pH Units	6 to 9	7.4	8	7.6	7.9	7.56	7.9	8.1	7.7	7.9	7.98	-
Ammoniacal Nitrogen as N	mg/l N	0.3	1.6	1.9	0.08	0.22	<0.2	0.12	<0.01	<0.01	6.1	0.15	-
Total Suspended Solids	mg/l	25	<5	21	25	13	<2	5	<5	120	6	13	-
BOD Unfiltered	mg/l	5	<4	<1	16	<4	-	<4	<4	<4	<4	13	-
COD Unfiltered	mg/l	5	3.6	2	21	3.6	<7	<2	14	20	11	9	-
Ortho Phosphate	mg/l PO_4	0.03	<0.02	0.063	0.063	0.08	<0.05	<0.02	0.075	0.023	0.14	<0.02	-
Nitrate	mg/l NO_3	25	17	32	21	16	18.2	11	2.5	17	18	18	-
Total Phosphorus	mg/l P	0.1	<0.00652	<0.00652	<0.00652	<0.00652	<0.00652	<0.00652	<0.0326	<0.0326	<0.1	<0.1	-
TPH/ Oils & Greases	mg/l	1	<1	<1	-	<1	<1	-	-	<1	<1	-	-

Parameter	Unit	ELV	13/12/2016	21/12/2016	05/01/2017	10/01/2017	16/01/2017	25/01/2017	31/01/2017	08/02/2017	13/02/2017	20/02/2017	27/02/2017
pH	pH Units	6 to 9	7.87	7.87	7.85	7.96	7.95	7.91	7.93	8.04	7.84	7.92	7.95
Ammoniacal Nitrogen as N	mg/l N	0.3	0.0183	0.0383	0.0165	0.0161	0.0179	0.0147	0.0146	0.0211	<0.01	0.0128	<0.01
Total Suspended Solids	mg/l	25	<2	<2	<2	<4	<2	<2	<2	<9	4.4	<2	<2
BOD Unfiltered	mg/l	5	-	-	-	<1	-	-	-	<1	-	-	-
COD Unfiltered	mg/l	5	-	-	-	<7	-	-	-	<7	-	-	-
Ortho Phosphate	mg/l PO_4	0.03	-	-	-	<0.05	-	-	-	<0.05	-	-	-
Nitrate	mg/l NO_3	25	-	-	-	15	-	-	-	17.9	-	-	-
Total Phosphorus	mg/l P	0.1	-	-	-	<0.02	-	-	-	<0.02	-	-	-
TPH/ Oils & Greases	mg/l	1	-	-	-	<1	-	-	-	-	-	-	-

Parameter	Unit	ELV	08/03/2017	15/03/2017	21/03/2017	27/03/2017	04/04/2017	13/04/2017	20/04/2017	28/04/2017	04/05/2017	-	-
pH	pH Units	6 to 9	7.91	7.98	7.93	7.96	8.03	7.98	7.89	7.95	8	-	-
Ammoniacal Nitrogen as N	mg/l N	0.3	0.0197	0.0165	0.019	<0.01	0.0405	0.0214	0.0207	0.0229	0.0505	-	-
Total Suspended Solids	mg/l	25	<2	<2	<2	<2	<4	<2	<2	<2	<6	-	-
BOD Unfiltered	mg/l	5	<1	-	-	-	<1	-	-	-	<1	-	-
COD Unfiltered	mg/l	5	<7	-	-	-	<7	-	-	-	11.2	-	-
Ortho Phosphate	mg/l PO_4	0.03	<0.05	-	-	-	<0.05	-	-	-	<0.05	-	-
Nitrate	mg/l NO_3	25	21.3	-	-	-	21.2	-	-	-	18.4	-	-
Total Phosphorus	mg/l P	0.1	<0.02	-	-	-	0.0229	-	-	-	<0.020	-	-
TPH/ Oils & Greases	mg/l	1	-	-	-	-	-	-	-	-	<1	-	-

Biological surface water quality data available from the EPA for their station at Cardinal Moran Bridge (RS14B012680) (located downstream of the Site on the River Barrow) gives a quality value (Q) rating of 3-4, which represents water which is classed as being of 'moderate status', similar to other stations both upstream and downstream on the Barrow catchment.

7.3.2 Groundwater - Hydrogeology

Groundwater is defined as water that moves through and is stored within sub-terrain geological strata. The groundwater flow in this region is controlled by the topography and the underlying glacio-fluvial sands and gravels and bedrock geology.

The principal hydraulic boundaries in the area are the Leinster Granite to the east and the River Barrow to the west. The groundwater in the bedrock and overlying sands and gravels are considered to be in hydraulic continuity and the water-table is therefore considered to be unconfined. The sands and gravels drain to the quarry void via the underlying limestone bedrock.

Bedrock exposure in the quarry would seem to indicate that bedding planes and minor faulting are the primary groundwater flow paths (no significant karstification or dolomitisation is evident in the quarry), while jointing in general tends to be tight and does not appear to permit significant groundwater flow. However, the main location where groundwater ingress has been identified in the quarry is at the basal sump, which receives water through fractures in the quarry floor. The oval shape of the cone of drawdown for the Site as presented in Figure 7.3 reflects the general shape of the quarry void and is indicative of relatively low permeability of the bedrock.

The relatively uniform thickness of sands and gravels which overlay the limestone bedrock has been removed from the extraction area of the quarry. However, the sand and gravel aquifer is still intact in the vicinity of the Site, varying in thickness of between 4 and 12 m, with the depth to groundwater within the sand and gravel aquifer increasing in proximity to the quarry void (Figure 7.3). This sand and gravel aquifer plays a significant hydrogeological role at the Site in terms of its groundwater storage contribution (from rainfall) and recharge to the underlying bedrock aquifer.

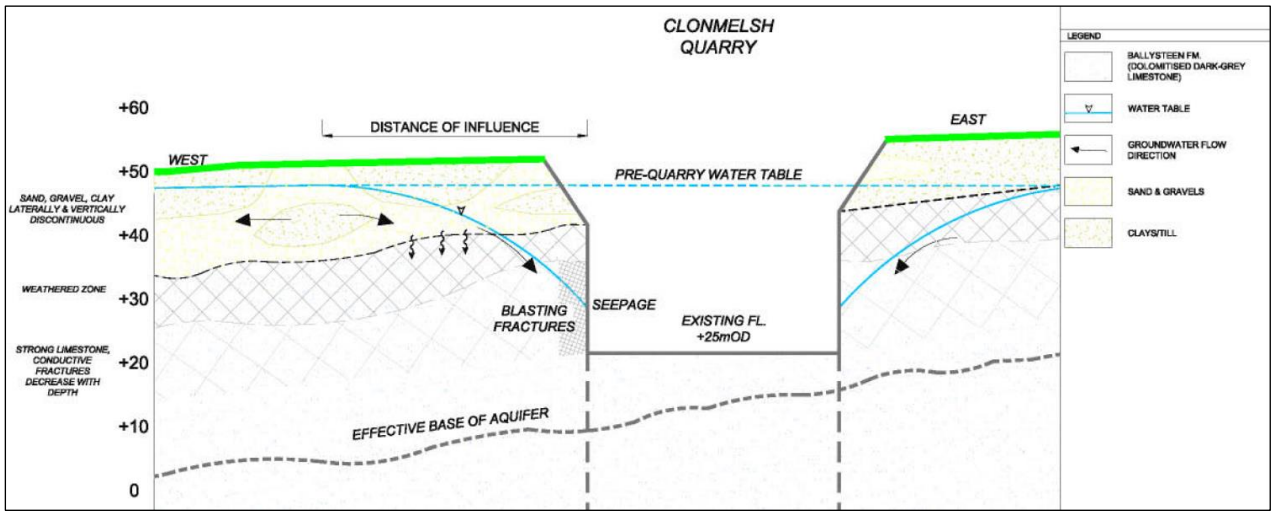


Figure 7.3: Cross-section showing relationship of groundwater with quarry void

The Geological Survey of Ireland (GSI), Groundwater Section well database was consulted to obtain details of wells within 1 km of the boundary of the Site (Appendix 7.2). A total of 40 wells are recorded in the area, predominantly domestic water supply wells and those associated with monitoring of the Powerstown Landfill. A review of the database indicates that while some wells exhibited good yields (> 100 m3/d) the aquifer is not uniformly productive.

In July 2007 a domestic well survey (non-inclusive) carried out by SLR identified 11 wells within a 500 m buffer area of the

Site (Figure 7.4). None of those visited reported any problems with their well water supply as all wells surveyed extract groundwater from the bedrock aquifer (Appendix 7.3). The well survey determined that some of the houses to the northeast of the Site are supplied by mains water from the Ballyloo Reservoir.

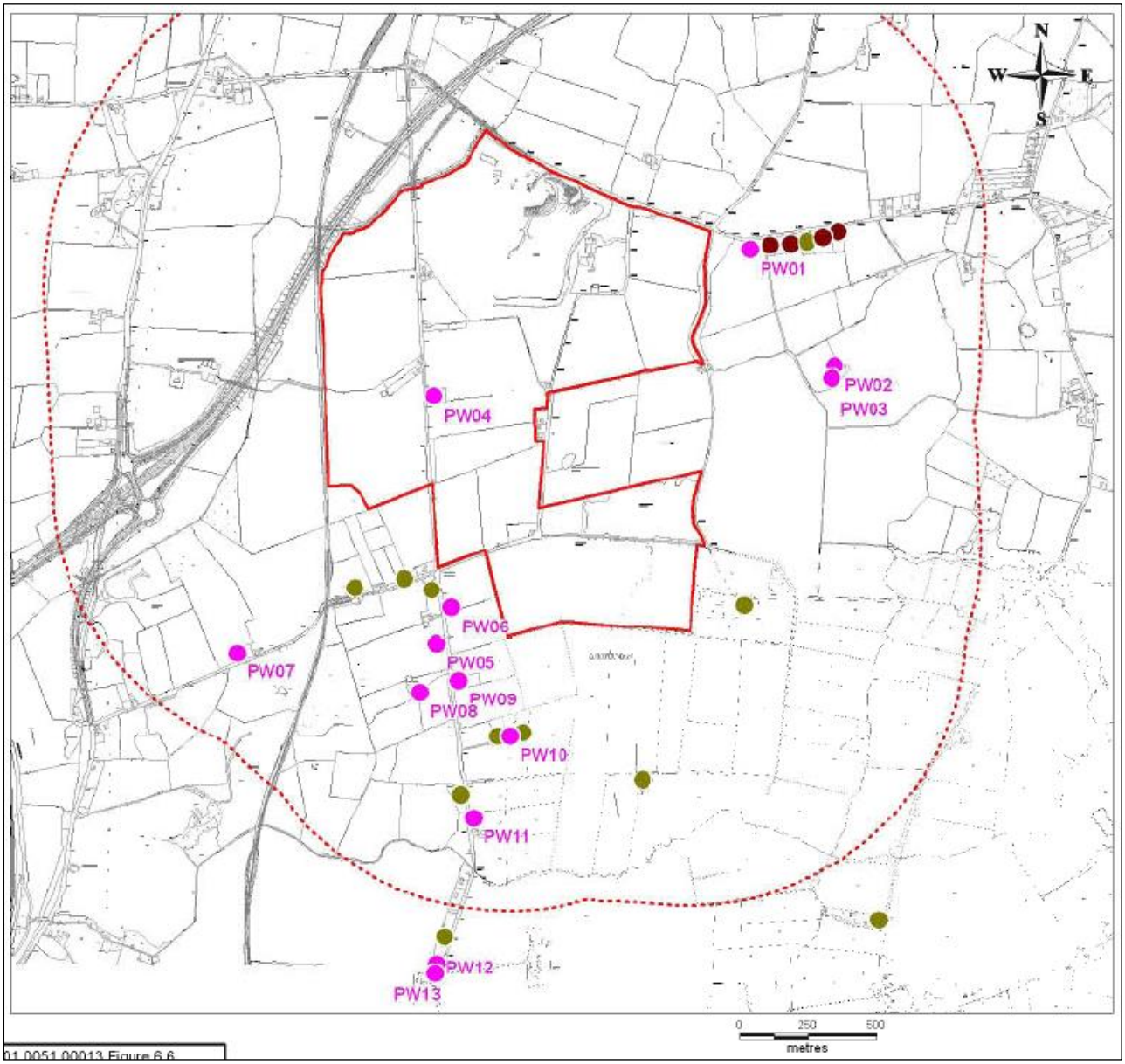


Figure 7.4: Plan showing location of private wells within 500m of the edge of the Site (2010 SLR)

Bedrock Aquifer

The bedrock aquifer underlying the Site has been characterised as 'Rkd', a regionally important diffuse karstified bedrock aquifer with good development potential (from discrete fractures) (Figure 7.5). However, the jointing in the limestone bedrock is predominately tight, restricting groundwater flow to discrete fractures/fissures.

In addition, the overlying Quaternary deposits of sands and gravels have been classified as a regionally important gravel aquifer (Rg), although with limited value due to the highly variable nature of the deposits themselves. The water-table is generally found less than 2 m below ground level within these deposits, and the main importance of this aquifer is in providing storage, and allowing recharge to the underlying limestone bedrock aquifer.

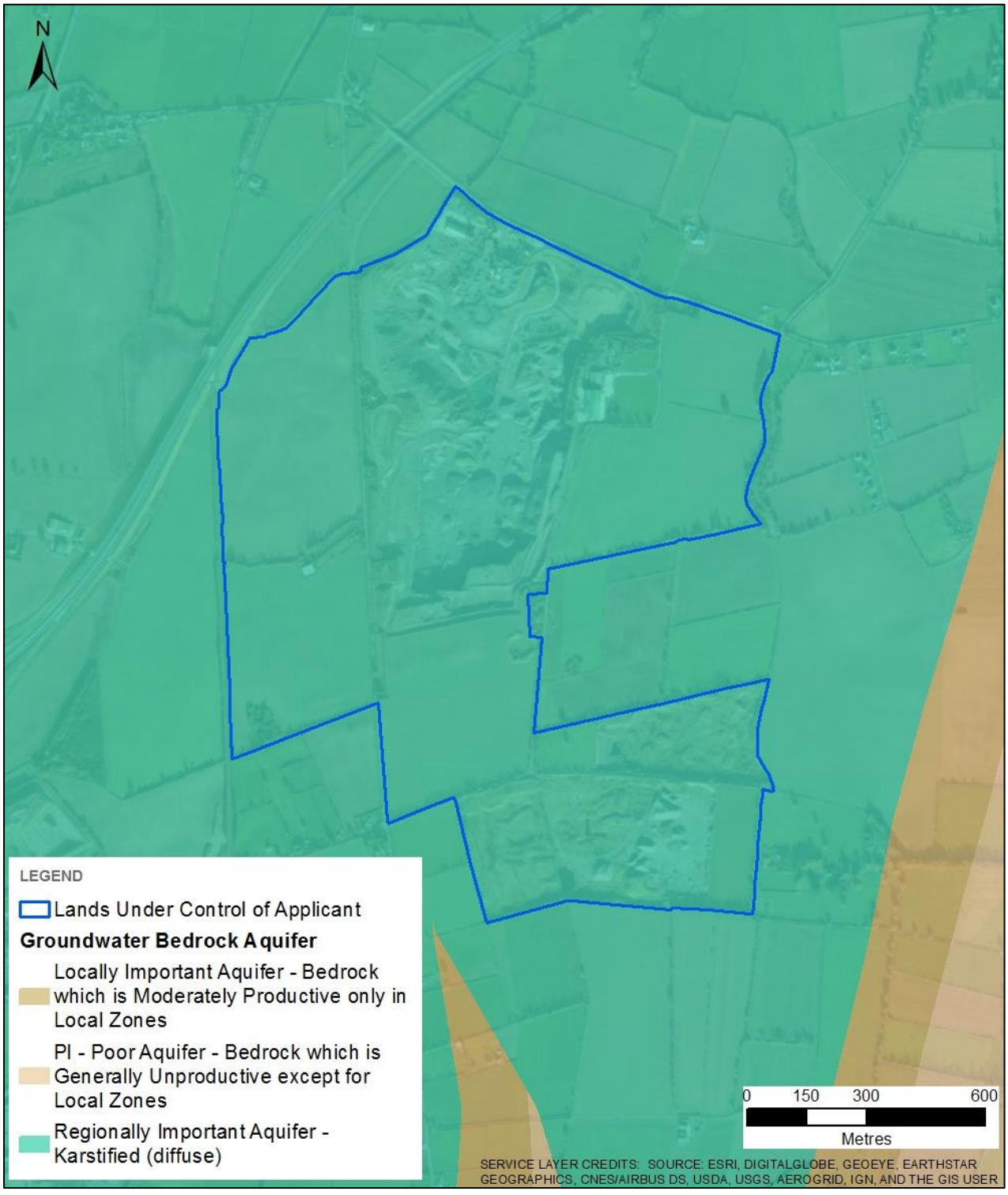


Figure 7.5: Bedrock aquifer map

Groundwater Vulnerability

'The vulnerability of groundwater depends on: (i) the time of travel of infiltrating water (and contaminants); (ii) the relative quantity of contaminants that can reach the groundwater; and (iii) the contaminant attenuation capacity of the geological materials through which the water and contaminants infiltrate. 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:

i) The sub-soils that overlie the groundwater;

ii) The type of recharge - whether point or diffuse; and

iii) The thickness of the unsaturated zone through which the contaminant moves.

In summary, the entire land surface is divided into four vulnerability categories Table 7.4: extreme (E), high (H), moderate (M) and low (L) - based on the geological and hydrogeological factors described above. This subdivision is shown on a groundwater vulnerability map. The map shows the vulnerability of the first groundwater encountered (in either sand/gravel aquifers or in bedrock) to contaminants released at depths of 1-2 m below the ground surface. Where contaminants are released at significantly different depths, there will be a need to determine groundwater vulnerability using site-specific data. The characteristics of individual contaminants are not taken into account.' GSI 1999.

Vulnerability Rating	**Hydrogeological Characteristics**				
	Subsoil Permeability (Type) and Thickness			**Unsaturated Zone**	**Karst Features**
	High Permeability (Sand/Gravel)	**Moderate Permeability (Sandy subsoil)**	**Low Permeability (Clayey Till, Clay, Peat)**	**(Sand/gravel aquifers only)**	**(<30 m radius)**
Extreme (E)	0 – 3.0 m	0 – 3.0 m	0 – 3.0 m	0 – 3.0 m	-
High (H)	> 3.0 m	3.0 – 10.0 m	3.0 – 5.0 m	> 3.0 m	N/A
Moderate (M)	N/A	> 10.0 m	5.0 – 10.0 m	N/A	N/A
Low (L)	N/A	N/A	> 10.0 m	N/A	N/A
Notes: i) N/A = not applicable ii) Precise permeability values cannot be given at present. iii) Release point of contaminants is assumed to be 1-2 m below ground surface.					

Table 7.4: Extract from 'Groundwater Protection Schemes', Department of the Environment and Local Government, Environmental Protection Agency, Geological Survey of Ireland, 1999

Groundwater vulnerability at the Site has been defined as 'High' (Figure 7.6). It can be seen that the vulnerability of the Site has been correlated with the sub-soils occurring at the Site.

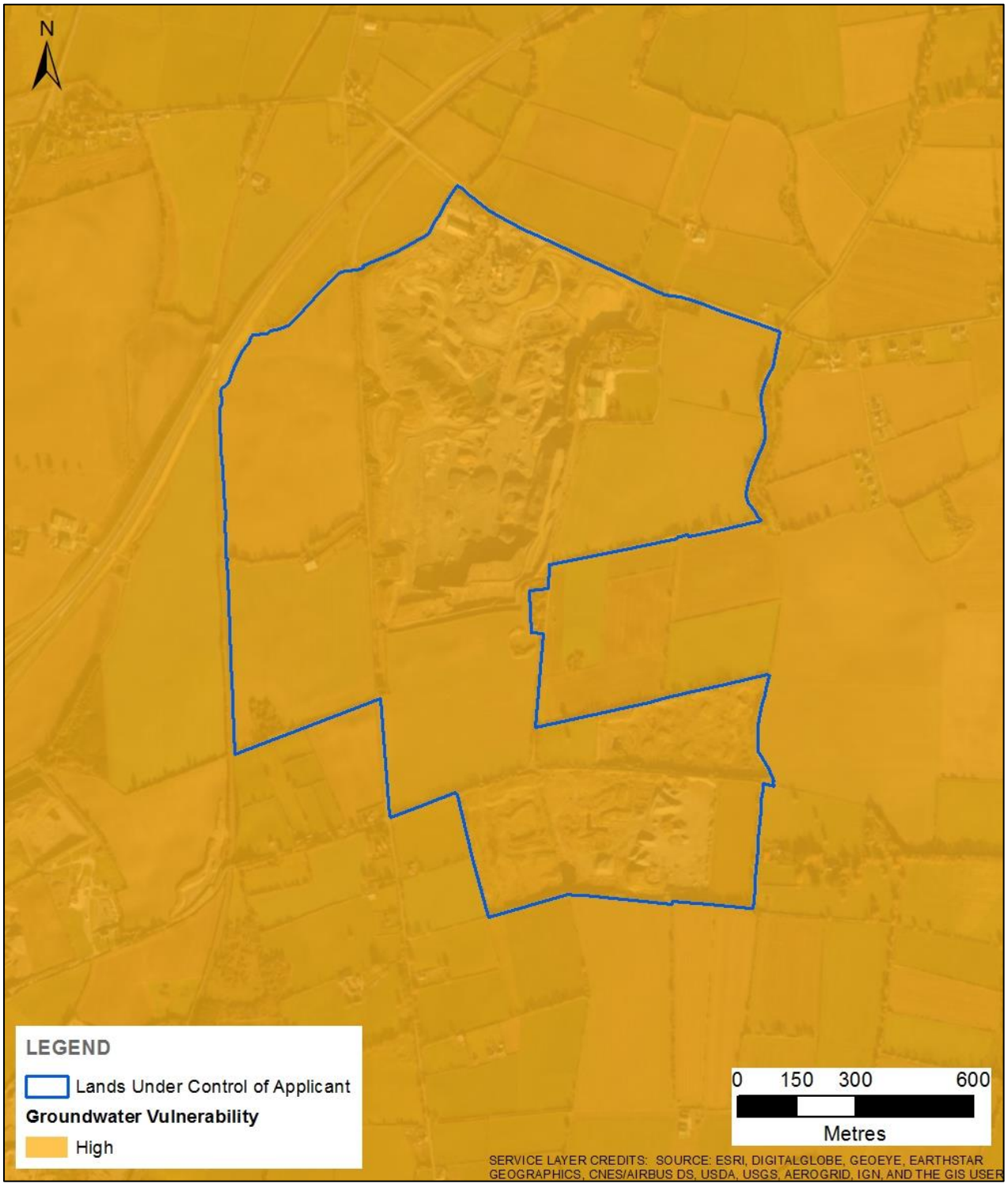


Figure 7.6: Groundwater vulnerability map

Groundwater Levels

Groundwater levels for the 8 groundwater monitoring boreholes drilled in 2007 are presented in Figure 7.7. BH06 was destroyed by agricultural activity. The locations for the boreholes are shown on Figure 7.8.

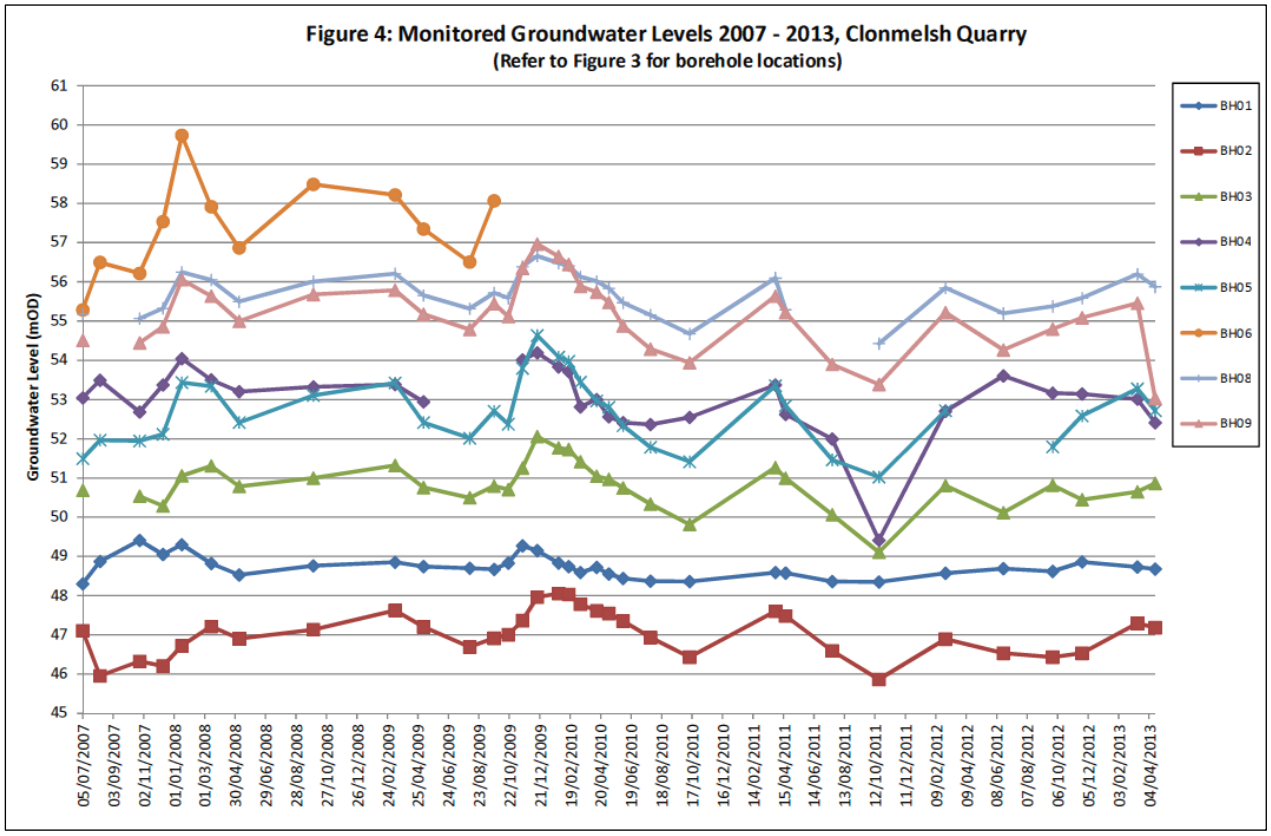


Figure 7.7: Hydrograph showing groundwater monitoring levels (2007 - 2013)

It can be seen from Figure 7.7 that groundwater levels around the quarry were relatively stable over the period of monitoring. However, the boreholes show a broad seasonal variation, with no significant reflection of ongoing quarrying activities (including the influence of pumping and increasing of the void footprint over time).

There is a general groundwater flow from east to west across the Site towards the River Barrow. Superimposed on this flow direction is the local flow into the quarry void from all sides. Figure 7.8 presents the interpreted groundwater flow direction superimposed on the drawdown cone for the Site in 2008. Groundwater levels are higher at the eastern and southern wells (BH06, BH08 and BH09), and lower to the west of the Site (BH01, BH02 and BH03).

The lowest water level in the quarry is a large sump located at ca. +15 m OD (base of the sump), making it ca. 35 m below the groundwater level of the surrounding area. Despite dewatering, the bedrock aquifer remains essentially fully saturated, with the depth to groundwater in the sands and gravels varying with distance from the excavation (refer to Figures 7.3 and 7.8).

Groundwater is interpreted to move primarily within the porous sand and gravel aquifer and along bedding planes and fractures in the shallow bedrock. The water-table is unconfined. The hydraulic gradient measured across the ground to the south of the quarry is ca. 0.016, which is a moderate gradient. However, this gradient is expected to be very steep (ca. 0.17) at the quarry faces, as groundwater drains into the excavation. The bedrock aquifer remains almost fully saturated to within 10's of metres of the excavation. The bedrock aquifer is essentially fully saturated (and in hydraulic continuity with the overlying sands and gravels) except for a zone in the immediate vicinity of the quarry face, where monitoring borehole BH04 (the closest borehole to the quarry face (ca. 50 m) encountered bedrock at 52.5 m OD. Groundwater monitoring in this borehole has not seen the water-level fall below 52.4 m OD in over three years of monitoring (2007 - 2010), implying that overlying gravels help to keep the bedrock aquifer saturated.

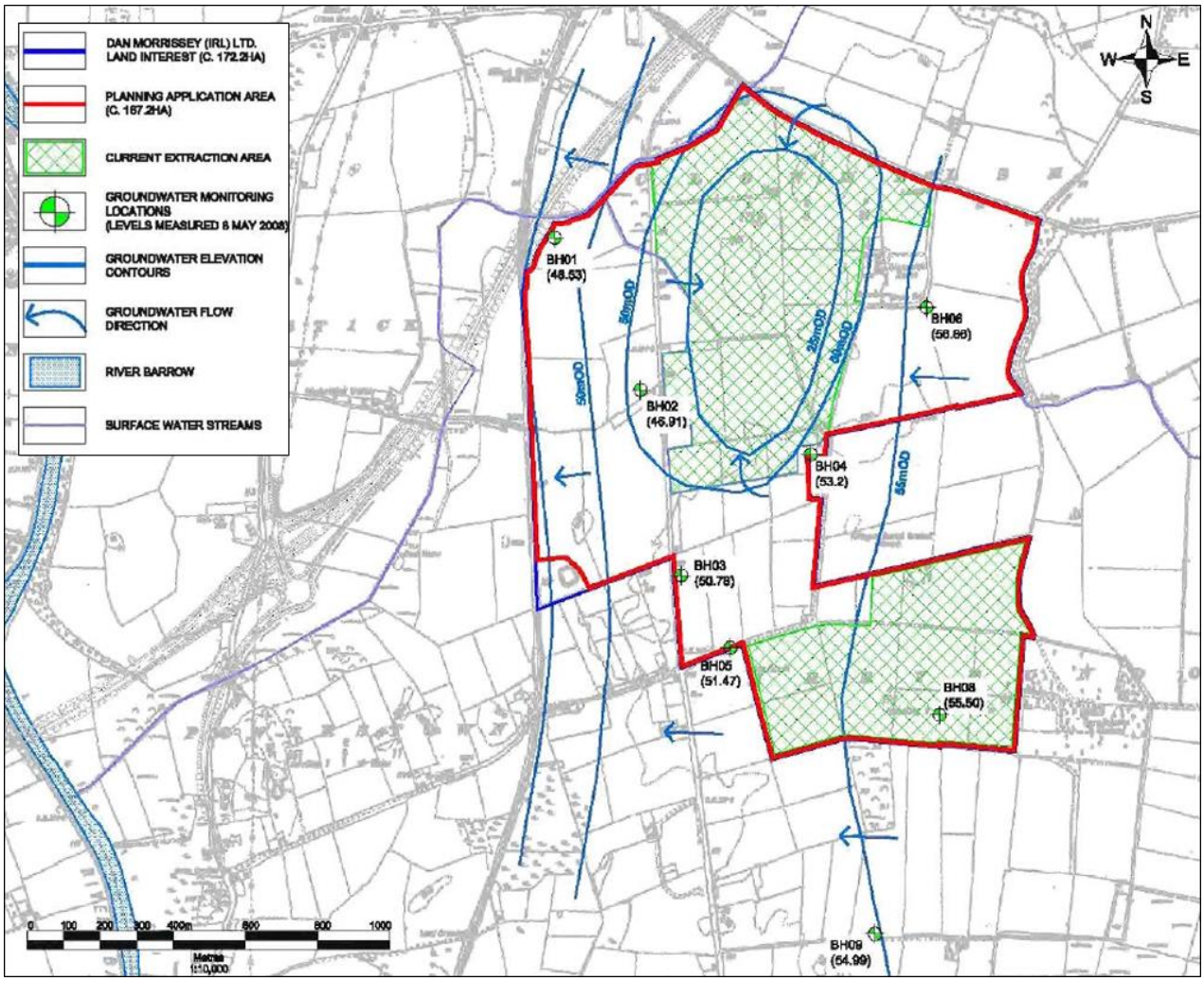


Figure 7.8: Groundwater drawdown and flow direction (2008)

The structural geology of the Site shows that the bedrock lies unconformably on the Leinster Granite, and has a gentle regional dip to the west of ca. 10°. Faults exposed within the quarry void trend NNE-SSW and dip steeply to the ESE. A second set of structures are represented as low angle faults dipping 25-35° to the SSE.

Master joints trend roughly N-S and dipping steeply to the west. They are typically weathered out in the near surface, becoming tight with depth; indicating that discontinuities (including bedding) in the rockmass do not appear to permit significant groundwater flow, other than from discrete fractures. The rockmass is generally strong to very strong, with weathering confined to within a few metres below the surface.

Source Protection Zones

There are no source protection zones within the area of the existing quarry or proposed extension area. The nearest source protection area to the development is located ca. 10 km to the south-east of the Site at Paulstown.

Groundwater Body

Groundwater bodies have been defined by the GSI to determine the catchment areas and divides within areas, in a similar fashion to the river basins defined for surface water features. The Site occurs within the Bagenalstown Lower Groundwater Basin (GWB) (IE_SE_G_157), which is classified as a regionally-important 'karstified diffuse-flow aquifer' (Rkd), receiving much of its recharge from the slopes of the Barrow Valley. It is not at risk of over-abstraction as determined by the EPA.

The Quaternary deposits within which the Site lies, is classified as a regionally important gravel aquifer, and is referred to as the Barrow Valley GWB (GSI). Due to the highly variable nature of the deposit it has limited development potential for

drinking water schemes. The main importance of this aquifer is in providing storage, and allowing recharge to the underlying limestone bedrock.

Karst Features

No karst features have been identified by the GSI within a 2 km radius of the Site. A thin epikarst zone is developed at the top of bedrock extending only 1 m into rock and is characterised by slight enlargement of joints by solution. No other karst features have been noted.

Groundwater Quality

The regional groundwater quality of the area is controlled by the limestone bedrock, the overlying Quaternary deposits of sands and gravels, and the impact of agricultural activities upon them. The waters are generally calcareous and very hard, with elevated nitrate levels having been detected at several locations within the Barrow Valley (one of the most intensely farmed/tilled regions in the country).

Eight (8) groundwater monitoring boreholes were installed around the Site in May and June 2007 (Figure 7.8). Table 7.5 presents a summary of the boreholes (logs are provided in Appendix 6.1).

Borehole Number	Ground Elevation (m OD)	Screen Interval (m bgl)	Geology	Depth to Bedrock (m bgl)
BH01	50.48	11.9 - 15.5	Limestone	11.9
BH02	54.75	11.0 - 80.0	Limestone	10.8
BH03	63.85	15.8 - 20.5	Limestone	15.8
BH04	61.55	8.5 - 13.0	Limestone	8.5
BH05	63.84	15.0 - 24.5	Limestone	15.0
BH06	67.78	11.2 - 16.0	Limestone	11.2
BH08	58.30	4.0 - 10.0	Silty Sand	NE
BH09	62.36	12.8 - 26.0	Limestone	13.0

Table 7.5: Borehole Summary

Groundwater quality analysis was collected from the 8 monitoring boreholes during 2007 and 2008. Each sample was tested for the following parameters:

- Dissolved Metals: Antimony, Arsenic, Barium, Boron, Cadmium, Chromium, Cobalt, Copper, Lead, Mercury, Molybdenum, Nickel, Phosphorus, Selenium and Zinc;
- Total Metals: Arsenic, Barium, Boron, Cadmium, Chromium, Cobalt, Copper, Lead, Mercury, Molybdenum, Nickel, Phosphorus, Selenium and Zinc;
- Extractable Petroleum hydrocarbons;
- Fluoride, Chloride, and Sulphate;
- Nitrate as NO3, and Nitrite as NO2;
- Orthophosphate as PO4, and Molybdenum Reactive Phosphorus (MRP) as PO4;
- Total Ammonia as NH4;
- Total Alkalinity as CaCO3;
- Electrical Conductivity;
- pH; and
- Volatile Organic Compounds (VOCs).

The results of the groundwater quality analysis at the Site are presented below and compared with EPA Interim Guideline Values for Groundwater Protection and S.I. No.9 (2010), the European Communities Environmental Objectives (Groundwater) Regulations regarding groundwater status (Table 7.6). The laboratory results are included in Appendix 7.4.

Table 7.6: Groundwater Quality Results

Parameter	Units	EPA IGV	S.I. No.9	BH01	BH01	BH02	BH02	BH03	BH03	BH04	BH04	BH04
				6/7/07	8/5/08	17/1/08	8/5/08	17/1/08	8/5/08	6/7/07	17/1/08	8/5/08
Temperature	°C	25	-	11.8	10.1	11.3	11	10.7	11.1	13.4	9.7	11.9
pHmV	-	-	-	-	-17.3	-	-21.4	-	-26.7	-	-	-19
ORP	-	-	-	-	-43	-	-98	-	-86	-	-	-48
Field Elec. Conductivity	µS/cm	1000	800-1875	780	846	779	886	732	804	790	682	873
Lab Elec. Conductivity	µS/cm	1000	800-1875	756	657	770	807	717	567	787	653	810
Dissolved Oxygen	%	NAC	-	-	33.7	35	31.4	66	89.1	120	71	91.1
Dissolved Oxygen	mg/l	NAC	-	-	3.78	-	3.44	-	9.79	-	-	-
Field pH	pH units	6.5-9.5	-	-	7.08	-	7.13	-	7.23	-	-	7.09
Lab pH	pH units	6.5-9.5	-	7.69	7.48	7.3	7.71	7.41	7.72	7.69	7.68	7.29
Dissolved Ca	mg/l	200	-	137.9	130.6	151	131.9	141	64.5	130	134	129.9
Dissolved Mg	mg/l	50	-	15.09	14.44	18.9	16.33	17	9.38	16.3	15.6	14.05
Dissolved Na	mg/l	150	-	9	9.4	16	17.3	10.4	10.7	11.5	8.1	11.2
Dissolved K	mg/l	5	-	0.8	0.9	1.3	0.5	1.56	1.9	4.4	7.91	10
Total Alkalinity as $CaCO_3$	mg/l	NAC	-	250	250	317	230	294	220	160	278	220
Total Hardness as $CaCO_3$	mg/l	30	-	-	386	455	397	423	200	-	399	382
Chloride	mg/l	30	24-187.5	21	23	28.3	24	30.6	26	25	23	27
Sulphate	mg/l	200	187.5	55	62	66	64	10.4	29	40	24.9	27
Amm. Nitrogen as NH_4	mg/l	0.15	0.065 – 0.175	<0.01	<0.2	<0.04	<0.2	<0.04	<0.2	0.41	<0.04	<0.04
Nitrite as NO_2	mg/l	0.1	0.375	<0.05	-	<0.01	-	<0.01	-	0.11	0.03	-
Nitrate as NO_3	mg/l	25	37.5	19.2	27.3	37.7	38.2	60.3	53	101	55.4	78
Total Dissolved Fe	µg/l	200	-	<2	<2	<25	<2	<25	40	6	668	<2
Dissolved Mn	µg/l	50	-	11	2	298	116	4	20	50	29	4
Orthophosphate as PO_4	mg/l	0.03	-	<0.03	-	<0.03	-	0.03	-	0.11	0.06	-
Total Organic Carbon	mg/l	NAC	-	3	<2	1.55	<2	1.3	<2	3	1.92	<2
Total Pet. Hydrocarbons	µg/l	10	-	<10	<10	-	<10	-	<10	<10	-	<10
Mineral Oil	µg/l	10	-	<10	-	-	-	-	-	<10	-	-

NAC – No abnormal change

Table 7.6 continued: Groundwater Quality Results

Parameter	Units	EPA IGV	S.I. No.9	BH05	BH05	BH05	BH06	BH06	BH06	BH08	BH08	BH08	BH09
				6/7/07	17/1/08	8/5/08	6/7/07	17/1/08	8/5/08	6/7/07	17/1/08	8/5/08	8/5/08
Temperature	°C	25	-	11.8	10.7	11	13	11	-	13.5	10.9	12.1	10.7
pHmV	-	-	-	-	-	-31.5	-	-	-	-19.9	-	-53.2	-23.2
ORP	-	--	-	-	-	-54	-	-	-	-54	-	-18	-71
Field Elec. Conductivity	µS/cm	1000	800-1875	754	707	778	779	740	805	475	448	255	810
Lab Elec. Conductivity	µS/cm	1000	800-1875	759	692	692	760	726	740	421	453	390	732
Dissolved Oxygen	%	NAC	-	74.5	52.3	66.1	90	81.7	97.9	70	72	83.1	92
Dissolved Oxygen	mg/l	NAC	-	-	-	7.29	-	-	10.7	-	-	8.92	10.2
Field pH	pH units	6.5-9.5	-	-	-	7.32	-	-	7.1	-	-	7.72	7.17
Lab pH	pH units	6.5-9.5	-	7.58	7.39	7.72	7.57	7.46	7.48	8.06	7.77	7.99	7.52
Dissolved Ca	mg/l	200	-	131	136	113.8	112	144	116.9	70.75	83.3	63.86	113
Dissolved Mg	mg/l	50	-	14.6	16.8	15.03	28.1	17.9	14.1	9.81	11	8.5	14.54
Dissolved Na	mg/l	150	-	10.5	10.9	10	13	13.9	13.5	7.5	6.9	6.6	10.1
Dissolved K	mg/l	5	-	1.7	2.2	1.5	2.7	2.07	2.8	1	0.74	0.7	12.7
Total Alkalinity as $CaCO_3$	mg/l	NAC	-	200	292	180	190	296	200	167	191	150	200
Total Hardness as $CaCO_3$	mg/l	30	-	244	109	346	-	434	350	-	233	194	342
Chloride	mg/l	30	24-187.5	27	23.8	29	37	39.7	40	7	15.5	14	40
Sulphate	mg/l	200	187.5	27	33.1	36	35	34.8	32	38	27	21	15
Amm. Nitrogen as NH_4	mg/l	0.15	0.065 – 0.175	<0.01	<0.04	<0.2	0.38	0.37	<0.2	0.02	0.31	0.4	<0.2
Nitrite as NO_2	mg/l	0.1	0.375	<0.05	0.05	-	0.13	0.3	-	0.08	0.42	-	-
Nitrate as NO_3	mg/l	25	37.5	81.1	62.9	54.5	71.3	62.9	65.3	6.7	25.6	19.6	69.2
Total Dissolved Fe	µg/l	200	-	21	124	<2	9	99	<2	12	113	<2	<2
Dissolved Mn	µg/l	50	-	6	6	3	2	4	2	<1	<3	3	1
Orthophosphate as PO_4	mg/l	0.03	-	0.32	0.11	-	<0.03	0.39	-	0.26	0.5	-	-
Total Organic Carbon	mg/l	NAC	-	3	1.9	<2	3	1.68	<2	3	1.03	<0.2	<2
Total Pet. Hydrocarbons	µg/l	10	-	<10	-	<10	<10	-	<10	<10	-	<10	<10
Mineral Oil	µg/l	10	-	<10	-	-	<10	-	-	<10	-	-	-

NAC – No abnormal change

The groundwater analyses for this period indicate that elevated results were recorded for Chloride, Nitrate (NO3), Nitrite (NO2), Orthophosphate (PO4), Potassium (K) and Ammoniacal Nitrogen as NH4. These results suggest that groundwater within the vicinity of the Site are being impacted by agricultural activities. Total Hardness Dissolved (as CaCO3) was elevated in all samples, however this is expected given the limestone geology.

7.4 Conceptual Hydrogeological Site Model

The boundaries of the groundwater catchment are the upland area to the east and the River Barrow to the west. Recharge occurs over the entire area and groundwater naturally discharges to the River Barrow. There is localised drawdown of the water-table surrounding the Site, however the distance of influence is restricted due to the following contributory factors, which form the basis for a conceptual hydrogeological site model:

- Shallow water table within sands & gravels (ca. 2 m);
- Unconfined flow, predominantly shallow through permeable sands & gravels;
- Bedrock fully saturated, fracture flow only;
- Permeability decreases with depth in bedrock, effective base of bedrock aquifer conservatively assumed at ca. 20 to 30 m below the rock-head (top of rock);
- Sands & gravels in hydraulic continuity with bedrock;
- Sands & gravels thicken to the west and thin/absent to the east;
- Shallow groundwater flow to east within granite and Quinagh Formation (mudstones);
- Deeper groundwater flow to west within Milford Formation (dolomitised limestones);
- Recharge occurs over entire area; and
- Groundwater discharges to the River Barrow ca. 1.5 km to the west.

7.5 Water Management

Chapter 2.0 and 3.0 of this rEIAR presents a description of the development of the operations on site to their appearance today. Site drainage water is discharged to the Powerstown Stream at a single discharge point (DW01), via a series of Settlement Ponds. A discharge licence (DL7/233) is in place for the Site, which allows for 25 mg/l suspended solids and nitrates in terms of quality, and 2,000 m3/d in terms of volume (Appendix 7.1).

The existing water management system for the Site can be divided into the following main components (Figures 7.9 and 7.10):

- Rainfall water and surface run-off collects on the quarry floor, and drains into the Quarry Sump; from where it flows through a series of Settlement Ponds and subsequently into the Central Sump before being pumped via a high-capacity riser to a channel that crosses beneath the entrance of the quarry, and discharged (at DW01) into a channel prior to entering the Powerstown Stream;

- Groundwater is also collected in the Quarry Sump, from where it flows through the same series of Settlement Ponds and subsequently into the Central Sump before discharging (DW01) into a drainage channel which flows westwards into the Powerstown Stream;

- Attenuation capacity is provided in the lower parts of the quarry floor during periods of prolonged rainfall or extreme storm events;

- Surface water channel (Clonmelsh Stream), which has been diverted on a number of occasions to accommodate quarry development;

- Rainfall water and surface run-off from buildings and the Plant Site floor area which is pumped to the Surface

Settlement Pond where it is recycled and used in the Readymix Batching Plant, the Block Plant and Asphalt Plant;

- Water sourced from an additional group of Settlement Ponds adjacent to the quarry floor Settlement Ponds is used to provide 'top-up' water for the Aggregate Processing Plant which operates as a closed circuit system. Silt is pumped from the Aggregate Processing Plant to a large Silt Pond located to the north-east;
- An existing septic tank treats foul water from the Site; and
- Water for welfare facilities is supplied from a well located adjacent to the Surface Settlement Pond (drinking water is supplied by a commercial supplier).

At the quarry floor, the Central Sump's pump operates on a float switch, which activates once a certain water level within the sump is exceeded (providing an intermittent flow rate of up to ca. 22 l/s or 1,900 m3/d). During 95% flow conditions, it is estimated that the pump is operational for ca. 50% of the time, producing an average discharge of about 11 l/s (or 950 m3/d).

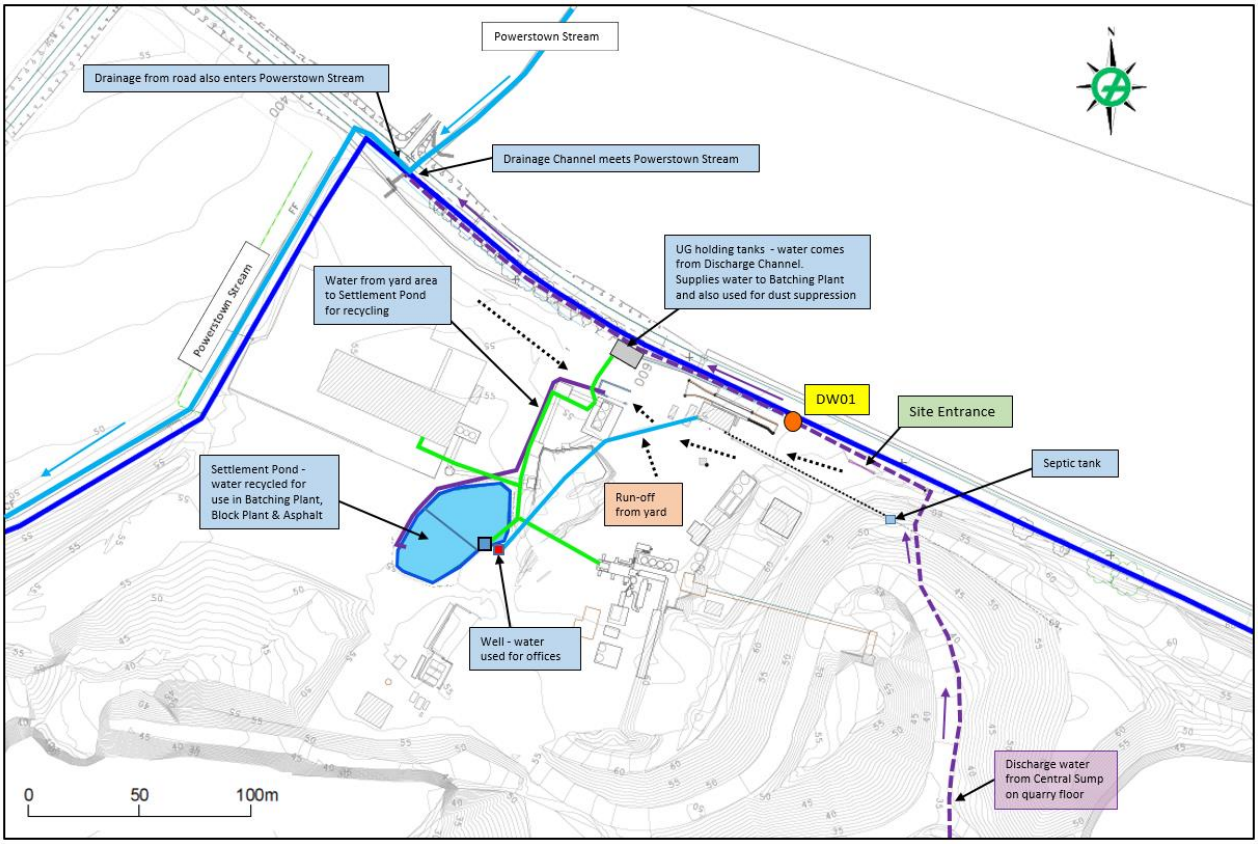


Figure 7.9: Water management plan – Plant Site

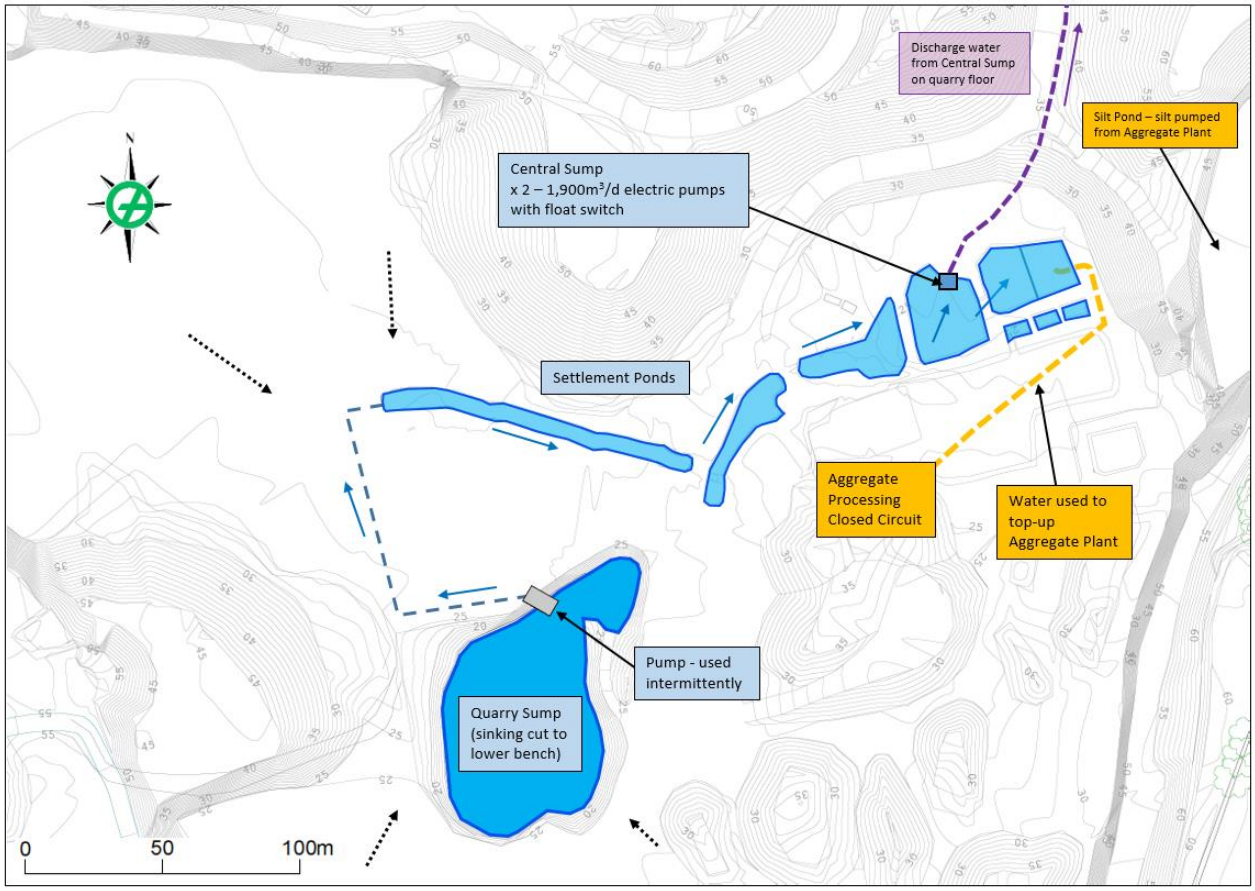


Figure 7.10: Water management – Quarry

7.5.1 Waste Water Treatment System (Septic Tank)

An existing septic tank treats foul water from the Site and is designed to cater for (Figure 7.9).

Domestic wastewater is composed of sewage and office wastewater and passes through an on-site septic tank and percolation area. The septic tank is emptied as required by licensed waste contractors. Historically, there have been no issue with this on-site septic tank.

A site characterisation was carryout by MK Architectural & Building Surveying in May 2011 (Site Characterisation Report Provided by MK Architectural & Building Surveying. SLR Ref: 501.0051.00060.Rev0. September 2012) for 20 persons. The findings of the characterisation concluded that the site was suitable for a septic tank system (and percolation area) (Appendix 7.5). The capacity of the existing septic tank is understood to be ca. 3,800 litres, which is adequate for the current number of people (12 permanent plus visitors) on the site.

A walkover of the Site in the surrounding area did not highlight any signs of surface pollution from the septic tank. Given that the septic tank is located within a disused part of the quarry site (i.e. in close proximity to the edge of the quarry void) and with depths to groundwater of >20m due to quarry de-watering, it is likely that the thickness of soils and overburden material (ca. 10 to 15 m) underlying the septic tank is sufficient to provide percolation. This does not present an environmental risk based on the current usage and there is no evidence of environmental pollution of the septic tank system due to past usage at the Site.

Typical indicators of septic tanks contamination include chloride, sulphate, nitrate, nitrite, ammonia, and phosphate, which have shown elevations in the surface water and groundwater on occasion at the Site. Previous studies in the Barrow Valley have shown that groundwater in certain areas have elevated nitrate concentrations (Daly, 1981). This has resulted mainly

from intensive agricultural production and disposal of sewage from individual wastewater treatment systems. As noted above it is considered that such elevations are resulting from off-site sources and land practices.

7.5.2 Site Water Balance

Water produced on the Site primarily consists of run-off from rainfall and groundwater emanating from the quarry void. The storage capacity for the 1 in 100 year storm was estimated from rainfall data provided for the closest Met Éireann station.

Rainfall Data

There is no official meteorological data specific to the Clonmelsh Site. In order to give reliable climatic data, data from Met Éireann's synoptic station at Oakpark, Carlow was used (Appendix 7.6). This measuring station is ca. 9 km north of the Site. All rainwater falling within the operational area of the quarry is directed to the Quarry Sump. Water falling on the Site either evaporates, is used in quarry processes/activities, or is discharged from the Site.

Evapotranspiration and Effective Rainfall

Evapotranspiration is the return of water vapour to the atmosphere by evaporation from land and through transpiration by plants, generally measured from a short-grass covered surface (such as permanent pasture) adequately supplied with water. Evaporation is the return of water vapour to the atmosphere by evaporation from a free water surface such as a pan of water, known as a "Class A Pan", fitted with a depth-measuring gauge.

Evapotranspiration is very low during the winter months when plant growth is minimal. The vast majority of evapotranspiration during winter months is attributable to direct evaporation from ground surfaces. During summer months the rate of evapotranspiration increases and often exceeds the monthly rainfall. This is due to increased free evaporation from the surface and from transpiration from plants.

Using the rainfall data and the potential evapotranspiration data for Oakpark Synoptic Station, the effective rainfall for the Site has been calculated. The water balance for the Site is summarised below in Table 7.7. Calculations supporting Table 7.7 are presented in Appendix 7.6.

(1) Estimated Area of Site Catchments (m^2)	530,000 m^2
(2) Mean Annual Precipitation (mm)	840.2 mm
(3) Annual Potential Evapotranspiration (mm)	522.2 mm
(4) Actual Evapotranspiration (mm) 90% of (3)	470.0 mm
(5) Effective Annual Precipitation (mm) (2)-(4)	370.2 mm
(6) Annual Volume of Water moving into Catchment Area (m^3) (1) x (5)	196,206 m^3
(7) Estimated Average Daily Volume of Water for Quarry Use*	150 m^3
(8) Estimated Average Monthly Volume of Water for Quarry Use*	3,400 m^3
(9) Estimated Average Annual Volume of Water for Quarry Use*	41,000 m^3
(10) Estimated Daily Groundwater Inflow (see Section 6.5.1.3)	1,300 m^3
(11) Estimated Annual Groundwater Inflow (see Section 6.5.1.3) (10) x 365 days	474,500 m^3
(12) Permitted Discharge Volume per day (DL7/233)	2,000 m^3
(13) Permitted Discharge Volume per year (12) x 365 days	730,000 m^3

(* see Table 6.8, estimates have been supplied by the quarry operator)

Table 7.7: Estimated Annual Water Balance (mean values are between 1981 – 2010)

The water requirements are satisfactorily met by the ingress of water into the quarry from rainfall and groundwater. Table 7.8 presents an estimate for the average daily water requirements for on-site activities based on a 10 hour day.

Operation	Requirement (m^3/day)
Aggregate Processing	Closed circuit
Readymix Concrete	50 - 100
Dust suppression (seasonal)	10 - 20
Concrete Blocks/Asphalt	20
Canteen	2
Total	<150

Table 7.8: Estimated Daily On-site Water Requirements

Groundwater Inflow

The 2013 Hydrological / Hydrogeological Impact Assessment (SLR Consulting Ltd, April 2013), used a radial flow model (Thiem-Dupuit Method) to provide an estimate of groundwater flow into the quarry void. This Method identified an inflow of ca. 1,300 m3/d (ca. 15 l/s) based on groundwater levels in monitoring boreholes BH02 and BH04. Assumptions and inputs to their model included:

- Hydraulic conductivity (K) value of 0.15 m/d;
- Radius of Influence of 518 m from groundwater level monitoring;
- Equivalent radius of Clonmelsh Quarry, measured to be 318 m;
- Quarry floor level of 25 m OD;
- Aquifer base of 15 m OD;
- Height of the water-table at radius of influence from groundwater level monitoring of 53 m OD; and
- Height of the water-table at quarry floor of 25 m OD.

Extreme Weather Events

Extreme Rainfall Return Periods for the Site were provided by Met Éireann (Appendix 7.6). For storage of incident rainfall calculations, the runoff from a rainfall return event with a 60 minute, 100 year return period (37.1 mm in the Clonmelsh area) is taken to represent a suitable scenario. Over the ca. 54 ha contributing area, the rainfall event will generate ca. 8,487 m3 of water (Appendix 7.6) over the course of this period (assuming no percolation or evaporation during the event). This is substantially higher than the permitted discharge volume of 2,000 m3/d (DL7/233). Short-term water storage capacity is provided on the quarry floor which has an area of ca. 49 ha.

7.6 Predicted Impacts of the Proposed Development

Predicted impacts which may be experienced at the Site include the following:

- There is a potential for suspended solids-impacted waters generated within the quarry to be discharged into the Clonmelsh and Powerstown Streams;
- Stripping of topsoil and overburden to access the resource. Topsoil and overburden already stripped will be used to in the phased restoration of the Site (refer to Chapter 12 for details);
- Mechanical handling of materials. Primary and secondary processing of materials takes place at the Site. Extraction by blasting, primary crushing by mobile crusher, haulage of aggregate, processing of aggregate, manufacture of products and restoration of the areas on a phased basis are activities which occur on the Site;
- Private water wells in the vicinity of the Site extract groundwater from the bedrock aquifer. Monitoring of groundwater levels (Figure 7.7) by the Applicant has shown that bedrock is fully saturated to within a short distance of the quarry. Drawdown occurs within the zone of influence but only within the overburden deposits - the bedrock remains saturated

due to the blanket of water-bearing overburden deposits which 'top up' the bedrock and act as storage. Therefore it is anticipated that there will be no significant impact on water supplies from these private wells;

- A potential impact on the water environment from quarrying related activities could result from accidental spillage of fuels or oils to the groundwater environment during refuelling operations. This potential impact is likely to occur if contaminants are allowed to infiltrate to ground during refuelling operations, and then migrate offsite. There is no evidence of pollution of the water environment in the vicinity of the Site resulting from spillage of fuels or oils, during site visits undertaken during 2017. Mitigation measures, as described below have been implemented at the Site to reduce the risk of such an event occurring; and
- Following closure of the quarry, the water level will be permitted to recover to pre-pumping levels, and the Site will be restored as a lake.

7.6.1 Potential Impacts on Groundwater

The main potential polluting impacts associated with the development are the introduction of hydrocarbons to the underlying groundwater. Given the level of activity at the Site, as long as mobile plant (and any other machinery brought on site) is properly maintained it is considered very unlikely that hydrocarbon pollution will become an issue at the Site. A number of other factors also indicate that the likelihood of negatively impacting the groundwater will be very low. These include:

- The continuation of groundwater monitoring using existing boreholes;
- The development area of the Site is not located within a Source Protection Area of a public water supply scheme;
- The level of activity at the Site is in keeping with the level of activity having previously taken place at the Site; and
- Monitoring information demonstrates that the bedrock aquifer remains fully saturated until within a short distance from the quarry (conservatively assumed in calculations at 200 m, but so far measured at less than 50 m).

The existing development may result in a small increase in the depth to the water-table over parts of the adjoining landholdings. However, this will not cause crop dehydration. The water demand of crops where the water-table is not close to the surface, is entirely met by water extracted from the soils which is supplied by rainfall.

7.7 Mitigation Measures

Mitigation measures in place at the Site are in accordance with the "best practice/possible mitigation measures" as set Quarries and Ancillary Activities: Guidelines for Planning Authorities, DoEHLG (2004) and the discharge licence requirements set out in DL7/233 (granted in 2009).

It is proposed that the following mitigation measures will continue to be adhered to at the Site to ensure that no adverse environmental impacts will occur to the underlying hydrogeology as a result of the present activities:

- As part of the compliance with the discharge licence for the quarry (DL7/233), regular water quality monitoring of the discharge and the Powerstown and Clonmelsh Streams takes place, with results being submitted to Carlow Co. Council;
- The Applicant has provided an undertaking to carry out appropriate remedial measures to restore water well supplies in the event that it is demonstrated that quarry operations are having an adverse impact on private wells;
  - Data loggers (divers) will be placed in selected monitoring boreholes and private wells to monitor fluctuations in groundwater levels on an ongoing basis;
  - Data loggers will also act as an early warning system should a dramatic drawdown in groundwater levels occur;
- The quarry discharge considerably dilutes the levels of nitrate in the Powerstown Stream. This is considered to be a positive impact;

- Surface water channels constructed within the quarry to collect surface water runoff and any perched groundwater seepage. These channels are cleaned out regularly, with the fine materials used on site in remediation works;
- Continued revision of the existing Environmental Management System (EMS) for the Site;
- No excavation shall take place below +25 m OD;
- Measures implemented within the quarry to ensure that adequate settlement time is available to discharge water to mitigate against an excessive suspended solids load;
- All soil / overburden stockpiles to be covered (i.e. vegetated) to minimise the risk of rain / wind erosion;
- Restoration with topsoil and overburden will be carried out on an 'rolling-basis' (on-going basis) to reduce the vulnerability of the bedrock aquifer to possible contamination;
- Most mobile plant will use the existing concrete apron at the current quarry garage for refuelling. Static plant or tracked excavators will refuel over a drip tray with an absorbent mat;
- Any processing plant and/or mobile plant on the Site will be regularly maintained, and where plant is damaged or leaking it will be fixed or replaced immediately, as part of the ongoing operational management of the quarry to reduce the risk of leaks;
- All fuel on-site will be stored in bunded tanks in accordance with the EPA guidance Note on Storage and Transfer of Materials for Scheduled Activities (2004); and
- All chemicals and petroleum-based products and chemicals are to be stored on spill pallets or similar;
- No mechanical repairs shall take place within the quarry floor area;
- An emergency spill kit (including absorbers) will be available for use in the event of an accidental spill on the quarry floor;
- After site closure, all chemicals, petroleum based products, mechanical and electrical equipment shall be removed and disposed of by a registered contractor;
- Monthly monitoring of quarry specific groundwater monitoring boreholes and private wells within a 500 m wide radius to monitor possible drawdown and groundwater quality;
- Drainage from the smaller roofs of the proposed office, the existing workshop, and ESB sub-station will be / is channelled into the overall site drainage system for the site facilities area; and
- The water management system set out under the existing discharge licence (DL7/233) includes provision for settlement ponds and provides for a hydrocarbon interceptor.

The combined application of these measures ensures that inputs to, and subsequent contamination of, the water environment have not occurred at the Site during quarrying related activities.

In the unlikely event that the quarry operations are demonstrated to have an adverse impact on third party water supply wells the operator will undertake appropriate remedial measures to restore / replace the water supply at his own expense.

7.8 Residual/Likely Significant Effects

Spillages could have occurred during refuelling and servicing on-site. As the mitigation measures described in the section above were implemented, it is considered unlikely that there has been any effect on the water environment as a result of

quarrying related activities being undertaken at the Site. There has been no evidence to date to suggest that this has occurred.

There are a number of third party wells located in close proximity to the quarry void. All of the wells surveyed extract water from the bedrock aquifer, and it is anticipated that there will be no significant impact on water supply from these wells, as groundwater monitoring has demonstrated that the bedrock aquifer is saturated within a short distance of the quarry void (ca. 50 m). Notwithstanding this, the operator has provided an undertaking to carry out appropriate remedial measures to restore well water supplies in the event that it is demonstrated that quarrying operations are having an adverse impact on third party wells.

As a result of not having an effect (of drawdown) on groundwater wells in its immediate vicinity, it is unlikely that the development will have an effect on the River Barrow, located ca. 1.5 km to the west.

7.9 Cumulative Impacts

The existing development takes place below the water-table and there is discharge to surface water. The discharge of water from the Site coupled with discharge from the Powerstown Landfill further downstream on the Powerstown Stream has a cumulative impact on the receiving watercourse. Providing all mitigation measures are adhered no adverse effects on the Powerstown Stream are expected.

7.10 Summary of Site Conditions

- Clonmelsh Quarry has been excavated into bedrock (Ballysteen Limestone Formation) and the overlying Quaternary subsoil deposits. The former is predominantly limestone (with elements of argillaceous material) in character, and the latter consists of interbedded sands and gravels and tills.
- The limestone bedrock and the subsoil deposits are classified as Regionally Important aquifers in the Barrow Valley. This is not confirmed by the results of the investigations undertaken at this site.
- The subsoils in the site area are situated at the eastern edge of Quaternary deposits in the Barrow Valley and are thinly saturated. They have been fully excavated over part of the site area.
- The limestone bedrock in the quarry area has relatively low permeability whereas the permeability of the overlying subsoil deposits can be up to two orders of magnitude higher.
- A shallow cone of drawdown has developed in the bedrock and sands and gravels in response to dewatering of the quarry.
- Groundwater in the bedrock and sand and gravels are considered to be in hydraulic continuity in the site area and are unconfined. The principal hydraulic boundaries in the area are the Leinster granite to the east and the River Barrow to the west.
- The stream (Clonmelsh Stream) that passes through the Site has been diverted to the southern part of the main excavation. This stream is understood to be ephemeral in nature.
- Direct rainfall to the quarry working area, streamflow infiltration and groundwater inflow is directed to the Quarry Sump, and subsequently flows via a series of Settlement Ponds to the Central Sump, from where it is be pumped to a licenced surface water discharge point (DW01) on a drainage channel which flows into the Powerstown Stream.
- The seasonal fluctuation in the water-table in the site area ranges from about 1.5 m to 5 m. Groundwater flows in a generally westerly direction in the area aside from the immediate area around the quarry where it flows from all sides

into the excavation.

- The average groundwater component of the discharge is estimated to be about 15 l/s (ca. 1,300 m3/d) in the winter months.
- Groundwater in certain parts of the Barrow Valley have elevated nitrate concentrations. This has resulted mainly from intensive agricultural production and disposal of sewage from individual wastewater treatment systems. The local streams in the area appear to have high levels of nitrate. The quarry discharge dilutes the nitrate levels in the stream, and is broadly representative of regional groundwater quality; and
- Groundwater is used in domestic and farm water supplies throughout the area.

7.11 References

Geology of Carlow-Wexford: A Geological Description, with accompanying Bedrock Geology 1:100,000 Scale Map, Sheet 19, Carlow - Wexford (GSI), 1994;

Environmental Protection Agency (EPA) Water Quality in Ireland 2004-2006, 2008;

S.I. No. 9 - European Communities Environmental Objectives (Groundwater) Regulations 2010;

S.I. No. 389 - European Communities Environmental Objectives (Groundwater) (Amendment) Regulations 2011;

Geological Survey of Ireland interactive web maps; and

Environmental Protection Agency (EPA) interactive web maps.

Hydrological / Hydrogeological Impact Assessment, SLR Consulting Ltd, April 2013

Daly, E.P., 1981. Nitrate Levels in the Aquifers of the Barrow River Valley. Geological Survey of Ireland.

8.0 AIR QUALITY & CLIMATE

8.1 Introduction

The following Chapter of the remedial Environmental Impact Assessment Report assesses any potential impact the quarrying and ancillary activities at the site may have had on the surrounding environment, with regards to the local climate and the receiving air environment. The assessment period for this study is from 1990 to the present day.

For quarrying related activities, the most likely emission to the air environment is dust, which arises predominantly from the excavation, processing and transporting of aggregate. These sources are generally dispersed sources rather than specific point sources and this dictates the measures required to mitigate dust related impacts.

An industrial plant for the production of bitumen macadam and asphalt, (and products containing those constituents) is understood to have been constructed on site in 2010 and commenced operation that same year. A point source from this operation is regulated by an Air Pollution Licence (APL 10/01) granted in July 2010 by Carlow County Council under the Air Pollution Act, (1987).

A description of climatic factors relating to the Clonmelsh Site has been derived from data obtained from Met Éireann's automatic weather station at Oak Park, Co. Carlow. The Oak Park station is located at Oak Park, Co. Carlow, ca. 10 km north of the Clonmelsh Site.

8.2 Methodology

The impact of dust is usually monitored by measuring rates of dust deposition. According to the EPA Guideline Document entitled Environmental Management in the Extractive Industries (April 2006), there are currently no Irish statutory standards or EPA guidelines relating specifically to dust deposition thresholds for inert mineral dust. There are a number of methods to measure dust deposition but only the German TA Luft Air Quality Standards (TA Luft, 1986) specify a method of measuring dust deposition – the Bergerhoff Method (German Standard VDI 2119, 1972) – with dust nuisance. It is the only enforceable method available. On this basis, the EPA recommend a dust deposition limit value of 350 mg/m2/day (Table 8.1) (when averaged over a 30-day period) has been adopted at site boundaries associated with quarrying related activities.

The then Department of Environment, Heritage and Local Government (DoEHLG) published 'Quarries & Ancillary Activities: Guideline for Planning Authorities' (2004) also recommends the TA Luft dust deposition limit is adopted at site boundaries near quarry developments. In addition, the DoEHLG have identified that residents within 500m of the dust source can potentially be effected from emissions, with more severe concerns about dust within 100m of the source.

Procedures	Monitoring Frequency	Standard
Dust Emissions	Monthly	<350 mg/m^2/day, Bergerhoff Method

Table 8.1: Dust Limit Values

Five dust monitoring points (D1, D2, D3, D4 and D5) have been operated on site since February 2007. A sixth location (D6) was included in the analyses in August 2010 and a seventh (D7) in May 2012. Their locations are at the existing extraction area boundaries and assess any impacts of extraction related activities on the existing site and on the local environs, (Figure 8.1).

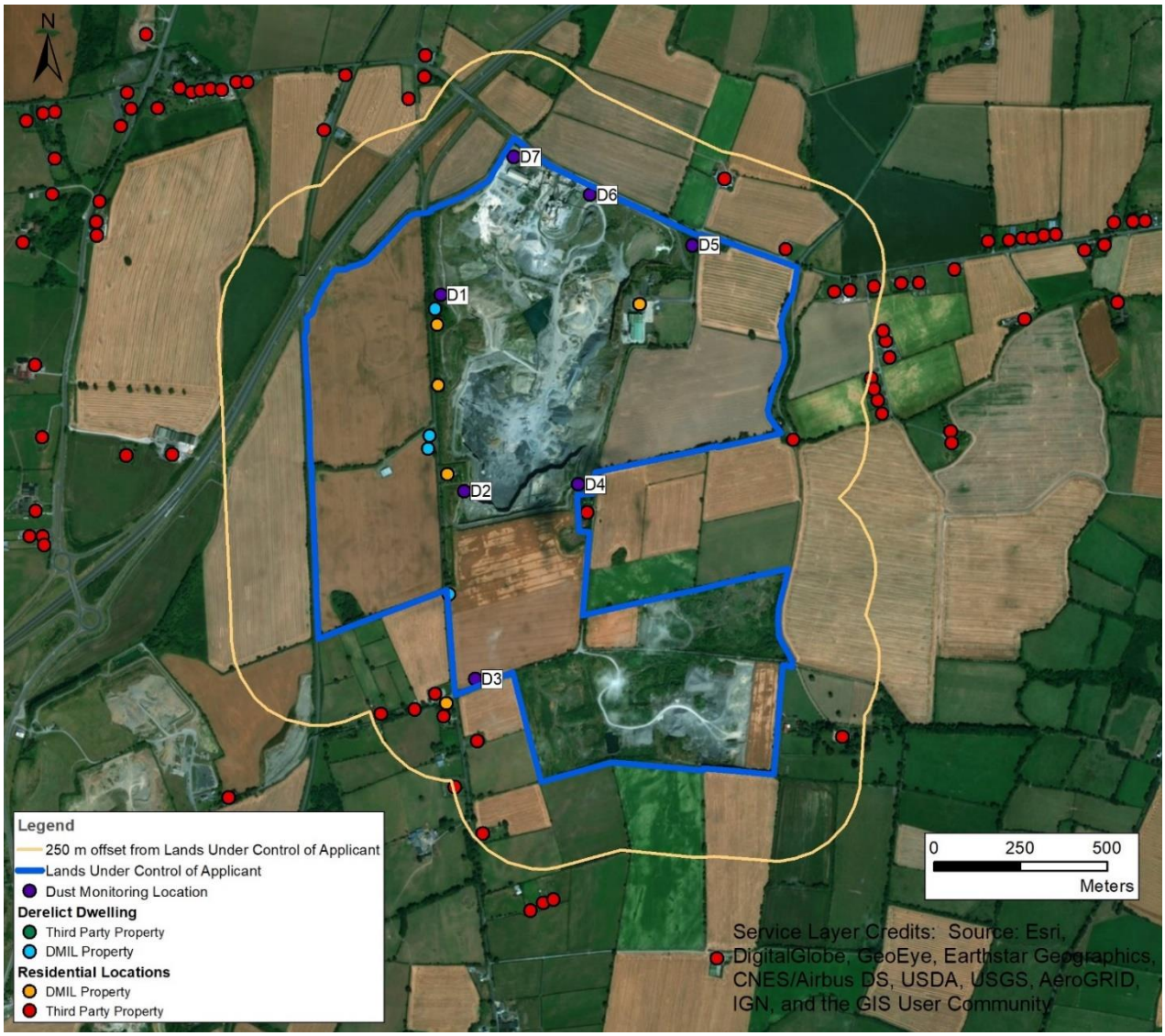


Figure 8.1: Plan showing location of dust monitoring locations

In addition to the dust sources, the asphalt plant contains a point emission source. The asphalt plant is regulated by an Air Pollution Licence (APL 10/01), granted by Carlow County Council. Parameters monitored, frequencies and Emission Limit Values have been presented in Table 8.2 below.

Parameter	Monitoring Frequency	Emission Limit Value
Particulates	Continuous	50 mg/Nm^3
NO_x	Quarterly	450 mg/Nm^3
SO_2	Quarterly	500 mg/Nm^3
Volumetric Flow	Quarterly	800,000 Nm^3/day (based on 8 hours of emissions); 100,000 Nm^3/hour
Temperature	Quarterly	Not specified

Table 8.2: Clonmelsh Air Pollution Licence Emission Limit Values and monitoring frequencies

8.3 Existing Environment

An outline for the Site in the regional and local context is provided in Figures 2.1 and 2.2 (Chapter 2.0). The site itself has been operated as a quarry since 1947. The site the subject of this rEIAR holds excavated lands and a plant area over a total area of 81 ha. The lands the subject of this rEIAR [the subject lands] extend to approximately 81 ha. at the centre of this landholding. The subject lands occur in 2 no. land units named after the townlands within which they occur consisting of generally excavated land described in this rEIAR as; Clonmelsh to the north (54 ha.) that includes the plant area and Garyhundon to the south (27 ha.).

The purpose of the rEIAR is to support two applications for substitute consent for a quarry and a plant area, both already in existence thus development here considered is retrospective.

In summary the **extant plant area the subject of the substitute consent application consists of:**

A plant area over about 3.22 ha. containing; Readymix concrete batching plant (110 sqm) & shed (1,224 sqm); Mobile canteen (container) (27 sqm); Demountable Readymix concrete plant (219 sqm); Shipping Office (103 sqm) Container 1 (storage) (14.5 sqm); Container 2 (mobile office) (29 sqm); Weighbridge (53 sqm) originally permitted under Reg. Ref. 2981; Demountable asphalt production plant (Amman) (847 sqm) the subject of APL10/01 & control room (66.5 sqm); ESB Substation (50.6 sqm); Bunded fuel tanks (168 sqm) & Pumphouse (34.56 sqm); and Workshop (180 sqm). The development also holds supporting infrastructure consisting of; entrance onto the L3050 and water management system including septic tank; water holding tanks; well; settlement pond; discharge license DL7/233 and ancillary site works including aggregate and precast, concrete and cold asphalt product storage areas.

In summary **the extant quarry area the subject of the substitute consent application consists of:**

A quarry over two areas; 51 ha. in Clonmelsh to an average depth of approximately 25 mAOD and 27 ha. in Garyhundon to an average depth of approximately 57 mAOD. The development also holds supporting infrastructure consisting of; existing entrance to the L3045 at Garyhundon permitted under Reg. Ref. 2979; asphalt plant permitted under Reg. Ref. 92/137; 2 no. aggregate processing plants permitted under Reg. Refs. 76/3642 and 76/3842. Ancillary site development includes; water management system consisting of settlement ponds, mobile pump and underground pipeline crossing associated plant area at Garyhundon, mobile aggregate processing plant, storage containers and haul routes.

The lands surrounding the Site can be characterised as rural in nature, with land uses in the area being generally agricultural and single-house residential. The lands contiguous to the boundaries of the Site are in agricultural use, predominantly arable lands for crops. Small areas of scrub land exist within the Site boundary towards the north-east and along the western boundary. There is some sparse residential housing in the area, however this is primarily concentrated to linear ribbon settlements along local roads.

8.3.1 Climate at the Site

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 Application Site is typical of the Irish climate, which is temperate maritime.

The closest Met Eireann Synoptic station was at Kilkenny, approximately 27 km south-east of the Site. This station was in operation between 1978 and 2007. Parameters recorded at the Met Éireann station during this period have been averaged monthly in Table 8.2 below. Monthly averages from 2007 to 2017 have been provided for a number of climactic parameters in Table 8.3.

Other parameters such as: Mean 10 cm soil temperature at 0900 UTC, Global Solar Radiation in Joules/cm2, Potential Evapotranspiration, Evaporation and Degree Days Below 15.5°C which are recorded at Oak Park from January 2014 to June 2017 are also included in Table 8.2.

Table 8.3: Kilkenny 1978–2007 recorded weather averages

TEMPERATURE (°C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean daily max	8.2	8.6	10.6	12.9	15.7	18.2	20.3	20.2	17.8	14.1	10.8	8.8
Mean daily min	1.6	1.9	3.2	4.2	6.5	9.3	11.3	11	9.1	6.5	3.7	2.4
Mean temperature	4.9	5.2	6.9	8.5	11.1	13.8	15.8	15.6	13.4	10.3	7.3	5.6
Absolute max.	14.1	15.6	19.2	22.4	26	29.6	31.4	30.8	26.6	21.4	17.5	15.5
Min. maximum	-3.3	-0.3	1.6	5	7.5	11.5	12.3	12.2	9.6	6.4	2.1	-1.9
Max. minimum	11.4	11.9	11.8	12.3	14.5	17	17.6	18.1	16.9	15.5	13.3	12.9
Absolute min.	-14.1	-8.5	-7.9	-4	-3	1	3.6	2.2	-0.9	-4.8	-7	-8.8
Mean num. of days with air frost	10.9	9	5.4	3.2	0.7	0	0	0	0.2	2	6.6	8.9
Mean num. of days with ground frost	20	16	15	14	9	2	0	1	4	9	15	18
Mean 5cm soil	3.6	3.7	5.5	8.5	12.8	16	17.5	16.4	13.3	9.3	6.1	4.4
Mean 10cm soil	4	4.1	5.6	8.1	12	15.1	16.8	15.9	13.2	9.6	6.6	4.8
Mean 20cm soil	4.6	4.9	6.4	8.8	12.2	15.2	17	16.5	14.2	10.8	7.6	5.6
RELATIVE HUMIDITY (%)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Mean at 0900UTC	88.4	87.7	84.8	79	75.8	76.7	78.1	80.9	84.8	88.5	90.1	89.6
Mean at 1500UTC	79.5	74.3	69.2	63.6	63.4	65.9	65.2	65.1	67.5	74.2	78.9	81.8
SUNSHINE (hours)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Mean daily duration	1.8	2.3	3.2	4.9	5.6	4.9	4.7	4.7	4	3	2.2	1.6
Greatest daily duration	8.4	9.8	11.6	13.7	15.5	16.3	15.4	14.5	11.8	10.2	8.7	7.2
Mean num. of days with no sun	9.9	7.1	5.4	2.3	1.7	1.7	1.8	2.2	2.9	5.4	8.7	11.6
RAINFALL (mm)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Mean monthly total	78.3	66.1	67.9	56.4	60.4	61	54.6	77.8	69	95.3	80.2	90.4
Greatest daily total	25.2	24.8	27.9	23.4	31.1	28.2	66.4	58.3	34.7	33.6	34.2	43.8
Mean num. of days with >= 0.2mm	18	16	18	14	16	14	14	15	15	18	17	18
Mean num. of days with >= 1.0mm	13	12	12	10	11	10	9	10	10	13	12	13
Mean num. of days with >= 5.0mm	5	4	4	4	4	3	3	4	4	6	5	6
WIND (knots)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Mean monthly speed	7.9	8	8.1	7	6.6	6.2	5.9	5.7	6.2	6.8	6.9	7.3
Max. gust	68	72	62	56	54	44	48	50	54	57	56	75
Max. mean 10-minute speed	44	39	43	34	32	27	29	29	30	38	36	47
Mean num. of days with gales	0.5	0.4	0.2	0	0	0	0	0	0	0.1	0.1	0.6
WEATHER (mean no. of days with...)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Snow or sleet	3.6	3.6	2.5	0.8	0.1	0	0	0	0	0	0.1	2
Snow lying at 0900UTC	1.5	1.1	0.3	0.1	0	0	0	0	0	0	0	0.2
Hail	0.7	1	2.1	2.5	1.2	0.3	0.2	0.1	0.1	0.3	0.2	0.2
Thunder	0.1	0	0.1	0.4	0.7	0.9	0.7	0.8	0.2	0.2	0.1	0
Fog	3.2	2.8	1.7	1.9	1.9	1.3	1.7	2.9	3.8	3.8	3.2	3.8

Table 8.3: Oak Park, Co. Carlow recorded Climate Information

Mean Air Temperature (°C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2007	6.7	5.8	6.5	11	11.7	14	14.9	15.3	13.3	11.3	8.3	6.5
2008	6.3	5.5	6	7.9	12.6	13.1	15.4	15.8	12.5	9	7.1	4.1
2009	3.9	5	6.9	8.9	11.2	14.3	15.1	15.5	13.1	11.4	7.4	2.9
2010	1.6	2.7	5.5	8.9	10.9	15.2	16	14.6	13.7	10.2	5.1	-0.8
2011	3.2	7.2	6.7	10.8	11.3	12.3	14.7	13.9	13.9	11.9	9.7	5.9
2012	6.5	6.9	8.5	7.1	10.8	13.4	14.4	16.0	12.4	9.0	6.1	5.3
2013	5.3	4.7	3.8	7.5	10.4	13.7	18.2	16.3	14.0	12.1	6.4	6.6
2014	5.5	5.7	7.0	10.1	11.9	14.5	16.9	14.5	14.3	11.4	7.2	5.6
2015	5.0	4.3	6.2	8.7	10.2	13.4	14.6	14.6	12.4	10.2	9.2	8.6
2016	5.9	4.9	6.1	7.5	12.3	15.1	16.0	16.0	14.6	10.6	5.2	6.3
2017	6.0	6.5	8.3	9.0	-	-	-	-	-	-	-	-
Maximum Air Temperature (°C)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
2007	13.4	14.6	14.3	19.9	21.8	24.4	21.7	23.7	22.3	19.2	15.5	15.1
2008	14.1	13.1	12.9	17.4	22.8	22.6	24.6	22.2	19	16.8	13.1	13
2009	11.6	11.6	14.9	17.8	22.3	26.8	21.5	22.2	21.2	16.9	14.3	11.8
2010	10.6	9.6	14.1	19.3	25.6	23.3	24.2	24.2	22.4	20.6	17.1	10.7
2011	12.1	14.6	16.7	21.6	16.9	25.5	24.4	22.5	21.1	20.1	15.9	13.7
2012	12.3	14.8	18.9	13.5	25.6	22.8	24.1	24	22.3	15.4	13.7	13.6
2013	13.4	12.3	11.9	17.4	19.3	23.4	29.5	24.3	23.9	19.5	14.2	13.3
2014	12.2	10.7	15.1	18.2	20.9	24.9	27.6	22.4	22.8	17.7	14.2	13.5
2015	16.2	12.8	14.2	18.9	19.2	24	23.4	23	19.4	19.1	17.7	14.1
2016	13.6	13.1	14.1	17.2	21.9	23.7	27.5	23.5	25.6	16.6	15.9	13.8
2017	11.9	14.1	16.3	17.2	-	-	-	-	-	-	-	-
Minimum Air Temperature (°C)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
2007	-1.8	-5.9	-3.2	-0.2	1.7	6.6	7	7.6	1	-0.2	-2.8	-3.3
2008	-2.3	-5.8	-1.2	-0.6	2.5	4.6	5.9	9	4	-2.2	-4	-5
2009	-7	-3.2	-1.8	0.8	3.9	4.6	7.8	7.6	4.2	1.4	-2.3	-4.9
2010	-12.1	-4.5	-6.2	-1	-0.4	5.8	8.5	3.3	1.8	-2.9	-9.1	-12.9
2011	-5.9	-1.5	-3.6	1	3.5	1.4	5.7	5.2	6.2	2	-2.1	-2.2
2012	-1.0	-4.4	-0.2	-0.7	-2.1	5.4	6.1	8.4	2.0	-2.1	-2.3	-3.7
2013	-3.6	-2.5	-3.4	-3.8	1.8	5.3	7.4	5.9	4.8	2.6	-1.9	-2.2
2014	-1.7	-0.5	-1.9	1.2	5.2	5.3	7.2	5.7	4.4	0.5	-2.1	-5.3
2015	-4.8	-5.6	-2.2	-0.4	1.6	3.6	6.4	6.0	3.8	0.3	-2.1	0.1
2016	-3.1	-3.2	-3.5	-1.4	3.4	4.7	6.8	7.8	4.5	2.1	-4.4	-4.7
2017	-4.4	-3.5	-0.6	-0.5	-	-	-	-	-	-	-	-
Mean Maximum Temperature (°C)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
2007	9.5	9.3	10.8	16.5	16.5	18.2	18.8	19.3	17.7	15.2	11.3	9.7
2008	9.6	9.7	9.9	12.2	17.3	17.6	19.4	18.9	16.7	12.9	9.9	7.5
2009	7.2	7.9	11.2	13	15.6	19.1	18.8	19.7	17.4	14.8	10.4	5.9
2010	4.8	6.2	9.9	13.8	15.8	19.9	19.9	19.4	17.8	14.4	8.4	2.2
2011	6.2	10.5	11.7	16.2	15.1	17.3	19.2	18.6	17.2	15.1	12.7	9
2012	9.3	9.4	12.7	10.9	15.4	16.9	18.2	19.7	16.7	12.4	9.4	8.4
2013	8.1	7.8	6.8	11.4	14.8	18.9	24.1	20.7	18.0	15.4	9.4	9.7
2014	8.5	8.8	10.8	14.4	15.8	19.1	21.9	18.7	19.4	15.3	10.7	8.6
2015	8.2	7.5	10.4	14.1	14.3	18.3	18.5	19.1	16.5	14.2	12.7	11.9
2016	9.0	8.4	10.3	11.9	17.2	19.2	20.1	20.3	18.5	14.4	8.9	9.6
2017	8.7	9.6	12.3	12.9	-	-	-	-	-	-	-	-

Table 8.3 continued: Oak Park, Co. Carlow recorded Climate Information

Mean Minimum Temperature (°C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2007	3.9	2.2	2.3	5.6	6.9	9.9	10.9	11.2	9	7.4	5.2	3.3
2008	3	1.3	2.2	3.7	7.9	8.6	11.3	12.6	8.4	5	4.3	0.8
2009	0.7	2.1	2.6	4.8	6.9	9.5	11.3	11.3	8.7	8.1	4.3	-0.1
2010	-1.7	-0.8	1.1	4.1	5.9	10.5	12.1	9.8	9.6	6	1.8	-3.9
2011	0.2	3.8	1.6	5.4	7.5	7.4	10.3	9.2	10.6	8.6	6.8	2.9
2012	3.7	4.4	4.3	3.2	6.1	9.9	10.7	12.3	8.2	5.6	2.9	2.2
2013	2.5	1.7	0.8	3.5	6.1	8.6	12.2	11.9	10.1	8.7	3.4	3.4
2014	2.6	2.5	3.2	5.8	8.0	9.8	11.8	10.4	9.1	7.5	3.8	2.6
2015	1.8	1.1	2.1	3.2	6.1	8.5	10.7	10.2	8.4	6.2	5.7	5.3
2016	2.8	1.3	1.9	3.0	7.5	10.9	11.9	11.8	10.6	6.8	1.5	3.0
2017	3.4	3.4	4.4	5.2	-	-	-	-	-	-	-	-
Precipitation Amount (mm)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
2007	74.6	72.8	72.1	16.4	38.3	112.1	126.3	103.8				
2008	124.7	28.8	83.9	31.8	37.1	86.8	141.3	142.4	81.5	89.9	47.4	47.8
2009	113.4	29.2	32.6	102.4	69	65.4	152.4	100.9	41.8	127.8	215.5	73.7
2010	71.5	48	80.7	49	51.4	37.7	93.6	25.5	108.7	68.9	87.7	52.2
2011	50.6	121.9	16	19.5	50.7	75.2	46.4	25.5	93.9	93.9	89.2	55.5
2012	70.8	24.5	18.0	56.3	50.2	162.6	76.2	127.7	37.9	63.4	80.9	68.1
2013	76.2	35.8	57.6	44.4	35.6	37.5	-	85.6	24.4	170.0	27.7	136.6
2014	147.2	176.7	65.0	52.6	78.6	61.9	24.6	122.1	18.2	138.2	165.6	47.7
2015	66.0	36.3	53.5	26.3	89.4	29.7	79.4	83.0	27.6	56.8	110.0	270.9
2016	110.9	95.7	40.6	64.3	61.6	61.7	29.6	46.0	97.4	32.3	26.3	80.2
2017	36.3	57.8	66.6	15.8	-	-	-	-	-	-	-	-
Grass Minimum Temperature (°C)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
2007	-5.8	-9.7	-6.8	-5.1		3.7	4.4	3.8	-2.2	-3.6	-7.4	-7.5
2008	-6.7	-9.8	-6.1		-1.2	1.3	1.9	5.8	0	-7.3	-6.6	-9.4
2009	-10.9	-8.4	-6.3	-4	-0.3	1	3.7	3.5	-1.1	-1.3	-5.5	-10.9
2010	-11.6	-11	-11.8	-5.5	-4.2	3.5	6	-1.1	-2.9	-7.5	-7.8	-14.4
2011	-11.5	-7.1	-9.5	-4.7	-1.9	-3.3	1.2	-0.1	1.3	-2.4	-7.1	-7
2012	-5.0	-9.8	-5.2	-5.4	-7.6	1.9	-	3.4	-2.5	-6.7	-6.3	-10.2
2013	-8.7	-7.8	-9.6	-9.8	-2.6	1.4	-	1.0	0.6	-1.6	-7.1	-7.6
2014	-7.0	-3.8	-6.8	-3.1	-0.4	0.6	2.9	1.2	0.7	-2.1	-6.1	-10.2
2015	-9.6	-10.4	-7.1	-6.2	-4.5	-1.4	0.0	-0.8	-1.7	-5.1	-6.5	-3.5
2016	-10.1	-10.4	-9.5	-8.0	-1.2	-1.6	1.5	2.9	-0.4	-2.2	-8.6	-8.2
2017	-10.1	-8.0	-6.1	-5.0	-	-	-	-	-	-	-	-
Mean Wind Speed (knot)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
2007	10.8	7.9	8.6	5.9	7.5	6.2	6.9	6.4	6.2	5.1	6.4	9.7
2008	9.7	8.1	10	7.6	6	6.9	6.9	7.5	6.7	8.6	8.1	6.1
2009	8.2	5.8	8.6	7.3	8.2	6	7.4	8.9	6.2	6.5	10.3	6.8
2010	5.8	5	6.7	6.6	6.1	5.8	7.5	6.7	7.2	6.7	7.1	4.5
2011	5.5	8.4	5.3	5.9	10.3	6.5	5.7	6.1	9.9	9.2	8.9	9.7
2012	9.3	6.9	6.4	7.5	5.8	6.9	6.7	7.6	7.0	5.8	7.4	7.8
2013	7.9	7.5	7.0	9.3	8.6	6.2	-	7.0	6.5	7.5	5.9	10.8
2014	9.0	12.0	7.9	7.1	7.1	5.3	5.7	7.5	4.2	8.5	5.8	8.3
2015	10.3	7.7	9.2	6.7	8.8	7.8	7.8	6.9	6.1	5.6	9.7	12.0
2016	9.2	8.7	7.3	7.2	6.3	6.2	7.0	7.5	8.2	5.3	6.0	6.7
2017	6.9	9.2	8.4	6.3	-	-	-	-	-	-	-	-

Table 8.3 continued: Oak Park, Co. Carlow recorded Climate Information

Highest Gust (knot)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2007	56	49	47	36	38	29	41	25	31	29	31	49
2008	47	50	54	41	33	40	33	31	35	37	38	34
2009	53	24	41	44	44	31	31	32	33	40	46	37
2010	40	34	42	43	27	27	31	31	31	36	47	31
2011	35	46	48	37	43	30	32	30	46	44	39	45
2012	45.0	31.0	36.0	41.0	30.0	35.0	27.0	36.0	32.0	38.0	40.0	43.0
2013	55.0	50.0	33.0	50.0	42.0	31.0	30.0	33.0	40.0	43.0	38.0	55.0
2014	52.0	68.0	45.0	31.0	38.0	27.0	27.0	31.0	22.0	43.0	38.0	38.0
2015	46.0	49.0	53.0	39.0	38.0	39.0	32.0	41.0	30.0	31.0	68.0	52.0
2016	46.0	42.0	44.0	43.0	41.0	27.0	32.0	34.0	39.0	35.0	39.0	37.0
2017	35.0	53.0	38.0	32.0	-	-	-	-	-	-	-	-

An important meteorological parameter with regard to the dilution and dispersal of air pollutants is wind speed and direction. A windrose for the Oak Park station is presented in Figure 8.2 for the period August 2003 to July 2017, (such data was not available at this station prior to August 2003). It is evident that the prevailing winds are from a southerly direction.

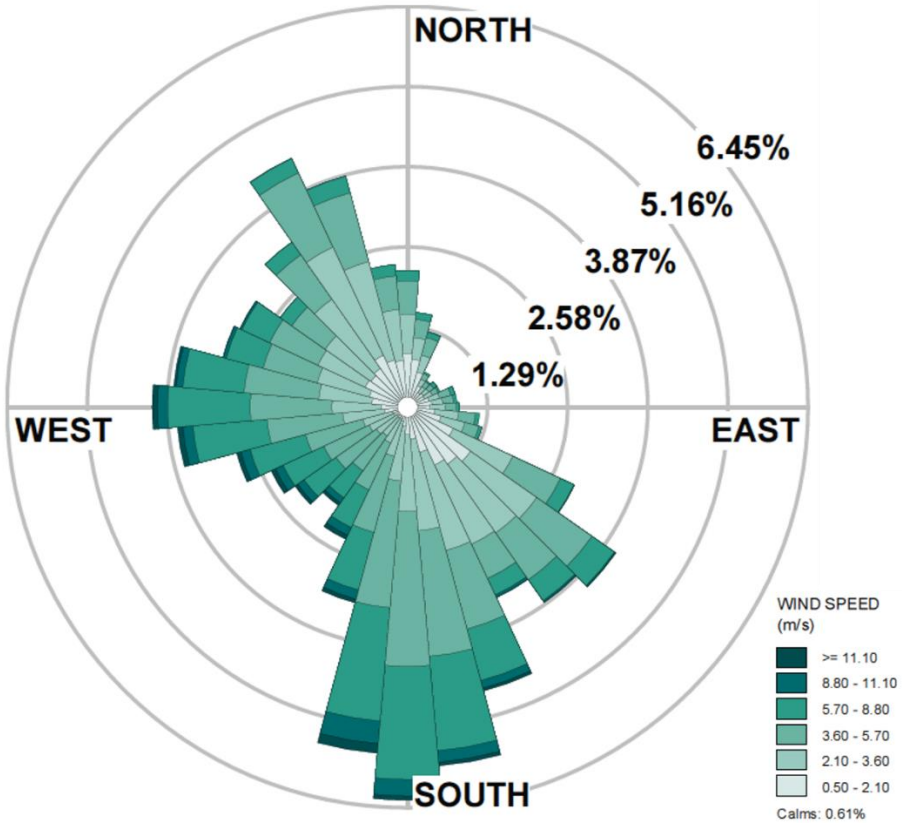


Figure 8.2: Dominant wind direction at Oak Park over assessment period August 2003 to July 2017

Characteristics of the Development

The extraction rate for the development in the years 1997 to present has varied to an average of about 180,000 tonnes per annum for the last two years (see Chapter 2.0). The period from 2012 to today saw a decrease in output from the site due to a reduction in national market demands

The following activities associated with the development are the most likely dust generating sources:

- Movement of full and empty trucks along haul roads;
- Stripping of subsoil and overburden;
- Loading and movement of overburden to dump areas;
- Extraction of materials;
- Loading of materials;
- Screening of sand and gravel;
- Crushing of oversized materials;
- Unloading of overburden for restoration; and
- Wind erosion at dump areas and exposed faces.

The stack emission from the asphalt plant present a point emission source. The asphalt plant is regulated by an Air Pollution Licence (APL 10/01), granted by Carlow County Council. Emission Limit Values specified in the licence include:

Volumes to be emitted; Maximum in any one day – 800,000 Nm^3/day (based on 8 hours of emissions), and Maximum rate per hour – 100,000 Nm^3/hour

Period of emissions; 06:00 to 19:00 Monday to Friday, and 06:00 to 15:00 on Saturdays

Minimum discharge height; 33m above ground level

Parameters; NO_x (450 mg/Nm^3), SO_2 (500 mg/Nm^3) and Particulates (50 mg/Nm^3)

8.4 Climate Change

Ireland's greenhouse gas emissions per person are amongst the highest on the planet and the fourth highest of the EU 28 countries. The reduction in greenhouse gas emissions in Ireland and other parts of the globe, which is primarily due to the global financial crisis, has shown that there is still a strong link between economic growth and emissions (EPA, 2011). The most recent emissions figures compiled show that in Ireland agriculture is the single largest contributor to the overall emissions, at 33.0% of the national total, followed by transport at 19.8 and energy at 19.7%. The remainder is made up by the residential sector at 10.1%, manufacturing and combustion at 7.6%, and industrial processes at 3.3% (DCCAE, 2017).

Ireland is a party to both the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol, which together provide an international legal framework for addressing climate change. In December 2015, an ambitious new legally binding, global agreement on climate change was agreed in Paris. The Paris Agreement aims to restrict global temperature rise to well below 2°C above pre-industrial levels, and to pursue efforts to limit the temperature increase to 1.5°C. The EPA's 2020 Vision strategy sets out our vision for Ireland's environment over the coming decade and beyond. The strategy aims to achieve results in a number of critical areas, including climate change, and is set within the framework of sustainable development. The EPA recognises that social, economic and environmental issues are interconnected and that good decisions and policy should encompass these three elements in a balanced and harmonious way. The 2020 Vision outlines six environmental goals, reflecting the main challenges identified by the EPA for Ireland as well as key issues at global and EU levels (EPA, 2011). These goals are:

- Limiting and adapting to climate change;
- Clean air;
- Protected waters;
- Protected soil and biodiversity (native plants and animals);
- Sustainable use of natural resources (water, energy and materials); and
- Integration and enforcement.

8.5 Assessment

8.5.1 Dust Monitoring Locations

In order to establish any impacts from quarrying related activities that may have occured at the Application Site and its environs, the seven dust monitoring locations were selected. Descriptions of the dust monitoring locations are presented in Table 8.3 below and their locations are shown in Figure 8.1. The monitoring locations are situated around the boundary of the Clonmelsh Site, with the exception of D3 which is located west of the Garyhundon site. It is of note that (with the exception of D3) the dust monitoring points are located north of the Garyhundon site which is in the prevailing wind direction as depicted in the Oak Park data for the assessment period of 2003 to 2017. As noted in Section 8.2, five dust monitoring points (D1, D2, D3, D4 and D5) were operated on site since February 2007. A sixth location (D6) was included in the analyses in August 2010 and a seventh (D7) in May 2012. Their locations are at the existing extraction area boundaries and assess any impacts of extraction related activities on the existing site and on the local environs, (Figure 8.1).

Location	Description
D1	Located to the west of the Clonmelsh Site
D2	Located to the south-west of the Clonmelsh site
D3	Located west of the Garyhundon Site
D4	Located to the south-east of the Clonmelsh Site
D5	Located north-east of the Clonmelsh Site
D6	Located to the north of the Clonmelsh Site
D7	Located to the north of the Clonmelsh Site

Table 8.4: Description of Dust Monitoring Locations

The following dust monitoring was undertaken at the site, the monthly results for dust deposition rates from February 2007 to June 2017 are shown in Table 8.4.

Table 8.5: Total Particulates Data Results for 19 August 2008 to 10 January 2017, Results in mg/m²/day.

From	To	D1	D2	D3	D4	D5	D6	D7	Comments
07/02/2007	04/04/2007	12	7	48	38	37			
04/04/2007	09/05/2007	53	89	94	118	103			
09/05/2007	07/06/2007	28	28	122	43	15			
07/06/2007	12/07/2007	54	59	57	118	54			
12/07/2007	08/08/2007	36	319 *	184 *	29	103			* Contaminated
08/08/2007	19/09/2007	17	16	776 *	887	41			* Clay in sample
19/09/2007	23/10/2007	35	33	59	392 *	70			* Clay in sample
23/10/2007	29/11/2007	11	2	27	115	24			
29/11/2007	22/01/2008	23	9	38	110	26			
22/01/2008	19/02/2008	41	41	139	68	77			
19/02/2008	15/04/2008	25	22	232	72	79			
15/04/2008	08/05/2008	141	254	436 *	57	436 *			* Samples dusty
08/05/2008	10/06/2008	303	179	110	236	41			
10/06/2008	18/07/2008	16	36	323	143	78			
18/07/2008	19/08/2008	27	64	152	32	114			
19/08/2008	01/10/2008	20	83	25	232	49			
22/04/2009	09/06/2009	152	57	53	6	28			
09/06/2009	09/07/2009	13	130	196	250	20			
09/07/2009	13/08/2009	<1	110	133	146	58			
13/08/2009	22/09/2009	12	2698 *	50	14	38			* Contaminated
22/09/2009	02/11/2009	1	346	38	5	14			
25/03/2010	06/05/2010	16	155	22	290	65			
06/05/2010	09/06/2010	18	38	88	166	14			
09/06/2010	07/07/2010	8	14	209	237	61			
07/07/2010	25/08/2010	<1	20	326	45	12			
25/08/2010	12/10/2010	14	89	N-S	219	25	312		
12/10/2010	17/11/2010	N-S	N-S	N-S	N-S	N-S	559		
17/11/2010	06/01/2011	N-S	N-S	N-S	N-S	N-S	46		
06/01/2011	17/02/2011	N-S	N-S	N-S	N-S	N-S	534		
17/02/2011	25/03/2011	N-S	N-S	N-S	N-S	N-S	1862		
30/03/2011	05/05/2011	91	150	*	50	85	N-S		* Missing
25/03/2011	09/06/2011	N-S	N-S	N-S	N-S	N-S	301		
05/05/2011	09/06/2011	37	27	*	198	72	N-S		* Missing
09/06/2011	20/07/2011	40	25	14	45	48	1314		
20/07/2011	23/08/2011	35	84	16	164	28	1549		
23/08/2011	21/09/2011	32	6	44	56	129	211		
21/09/2011	20/10/2011	4	23	38	4	42	227		
20/10/2011	21/11/2011	4	43	1	6	11	67		
21/11/2011	20/12/2011	1	12	1	1	7	100		
20/12/2011	26/01/2012	1	8	*	**	8	197		* Destroyed ** Contaminated
26/01/2012	28/02/2012	1	3	3	32	*	160		* Missing
28/02/2012	30/03/2012	24	55	13	69	N-S	784		
30/03/2012	26/04/2012	20	681	22	432	N-S	477		
26/04/2012	31/05/2012	6	51	*	97	N-S	31		* No Access
31/05/2012	28/06/2012	1	47	*	55	26	193	87	* No Access
28/06/2012	01/08/2012	3	38	*	3	12	166	197	* No Access
01/08/2012	29/08/2012	39	19	*	9	22	46	239	* Contaminated
29/08/2012	26/09/2012	<1	9	1	22	14	21	14	

From	To	D1	D2	D3	D4	D5	D6	D7	Comments
26/09/2012	23/11/2012	1	18	55	5	4	89	37	
23/11/2012	19/12/2012	164	1	1	1	<1	70	10	
19/12/2012	12/03/2013	14	40	48	20	6	38	87	
12/03/2013	16/04/2013	27	14	2	46	8	18	33	
16/04/2013	16/05/2013	<1	11	<1	72	49	9	7	
16/05/2013	24/06/2013	9	32	11	35	4	246	1	
24/06/2013	24/07/2013	9	30	<1	51	23	76	34	
24/07/2013	28/08/2013	<1	45	73	77	47	23	42	
28/08/2013	24/09/2013	4	25	27	21	5	58	10	
24/09/2013	30/10/2013	47	28	5	<1	3	7	1	
30/10/2013	26/11/2013	<1	3	1	22	31	18	8	
26/11/2013	20/01/2014	2	12	3	2	2	4	2	
20/01/2014	20/02/2014	<1	<1	4	4	2	100	4	
20/02/2014	20/03/2014	1	12	16	22	1	19	5	
20/03/2014	23/04/2014	6	1	8	4	3	11	5	
23/04/2014	22/05/2014	141	33	50	54	2	59	18	
22/05/2014	11/07/2014	53	11	91	9	22	32	10	
11/07/2014	03/12/2014	26	7	15	17	28	127	16	
16/12/2016	10/01/2017	<1	10	23	1	<1	18	11	
10/01/2017	08/02/2017	47	46	11	<1	5	181	221	
08/02/2017	08/03/2017	63	63	40	<1	14	216	102	
08/03/2017	05/04/2017	11	51	78	28	33	28	127	
05/04/2017	04/05/2017	40	160	156	121	48	141	60	
04/05/2017	14/06/2017	71	2	22	11	18	43	158	

N-S – No Sample

SLR Consulting have noted that the dust deposition monitoring has been in general compliance with the DoEHLG (2004) recommended threshold limits. During this period 403 samples were collected and analysed. The records from this period shown fourteen exceedances. Comments on these note two of these samples to have been contaminated with clay and one with unspecified contamination. The eleven exceedances is the equivalent of 2.7% of the samples exceeding the 350 mg/m^2/day threshold.

8.5.2 Stack Monitoring

Difficulty in the compilation of monitoring records has been noted in Chapter 1. The Licencee has detailed that records of monitoring events as specified in APL 10/01 Appendix B have been reported to the Local Authority. The Licencee has also detailed that the emission comply with the emission limit values as specified in Appendix A of APL 10/01.

8.6 Impacts

8.6.1 Climate

The Clonmelsh development is not considered to be of a sufficient scale to have had the potential to impact the regional or local climate in any significant manner. In addition, the operation of plant and traffic movements at the Application site have had imperceptible effects on atmospheric CO_2.

The Application Site has not had any significant effects on local prevailing weather conditions, nor has the development increased the potential of flooding in the surrounding area.

The Application Site therefore has not/does not have the potential to impact the climate significantly.

8.6.2 Air Quality

8.6.2.1 Dust Emission

As noted in Section 8.6.1 approximately of 2.7% of the samples exceeded the 350 mg/m^2/day threshold for the monitoring period. The overall impact from the Site over this period, in terms of dust emissions, has therefore been slight to imperceptible to the local air environment. Based on these results it is anticipated that prior emissions from 1990 to the commencement of monitoring were of a similar in nature.

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 0.2 mm has fallen. Information collected from Met Eireann's Oak Park Meteorological Station (available data from August 2003 to June 2017) identified that 2,508 days over the period are "wet" (approximately 50% of days in that period).

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.

8.6.2.2 Stack Emissions

The Licencee has confirmed that monitoring has been carried out in accordance with Appendix B of the Site's Air Pollution Licence (APL 10/01). The Licensee has retained the services of Axis Environmental to undertake monitoring in accordance with APL 10/10. Please see Appendix 8.1 for a copy of the Licence and an exampler of the monitoring report demonstrating operation within specified Air Pollution License limits.

8.7 Mitigation

8.7.1 Climate

The following mitigation measures will continue to be implemented at the Application Site for the duration of future works and during final restoration activities:

- Plant not left idling, thus reducing carbon footprint of the continued development;
- Vehicles and plant will be well maintained. Should any emissions of dark smoke occur (except during start up) then the relevant machinery will be stopped immediately and any problem rectified before being used;
- Plant is serviced regularly to ensure efficient fuel consumption; and
- The Applicant will explore initiatives which are mutually beneficial to the development's environmental goals and overall corporate profitability. These include the optimisation of transport through: efficient delivery and haulage by the use of GPS route planning, ensuring loads are at the safe loading full capacity, effective fleet management and journey optimisation.

8.7.2 Air Quality

Details of mitigation measures that will be employed at the Application Site are summarised below.

- Dust monitoring will continue to be carried out monthly at the designated monitoring locations;
- The timing of operations will be optimised in relation to meteorological conditions;
- Material in outdoor stockpiling will be conditioned with water to minimise dust during dry and windy conditions. In addition, stockpiles will be sited to take advantage of shelter from wind;
- Overburden mounds will be grass-seeded and planted to eliminate wind-blown dust;
- Internal haul roads will be compacted and maintained;
- A water bowser/sprayer will be available at all times to minimise dust during dry and windy conditions where it is impractical or inappropriate to operate a fixed water spray/sprinkler system;
- On site speed restrictions (<25 kph) will be maintained in order to limit the generation of fugitive dust emissions;
- All vehicles exiting the site will exit through the existing wheelwash;
- All vehicles carrying fine dry loads will be covered prior to exiting the site;
- Adhering to monitoring requirements and emission limit values as specified in the Site's Air Pollution Licence.

Emissions from vehicles during the extraction and restoration phases can add to the receiving air environment. Coupled with mitigations in Section 8.7.1, the engines and exhaust systems will be regularly serviced according to the manufacturer's recommendations and maintained to meet statutory limits/opacity tests.

The adoption of the above mitigation measures will ensure that the resulting impact significance is imperceptible.

8.8 Residual Impacts

Residual impacts of the proposed extraction activities on air quality, microclimate and climate change are considered to remain imperceptible. During long spells of dry weather, dust emissions can potentially be more elevated, however dust nuisance from the operation is expected to be unlikely if the above mitigation measures are implemented during production and restoration. The overall impact from the proposed quarry, in terms of dust emissions, is **not significant** to **imperceptible** to the air environment.

In the longer term, on completion of the site restoration, the concentration of airborne dust would expected to be reduced from present day levels as the result of covering and seeding of exposed, un-vegetated soil surfaces. This will most likely constitute a minor **positive impact** for the local environment.

There are no residual impacts anticipated from the asphalt plant once mitigation measures, abatement/treatment protocols and emission limit values stipulated in the Air Pollution Licence are adhered to.

8.9 Cumulative Impacts

Research has shown that the greatest proportion of dust predominately deposits within the first 100 m away from the source (*The Environmental Effects of Dust from Surface Mineral Workings, Volume 1 DETR, HMSO 1995*) as they have a higher deposition velocity than finer particles (i.e. PM10 and PM2.5). The finer particles of less than 10 microns aerodynamic diameter may remain airborne for longer and therefore travel larger distances, although a large proportion may still deposit

within 200 m of the source.

Other industries in the area include Kilcarrig Quaries Ltd and the Powerstown Landfill and Recycling Centre located ca. 1 km and 600 m, respectively, to the south-east. However, as there are no extractive industry sites located in the immediate vicinity of the open-pit mine, cumulative impacts relating to air quality and climate are not envisaged.

8.10 References

Arup Environmental, Ove Arup and Partner (1995) The Environmental Effects of Dust from Surface Minerals Workings, HMSO, London (ISBN 11 75 3186 3)

Department of the Environment, Heritage and Local Government (2004) Quarries and Ancillary Activities, Guidelines for Planning Authorities.

Department of Environment, Community and Local Government (2013) Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment

Department of Communications, Climate Action and Environment (2017) Draft National Mitigation Plan.

Environmental Protection Agency (2015) Draft - Revised Guidelines on the Information to be contained in Environmental Impact Statements.

Environmental Protection Agency (2012) Ireland's Environment 2012 - An Assessment

Environmental Protection Agency (2011) The EPA & Climate Change: Responsibilities, challenges and opportunities 2011 Update.

Environmental Protection Agency (2006) Environmental Management in the Extractive Industry: Guidelines for Regulators.

Environmental Protection Agency (2003) Advice Notes on Current Practice in the preparation of Environmental Impact Statements.

Environmental Protection Agency (2002) Guidelines on the Information to be contained in Environmental Impact Statement. Environmental Protection Agency, Johnstown Castle Estate, Co. Wexford.

Institute of Geologist of Ireland (2013). Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements.

TA Luft (1986) Technical Instructions on Air Quality Control – TA Luft in accordance with Article 48 of the Federal Emission Control Law (BImSchG) dated 15th March 1974 (BGBI, I p. 721). Federal Ministry for Environment, Bonn 1986 and amendments.

9.0 NOISE & VIBRATION

9.1 Introduction

This Chapter of the rEIAR assesses noise and vibration impacts which may have occurred at the site from 1990 to the present day. An assessment of the potential noise impacts has been undertaken with reference to EIA good practice, EIA regulations, and other guidance documents.

9.1.1 Noise

The noise assessment, which is a review of all existing information for the site and its environs, is based on a desk based review of the following:

Noise monitoring undertaken by the developer as part of their site's environmental management programme, between February 2008 and June 2017;

Typical noise limits associated with quarry operation as applied by the Environmental Protection Agency Guideline Document for Extractive Industries (Non Scheduled Minerals April 2006). This EPA document presents a summary of current environmental management practices for surface workings within the extractive industry. They are based on a review of current environmental management practice in Ireland, the UK and Europe. The published guidelines are intended to provide general advice and guidance in relation to environmental issues to practitioners involved in the planning, design, development, operation and restoration of surface extractive industry developments and ancillary facilities in Ireland;

Irish Concrete Federation published their 'Environmental Code' in 2005 which outlined commitments to environmental standard across the industry for a number of impacts, including noise and vibration; and

Department of the Environment, Heritage and Local Government (DoEHLG) – Quarries and Ancillary Activities: Guidelines for Planning Authorities, 2004. These DoEHLG Planning Guidelines are primarily addressed to statutory planning bodies. They provide an overview of environmental issues and best practice / possible mitigation measures associated with surface working of aggregates and associated ancillary activities. The guidelines are routinely referred to by practitioners involved in the planning, design, development, operation and restoration of surface workings and ancillary facilities in Ireland.

Noise assessment thresholds for the Application Site

The primary source of noise from this development includes include traffic, intermittent noises, screening, reversing alarms, general plant and machinery, noise associated with workings at the asphalt plant and blasting.

Current noise limits for the site and its ancillary activities have been specified in the below conditions to the activity's licence and planning conditions:

Condition 5.26 of the Site's Air Pollution Licence (APL 10/01) which specifies that activities associated with the asphalt plant shall not give rise to noise levels off site, when measured at noise sensitive locations which exceed the sound pressure limits of: 55 db(A) (15 minutes, L_{eq}) during the daytime, and 45 db(A) (15 minutes, L_{eq}) during the night-time; and

Condition 8 of Carlow County Council Planning Permission 12/240 which specifies that activities on site shall not give rise to noise levels at sensitive locations which exceed: 55 db(A) ($L_{Aeq\ 1\ hour}$) during the hours of 08:00 to 20:00, and 45 db(A) ($L_{Aeq\ 1\ hour}$) during the hour of 20:00 to 08:00.

Prior to the stipulation of the above conditions by Carlow County Council and the 2004 publication by the DoEHLG the most applicable guidance in an Irish context was the EPA's 'Guidance Note for Noise in Relation to Scheduled Activities'. This document was published by the Agency in 1995, and was designed to provide general acoustic guidance for licensed activities. A second edition was updated in 2006 to reflect legislative changes since 1995 and took cognisance of developments in Agency policy and licensing requirements over the intervening years. Both documents during this time

specified a daytime noise limit of 55 dB(A). Although the activity at the Application site during these years was not a scheduled/licensed activity, it is considered appropriate to assess prior impacts based on this limit.

9.1.2 Vibration

The vibration assessment, which is a review of all existing information for the site and its environs, is based on a desk based review of the following:

Vibration monitoring undertaken on behalf of the licensee as part of their site's environmental management programme, during each blast;

The *"Environmental Code"* (ICF), EPA guidelines in relation to blasting activities outlining the methodology and limits to be used for vibration measurement;

Environmental Management in the Extractive Industry, EPA;

Good Environmental Practice in the European Extractive Industry: a Reference Guide, Centre Terre & Pierre – Tournai (Belgium);

Vibration Monitoring undertaken by the Applicant as part of the Environmental Management System in place at the Application Site;

Department of the Environment, Heritage and Local Government – Quarries and Ancillary Activities: Guidelines for Planning Authorities, 2004;

The Evaluation of Human Exposure to vibration in buildings, BS 6472:1992; and

Evaluation and measurement for vibrations in buildings, BS 7385-1:1990.

It has been confirmed that vibration monitoring is carried out at each blasting event. All monitoring results are filed as part of the Environmental Management System (EMS) that is in operation at the quarry. The vibration monitoring is undertaken in accordance with the above criteria.

Vibration assessment thresholds for the Application Site

Current vibration limits for the site and blasting activities has not been specified by final planning condition but is guided by condition no. 31 of the notification of decision to grant planning permission under Reg. ref. 10/130. This decision was overturned on appeal but remains the only vibration condition applied in respect of the site as it held pre '63 status ahead of S.261 registration under QY25 and thus was not subject to any conditioned limits. been specified in the below conditions to the activity's licence and planning conditions:

Condition 31 of Carlow County Council notification of planning permission Reg. ref. 10/130 set down; *"The following vibration and air overpressure ELV's shall apply to the nearest vibration and air overpressure sensitive locations (e.g. residential property);*

Ground-bourne vibration: Peak Particle velocity = 12mm/s, measured in any of the three mutually orthogonal directions at the receiving location (for vibration with a frequency of less than 40 Hz).

Air overpressure: 125 dB (linear maximum peak value), with a 95% confidence limit."

It is noted too that blasting was excluded before 0800 or after 1800 hours Monday to Friday and not allowed on Saturdays, Sundays or bank holidays.

In the case of traffic, vibration is perceptible at around 0.5 mm/s and may become disturbing or annoying at higher magnitudes. However, higher levels of vibration are typically tolerated for single events or events of short duration like blasting.

BS 7385 states that there should typically be no cosmetic damage if transient vibration does not exceed 15 mm/s at low frequencies rising to 20 mm/s at 15Hz and 50 mm/s at 40Hz and above. Both the ICF 'Environmental Code' and the Agency's 'Environmental Management in the Extractive Industry' publications specify ppv limits of 12 mm/s.

Blasting should not give rise to air overpressure values at sensitive locations which are in excess of 125 dB(Lin) max peak. To allow for wind fluctuations and weather conditions, 95% of all air over-pressure levels measured at the nearest noise sensitive locations should conform to the specified limit value. No individual air over-pressure value should exceed the limit value by more than 5 dB(Lin).

9.2 Method

9.2.1 Study Area and Sensitive Receptors

From up to date mapping and available online resources there are 17 third party and 4 DMIL residential properties within 250 m of the site. In addition, there is one derelict third party dwelling and four derelict DMIL dwellings within 250 m of the Site.

SLR Consulting Ltd., an independent company providing environmental services including air quality analysis, noise and dust monitoring, carried out noise monitoring surveys at noise monitoring locations on behalf of the Applicant at the Application Site. The Noise levels were measured in general accordance with International Standard ISO 1996: "Acoustics Description and Measurement of Environmental Noise" and the Environmental Noise Survey Guidance Document issued by the EPA.

Blasting operations at the existing quarry are monitored. Ground borne vibration and air overpressure levels are measured and recorded for each blast. The blasting results for 2009 have been reviewed as part of this assessment. Vibration monitoring is carried out on site by Irish Industrial Explosives (IIE).

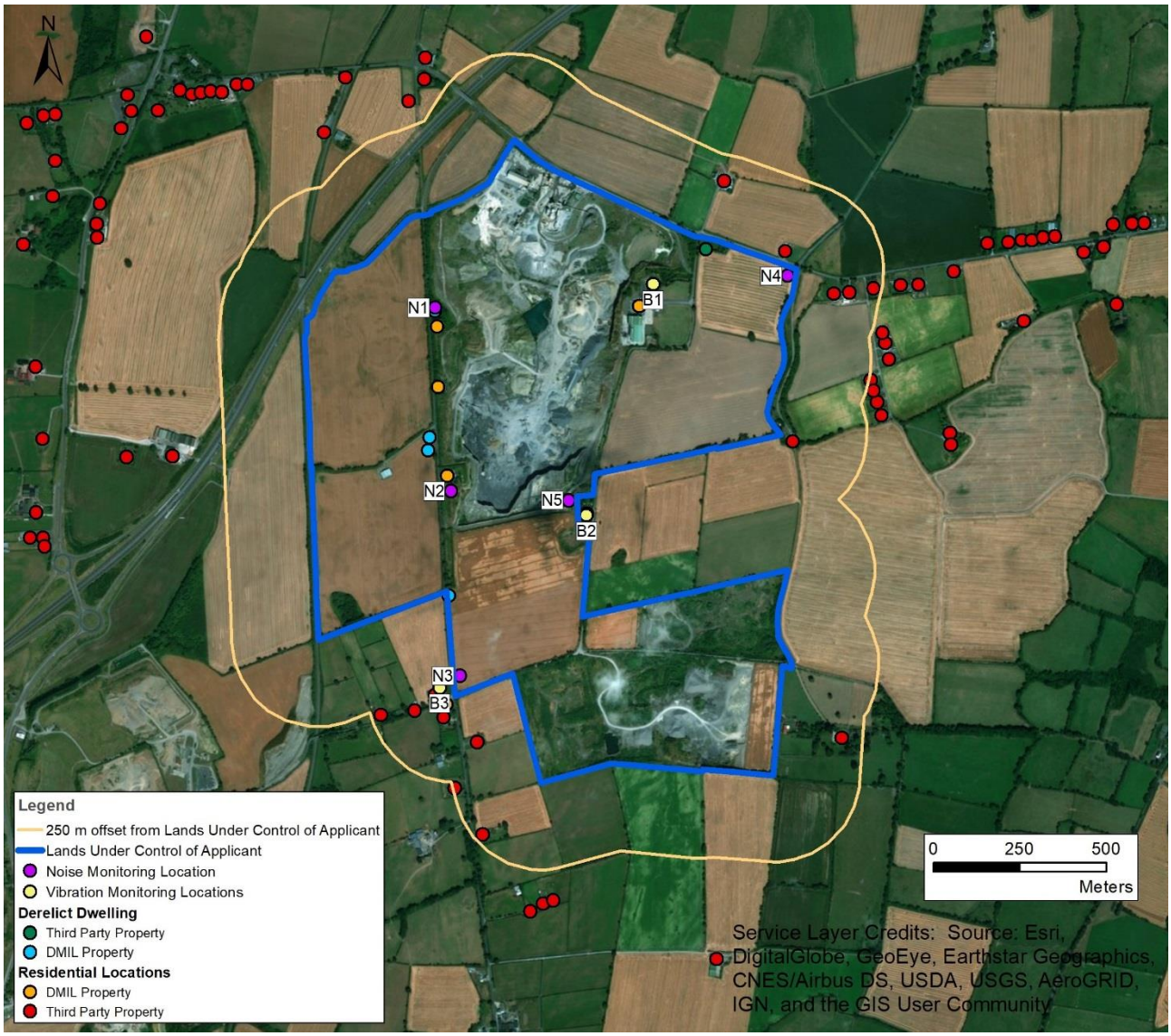


Figure 9.1: Noise and Vibration Monitoring Locations

9.2.2 Evaluation Criteria

Noise Measurement Parameters

At the measurement positions, the following noise level indices have been recorded:

- LAeq,T – the A-weighted equivalent continuous sound pressure level over the measurement period T, effectively represents an "average" energy level of all the sampled levels. The ambient sound level is usually measured as an LAeq,T and is made up of all the sound in the area from sources near and far.
- LA90,T – the A-weighted noise level exceeded for 90% of the measurement period, T. This parameter is often used to describe the" background" noise level, it gives a clear indication of the underlying noise level, or the level that is almost always there in between intermittent noisy events.
- LA10,T – the A-weighted noise level exceeded for 10% of the measurement period, T. This parameter is often used to describe or identify road traffic noise.

Vibration Measurement Parameters

- Ground vibration at sensitive receptors is measured as peak particle velocity (ppv) in mm / sec. The ppv is the maximum instantaneous velocity of a particle at a point during a given time interval; and
- Air Blast (Air-Overpressure) Noise is measured in dB (Lin). Air overpressure is energy transmitted from the blast site within the atmosphere in the form of pressure waves and is generally perceived as a loud bang.

9.3 Existing Environment

Quarry related activities have been undertaken at the Site since the 1940s. The lands surrounding the Application Site can be characterised as rural in nature, with land uses in the area being generally agricultural and single-house residential. The lands contiguous to the boundaries of the Application Site are in agricultural use, predominantly agricultural lands. There are scattered residential properties in the vicinity of the site, with ribbon form developments to the east. The M9 motorway runs north-east to south-west west of the Site.

9.3.1 Potential Noise and Vibration Sources on Site

The principal potential noise impact arising from the operation of the pit in the past is increased noise nuisance. Increased noise levels is likely to have arisen on account of:

- Increased traffic along existing access roads to the facility and internally across the applicant's landholding;
- Operation of plant within the Application Site for aggregate extraction processes;
- Drilling of blast holes; and
- Excavations and earthmoving for any preliminary restoration works.

With respect to the potential for noise impacts, the key objective at the Application Site has been to manage activities in order to ensure that any discernible increase in noise levels have been prevented and the effect of any increase in noise emissions has been minimised.

The only activity undertaken onsite which have potential to have given rise to ground borne vibration in the past is the blasting of bed rock. The activity of mechanical rock breaking using hydraulic excavator attachments has been considered. However, the rock breaking can give rise to relative levels of ground vibration in close proximity to the breaking area, but the vibration tends to contain relatively little energy in the lower frequencies at which buildings and their occupants are most vulnerable. Furthermore, higher frequencies attenuate more rapidly than low frequencies, thus minimising the impact zone. For this reason, most vibration guidance documents such as *British Standard BS 5228-1:2009 Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration* (2009) ignore rock breaking vibration.

9.3.2 Monitoring Locations

Table 9.1 below describes the noise monitoring locations at the Application Site, these have also been included on Figure 9.1.

Location	Description
Noise	
N1	Located at the residence to the western boundary of the Clonmelsh extraction area.
N2	Located at the residence to the western boundary of the existing extraction area.
N3	Located to the south of the Clonmelsh site and west of the Garyhundon Site.
N4	Located at the north-east corner of the Clonmelsh site, and approximately 1km north of the Garyhundon site.
N5	Located just south of the Clonmelsh extraction area and north of the Garyhundon site.
Vibration	
Clonmelsh House B1	Located east of the Clonmelsh site.
Monks Residence B2	Located 100 m south of the Clonmelsh site and approximately 300 m north of the Garyhundon site.
McGrath Residence B3	Located approximately 250 m west of the Garyhundon site.

Table 9.6: Description of Noise Monitoring Locations

9.3.3 Results from assessment period

Noise

As highlighted in Table 9.2 below, there have been a number of exceedances above the 55 dB(A) daytime threshold. SLR have determined in their reporting that the high noise levels recorded at all locations were mainly due to external traffic noise sources on the adjacent public roads as shown by the elevated L_{A10} readings, (as specified in monitoring reporting and previous . An additional noise monitoring survey was carried out on 05 March 2010 to assess the background noise levels arising from traffic on the external road network (when the quarry was not operational), noted similar results to the fully operational facility. This additional monitoring survey confirms that the high noise levels in the vicinity of the quarry are due to external noise sources (traffic on the external road network). There was no significant decrease in noise levels observed during the monitoring period when the quarry was not operational.

Ambient noise in the vicinity of the Application Site would have increased from the period of 2006 to present with the construction of the M9 Motorway and subsequent traffic noise.

Vibration

There has been no exceedances in peak particle velocity in blasts monitored in Table 9.3. Air Overpressure exceeded the limit on two occasion only, on 16 June 2009 and 03 April 2009, however it has been noted that this indicates a compliance within a 95% confidence limit.

Table 9.7: Summary of Noise Results at Clonmelsh Quarry for Assessment Period 2008 to 2017 (dBA)

N1	Date	27/02/2008	15/04/2008	05/11/2008	01/04/2009	09/06/2009	09/07/2009	27/11/2009
	Time	09:18 – 10:18	08:54 – 09:54	09:58 – 10:58	12:01 – 13:01	10:05 – 11:05	11:40 – 12:40	10:10 – 11:10
	$L_{Aeq, 1 hour}$	65.2	65.0	60.9	65.3	55.3	60.8	57.4
	$L_{A10, 1 hour}$	65.2	68.2	58.4	61.2	55.8	56.5	56.6
	$L_{A90, 1 hour}$	42.9	43.2	42.8	41.7	41.6	43.8	44.3

N2	**Date**	**27/02/2008**	**15/04/2008**	**05/11/2008**	**01/04/2009**	**09/06/2009**	**09/07/2009**	**27/11/2009**
	Time	10:21 – 11:21	09:58 – 10:58	11:02 – 12:02	10:53 – 11:53	11:11 – 12:11	10:37 – 11:37	11:15 – 12:15
	$L_{Aeq, 1 hour}$	68.6	66.5	64.9	60.3	65.5	55.3	68.0
	$L_{A10, 1 hour}$	63.6	61.3	60.4	59.7	65.3	56.5	66.5
	$L_{A90, 1 hour}$	41.6	38.0	42.9	37.9	50.1	43.0	47.2

N3	**Date**	**27/02/2008**	**15/04/2008**	**05/11/2008**	**01/04/2009**	**09/06/2009**	**09/07/2009**	**27/11/2009**
	Time	11:25 – 12:25	14:33 – 15:33	12:08 – 13:08	09:47 – 10:47	12:50 - 13:50	12:44 – 13:44	12:57 – 13:57
	$L_{Aeq, 1 hour}$	57.9	65.5	47.8	55.7	61.0	58.9	55.3
	$L_{A10, 1 hour}$	60.1	64.3	41.9	58.1	57.2	61.0	58.2
	$L_{A90, 1 hour}$	39.7	45.9	32.5	36.7	43.7	40.5	41.3

N4	**Date**	**27/02/2008**	**15/04/2008**	**05/11/2008**	**01/04/2009**	**09/06/2009**	**09/07/2009**	**27/11/2009**
	Time	12:31 – 13:31	15:40 – 16:40	13:42 – 14:42	13:22 – 14:22	14:10 – 15:10	09:26 – 10:26	14:07 – 15:07
	$L_{Aeq, 1 hour}$	65.3	67.1	68.9	57.3	67.9	66.1	69.6
	$L_{A10, 1 hour}$	64.7	65.5	68.3	58.6	66.7	63.4	69.6
	$L_{A90, 1 hour}$	43.4	43.4	36.7	36.5	41.3	37.2	45.4

N5	**Date**	-	-	-	-	-	-	-
	Time	-	-	-	-	-	-	-
	$L_{Aeq, 1 hour}$	-	-	-	-	-	-	-
	$L_{A10, 1 hour}$	-	-	-	-	-	-	-
	$L_{A90, 1 hour}$	-	-	-	-	-	-	-

Table 9.2 continued: Summary of Noise Results at Clonmelsh Quarry for Assessment Period 2008 to 2017 (dBA)

N1	Date	22/01/2010	05/03/2010	04/04/2012	27/09/2012	03/12/2014	08/02/2017	16/06/2017
	Time	08:44 – 09:44	17:03 – 17:33	08:03 – 09:03	09:01 – 10:01	14:02 – 15:02	08:29 – 09:29	09:24 – 10:24
	$L_{Aeq, 1\ hour}$	63.7	65.4	62	60.8	61	64	51
	$L_{A10, 1\ hour}$	63.2	63.7	63	59.3	63	64	52
	$L_{A90, 1\ hour}$	51.2	51.4	50	52.0	48	51	41

N2	**Date**	**22/01/2010**	**05/03/2010**	**04/04/2012**	**27/09/2012**	**03/12/2014**	**08/02/2017**	**16/06/2017**
	Time	11:27 – 12:27	17:42 – 18:12	09:06 – 10:06	10:03 – 11:03	11:31 – 12:31	09:33 – 10:33	10:30 – 11:30
	$L_{Aeq, 1\ hour}$	68.0	68.9	63	62.1	64	65	49
	$L_{A10, 1\ hour}$	66.0	67.6	60	56.1	62	61	51
	$L_{A90, 1\ hour}$	44.3	49.9	47	49.3	37	47	41

N3	**Date**	**22/01/2010**	**05/03/2010**	**04/04/2012**	**27/09/2012**	**03/12/2014**	**08/02/2017**	**16/06/2017**
	Time	10:15 – 11:15	17:01 – 17:31	10:09 – 11:09	11:06 – 12:06	10:28 – 11:28	10:35 – 11:35	11:35 – 12:35
	$L_{Aeq, 1\ hour}$	56.8	58.9	52	48.0	58	53	65
	$L_{A10, 1\ hour}$	57.6	62.0	53	49.0	57	55	61
	$L_{A90, 1\ hour}$	44.6	42.6	43	43.5	50	37	36

N4	**Date**	**22/01/2010**	**05/03/2010**	**04/04/2012**	**27/09/2012**	**03/12/2014**	**08/02/2017**	**16/06/2017**
	Time	12:32 – 13:32	17:40 – 18:10	12:17 – 13:17	13:45 – 14:45	8:15 – 9:15	12:43 – 13:43	12:46 – 13:46
	$L_{Aeq, 1\ hour}$	67.7	66.6	63	68.4	57	58	58
	$L_{A10, 1\ hour}$	66.8	68.0	64	66.3	61	59	57
	$L_{A90, 1\ hour}$	37.2	44.0	44	43.3	48	43	31

N5	**Date**	-	-	**04/04/2012**	**27/09/2012**	**03/12/2014**	**08/02/2017**	**16/06/2017**
	Time	-	-	11:14 – 12:14	12:37 – 13:37	9:23 – 10:23	11:41 – 12:41	13:55 – 14:55
	$L_{Aeq, 1\ hour}$	-	-	51	51.4	45	44	54
	$L_{A10, 1\ hour}$	-	-	53	55.6	47	45	53
	$L_{A90, 1\ hour}$	-	-	47	45.1	42	43	50

Table 9.8: Summary of Vibration Results at Clonmelsh Quarry for Assessment Period 2009

Date	Location	Peak Particles Velocity (mm/sec)			Air Over Pressure dB(Lin)$_{max.peak}$)
		Tran	Vert	Long	
20/01/2009	Clonmelsh House B1	2.3	1.2	2	119.7
20/01/2009	McGrath Residence B3	1.3	1.5	1.5	106
03/03/2009	McGrath Residence B3	1.4	1.4	2.3	109
03/04/2009	Clonmelsh House B1	1.8	1.0	2.2	130
03/04/2009	McGrath Residence B3	2.0	3.1	3.0	104
12/05/2009	McGrath Residence B3	2.2	2.3	1.8	107
12/05/2009	Clonmelsh House B1	2.92	2.6	2.16	117.8
16/06/2009	Clonmelsh House B1	1.27	1.14	1.84	125.7
16/06/2009	McGrath Residence B3	2.0	2.2	2.2	102
28/07/2009	McGrath Residence B3	1.84	2.03	0.88	103.5
28/07/2009	Clonmelsh House B1	1.2	1.2	1.8	124
03/09/2009	Monks Roadway B2	*	*	*	*
03/09/2009	McGrath Residence B3	1.1	1.3	1.1	108
08/10/2009	Monks Residence B2	7.6	10.7	10.6	119
08/10/2009	McGrath Residence B3	1.6	1.2	1.4	107
06/11/2009	McGrath Residence B3	2.48	1.33	1.04	107.5
04/12/2009	Monks Gate B2	5.91	5.4	4.95	114.2
04/12/2009	McGrath Residence B3	0.57	0.64	0.45	108

** Vibration from the blast was too low to trigger the monitor*

9.3.4 Comments and conclusions from noise monitoring reports during assessment period 2014 to 2017

SLR Consulting Ltd concluded for all events in this period that the noise levels recorded at N1, N2, N3 and N4 were mainly influenced by external traffic noise sources on the adjacent public roads and on the M9 motorway as shown by the elevated LA10 readings. Noise levels recorded at location N5 were more representative of site activity as the noise levels at this location were not influenced by external noise sources at the time of monitoring. Taking into account the external traffic noise sources, SLR noted that the noise monitoring results indicate that the noise emissions from the site has complied with the daytime noise threshold limit of 55 dB(A), measured at 'sensitive locations' recommended in Quarries and Ancillary Activities: Guidelines for Planning Authorities (DoEHLG, 2004):

- An LAeq,1hr value of 55 dB(A) - Daytime, at the nearest noise sensitive location; and
- Due to the inactivity at the quarry during the night it can be considered to comply with an LAeq,15min level of 45 dB(A) - Night time, at the nearest noise sensitive location.

Monitoring results and reports were obtained from staff members formerly employed by DMIL and now by the licensee. They accessed historic date on site but did not have a record of monitoring data or schedules from 2010 – 2014, the period over which the former application for continuation of quarrying under S.261(7) was being considered. Data from that interim period has been collated from site applications and submissions to the relevant authorities.

Please refer to Chapters 2.0 and 3.0 for a description of the site and development giving rise to the site over its lifetime where fluctuations in extraction and production levels match market demand that witnessed unprecedented highs and lows in recent years.

9.3.5 Comments from vibration monitoring results

From a review of historic mapping and other sources it appears that extraction of rock as part of sand and gravel extraction and below sand and gravel deposits was undertaken since the beginning of quarrying on the site. The practice of blasting to remove/extract rock was part of the extraction methods employed on site but its year of commencement is unknown.

A review of the blast monitoring results from 2009 indicates compliance with the DoEHLG (2004) recommended threshold limits for ground borne vibration of 12 mm/sec (peak particle velocity) and for air overpressure of 125 dB (Lin) with a 95% confidence limit.

All blasts are monitored, with records kept detailing the results of vibration, air over pressure, and the blast design as part of the Environmental Management System (EMS) implemented at the quarry. It has been reported that the scope of the blast monitoring has been reviewed annually, and assessed if amendments have been required in light of prior results.

9.4 Mitigation

Noise mitigation measures and control have been adopted into site management, working practices and site design for a considerable period of time. The effective application of these mitigation measures has been monitored at the Application Site. Through their implementation on site it is considered that the extraction and ancillary activities have had no significant impact at nearby NSRs. Measures implemented at the site to reduce potential noise impacts have included:

- The maintenance of haul routes and site surfacing to ensure rattles and other impulsive noises associated with machinery on rough terrains are minimised;
- Undertaking activities and the routing of haul roads within the site in a manner where landforms and berms offer noise attenuation benefits to noise sensitive locations. This has included the screening and processing of materials within the base of the quarry, to ensure noise attenuation;
- Noise minimisation practices for machinery operators which includes elimination of unnecessary revving of engines, reduction in drop heights of materials in to stockpiles and truck, and turning off idling plant when not in use;
- Proper upkeep of machinery and plant, including lubrication of moving parts and the maintenance of exhaust silencers and engine covers, with damaged components being replaced as soon as practicable;
- A 'good neighbour' policy has been adopted in all site practices. Site Management are conscious of noise emissions during activities. This has been evident as the site, over the licensee occupation period for 2014, has not received any noise complaints from neighbouring dwellings or businesses.

The following controls are implemented at the Application Site during blasting to ensure that Ground Vibration and Air Overpressure Noise is minimised and kept within the specified guideline limits:

- Laser profiling has been used to establish an accurate geometry of the quarry face, thereby enabling the optimum burden and spacing to be applied for the blasts;
- In recent years all blasts have been initiated by an electronic detonation system, which is the latest technology available to fire a blast;
- Blast ratios have been optimised to ensure that the maximum amount of explosive on any one delay, the maximum instantaneous charge has been optimised so that the ground vibration levels are kept below those

specified;

- Explosive charges have been properly and adequately confined by using a sufficient quality of 20 mm aggregates for stemming, as they provide the best particle interlock;
- Adequate confinement of all charges by means of accurate face survey and the subsequent judicious placement of explosives;
- No blasting has been carried out at weekends or public holidays;
- No exposed detonating fuse have been used in blasting;
- All blasts have been measured (ground vibration & air overpressure) in the area of at least one of the sensitive residence to ensure compliance with the aforementioned limits. This information has been employed modifications of subsequent blast designs;
- Notice of all blasts has been given to local residents by means of a phone call, text message or letter drop prior to the blast taking place;
- All monitoring equipment has been calibrated at the appropriate intervals to ensure that peak particle velocity and air overpressure generated from each blast were accurately measured;
- Blasting at the Application Site is only carried out by professionally trained blast engineers; and
- Drilling contractors completed a logs for every borehole drilled.
- Over the licensee occupation period for 2014, has not received any noise complaints from neighbouring dwellings or businesses.

9.5 Indirect Impacts

For the rEIAR assessment period there are no anticipated indirect impacts associated with noise or vibration at the Site.

9.6 Residual Impacts

Any impacts resulting from quarry related activities at the Application Site are considered slight as confirmed by historical noise monitoring. Noise monitoring reports for the 2012-2017 period detail that activities at the Application Site are audible at low levels at some locations, however these are concluded to be in compliance with the appropriate conditions. The overall noise impact as a result of the extraction activities has been not significant and it is considered that there has been no detrimental effect from noise at the Application Site on the local environs.

From the implementation of the above mitigation measure on site during blasting, there have been no residual impacts from vibration at the Site.

9.7 Cumulative Impacts

There are no predicted cumulative impacts for noise during the rEIAR assessment. It has been noted that her noise emanating from the quarry operations are considerably lower than the background noise levels arising from traffic and the local road network.

9.8 References

Code of Practice for Noise and Vibration Control on Construction and Open Sites, Part 1: noise (BS 5228:2009-1) – British Standards Institute – 2009.

Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4) – Environmental Protection Agency Office of Environmental Enforcement – January 2016.

Guideline Document for Extractive Industries (Non Scheduled Minerals) - Environmental Protection Agency – April 2006.

Quarries and Ancillary Activities: Guidelines for Planning Authorities – Department of Environment Heritage and Local Government - 2004

10.0 MATERIAL ASSETS & TRAFFIC

10.1 Introduction

The extraction and plant processing lands the subject of this rEIAR [the subject lands] occur in 2 no. land units described in this rEIAR as *Clonmelsh* to the north and *Garyhundon* to the south after the townlands within which they occur.
Clonmelsh is approximately 54 ha. consisting of a limestone quarry to an extant floor depth of around 25 AOD with processing plant in the north western quadrant. This land unit holds the main quarry and plant entrance toward the centre of the northern boundary of the land unit and accessing the L3050.

Garyhundon is approximately 27 ha. in extant consisting of a part-restored sand and gravel resource to an extant floor depth of around 55 AOD. This site holds 1 no. entrance at the centre of its western boundary with the L3045. Since the 1970s plant and machinery has been concerted in the Clonmelsh land unit and therefore the majority of aggregate recovered at Garyhundon was transported to Clonmelsh for onward sale or processing.

It is understood that extraction on these lands has occurred since the late 1940s in the case for Clonmelsh and from about 1955 in the case of Garyhundon. The requirement for EIA arose in 1990 and therefore this is the effective or baseline year from which development is required to be assessed. This rEIAR supports applications for substitute consent that are retrospective and thus the development is assessed in this rEIAR from 1990 to today (September 2017).

In accordance with section 1.2.4 of this report an rEIAR is a report of the direct and indirect 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.

The objective of this chapter is therefore to identify and assess the significant effects that have occurred, are occurring or can be reasonably expected to occur in respect of material assets and the existing road network.

In this regard the nature of the development that involves removal of land and processing of that land over a significant period of time and therefore preceding and succeeding chapters are devoted to a consideration of material assets in particular; land, soils and geology, water, landscape. This is recognised in the description of material assets at the EPA Draft 2017 Guidance for EIAR*; "Material assets can now be taken to mean built services and infrastructure. Traffic is included because in effect traffic consumes roads infrastructure. Sealing of agricultural land and effects on mining or quarrying potential come under the factors of land and soils."*

This rEIAR is prepared to support two applications of substitute consent over adjoining lands. Applications for substitute consent cannot propose new development and therefore there will be no change in the occurrence or level of usage of material assets at the rEIAR lands.

Having regard to the above and the retrospective nature of this rEIAR to support two applications for substitute consent for development already undertaken this chapter sets out a summary description of the built services at the site at baseline and today guided by 'typical topic' at table 3.1 of the EPA Draft 2017 Guidance for EIAR.

With regards to Roads and Traffic this chapter outlines the maximum volume of traffic that was capable of being generated by the subject site during its operation as an aggregate extraction and processing facility and assesses, in so far as is practicable, the impact that this traffic has had on the public road network in the vicinity of the development.

10.2 Description of Development

Figure 10.1 overleaf depicts the location of the lands the subject of this rEIAR.

10.2.1 Material Assets, excluding Roads & Traffic

Built assets as regards buildings and plant associated with processing quarried material are described in Chapter 2 of this EIS.

Built services infrastructure associated with the rEIAR lands and development thereon consist of power, telecommunications and water.

There is a substation located in the plant area at Clonmelsh (P11 on submitted plant area substitute consent site layout drawings). Due to its being visible on historic aerial photography that substation has been in existence since before the 1990s.

The lands have telecom lines accessing the site office, itself in existence pre '63. In addition, there is wifi in and around this office.

Potable water is required for welfare and processing facilities on site there is no public water mains supply. There is a well in the plant area that feeds welfare facilities. Por cessing of aggregate and making of concrete require water inputs generally obtained from the settlement ponds in the plant area and in the quarry void. The settlement pond system in the quarry void has a pump installed to port water to the

Plant area where it is stored in water tanks ahead of discharge off site close to the site office.

There are 2 no. toilets on site, both located in the site office for the use of 12 no. full time members of staff and visitors. There is an existing septic tank on site to accommodate the requirements of these toilets.

There are no services facilities on the Garyhundon rEIAR lands.

10.2.2 Roads & Traffic

There are two main accesses from the site onto the public road; one at *Clonmlesh* and one at *Garyhundon*:

- *Clonmelsh*: The main access for Clonmelsh is onto the L3050, located near the centre of the northern site boundary, and serves the 'plant site' and Clonmelsh.

  There is some evidence, via orthophotography from 1995, that there were two entrances from the site onto the local road at this location in the baseline year, positioned on either side of the office. It is not known on what dates the second access was opened, or closed. However, the volumes of material extracted, and traffic volumes generated, by the development are independent of which access was used, and the traffic distribution and assignment is similarly unaffected. For the purposes of this traffic impact assessment it is assumed that there was only one entrance for the duration of operations.

- *Garyhundon:* The main access for Garyhundon is onto the L3045, located to the centre of the western boundary. Material recovered from Garyhundon was predominantly processed at the Clonmelsh plant site, and thus the public road haul route from Garyhundon would have been to Clonmelsh for storage/processing of the sand and gravel recovered there from the 1970s onward.

The majority of traffic generated by the development for the purposes of importation and shipping used the *Clonmelsh* entrance onto, and off-of, the L3050 since the baseline year. Consequently the access at Clonmelsh is considered the primary entrance/exit for the entire of the lands under consideration in this rEIAR.

Each of these entrances were surveyed in 2014 and have not since altered. Drawing no. 10.1 at the rear of this chapter depicts the Clonmelsh and Garyhundon entrances and sightlines as they now exist using current survey information. Having regard to historic EISs, mapping and photography sources it appears that these entrances remain unchanged since at least 2010 and likely since the 1990s. and have remained unchanged since at least 2010.

A 2013 Traffic Survey and Forecast submitted as further information to Reg. Ref. 12/240 (retention and permission for plant site) recorded the L3050 at 6m to 6.5m in width, connecting with the R448 (N/M9) to the west and with the N80 to the east. It further states that 80% of traffic generated accessed the M9 to the west and the remaining 20% the N80 to the east; each accessed by the aforementioned L3050. We understand that this continues to be the case and this split is relied upon to reflect current and historic travel patterns.

10.3 Methodology

In order to meet the objective of this Chapter, to assess the impact the rEIAR development had and may have on material assets and the existing road network an estimation of the level of infrastructure services for the subject site eat 1990 and today is set out ahead of assessing the observed and likely impact on each metric.

As regards traffic and roads, the traffic profile arising from the activities on the subject lands from baseline year (1990) to today has been calculated. The development traffic has then been assigned to one of the entrances/exits of the subject lands, and distributed on the public road network, the commensurate receiving environment, in so far as that is reasonable and practical to evidence.

10.4 Primary Sources of Information

An estimation of power, water and wastewater infrastructure on site at baseline arises primarily from site inspection, historic ordnance survey and mapping information. In most instances where infrastructure has been installed for over 10 no. years no originating paperwork e.g. invoice for works or specifications for installation, whether bespoke or standard, was retained in site or associated offices. Therefore in addition, the information submitted in support of applications for extension and continuation of quarrying under Reg. ref. 10/130 and retention and permission for additional buildings and facilities under Reg. Ref. 12/240 were reviewed alongside interviews with former DMIL employees.

An estimation of traffic generation for the subject lands and its impact, including interaction with existing and expected traffic in the surrounding area, is primarily informed by evidence submitted to planning authorities under:

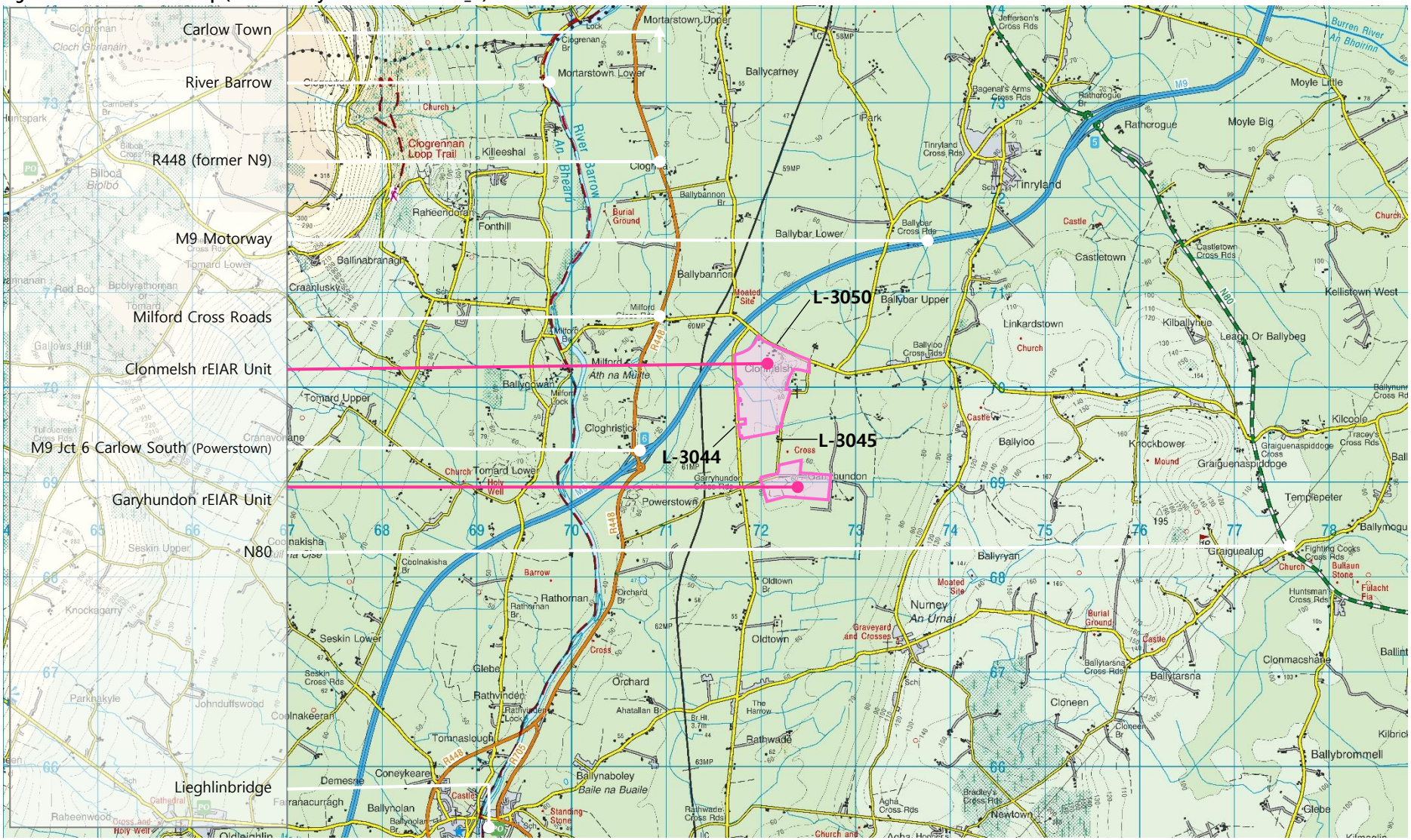
A. S. 261 Registration in 2005 where an annual extraction rate of 1,000,000 tonnes per year was declared alongside '200 traffic movements a day';
B. previous Traffic and Transportation Section and further information of an EIS originally submitted 28th April 2010 under Reg. Ref. 10/130 & appeal ref. PL01.238679 in support of a deepening and extension of the area the subject of this rEIAR that was considered over the period 2010 to 2013 when an extraction rate of 1,000,000 tonnes was declared; and
C. traffic information submitted as part of response to request for further information Reg. Ref. 12/240 and appeal ref. PL01.242648. This is the primary information relied upon as the response to request item no. 2 was a Traffic Survey and Forecast. This application was for retention permission of certain of plant items in Clonmelsh, also

part of this rEIAR area, permission for a revised, larger office, and further plant items. This traffic information related solely to the *Clonmlesh* entrance/exit and thus reflected the maximum expected traffic volume and type generation from the subject lands. This application and appeal were considered over the period 2012 to 2014.

This Chapter of the rEIAR further relies on discerned rates of traffic generation as at Chapter 2 of this rEIAR that are calculated by reference to estimated levels of extraction and importation of material.

Finally relied upon are observed extrapolated traffic levels over the receivership licensee period.

Figure 10.1 Site Location Map (On Discovery Series Tile OS2616_D)



10.5 Receiving Environment

The lands the subject of this rEIAR, whose imports and exports, including staff vehicles enter and leave the site via the Clonmelsh entrance onto the L3050 are located approximately 6km south of Carlow Town and 1.5km east of the intersection of the L3050 with the R448 known as Milford crossroads.

The L3044 bounds the Clonmelsh lands to the west and the L3045 bound the Clonmelsh lands to the east and Garyhundon lands to the west.

The M9 is the main arterial road in the area.

The Dublin – Waterford Rail line lies to the 500 metres west of the subject lands.

Figure 12.2 presents Ordnance Survey mapping from the 1960s and aerial photography from 1995 and 2010 to illustrate the locations of the above primary pieces of transport infrastructure and the appearance of the lands over that time period.

10.5.1 Power

There is a substation located in the plant area at Clonmelsh (P11 on submitted plant area substitute consent site layout drawings). Due to its being visible on historic aerial photography that substation has been in existence since before the 1990s.

It is noted that oudie of the rEIAR boundaries but within the lands under the control of the developer that a biofuel plant had been installed in and around an existing agricultural shed located to the immediate east of the Clonmelsh void. This biofuel plant was associated with the subject rEIAR lands in that it processed rape to make a biofuel to be used in the vehicles operating on the quarry lands. This biofuel plant was retrospectively permitted under under Reg. Ref. 11/301 and PL01.240883 in 2012. We understand form former DMIL employees that this plant was installed in 2010 and closed in 2013 and the plant (tanks, switchroom, gantries) associated within it was sold and removed after plant machinery sale instructed by the Receivers in 2016.

As noted at the outset, the lands have telecom lines accessing the site office, itself in existence pre '63. In addition there is wifi in and around this office.

10.5.2 Water & Wastewater

Potable water is required for welfare and processing facilities on site. All water used on site is from the site with no public water mains supply. There is a well in the plant area that has been in existence for decades and at least pre 1990. This feeds welfare facilities. The well location is indicated as P19 on the submitted plant area substitute consent application site layout drawings.

Well water for the purposes of aggregate processing and concrete production, is augmented by settlement pond waters in both the plant and quarry areas that are recharged by surface water runoff and, in the case of the quarry, by groundwater.

There is a pump installed at the settlement ponds in the quarry connected to a pipeline that draws water collected in the settlement ponds in the void to the water storage tanks in the plant area with excess discharge via the discharge point at the site offices. A discharge license was secure din 2008 (ref. DL7/233 & ABP ref. 01.LA.0085). A review of the site at around 19901 indicates a settlement pond in the quarry void (north west) but as the estimated quarry depth was circa 40AOD it is suspected that this settlement pond held surface water runoff only. The

requirement for a settlement pond system to accommodate both surface water runoff and groundwaters arising in the Clonmelsh Void would have likely arising in the ealry 2000s commensurate with the peak levels of extraction and deepening. The settlement pond system and pipeline are indicated as item Q8 on the submitted quarry substitute consent application site layout drawing.

There are 2 no. toilets on site, both located in the site office for the use of 12 no. full time members of staff and visitors. There is an existing septic tank system on site to treat foul waters arising. It is noted that in 2012 an application for retention of the septic tanks and its replacement by a bespoke waste water treatment system was made udner Reg. ref. 12/2040. Included for permission in that application was revised offices and statements that 40 to 60 staff would be accommodated throughout the site. This application was notified a grant of planning permission that was overturned on appeal ref. PL01.242648 in November 2014. There is no requirement for an enlarged office on site that accommodated back office staff that no longer are associated with the controlling firm DMIL. As such, the bespoke, enlarged and upgraded waste water treatment system is not required.

Please refer to chapter 7.0 for a detailed description of water occurrence, supply and wastewater treatment arrangements including water balance.

10.5.3 Local Road L3050

This is the local road onto which the main access that serves the quarry and plant site at Clonmelsh accesses and therefore takes the majority of the traffic generated by the subject lands, and has done since the 1970s when plant began to be concentrated in the Clonmelsh area necessitating the transport of material from Garyhundon to the plant area at Clonmelsh.

This local road does not appear to have altered in alignment over the entirety of the extractive lifetime of the subject lands. By 2013 this carriageway was recorded as being between 6m to 6.5m in width from a 2013 Traffic Survey and Forecast submitted as further information to Reg. Ref. 12/240 (retention and permission for plant site) that recorded the L3050 at this 6m to 6.5m in width, connecting with the R448 (N/M9) to the west and with the N80 to the east. It further states that 80% of traffic generated accessed the M9 to the west and the remaining 20% the N80 to the east; each accessed by the aforementioned L3050. We understand that this continues to be the case and this split is relied upon to reflect current and historic travel patterns

10.5.4 Local Road L3044

In common with the L3050 this local road is discernible since the inception of extraction on the subject lands. It is noted however, that the construction and opening of the M9 necessitated the realignment of the L3044 at the north-western corner of the quarry in 2008. This realignment brought a short length of the L3044 eastward into lands then owned by DMIL and secured via CPO associated with the roads scheme.

10.5.5 Local Road L3045

This is the local road that serves Garyhundon. Since the 1970s, when planning permission for a centralised access into Garyhundon and commensurate installation of plant in the north western corner of Clonmelsh was granted it is assumed that sand and gravel recovered from the Garyhundon lands were, as today, transported northward on the L3045 to its junction with the L3050 where the majority of the traffic then turns westward to enter the Clonmelsh plant area.

This local road has not altered in alignment since the beginning of extraction on the Clonmelsh and Garyhundon lands.

It is noted that the junction of the L3045 with the R448 (old N9) was significantly altered? as a result of a grant of planning permission for an extension to the municipal landfill at Powerstown in 2004 (An Bord Pleanála ref. 01.EL2020). At that time this upgrade was considered necessary to facilitate the increased traffic volumes and type expected to be generated by the landfill at its local road (L3045) junction with the then N9 (now R448).

The opening of the M9 resulted in significantly reduced traffic flows on the then N9 (now R448), with the Annual Average Daily Traffic (AADT) using the R448 (old N9) decreasing from 15,539 AADT in 2007 to 6,494 AADT in 2011. This was relied upon, in part, to demonstrate the ability of the local road network to facilitate the further expansion of the landfill in 2012 as recorded at Chapter 10 of the supporting EIS that accompanied the applications granted for planning permission (An Bord Pleanála ref. 01.JA0032) and updated IPPC License.

It is noted that the EIS for the extension to the landfill, dated February 2012, recorded the following types of traffic on the L3045: -

"• Vehicles visiting Powerstown landfill and civic amenity area
• Vehicles relating to the neighbouring quarries (limited)
• Local access to residential properties and farm holdings"

It is noted that the 'neighbouring quarries' traffic that includes the lands at Garyhundon the subject of this rEIAR and 3 no. smaller pits (2 no. DMIL and 1 no. Kilcarrig) immediately adjacent to the landfill was recorded as 'limited' in that EIS.

10.5.6 M9 Motorway

The M9 motorway has been identified as a principal project undertaken in the vicinity of the subject site. Each of the major iterations of the M9 motorway permitting and opening have been recorded and are summarised in table 10.1 below.

Date	M9 Motorway Principal Events
2004 Jun.	N9/N10 Kilcullen to Waterford Scheme-Kilcullen to Powerstown approved with modifications under PL09.ER2027
2005 Nov.	N9/N10 Kilcullen to Waterford Scheme - Waterford to Powerstown approved with modifications under PL10.ER2039
2008 May	M9 Kilcullen to Waterford Scheme (P1): Carlow bypass opens
2008 July	S.I. 279 of 2008 Declaration of Motorways Order 2008 (Jcts 1 to 6 of the N9). This also had the effect tof changing the name of the 'N9/N10 Kilcullen to Waterford Scheme' to the 'M9 Kilcullen to Waterford Scheme'
2009 July	S.I. 255 of 2009 Declaration of Motorways Order 2009 (Jcts 10 to 6 of the N9)
2009 Dec.	M9 Kilcullen to Carlow Scheme (P3): Kilcullen to Carlow opened
2010 Mar.	M9 Kilcullen to Waterford Scheme (P2): Waterford to Knocktopher (Jct 2 to 10) opened
Sept 2010	M9 Kilcullen to Waterford Scheme (P4): Carlow (Powerstown) to Knocktopher (Jct 6 to 10) officially opened

Table 10.1 M9 Motorway Principal Events

100% of traffic exiting the extraction and processing facilities of the subject lands does so from the *Clonmelsh* entrance. 80% of that traffic uses the M9 motorway accessed via Junction 6 (Powerstown) known as 'Carlow South'. The subject lands had full benefit of the M9 motorway by 2010 that coincided with the preparation of the EIS supporting Reg. Ref. 10/130 which was the first time that traffic volumes and routes arising from the subject lands was recorded. It is therefore impossible to prove what routes the products from the site previously took however, it is assumed due to strategic urban development patterns that the 80:20 west:east split of traffic leaving the *Clonmelsh* lands on the L3050 has remained fairly consistent throughout time with the traffic leaving the site heading westwards on the L3050 prior to 2009 accessing the old N9 now the R448.

10.5.7 Dublin – Waterford Rail Line

The Dublin – Waterford Rail line lies 500 metres to the west of the subject lands and has a north – south alignment in the vicinity of the subject site. The closest station on this route which carries an intercity service operated by Irish Rail is Carlow Station.

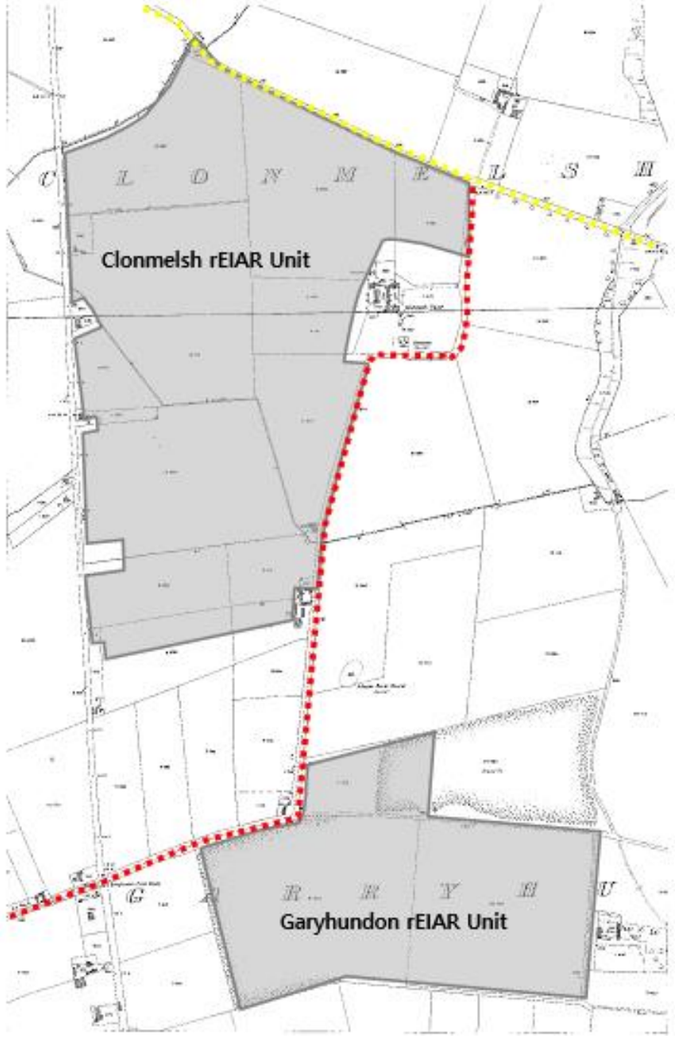
There was a station at Milford (close to Milford crossroads) and just west of Clonmelsh when the line originally opened in 1848 but that closed to goods and passengers in 1964.

10.5.8 Future Road Infrastructure

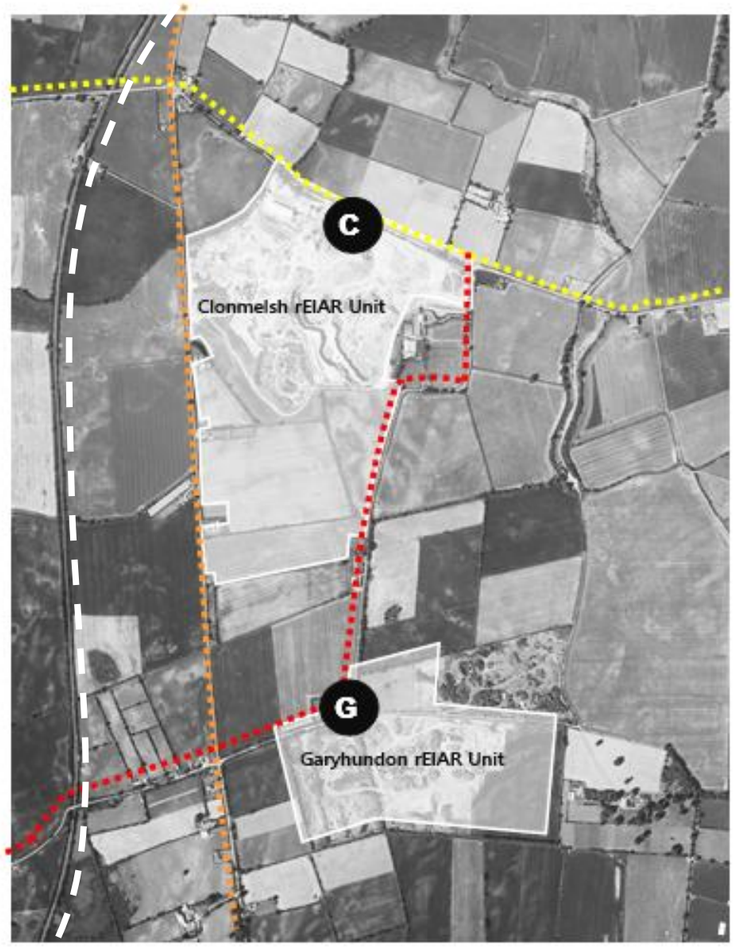
The traffic generated by the subject lands will continue to be road borne into the foreseeable future. There are no large scale roads upgrade proposals by either TII for the M9 or Carlow County Council for the local roads that serve the development having regard to roads objectives in the current County Development Plan 2015 – 2021.

The maintenance of the local roads network is by Carlow County Council facilitated by central government funding and development contributions. Maintenance of the M9 is by TII via central government funds. There is no toll on the M9 in the vicinity of the subject site.

Figure 10.2 Receiving Environment reflective of beginning of extractive land use, baseline year 1990 and today



6" OSI Map (Surveyed 1906, revised 1960s, levelled 1940s)



OSI Aerial Image June 1995

OSI Aerial Image April 2010

KEY

Areas shown shaded correspond with Clonmelsh and Garyhundon rEIAR land units

L3050

L3044

L3045

M9

Dublin – Waterford Intercity rail line

C Approximate location of main *Clonmelsh* entrance

G Approximate location of main *Garyhundon* entrance

10.5.9 Historic, Existing and Forecast Traffic Conditions

Milford crossroads consists of the R448 (formerly the N9 reclassified after the M9 opening) running north – south with the L3050 traversing. This crossroads is that which 80% of the traffic leaving Clonmelsh encounters before turning south onto the R448 and accessing the M9.

Milford Crossroads is a staggered t-junction with ghost island right-turning lanes on the R448 catering for traffic turning right from the R448 onto the local roads. In addition, there are left-turn merge/diverge tapers for traffic turning onto the L3050, to/from the east of the junction.

The L3050 to the west of the Milford crossroads runs in a westerly direction consists of a single carriageway road that crosses the River Barrow at a narrow bridge with a 5 tonne weight restriction. This weight restriction is signed at the Millford crossroads and results in the traffic entering and exiting the site from the west (80%) using the M9 or R448 to access the L3050 at Milford crossroads.

The N80 runs north-south approximately 4.5km east of the subject lands and is accessed by the L3050 via a staggered t-junction. Traffic entering / exiting the subject lands from the east (20%) use the L3050 to access the N80. In the 2013 traffic assessment (Item (B) at section 10.4) the N80 is described as it still exists; *"a wide single carriageway with right/left staggered junction with a right turning lane incorporated at the junction with the L3050*l ow volumes of about 20 tonnes per fortnight.

A review of historic mapping, aerial photography and planning history indicate, mostly by virtue of the obtaining of planning permission for the Garyhundon entrance in the 1970s, the Powerstown landfill EIS of 2012 (at section 10.5.3 above) and stating maximum peak extraction levels in S261 registration in 2005, that the peak of recovery of aggregate from these Garyhundon lands was over the period from the mid 1970s to the mid 2000s.

For the above reasons historic, current and predicted trip generation is presented here as deriving from the Clonmelsh site entrance.

Observed extraction, processing and resultant trip generation figures over the lifetime of the operations on site that take into account importation of material and the installation of plant and market demand are provided at table 2.2. Those discerned trip generation figures are here repeated alongside a restatement of trip generation figures reported in:

- The Traffic & Transportation Chapter 13 of EIS for the deepening and expansion of the current rEIAR site under Reg. Ref. 10/130 (table 13.1); and
- The 2013 Traffic Survey and Forecast, table 4.1[3], submitted as further information to Reg. Ref. 12/240 (retention and

Table 13.1
Summary of Peak Weekday Traffic Movements

Average Daily HGV Trips In	300
Average Daily HGV Trips Out	300
Trips during Peak Hr (In)	30
Trips during Peak Hr (Out)	29
Employee Trips during Peak Hour (In)	10
Employee Trips during Peak Hour (Out)	10
Total No. of Movements (600 HGV and 20 Employee Movements Daily)	620

[3] 2010 EIS (Table 13.1)

permission for plant site)[4]

Both of these analyses relied on trip generation figures from peak year in 2007 that assumed an extraction rate of 1M tonnes and average daily HGV trips of 300.

A comparison of both of these sources of information against the derived (table 2.2) estimated trip generation by extraction rates and importation of material approximate to one another. Therefore the weekday AM peak hour peak HGV movements from the site at peak were 40 arrivals and 39 departures with 600 HGV movements per weekday and 20 employee movements.

The current derived and observed weekday movements are approximately 100 with 24 no. staff movements. It is forecast that extraction rates to the short term time horizon to 2021 will only marginally recover at the site and thus the table below closes with estimated traffic movements at that time.

Table 10.2 Derived Trip generation of HGVs and Staff from Clonmelsh

YEAR	NO. OF INTERVENING YEARS	EQUIVALENT PRODUCT WEIGHT IN TONNES FOR INTERVENING PERIOD	ANNUAL AVERAGE NO. OF HGV PRODUCT EXPORTED	IMPORTATION OF HIGH PSV STONE 60:40 RATE	WEEKDAY AVERAGE NO. OF HGV TRIPS	WEEKDAY AVERAGE NO. OF HGV MOVEMENTS	EMPLOYEE AVERAGE WEEKDAY MOVEMENTS[1]
1947							
to	**6**	102,000	850	0	3	6	
1955							
to	**9**	459,000	2,550	0	9	17	
1964							
to	**9**	1,071,000	5,950	0	20	40	
1973							
to	**9**	1,989,000	11,050	0	37	74	
1982							
to	**8**	2,890,000	18,063	0	60	120	
1990							
to	**7**	2,975,000	21,250	53,125	177	354	
1997							
to	**10**	7,225,000	36,125	90,313	301	602	40[1]
2007							
to	**3**	1,657,500	27,625	69,063	230	460	
2010							
to	**4**	1,020,000	12,750	31,875	106	213	
2014							
to	**3**	382,500	6,375	15,938	53	106	24[3]
2017							

Average Daily HGV Trips (In)	300
Average Daily HGV Trips (Out)	300
HGV Trips during Peak Hr (In)	30
HGV Trips during Peak Hr (Out)	29
Employee Trips during Peak Hr (In)	10
Employee Trips during Peak Hr (Out)	10
Total No. of Movements (600 HGV and 20 Employee Movements Daily)	620

Table 4.1: Summary of Peak Weekday Traffic Movements

[4] 2013 Traffic analysis & forecast (table 4.1)

Forecast							
at	4		7,650	19,125	64	128	30
2021							

NOTES

1. There was no definitive, annualised or periodic report of number of employees on site. The Traffic Analysis and forecast submitted in 2013 sated that at 2013 the site directly employed 20 staff with a further 30 – 60 indirect jobs.
2. The 20 staff, translated in the movements then provided as 10 per day.
3. This historic rate has been applied to the 12 no. direct jobs now on the site to be 24 movements a day.

10.5.10 Trip Distribution

In the case of this quarry and associated plant area a licensee has operated the quarry for the past two years. The average annual rate of extraction from the site has been around 150,000 tonnes per annum for the license years to date. It is expected, subject to permits, to regularise over the medium term to extract 180,000 tonnes per annum.

It is noted that the reserve recoverable at the subject site is not of a PSV quality to be used in the production of construction products such as road coverings. Therefore the licensee has provided a site importation figure of necessary high PSV aggregate from elsewhere at a general rate of 60 (imported):40 (recovered on site).

As stated above it is expected that current and historic patterns of 80:20 (the M9: the N80) east:west of the entrance onto the L3050 will persist.

10.5.11 Traffic Growth

The 2013 Assessment went on to incorporate the then proposed development traffic distributed onto the local road network. Below, this distribution is repeated as figure 10.3.

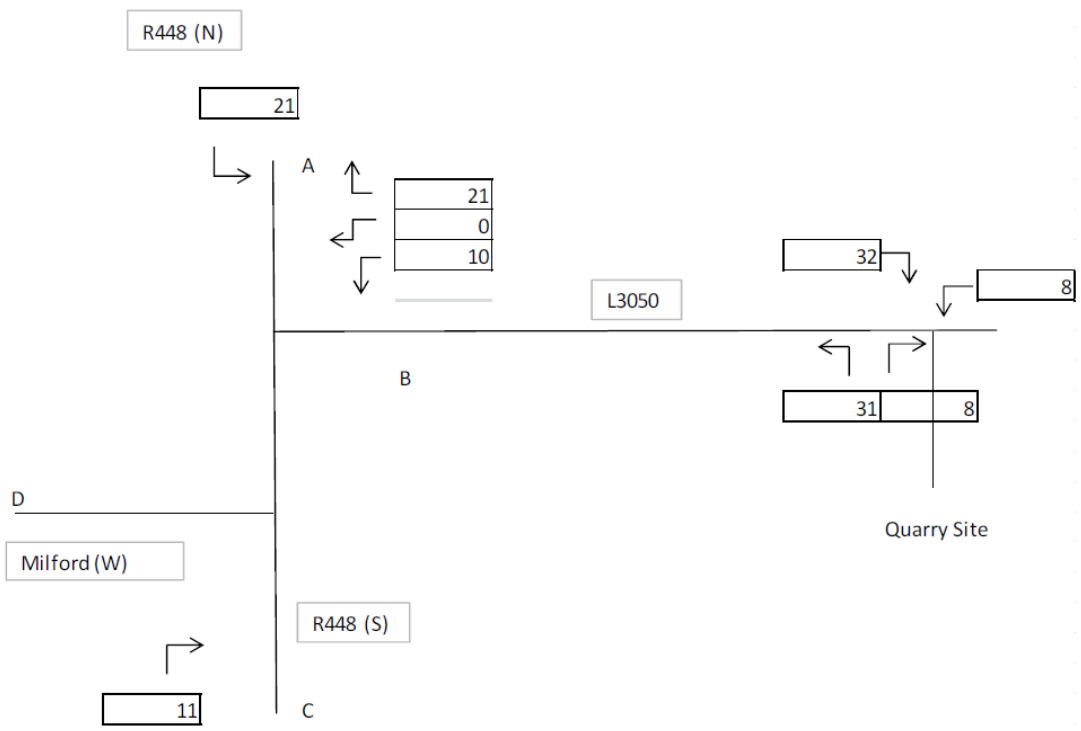


Figure 10.3 Repeat of 2013 Traffic Assessment Traffic from Proposed Development (620 movements) Distributed onto Local Road Network During AM Peak

12.6 Impact of Material Assets, excluding Roads & Traffic

The construction of the subjection on site ahead of baseline year in 1990 has a long term, negative, insignificant impact for reason of its being located within a plant site and removing limited lands from other economic use. For the purposes of the quarry development it has a long term, positive impact for it assuring supply adequate power to plant and machinery on the plant site area.

Continuously since the 1970s the collection and reuse of surface water runoff in aggregate processing and product production is a long term impact of no significance for reason of those waters not being relied upon by another established land use or population.

Continuously since the early 2000s the extraction of aggregate from below the table creates a cone of depression in surrounding lands. This is a long term, negative impact of local significance.

Continuously since the early 2000s the extraction of material from below the watertable has a permanent negative impact of local significance where other water supplies are affected.

The presence or a septic tank on site has a long term negative impact on immediate surrounding percolation grounds.

10.7 Road Impact

The construction and opening of the M9 with the attendant reclassification of the existing N9 as the R448 and attendant local roads improvements to the L3050 during the late 2000s has had the effect of improving the absorption capacity of the existing road network of the development traffic now and into the immediate future.

The traffic levels of 2013 are in line with those observed in 2017 and therefore the 'road impact' findings of the Traffic Assessment of 2013 are relevant. The assessment accepted that counts undertaken at Milford Crossroads were part constituted of traffic from the subject lands. For the purposes of the assessment however, this was discounted and the development was then assessed as if it were 'new' and furthermore that maximum extraction rates would prevail.

During the AM peak hour (0800 to 0900) the then increased traffic flows arising from the development would generate an increase of 63 west and 16 east on the L3050. The assessment concluded that "*This increase in traffic flow will have minimal impact on the carrying capacity of the L3050 and the entrance to the quarry site will have sufficient capacity to accommodate these flows.*" There is no new elements of development proposed in the substitute consents that this rEIAR supports and therefore no further impact on AM peak hour of the L3050 is found.

The assessment then went on to assess the impact of the development on the N80 and the Milford crossroads. The impact on the N80 junction was determined to be "*very minor and below the threshold requiring further assessment.*" The impact assessment then found that the predicted increase in traffic flows at the Milford crossroads accounted for an approximate 7.5% increase in the AM which was in turn determined as *"not significant and is less than the threshold value contained in the NRA TTA guidelines, junction analysis*". Notwithstanding the assessment went on to perform a junction analysis at Milford crossroads for the years: 2013, 2018 and 2028 using TRL's PICADY program. Ratio of Flow to Capacity (RFC) for the assessment years were produced to identify potential capacity issues in the future. It was assessed that; "*the traffic generated by the development has a negligible impact on the operation of the Milford Crossroad junction in 2013…The future year assessment of 2028 shows similar results to the 2013 assessment with the Milford crossroads comfortably accommodating the traffic flows in fifteen years time.*" There are no new elements of development proposed in the substitute consents that this rEIAR supports and therefore no further impact on Milford or the N80 junctions are found.

The L3050 was found to be of sufficient vertical and horizontal alignment and width to accommodate the then forecast traffic flows from the plant and quarry site. The entrance at Clonmelsh was found to be of sufficient width and depth with adequate sightlines for the then forecast traffic mitigated by the addition of 'quarry ahead' signs which have since been installed.

This rEIAR is retrospective and in support of applications for substitute consent for extant activity. In this way the residual traffic impact here identified is the continuation of traffic generation to the levels set down in table 10.2.

10.8 Mitigation Measures

The mitigation measures currently employed on the subject lands and surrounding road network by the development are here set out. Where possible, the origin of those mitigation measures are noted in order to provide an assessment to historic mitigation measures.

12.8.1 Power Supply

The substation will be decommissioned and permanently removed as part of the restoration proposals.

12.8.2 Water & Wastewater

Implement the mitigation measures set out at Chapter 7.0

The existing well and settlement ponds on site will be decommissioned and permanently removed as part of the restoration proposals.

10.8.3 Roads & Access

As set out at section 10.7 above the current and expected road network is of sufficient capacity to accommodate the development whose traffic generation is by the extant access at Clonmelsh onto the L3050 80:20 west:east. The local road network has altered little since the beginning of extraction of the subject lands with a significant improvement in strategic road infrastructure by the construction and opening of the M9 by 2010 to the west of the subject lands.

That local road (L3050) used to access the Clonmelsh site is of sufficient width and alignment to accommodate maximum previously anticipated traffic generation levels to the M9 to the west and N80 to the east of; 600 HGV movements and 40 staff movements a day where today's observed levels are just over 100 HGV and 20 staff vehicle movements per day expected in the near term to increase to about 130 HGV and 30 staff movements a day by 2021.

The accesses serving the site; the primary at Clonmelsh and the secondary at Garyhundon have been assessed and are found to be of sufficient width onto roads of adequate alignment to provide safe access for vehicles to the EAIR lands.

10.8.4 Road Condition

The local public road network is maintained by Carlow County Council.

All HGV vehicles entering and leaving the subject site are either covered in the case of aggregates or enclosed in the case of hot and cold products (asphalt, concrete). This avoids debris falling onto the local road pavement.

A water browser is available on site to dampen haul routes and faces during dry weather to avoid dust blow to sensitive receptors, including public road users.

10.8.5 Signage

The L3050 in the vicinity of the quarry currently has a speed limit of 80 km/h. Warning signs are currently in place along the L3050 approaching the Clonmelsh entrance advising motorists to the presence of a quarry entrance ahead. It is understood from information contained within the historic planning applications for the lands that this signage was advised in 2013 and thus is assumed to have been installed at that time.

Within the site boundaries a speed limit to less than 15 km/h is strictly enforced and augmented by signage. There is also directional signage within to avoid conflict of visitors, haulage and plant traffic. Haul routes within the lands are marked via signage.

10.8.6 Visitors

There is no access for visitors' vehicles past the visitor car parking at the office at the Clonmelsh site entrance and there is no visitor access to Garyhundon lands.

10.8.7 Parking Provision

There are 8 no demarcated car parking spaces on site adjacent to the office at Clonmelsh for visitors and office staff. Other parking for staff private vehicles is provided at the maintenance shed that holds sufficient turning and parking space for 10 no. cars and light vehicles. The subject site contains no dedicated truck parking facilities and none are required or were required since baseline year in view of the operations taking place within the subject site boundaries.

10.8.8 Pedestrians

There are no dedicated public footpaths in the vicinity of the lands. None are considered necessary due to the low population density (rural) character of the area.

Pedestrian movement within the subject site is forbidden save for the ancillary lands at and around office and plant areas i.e. any movement of people or product throughout the site must be by dedicated haul route in a vehicle.

10.8.9 Cyclists

There are no cycling facilities provided for in the immediate vicinity of the development, however there are cycle facilities along the R448. Cycle parking is available on an ad hoc basis on the lands associated with the subject site.

10.8.10 Public Transport

There is a regular Bus Éireann commuter service in operation in the vicinity of the quarry. But, it is considered that this development is, and was, neutral in terms of public transport as staff and product use dedicated private, not public transport modes.

10.8.11 Access for People with Disabilities

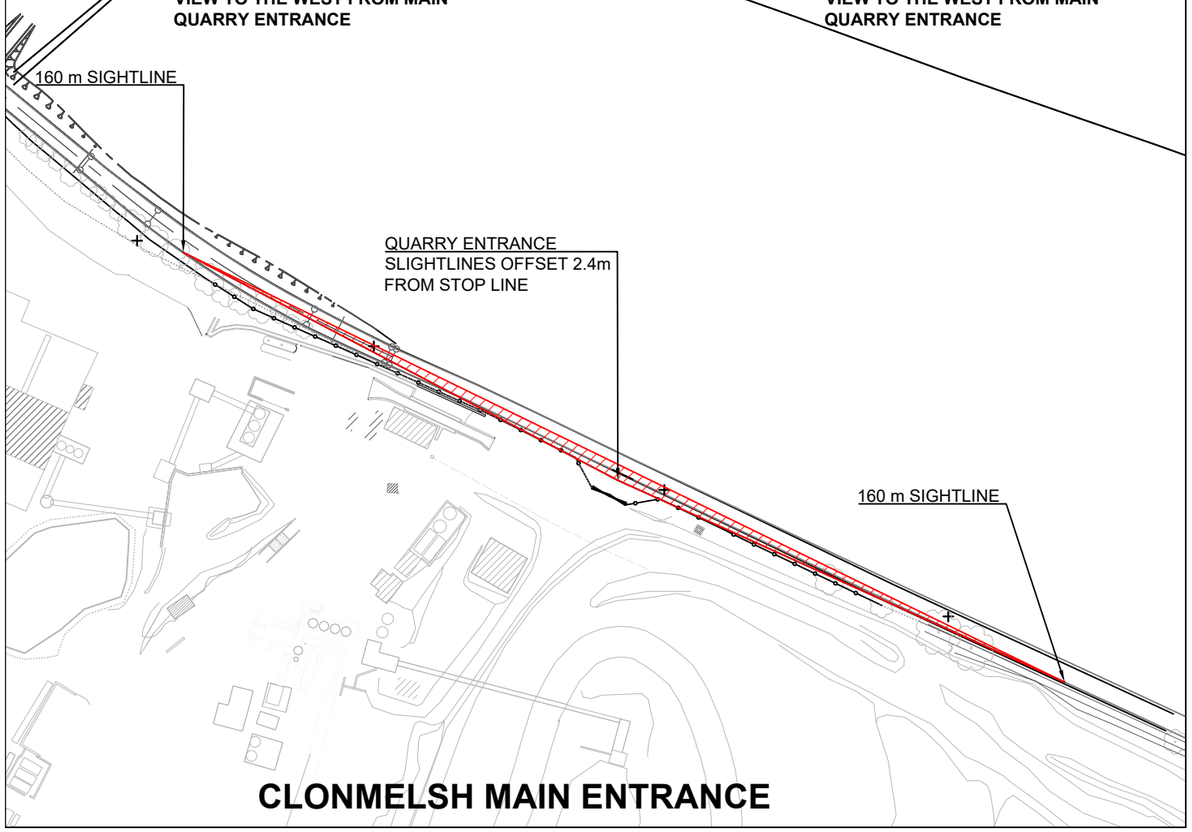
Due to the nature of the development and limited site access for visitors it likely was not, and is not, considered necessary to provide specific disabled access facilities on the subject site. Workers who have a disability will have had or be provided with adapted equipment.

10.9 Conclusions and Recommendations

No further recommendations are made in consideration of the retrospective nature of this rEIAR to support applications for substitute consent, the demonstrated capacity of the infrastructure, road and traffic environment for the subject development at extraction and production rates well in excess of currently observed and predicted levels.

VIEW TO THE WEST FROM MAIN QUARRY ENTRANCE

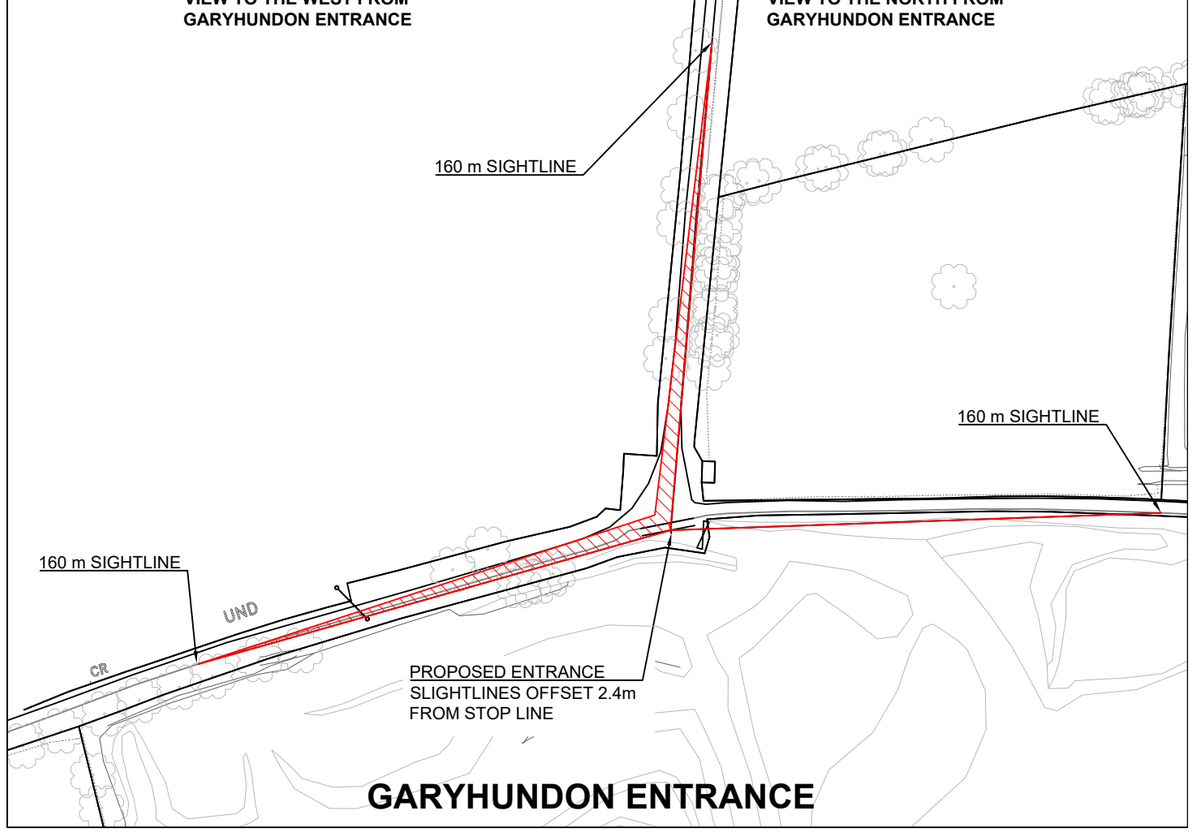
VIEW TO THE WEST FROM MAIN QUARRY ENTRANCE



CLONMELSH MAIN ENTRANCE

VIEW TO THE WEST FROM GARYHUNDON ENTRANCE

VIEW TO THE NORTH FROM GARYHUNDON ENTRANCE



GARYHUNDON ENTRANCE

P·M·C·E
PMCE Ltd.
Mona Villa
Lower Commons Road
Brownsbarn
Dublin 22
Tel: + 353 (1) 464 3041
Fax: + 353 (1) 459 1836
Email: info@pmceconsultants.com
Web: www.pmceconsultants.com

Client:

Rev.	Comment	Date
2.0	Final	19/10/17
1.0	Draft	1710/17

Notes:

1 Do Not Scale - use figured dimensions only.

Project: **Clonmelsh Quarry Traffic Peer Review**

Drawing Title: **10.1 Sightlines Drawing**

Drawn: PD	Date: 19/10/2017
Checked: TAG	Scale: 1:2000 A3
Approved: TAG	Status: Final
Drawing No: P17-068-DG-001	Revision: 2.0

11.0 CULTURAL HERITAGE

11.1 Introduction

This report presents the results of a remedial Environmental Impact Assessment Report for a quarry in the townlands of Clonmelsh and Garyhundon, Co. Carlow. The limestone quarry was in operation from the 1950's. The site consists of two areas covering 80.94 hectares which have been in use as an operational quarry.

The site is divided into two areas, Area 1 at the north has been in use since the 1950's and area 2 at the south is more recent. For the purposes of this report they will be discussed as one. The site has been heavily truncated over the past number of decades and extensive soil removal has taken place.

John Purcell Archaeological Consultancy undertook this report on behalf of the developer Dan Morrissey Ireland Ltd. (In Receivership).

The report includes a desktop study and a site inspection to assess the impact of the works to date on the cultural heritage landscape. The desktop section of the report was compiled using: The Records of Monuments and Places; buildings of Ireland, Excavations Bulletin; historic maps; aerial photographs; place names and historic books and journals.

A field inspection of the proposed site was also carried out as part of the assessment. This was undertaken on a dry day in August 2017.

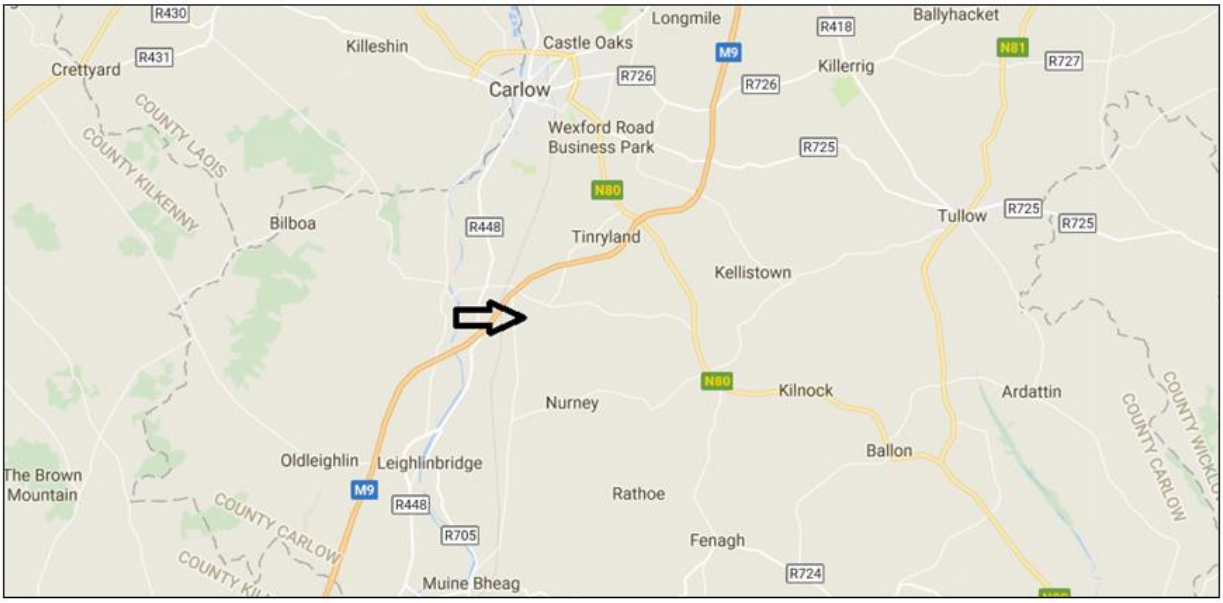


Figure 11.1 Location of the development in Co. Carlow

11.2 Assessment Methodology

11.2.1 Study Methodology

This assessment consists of a paper survey identifying all recorded sites within the vicinity of the proposed development and a site inspection. The methodology has been conducted based on the guidelines from the Department of the Arts, Heritage and the Gaeltacht (DAHG.).

11.2.2 Desktop Survey

The desktop survey undertaken consisted of a document and cartographic search utilising a number of sources including the following:

- Record of Monuments and Places (RMP); The RMP records known upstanding archaeological monuments, the original location of destroyed monuments and the location of possible sites identified through, documentary, cartographic, photographic research and field inspections. The RMP consists of a list, organised by county and subdivided by 6" map sheets showing the location of each site. The RMP data is compiled from the files of the Archaeological Survey of Ireland.
- National Inventory of Architectural Heritage; This database outlines all the protected structures in the country and gives a description of their importance.
- County Development Plans; The Development plan was consulted in order to ascertain if any structures listed in the Record of Protected Structures (RPS) and/or any Architectural Conservation Areas (ACAs). The Record of Protected Structures lists all protected structures and buildings in Dublin. This includes structures of architectural, historical, archaeological, artistic, cultural, social, scientific or technical importance.
- Cartographic Sources; The following maps were examined: 1st edition Ordnance Survey Map of the Dublin County (1836-1846) and 2nd edition Ordnance Survey Map of the Dublin County (1908).
- Literary Sources; Various published sources, including local and national journals, were consulted to establish a historical background for the proposed development site. Literary sources are a valuable means of completing the written record of an area and gaining insight into the history of the environs of the proposed development. Principal archaeological sources include:

The Excavations Bulletin; Local Journals; Published archaeological and architectural inventories; Peter Harbison, (1975). Guide to the National Monuments of Ireland; and O'Donovan's Ordnance Survey Letters.

A comprehensive list of all literary sources consulted is given in the bibliography.

11.2.3 Site Inspection

An archaeological field inspection survey seeks to verify the location and extent of known archaeological features and to record the location and extent of any newly identified features. A field inspection should also identify any areas of archaeological potential with no above ground visibility.

11.3 The Receiving Environment

The site is located in the Townlands of Clonmelsh and Garyhundon, Co. Carlow, to the east of the Carlow to Dunleckny road and south of

Carlow town. The quarry area is divided into two areas and measures 80.94 hectares. The site has been quarried since the 1950's and has been extensively truncated. Original topsoil has been largely removed. One area of the site remains unexcavated at the southeast of the site in the townland of Garyhundon, is currently in use for tillage. This field contains an enclosure.

11.4 General Archaeological and Historical Summary

11.4.1 Prehistory

The Sites and Monuments Record (SMR) lists a number of prehistoric sites in the area. These include a number of megalithic monuments, however the commonest are barrows and cists. These are associated with the Bronze/Iron Age burial tradition (c. 2400 BC - AD 400) and are defined by an artificial mound of earth or earth and stone, normally constructed to contain or conceal burials. These sites vary in shape and scale and can be variously described as bowl-barrow, ditch barrow, embanked barrow, mound barrow, pond barrow, ring-barrow and stepped barrow. The incidence and frequency of these sites in the area attests to the extent of prehistoric settlement in this area from earliest times.

Archaeological excavations undertaken as part of the M9 motorway uncovered a number of Bronze Age sites including a Bronze Age cemetery of four barrows and 8 pit burials in Ballybannon and pits and

postholes associated with Bronze Age pottery from Powerstown,

Cloghristick, Clonmelsh and Ballybar Lower.

11.4.2 Iron Age to Early Medieval Period

In late Bronze Age Ireland the use of the metal reached a high point with the production of high quality decorated weapons, ornament and instruments, often discovered from hoards or ritual deposits. The Iron Age however is known as a 'dark age' in Irish prehistory. Iron objects are found rarely, but there is no evidence for the warrior culture of the rest of Europe, although the distinctive La Tené style of art with animal motifs and spirals was adopted. Political life in the Iron Age seems to have been defined by continually warring petty kingdoms vying for power. These kingdoms, run on an extended clan system, had their economy rooted in mixed farming and, in particular, cattle. Settlement was typically centred on a focal hillfort.

Settlement in the Early Medieval Period is defined by the ringfort. These are the commonest monument across Co. Carlow and the country and have been frequently recorded in the area.

The introduction of Christianity to Ireland in the fifth century had a profound impact on Gaelic society, not in the least in terms of land ownership and the development of churches and religious houses. A number of early Christian Monuments are located in the vicinity of the site including a settlement in Carlow to the northwest. These sites were proto towns with a thriving settlement and a number of religious monuments including churches, Holy Wells and Bullaun stones.

11.4.3 Historic Period

The barony of Carlow was retained by Strongbow and was transferred by marriage to the Marshall and the Bygod families. The county had a strong Anglo Norman settlement and this is seen in the quantity of remains frim this period. Many of the early castles built were of earth and timber, called a motte and bailey. There would have been a strong timber tower on top of the motte with a defensive palisade around it. The bailey would also have had timber defences and would have contained the main residence, a hall for meetings and feasts, farm buildings and sometimes a chapel. These were superseded by the stone castle and later by the commonly built tower house.

11.4.4 Archaeological Monuments

The site includes four monuments recorded as part of the archaeological survey of Ireland database. The wider environs has been richly settled over the years as seen in the density of monuments and the quantity and quality of monuments recorded during excavation as part of the M9 motorway these are detailed below (all details from archaeology.ie).

Within the study area;

CW012-026----
Class: Enclosure
Townland: GARYHUNDON
Description: The following description is derived from the published 'Archaeological Inventory of County Carlow' (Dublin: Stationery Office, 1993). In certain instances the entries have been revised and updated in the light of recent research. This site has been removed as part of quarrying works.

CW012-027----
Class: Enclosure
Townland: GARYHUNDON
This site has been removed as part of quarrying works.

CW012-101----
Class: Enclosure
Townland: CLONMELSH
Description: Aerial photograph (GB89.O.42) shows cropmark of a D-shaped enclosure with entrance facing SE, with an attached incomplete curvilinear enclosure; both enclosures defined by a fosse. Quarrying has removed all remains of this site.

CW012-136----
Class: Enclosure
Townland: GARYHUNDON
Description: Aerial photograph (GB90.AV.21, 30 May 1990) shows cropmark of a curvilinear enclosure defined by a fosse. No surface trace of this monument is visible.

Sites in the environs of the study area;

CW012-024002-
Class: Font
Townland: CLONMELSH
Description: Reference in the Journal of Association for the Preservation of the Memorials of the Dead, Ireland' (1901, 7-8) about an 'old font' with an inscription on it which was found in the churchyard at Clonmelsh (CW012-024001-) and placed inside the church. Church completely overgrown when inspected by ASI in 1988 and it was not possible to ascertain if this was still present.

CW012-024003-
Class: Graveyard
Townland: CLONMELSH
Description: Rectangular graveyard (map dims. c. 30m N-S; c. 28m E-W) with a church (CW012-024001-) aligned E-W along the northern boundary of the graveyard.

CW012-183----
Class: Ring-ditch
Townland: CLONMELSH
Description: Aerial photograph (GB95.FR.31) shows cropmark of a ring-ditch.

CW012-185----
Class: Ring-ditch
Townland: CLONMELSH
Description: Aerial photograph (GB95.FR.31) shows cropmark of a ring-ditch.

CW012-202----
Class: Ring-ditch
Townland: POWERSTOWN
Description: Aerial photograph (GB96.FX.19) shows cropmark of a ring-ditch.

CW012-093----
Class: Enclosure
Townland: POWERSTOWN
Description: Aerial photographs (GB89.O.34 and GB89.S.06) shows cropmark of a rectilinear enclosure (with entrance facing east) defined by a fosse. A short internal fosse is attached to outer fosse (Barrett 1989).

CW012-194----
Class: Ring-ditch
Townland: CLONMELSH
Description: Aerial photograph (GB96.GE. 03) shows cropmark of a ring-ditch.

CW012-180----
Class: Ring-ditch
Townland: CLONMELSH
Description: Aerial photograph (GB95.FR.31) shows cropmark of a ring-ditch.

CW012-188----
Class: Ring-ditch
Townland: CLONMELSH
Description: Aerial photograph (GB95.FR.31) shows cropmark of a small ring-ditch; one of a pair located in close proximity (see also CW012-187----).

CW012-126----
Class: Enclosure
Townland: BALLYBANNON
Description: Partially excavated in advance of construction of the N9/N10 Kilcullen-Waterford Road (Excavation Licence number E2612 (a)). A ditch (Excavated portion L 42m; Wth 3.2m, D 1.2m) was uncovered which represented c. one-third of the projected extent of the enclosure. A piece of oak charcoal recovered from the ditch produced a calibrated radiocarbon date of 404-238 BC. A number of pits, postholes and stake-holes were discovered in the interior. (Richardson, Á. 2009, 44; Breen G, Kozlowska D and Clark L. 2009, 6-7)

CW012-101----
Class: Enclosure
Townland: CLONMELSH
Description: Aerial photograph (GB89.O.42) shows cropmark of a D-shaped enclosure with entrance facing SE, with an attached incomplete curvilinear enclosure; both enclosures defined by a fosse.

CW012-125----
Class: Excavation - miscellaneous
Townland: BALLYBANNON
Description: Test excavations in advance of construction of the N9/N10 Kilcullen-Waterford Road uncovered two pits and a number of possible field boundaries/drainage ditches. (Hughs J. 2008, 27). Full excavation (Excavation Licence number E2611) failed to locate the pits. The linear features were of post-medieval date. (O' Connell, T. 2009, 4)

CW012-127----
Class: Excavation - miscellaneous
Townland: BALLYBANNON
Description: Excavated in advance of construction of the N9/N10 Kilcullen-Waterford Road (Excavation Licence number E2612 (b)). A number of post-holes and pits were uncovered. Radiocarbon dates from the Neolithic and Bronze Age were obtained from these. (Richardson, Á. 2009, 44; Breen G, Kozlowska D and Clark L. 2009)

CW012-141----

Class: Excavation - miscellaneous
Townland: BALLYBANNON
Description: Excavated in advance of construction of the N9/N10 Kilcullen-Waterford Road (Excavation Licence number E2613). A large concentration of pits, post-holes and ditches were uncovered. (Richardson Á. 2009, 37)

CW012-012----
Class: Earthwork
Townland: BALLYBANNON
Description: Shown on 1839 'OS 6-inch' map as circular earthwork, probably mound (max. diam. c. 20m). Area has been quarried extensively. No visible surface traces.
Limited excavation as part of the N9/ N10 Kilcullen to Waterford road scheme revealed evidence for two heavily truncated curvilinear ditches (Hughes, J. 2008, 19).

CW012-196001-
Class: Enclosure
Townland: GARYHUNDON
Description: Aerial photograph (GB96.FX.21) shows cropmark of a curvilinear enclosure defined by a fosse and with an entrance facing south-east. Adjacent faint cropmarks suggest an associated field system (CW012-196002-).

CW012-025002-
Class: Cross - High cross
Townland: GARYHUNDON
Description: The following description is derived from the published 'Archaeological Inventory of County Carlow' (Dublin: Stationery Office, 1993). In certain instances the entries have been revised and updated in the light of recent research.

CW012-196001-
Class: Enclosure
Townland: GARYHUNDON
Description: Aerial photograph (GB96.FX.21) shows cropmark of a curvilinear enclosure defined by a fosse and with an entrance facing south-east. Adjacent faint cropmarks suggest an associated field system (CW012-196002-).

CW012-209----
Class: Enclosure
Townland: GARYHUNDON
Description: Aerial photograph (GB20.GP.15) shows cropmarks of two concentric curved fosses, probably defining the northern boundary of a curvilinear enclosure located immediately north of the Ecclesiastical Enclosure surrounding 'Killogan' burial ground (CW012-025001-).

CW012-189----
Class: Ring-ditch
Townland: GARYHUNDON
Description: Aerial photograph (GB95.FR.22) shows cropmark of a ring-ditch; one of two ring-ditches located in close proximity (see also CW012-190----).

CW012-190----
Class: Ring-ditch
Townland: GARYHUNDON
Description: Aerial photograph (GB95.FR.22) shows cropmark of a ring-ditch; one of two ring-ditches located in close proximity (see also CW012-189----).

CW012-135----
Class: Burial
Townland: GARYHUNDON
Description: Human remains of one individual discovered during work at a sandpit in August 1973. (Cahill and Sikora 2011, Vol. 2, 237-8).

The variety of sites show a consistent pattern of settlement from the earliest times. Evidence of additional archaeological remains may be preserved below the ground level. Houses constructed in prehistoric times and up to the 11th century AD were generally made of wood once this decayed the remains can only be detected through archaeological excavation. Similarly, burial sites may not have any surface markers and remain undetected below the surface. Ground disturbance may uncover buried archaeological sites, features or artefacts.

Figure 11.2 **Extract from the RMP for the development with the existing quarry visible**

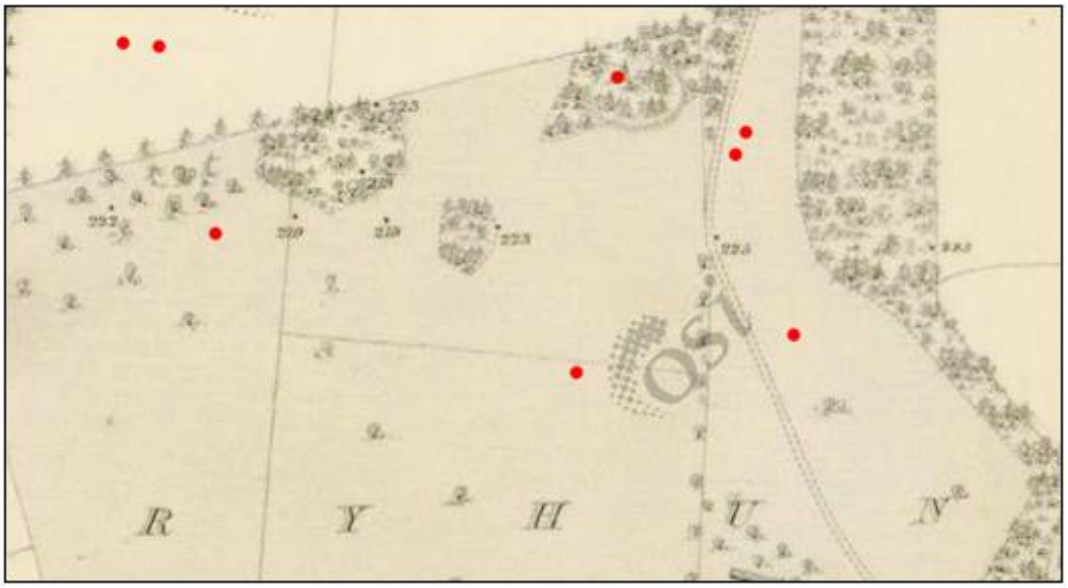


Figure 11.3 **First edition OS map extract for the site with the enclosures marked**

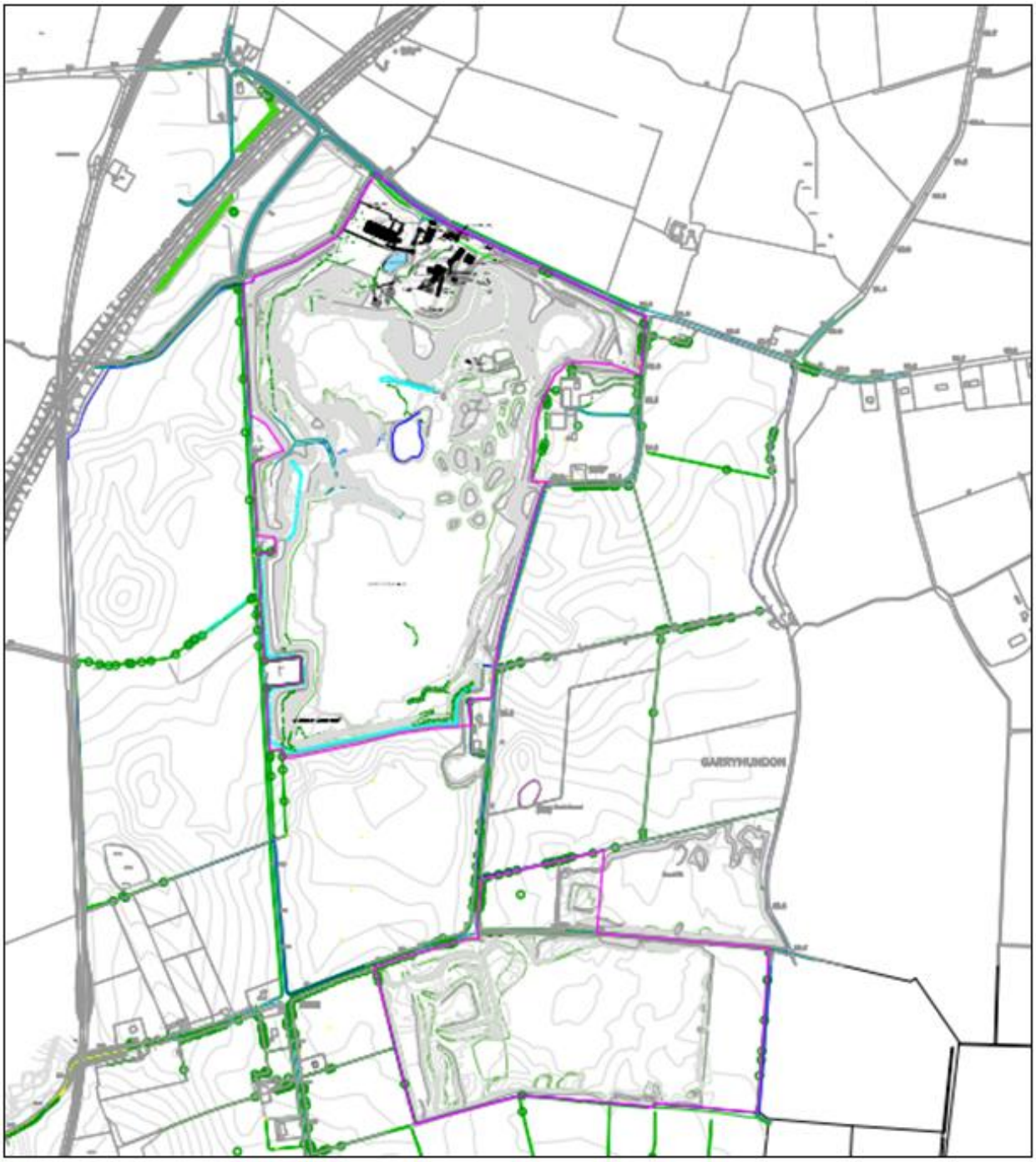


Figure 11.4 Current layout of the rEIAR lands

11.5 Impact on the Cultural Heritage Landscape

11.5.1 Recorded Monuments

Field walking undertaken in August 2017, has shown that the proposed development includes very little original ground, all but one field at the southeast has been excavated and heavily truncated.

A number of archaeological monuments are located within the boundary of the site at the south and southeast in the townland of Garyhundon and Clonmelsh. Excavated has taken place at the location of three of the monuments, material

has been removed to sterile subsoil and no archaeological remains exist (CW012 026, CW 012 027 and CW 012 101). No remains of these sites are visible and no artefacts or material was visible at the site.

The site of an enclosure (RMP CW 012 136) was identified as part of an aerial survey in 1990. This consisted of a curving ditch. The site of this potential feature remains unexcavated and no surface remains were visible. This has not been damaged as part of the quarrying and the site is in use for agricultural purposes. No remains were visible in the exposed baulks in the area of this site.

No other archaeological monument exists within the excavated area.

11.5.2 Previous Archaeological Works

No excavation works or records of archaeological monitoring remains for the study area. An archaeological assessment as part of an EIS was undertaken in 2007 (undertaken by Dr. Charles Mount). At this stage of the enclosures recorded within the study area had been removed.

Extensive archaeological excavations were undertaken as part of the M9 moterway to the north and west of the site. These sites included prehistoric burial grounds, a number of enclosures and fulachta fiadh.

11.5.3 Cartographic and Ariel Photographic Evidence

The first edition OS map, the 25" maps or the aerial photographs do not include any unrecorded archaeological finds, features or anomalies that could be interpreted as features within the study area. The two enclosures at the southeast of the site are clearly visible (Figure 4). The current OS map includes the extent of the quarry and its relationship to the recorded archaeological monuments.

11.5.4 Field Walking

Field walking was undertaken in August 2017 to access the impact of excavation works at the quarry on the archaeological landscape (Plates 1-6). The field work identified the location of the four archaeological monuments and confirmed that the area of three of them has been fully excavated and no archaeological remains exist. The location of the remaining enclosure in Garyhundon remains unexcavated and is in use as agricultural land. The remainder of the quarry was assessed and there was no evidence of any further archaeological remains disturbed by previous quarrying activity.

11.5.5 Architectural Heritage

Only one structure listed in the National Inventory of Architectural Heritage exists within the study area. This lies to the southeast of the quarry and has not be directly impacted on by the works to date.

11.6 Conclusion

This report was undertaken to assess the impact of quarrying to date on the cultural heritage landscape at Clonmelsh and Garyhundon, Co. Carlow. The study area lies within the boundaries of a pre-existing quarry. The study area has been heavily excavated. The majority of the site has been truncated and almost all original ground has been removed. The study area originally contained four archaeological monuments, all enclosures. These were visible on the OS maps and aerial

photographs for the area. The location of three enclosures has been fully excavated and no remains exist (RMP CW 012 026, 027 and 101). The remaining enclosure is located with agricultural land. Although it is not visible at ground level sub surface remains are likely to exist (RMP CW 012 136).

Field walking did not identify any archaeological remains across the site. All excavated areas, baulks and topsoil was assessed for deposits, artefacts or architectural fragments. None were visible.

The site has not impacted on any structures listed in the National Inventory of Architectural Heritage.

12.0 LANDSCAPE & VISUAL IMPACT ASSESSMENT

12.1 Introduction

This Landscape and Visual Impact Assessment (LVIA) has been prepared by Chartered Landscape Architects at Stephenson Halliday Ltd on behalf of Dan Morrissey Ireland Ltd (in receivership) ('DMIL') to support the Remedial Environment Impact Assessment at Clonmelsh and Garyhundon quarry ('the Site').

12.1.1 Assessment Format

The LVIA is organised in the following sections:

- Introduction;
- Scope of the Assessment;
- Methodology and Significance Criteria – an outline of the general methodology employed in the LVIA;
- Landscape Planning Policy - an outline of the local planning policies which are relevant to the LVIA;
- Current Landscape & Visual Receptors – a description of key landscape and visual receptors which may have been significantly impacted by the works;
- The Works - a description of the quarry operations at the Clonmelsh and Garyhundon quarries which could have the resulted in significant landscape or visual effects upon receptors within the study area. A description of the proposed concept final restoration plan is also provided;
- Landscape effects – assessment of any significant effects arising as a result of the quarry operations upon landscape fabric, landscape character, protected views and prospects and scenic routes;
- Visual effects - assessment of the any significant effects arising as a result of the quarry operations upon the visual amenity of the receptors within the study area; and
- Summary and conclusions.

This chapter should be read in conjunction with figures L1 – L7.

The following supporting information is contained within the Appendices:

Appendix A: LVIA Methodology;

Appendix B: Host Landscape Character Sensitivity Assessment;

12.2 Scope of the Assessment

Although linked, landscape and visual effects are identified and considered separately. Landscape effects derive from changes in the landscape fabric, which may result in changes to character, whereas visual effects are the effect of these changes as experienced by people (visual receptors).

12.2.1 Study Area

The assessment adopts a 5km study area around the site, but also considers the potential for more distant receptors, if necessary.

The assessment considers the potential effects upon:

Landscape fabric and landscape character;

Views and Prospects and Scenic Routes designated within the Carlow County Landscape Character Assessment and Schedule of Protected Views;

Visual receptors including residential, transport and recreational receptors.

12.2.2 Assessment Baseline

The assessment baseline is the Site in 1990. Documentation to support a review of the Site in 1990 comprises a survey from 1990 and OS aerial photography dated 1995 (the closest available date) as illustrated on Figure L6.

The assessment considers:

Operational effects: the landscape and visual effects which have arisen as a result of the operational works between the 1990 baseline and 2017; and

Residual effects (post-restoration): the residual effects which would occur following mitigation which assumes the existing Site is restored. In the absence of an approved restoration plan, a concept restoration plan has been provided at Figure L1 – L3. The mitigation provided by the concept restoration plan is assessed against the 1990 baseline.

12.3 Methodology and Significance Criteria

12.3.1 Methodology

Landscape effects derive from changes in the physical landscape elements which may give rise to changes in its distinctive character and how this is experienced, including consideration of aesthetic and perceptual aspects.

Visual effects relate to changes that arise in the composition of available views as a result of changes to the landscape, to people's responses to the changes and to the overall effects with respect to visual amenity.

The methodology forming the basis for this assessment is set out within Appendix A and summarised below. The criteria used for the assessment and definitions of the terms used form an essential part of this chapter.

The assessment of the landscape and visual effects has been carried out in accordance with the following best practice guidance:

Guidelines for Landscape and Visual Impact Assessment, (Third Edition), published jointly by the Landscape Institute and the Institute of Environmental Assessment (2013).

Advice Notes on Current Practice (in the preparation of Environmental Impact Statements) (EPA, 2003);

Landscape and Landscape Assessment (Department of the Environment, June 2000);

Landscape Character Assessment (The Countryside Agency and Scottish Natural Heritage, 2002):

County Carlow Development Plan 2015 - 2021; and

Landscape Institute Advice Note 01/09 – Use of photography and photomontage in landscape and visual assessment

"Landscape and Visual Impact Assessment is a tool used to identify and assess the significance of and the effects of change resulting from development on both the landscape as an environmental resource in its own right and people's views and visual amenity." (GLVIA3, paragraph 1.1). Wherever possible, identified effects are quantified, but the nature of landscape and visual assessment requires interpretation by professional judgement. In order to provide a level of consistency to the assessment, the prediction of magnitude and assessment of significance of the residual landscape and visual effects have been based on pre-defined criteria.

The Guidelines for Landscape and Visual Assessment (Third Edition) (GLVIA3) states that "*professional judgement is a very important part of the LVIA*" (paragraph 2.23) and that "in all cases there is a need for the judgements that are made to be

reasonable and based on clear and transparent methods so that the reasoning applied at different stages can be traced and examined by others." (paragraph 2.24).

12.3.2 Significance Criteria

The following information sets out the correlation between magnitude and sensitivity to determine the significance of potential effects.

The significance of any identified landscape or visual effect has been assessed in terms of major, moderate, minor or negligible (refer to Appendix A and Table 12.1 below). Intermediate correlations are also possible and depend upon professional judgement, i.e. major/moderate.

Landscape / Visual Sensitivity	Magnitude of Change			
	Substantial	Moderate	Slight	Negligible
High	Major *	Major/ Moderate*	Moderate	Minor
Medium	Major/ Moderate*	Moderate	Moderate/ Minor	Minor/ Negligible
Low	Moderate	Moderate/ Minor	Minor	Negligible

Table 12.1 Significance of predicted effects (*Indicates Significant Effects)

These categories are based on the juxtaposition of viewpoint or landscape sensitivity with the predicted magnitude of change. This juxtaposition is not used as a prescriptive tool, rather it allows for the exercise of professional judgement. Thus in some instances a particular parameter may be considered as having a determining effect on the analysis. Where the landscape effect has been classified as major or major/moderate this is considered to be equivalent to likely significant effect. Where moderate effects are predicted, professional judgement will be applied to ensure that the potential for significant effects arising has been thoroughly considered.

12.4 Landscape Planning Policy

The County Carlow Development Plan 2015 – 2021 provides the following policy which is relevant to the LVIA:

Heritage Policy 1

- *It is the policy of Carlow County Council to (inter alia):*
  - *Protect, manage and enhance the natural heritage, biodiversity, landscape and environment of County Carlow in recognition of its importance as a non-renewable resource, unique identifier and character of the county and as a natural resource asset*
  - *Protect designated Views, Prospects and Scenic Routes in the county as appropriate*

The designated Views, Prospects and Scenic Routes within the study area include:

- Protected View: 26, 27, 28, 29, 30 and 33;
- Scenic Routes 5 and 9

12.5 Current Landscape & Visual Receptors

With reference to Figures L1 – L6, this section describes current landscape character and visual receptors within the study area which could have been impacted by the works.

12.5.1 Landscape Character

The character of the local landscape has been assessed in the Carlow County Landscape Character Assessment and Schedule of Protected Views (2015).

The Site is located within the Central Lowlands principal landscape character area ('LCA') and the Farmed Lowland landscape type ('LT').

The key characteristics of the Central Lowlands LCA are:

- 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.

Key issues are identified as:

- 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.

Recommendations for landscape management are:

- 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 landscape character assessment also provides generic capacity and sensitivity guidance, however this does not take the place of site specific sensitivity assessment which is a necessary part of any LVIA (the site specific sensitivity assessment for the Site is set out in Appendix B).

For the Central Lowlands LCA the generic capacity and sensitivity guidance states (inter alia):

'The Central Lowlands character area is deemed to be moderately sensitive to development. It has capacity to absorb most types of development subject to the implementation of appropriate mitigation measures.'

The strategic policy within the landscape character assessment states, with reference to extractive industries:

'Applications for quarrying should be accompanied by a detailed landscape plan setting out mitigation measures with particular reference to land grading and screen planting.'

12.5.2 Visual Receptors

Visual receptors within the study area which may have experienced a significant effect include:

- Residents at dwellings within close proximity to the Site;
- Road users on the L3044, Ballybar Upper Road and minor roads passing the site (the M9 is also considered although it was not present at the 1990 baseline); and
- Recreational walkers on the Barrow Way.

12.6 The Works

The works which have occurred on the Sites and resulted in landscape and visual effects assessed as part of this LVIA are set out below with reference to the annotations on Figure L6:

- An extension of the void for mineral extraction operations, primarily southwards into medium sized fields (see annotations A and B) and also westwards into previously disturbed ground (see annotation C), including the relocation of processing and stockpiling operations within the void over time as the operations have progressed;
- The creation of overburden mounds primarily along the western Site boundary (see annotations D);
- The early establishment of naturally regenerating vegetation in the north eastern corner of the site (see annotation E)
- An extension of the worked ground to the east at Garyhundon

The operational effects are considered to be partially reversible due to the concept restoration proposal.

To provide mitigation for any significant adverse effects which have occurred since the 1990 baseline, a concept restoration plan has been provided (there is no existing approved restoration plan). The concept restoration plan assumes the existing site is restored, and it comprises:

Clonmelsh Quarry:

- The removal of all plant and machinery from the site;
- The creation of a large water body comprising the majority of the site, to the 48m AOD level, with marginal aquatic species;
- Regrading of the landscape profile and disturbed ground where required to create calcareous grassland habitat with intermittent areas of bare rock habitat;
- Planting of new native tree and shrub vegetation along the site boundaries; and
- Areas which are already naturally regenerating would be left undisturbed where possible to allow the naturally

occurring regeneration to continue

Garyhundon Quarry:

- Regrading of the landscape profile and disturbed ground at Garyhundon to restore the site to agricultural grassland
- Planting of new native hedgerows with hedgerow trees as part of the restoration of historic field boundaries; and
- Planting of new native woodland.

12.7 Landscape effects

This section examines the landscape effects arising as a result of the works with reference to:

The potential effects on landscape fabric within the site; and

The potential effects on landscape character, including consideration of any effects upon protected views, prospects and scenic routes.

The sensitivity of the local landscape combines judgements of susceptibility to the potential change brought about by the works and the value attached to the landscape.

12.7.1 Potential Effects on Landscape Fabric

12.7.1.1 Operational Effect on Landscape Fabric

The operational effects of the works upon landscape fabric are considered in the context of their duration, extent and the sensitivity of the landscape.

In line with guidance within the 'Guidelines on the information to be contained in Environmental Impact Statements' (EPA 2002), the duration of effects is considered to be long term (>15 years).

The sensitivity of the landscape to this proposal is considered to be medium, as assessed within Appendix B.

Clonmelsh

The Clonmelsh working void has extended to the south and west, increasing the areas of disturbed ground within the Site and resulting in the loss of agricultural land. The changes to landscape fabric comprise:

- Approximately 1,400m of hedgerow loss;
- Approximately 20.7 ha loss of agricultural land;
- Approximately 20.7 ha increase in disturbed ground

There has been a small degree of natural shrub regeneration around the north east corner of the Site which has mitigated a small amount of hedgerow loss. The overburden mounds along the western site boundary have also begun to regenerate with grassland and some shrub and young trees on the west facing slopes.

Garyhundon

The Garyhundon working void has extended slightly to the west, increasing the areas of disturbed ground within the Site and resulting in the loss of part of an agricultural field. Much of the Garyhundon site has naturally regenerated with scrub vegetation. The changes to landscape fabric comprise:

- Approximately 2.7 ha loss of agricultural land;
- Approximately 2.7 ha increase in disturbed ground;

- The continued natural regeneration of 13.2 ha of previously disturbed ground

As a result these long term, but partially reversible operational effects upon landscape fabric are considered to be of slight magnitude and moderate/minor significance (not significant).

12.7.1.2 Residual Effect on Landscape Fabric

Clonmelsh

The concept restoration plan proposes the removal of all plant and buildings within the Site. It proposes a large waterbody to the 48m AOD level on the Clonmelsh site. The remaining parts of the site would be restored to calcareous grassland habitat with some exposed bare rock retained to increase the habitat and biodiversity value of the site. Naturally regenerating areas would be left to continue establishing, and additional native tree and shrub planting would be planted along the site boundaries.

The proposed additions to the landscape would comprise approxiately:

- 32.4 ha of waterbody;
- 10 ha of calcareous grassland; and
- 6.9 ha of proposed tree and shrub planting

The shrub and tree planting would mitigate for the field boundary hedgerows lost since the 1990 baseline.

The calcareous grassland would provide minor degree of mitigation of the lost agricultural land, but would also provide biodiversity benefits.

Garyhundon

The Garyhundon site would be regraded and restored back to agricultural grassland. A new hedgerow would be planted along an historic field boundary, and an area of woodland planting would be created at the eastern edge of the site. The proposed additions to the landscape would comprise approximately:

- 20.2 ha of agricultural grassland;
- 3.4 ha of proposed woodland planting; and
- 300m of new hedgerow

Whilst the concept restoration scheme would not fully restore the grain of field patterns within the landscape, it would comply with the landscape guidelines within the landscape character assessment in that it would use native and indigenous species.

Overall, the concept restoration scheme would mitigate the effects arising from the works since the 1990 baseline.

12.7.2 Effects on Landscape Character

12.7.2.1 Central Lowlands LCA

The site is located within the Central Lowlands LCA as illustrated on Figure L5 The sensitivity of this area of the Central Lowlands LCA is considered to be of medium overall, as assessed in detail in Appendix B.

Influence of the quarry in 1990

The influence of the quarry upon landscape character at the baseline date of 1990 was limited to the landscape within close proximity to the site.

To the north of the Clonmelsh site, the buildings and plant were clearly visible detracting features within the landscape. Limited parts of the northern extraction void would have been visible beyond the buildings and plant, and the movements of plant and machinery in the north western corner of the site would also have been visible.

Within close proximity of Clonmelsh to the east, visibility was limited by hedgerows across the landscape. From rising ground at greater distance both the Clonmelsh and Garyhundon working voids would have been visible as would some of the plant and stockpiling operations. However, they would have formed minor components of wide panoramic, long distance views.

From the south, visibility of the quarries would have been largely restricted by hedgerows and trees across the landscape.

From the west, the plant and working void at Clonmelsh would have been visible from close proximity, however from 2008 the M9 embankment screened views of the all of the quarry except the top of the plant. From rising ground further west views into both the Clonmelsh and Garyhundon working voids and towards the plant remained, although they would have formed minor components of long distance views.

Overall, the influence of the quarries upon landscape character in 1990 was limited to areas to the north and west within close proximity of the site. From rising ground at greater distance to the east and west, whilst visible the quarry formed a small component of the view and did not exert any significant influence upon landscape character.

Effects of the works on landscape character

From the north there has been limited change; the plant and part of the Clonmelsh working void beyond are still visib le and exert an influence upon landscape character within close proximity. However, there has been a slight reduction in the visibility of the working site as the creation of the overburden mound along the site boundary has screened from view the plant, product stockpiling and machinery area in the north western corner of the Clonmelsh site. This mound is naturally regenerating with scrub vegetation. This slight reduction in visibility of the working site has resulted in a beneficial change of slight magnitude.

From the east, within close proximity of both sites the works have had very little effect due to the screening of existing vegetation. From higher ground further east the southerly extension of the Clonmelsh working void, and the slight extension to the Garyhundon void are visible, however they form minor components within long distance open panoramic views across the landscape as illustrated by Viewpoint 3. The magnitude of change in these areas is slight/negligible adverse.

To the south the works on both sites have had very little effect due to the screening of existing vegetation.

To the west, the construction of the M9 embankment has removed visibility of the works from much of the local landscape with the exception of rising ground further west. From these more distant and elevated locations the southerly extension of the Clonmelsh working void, and the slight extension to the Garyhundon void are visible, however they form minor components within long distance views across the landscape as illustrated by Viewpoint 7. The magnitude of change in these areas is slight adverse.

Around the southern part of the Site at Garyhundon, whilst the extraction void has extended slightly to the west, the majority of this part of the Site has naturally regenerated with scrub vegetation, which has resulted in this area being better integrated into the landscape. The magnitude of change in this area is slight beneficial.

Overall, due to the limited visibility of the works across the landscape and the small extent of the Central Lowlands LCA which has been affected, the magnitude of change has been slight and the effect moderate/minor and not significant.

Post Restoration Effects

Assuming the existing site is restored in line with the proposed restoration plan (see Figures L1-3), the limited landscape effects which have arisen as a result of the works would be mitigated.

The continued natural vegetation regeneration combined with proposed planting around the boundaries of the Clonmelsh

Site would provide effective screening of the waterbody from most parts of the surrounding landscape. When visible in glimpsed views or elevated distant views, the waterbody, whilst a new feature within the landscape, would provide a more natural landscape element than the existing void. Compared to the 1990 baseline it would represent a change from the agricultural fields, however it would comprise a limited component of the view and would exert limited influence upon landscape character.

The removal of the plant and buildings from the northern part of the site would remove a prominent detracting feature from the landscape.

The regrading of the southern part of the site at Garyhundon combined with hedgerow and woodland planting and the establishment of agricultural grassland would fully assimilate this part of the Site into the surrounding landscape and primarily return the site to the pre-developed landscape afteruse.

Overall the mitigation provided by the proposed restoration plan would mitigate the effects of the works upon landscape character.

12.7.2.2 Killeshin Hills

The Killeshin Hills LCA is located to the west of the Site as illustrated on Figure L5, and is considered to be medium sensitivity to the works.

Whist this LCA is located within approximately 0.5km of the Site at its closest point, the majority of the LCA is located to the west of the M9, along the River Barrow valley and then on rising ground to the west at greater distance from the Site.

The screening provided by the M9 embankment, the topography of the river valley, intervening vegetation across the landscape and the distance of the Site from the rising ground further west all limit the visibility of the Site from the majority of this LCA. There is visibility of the works from the very small part of the LCA which is east of the M9 and in close proximity to the Site, however this represents a very limited geographic extent of this LCA. Consequently the magnitude of change upon the character of the Killeshin Hills LCA is negligible.

12.7.2.3 Protected Views and Prospects

The closest protected views are 27 to the south east of Nurney and 33 west of the River Barrow.

Protected view 27 is focussed to the south. In northerly views the Site is screened by tree and hedgerows cover across the landscape. The works have not had any effect upon this viewpoint.

Protected view 33 is focussed on the River Barrow. It is located within the valley of the River Barrow in mature tree cover from where no visibility of the Site is possible. The works have not had any effect upon this viewpoint.

From other protected views within the study area visibility of the site is limited by distance, the screening effect of intervening tree cover across the landscape and topography. The works have not had any adverse effect upon any of the protected views within the study area.

12.7.2.4 Scenic Routes

The closest scenic route to the Site is scenic route 5, running on a north-south alignment along higher ground to the east of the Site.

As illustrated by Viewpoint 3, whilst the southerly extension of the Clonmelsh working void, and the slight extension to the Garyhundon void are just noticeable, they form minor components within long distance views across the landscape. Given their very limited influence the works have not had any detrimental impact upon this scenic view.

12.8 Visual effects

This section considers the extent of potential visibility with the sensitivity of each receptor and the resulting visual effect from changes in views that have occurred as a result of the works, and any mitigation provided by the proposed restoration plan.

12.8.1 Residents

For the purposes of this assessment, unless stated otherwise residential receptors in the study area are considered to be of high sensitivity. This is as a result of their high susceptibility and high value of their views in this rural area. The closest dwellings are identified in the dwelling annotations on Figure L6.

1: along the western Site boundary
At the 1990 baseline these dwellings had vegetation around their eastern boundaries largely screening visibility of the site. Glimpsed and filtered views through the vegetation across a field towards the Clonmelsh working void would have been possible.

This garden boundary vegetation still exists. The overburden mound along the western Site boundary is just visible through the vegetation. Whilst the overburden mound screens views into the working void it also prevents longer distance views which did exist. On balance, the benefit of screening the previously visible working void is countered by the adverse impact of screening longer distance views, and the effects is considered negligible.

The mitigation provided by the proposed restoration plan would retain the views as they are now, and the overburden mound would become increasingly vegetated as it naturally regenerates.

2: on the western Site boundary
This house had open views across agricultural fields at the 1990 baseline.

The southerly extension of the Clonmelsh working void has introduced extensive areas of disturbed ground into the view, resulting in a substantial/moderate magnitude of change and major-major/moderate significant effects.

The mitigation provided by the proposed restoration plan would mitigate the presence of disturbed ground by introducing the waterbody, grassland habitat and tree planting around the site boundary. Whilst the baseline scenario of agricultural land would not be restored, these features would reduce the adverse change arising from the works to a slight magnitude and moderate effects would continue, which would not be significant.

3: on the western Site boundary
These bungalows are unoccupied and owned by the quarry operator. If they are brought back into use in the future they would be occupied by quarry workers.

From these bungalows, set at lower level than the road, easterly views across the agricultural land would have been largely screened by garden boundary vegetation and the hedgerow along the L3044, although some longer distance views to higher ground beyond the hedgerow may have been possible.

The works have introduced a large overburden mound along the Clonmelsh site boundary which is a new feature in the view, and may have resulted in a degree of screening of longer distance views to higher ground.

The magnitude of change for any resident living here is slight and the effect moderate, which is not significant.

The mitigation provided by the proposed restoration plan would retain the views as they are now, and the overburden mound would become increasingly vegetated as it naturally regenerates. The moderate non-significant effect would therefore continue.

4: on the western Site boundary

This bungalow had open easterly views across the landscape over their garden hedge at the 1990 baseline. As a result of the works these easterly views have been curtailed by the overburden mound along the western Site boundary. Whilst the working void is not visible the loss of views has resulted in a moderate adverse magnitude of change and major/moderate significant effects for any receptors at this dwelling.

The mitigation provided by the proposed restoration plan would retain the views as they are now, however the overburden mound would become increasingly vegetated as it naturally regenerates, better assimilating it into the landscape. The magnitude of change would reduce to slight and the effect moderate effect which would not be significant.

5: previous quarry managers dwelling

This dwelling previously overlooked the Clonmelsh working void at close proximity at the 1990 baseline. Southerly views were largely screened by tree cover and large agricultural buildings south of the dwelling. In 2017 the working void has extended to the south, however due to the limited visibility to the south, the magnitude of change has been negligible. Parts of the 1990 void are now occupied by stockpiles which are naturally regenerating. Overall, the magnitude of change for residents at this dwelling has been slight/negligible, resulting in a moderate/minor effect (not significant).

The mitigation provided by the proposed restoration plan would introduce a large waterbody in westerly views from this dwelling. This would provide a more natural outlook than the working void, mitigating the effects of the works.

6: east of Garyhundon

At the 1990 baseline westerly views from this dwelling were largely screened by mature tree planting west of the dwelling. Some glimpsed views across an open field towards the Garyhundon working void beyond may have been possible. In 2017 the nature of this view remains essentially the same, however the working void has come slightly closer to the dwelling. Overall the composition and character of the view has remained, and the magnitude of change has been negligible.

The mitigation provided by the proposed restoration plan would restore the working void back to agricultural grassland and introduce woodland planting west of the dwelling, fully mitigating the effects of the works.

12.8.2 Other dwellings and settlement

From other dwellings and settlement within the study area, visibility of the works is limited by hedgerow and tree cover across the landscape, and also distance, as illustrated by Viewpoints 2, 4, 5, 6, 7, 8 and 9. No significant effects have occurred as a result of the works from other settlement within the study area.

12.8.3 Recreational Receptors

Barrow Way

The Barrow Way follows the River Barrow, which runs on a north-south alignment through the study area to the west of the site.

Views from the Barrow Way towards the Site are restricted by tree cover along the river and across the wider landscape. No effects have occurred as a result of the works for users of the Barrow Way.

12.8.4 Road Users

Road users within the study area are considered to be of medium sensitivity, as a result of their medium/low susceptibility and medium value of views.

L3044

The L3044 runs along the western boundary of the Site. The road had a hedgerow with hedgerow trees along its eastern verge at the 1990 baseline which would have heavily filtered views towards the site. However, some glimpsed views into the Clonmelsh site and towards the working void and existing exposed overburden were likely to have been possible. The overburden mound which was present at the 1990 baseline would have appeared bare and exposed, with little natural regeneration present.

In 2017 the roadside hedgerow is still present which limits views towards the Site. The limited filtered views towards the site have been screened by the larger overburden which has been created as part of the works, and is now natural regenerating.

The magnitude of change for road users is slight and the effect moderate/minor as the road passes directly past the site. From greater distance views from the road towards the Site are screened by hedgerow and tree cover across the landscape.

The mitigation provided by the proposed restoration plan would remove the plant and buildings from the north of the site. However, most views of the site from the road retain the views as they are now, and the overburden mound would become increasingly vegetated as it naturally regenerates. The moderate/minor effect would therefore continue.

Ballybar Upper Road

Ballybar Upper Road runs along the northern boundary of the Site.

At the 1990 baseline the Clonmelsh site was clearly visible as the road passed to the north, with the plant and buildings being prominent visual detractors. Limited parts of the northern extraction void would have been visible beyond the buildings and plant, and the movements of plant and machinery in the north western corner of the site would also have been visible.

The works that have occurred since the baseline in 1990 are largely screened from view. The plant and buildings are still visible. However, there has been a slight reduction in the visibility of the Clonmelsh working site as the creation of the overburden mound along the north western site boundary has screened from view the area of plant and machinery in the north western corner of the site. This berm is naturally regenerating with scrub vegetation. This slight reduction in visibility of the working site, whilst beneficial, is only experienced for a very short duration of the road and so the overall magnitude of change is negligible.

The mitigation provided by the proposed restoration plan would remove all plant and buildings and establish tree planting along the northern Site boundary. Whilst no adverse effects have arisen for users of this road, this would provide an improvement from the 1990 baseline scenario.

Minor road east of the site

This minor road runs along the eastern site boundary between Ballybar Upper Road and the L3044. At the 1990 baseline views into the Clonmelsh site were limited to the most northerly short section north of the (then) quarry managers property. Some views into the working void across intervening fields south of the quarry managers property were likely to also have been possible. Views into the Garyhundon site were limited by a roadside hedgerow, with only a momentary glimpse into the site possible at the site entrance.

In 2017 due to the southerly extension of the Clonmelsh main working void, some open westerly views are possible into the void, seen at close proximity. An overburden mound along part of the eastern boundary screens views towards the working void that would have been possible in 1990.

Views into the Garyhundon site remain limited by the roadside hedgerow, with only a momentary glimpse into the site possible at the site entrance form where the natural regeneration of the site is visible for a very short duration.

Overall due to the increase working activity visible on the Clonmelsh site, the magnitude of change for road users on this minor road is moderate, resulting in moderate effects (not significant).

The mitigation provided by the proposed restoration plan would provide planting along the site boundary, through which some glimpsed and filtered views towards the waterbody would be possible. The reduction in disturbed ground and the introduction of natural features (planting and the waterbody) at Clonmelsh, and the restoration of the Garyhundon site back to agriculture would fully mitigate the effects of the works which have occurred since 1990.

M9

The M9 was not built in 1990. The section near the site was constructed and opened in 2008.

In analysing aerial photography from 2010 (the closest available date to 2008), it is clear most of the southerly extension of the working void had occurred by that point. The slight increase in extraction void between 2010 and 2017 would be barely noticeable for road users travelling at speed along the short section of the M9 which passes the Site. Any effect upon road users on the M9 has been negligible.

12.9 Summary and Conclusions

Since the 1990 baseline the working extraction void at the Clonmelsh site has extended primarily to the south, and the working extraction void at the Garyhundon site has extended slightly to the west.

The loss of agricultural land at both sites is possible to be mitigated should the site be restored in line with the proposed concept restoration plan.

The impact of the works upon landscape character are very limited, due primarily to the screening effects of hedgerows and tree cover across the landscape. A moderate/minor effect would occur within the Central Lowlands LCA in the immediate environs of the Site, which is possible to mitigate should the site be restored in line with the proposed concept restoration plan.

No adverse effects would occur to the Killeshin Hills LCA, or at any of the protected viewpoints, prospects or scenic routes which are designated within the Development Plan.

From two of the closest dwellings which neighbour the site, the works since the baseline have resulted in significant visual effects. However it would be possible to mitigate these significant effects to a non-significant level should the site be restored in line with the proposed concept restoration plan.

No significant effects would occur from any other dwellings or settlement within the study area.

No significant effects would occur from the Barrow Way, or from any of the roads in the study area, including those roads which pass the site.

In summary, the landscape and visual effects of the works which have occurred since the 1990 baseline have been very limited both in degree and geographic extent. The few significant effects which have occurred are able to be mitigated to a non-significant level should the site be restored in line with the proposed restoration plan.

DESCRIPTION OF FINAL RESTORATION

Clonmelsh Quarry

The final restoration of the site would aim to provide nature conservation benefit via establishing a locally enhancing landscape afteruse comprising:

- Calcareous grassland, with areas of bare limestone rock habitat;
- Large waterbody with peripheral ephemeral wetland areas. The waterbodies would be bound by marginal aquatic vegetation established through natural regeneration or bare limestone former working face edges;
- Native tree and shrub vegetation; and
- naturally regenerated areas of native scrub.

Garryhundon Quarry

The final restoration of the site would aim to primarily return the landscape to the pre-developed afteruse comprising agricultural land with former field boundaries also restored. Native woodland is proposed in the vicinity of the eastern parts of the site.

The landscape profile would be to a reduced AOD level as a result of the minerals operations, although the landscape would be acceptable for agricultural afteruse and include a peripheral boundary gradient of a maximium 1:3.

The proposed landscape afteruse would comprise:
Agricultural grassland;

- Non-agricultural grassland within native tree and shrub planting areas; and
- Native tree and shrub vegetation incorporating proposed woodland areas and field boundary hedgerows.

Proposed calcareous grassland with areas of bare rock habitat with likely naturally regenerated native scrub vegetation.
minor re-grading works required to create final landform

Existing hedgerow & tree vegetation retained undisturbed

PROPOSED WATERBODY
48M AOD

CLONMELSH QUARRY

Former quarry working faces retained

Proposed native tree & shrub planting to integrate the restored site with the surrounding landscape

Marginal aquatic vegetation

Existing agricultural field

Proposed agricultural field restored to pre-developed landuse

Existing hedge retained undisturbed

Proposed native tree & shrub planting

GARRYHUNDON QUARRY

Proposed native field boundary hedge row in accordance with the historic field boundaries.

Existing field boundary hedge & trees to be retained

KEY

- Remedial EIA Site Boundaries
- Contours from site survey 2017 and dtm data @2m intervals
- Proposed Garryhundon Concept Final restoration contours @ 2m intervals
- Aerial photography dated 2011
- Existing native tree and shrub vegetation to remain undisturbed
- Existing agricultural grassland to remain undisturbed
- Proposed native tree and shrub vegetation
- Proposed calcareous grassland with intermittent bare areas of limestone habitat
- Proposed native scrub vegetation through natural regeneration
- Proposed water body with marginal aquatic vegetation
- Proposed agricultural land restored back to historic field boundary
- Proposed non-agricultural grassland
- Proposed field boundary post & wire fencing and field access gates
- Proposed native hedgerow

Note:
The final restoration landscape profile for Clonmelsh & Garryhundon Quarries has conceptually been prepared and not incorporated 3D volumetric analysis.

Clonmelsh & Garryhundon Quarries

STEPHENSON HALLIDAY
ENVIRONMENTAL PLANNING · LANDSCAPE ARCHITECTURE

QUARRY DEVELOPMENT PLAN:
Concept Final Restoration Masterplan

FIGURE L1

0 100 200m

NORTH

Date	By	Paper	Scale	QA	Rev
SEP 2017	LD	A3	1:4,000	TC/DF	-

CLN-001K Concept Restoration.dwg

KEY

- Remedial EIA Site Boundaries
- Contours from site survey 2017 and dtm data @2m intervals
- Aerial photography dated 2011
- Existing native tree and shrub vegetation to remain undisturbed
- Proposed native tree and shrub vegetation
- Proposed calcareous grassland with intermittent bare areas of limestone habitat
- Proposed native scrub vegetation through natural regeneration
- Proposed waterbody with marginal aquatic vegetation
- Proposed field boundary post & wire fencing and field access gates

Note:
The final restoration landscape profile for Clonmelsh Quarry has conceptually been prepared and not incorporated 3D volumetric analysis.

Clonmelsh & Garryhundon Quarries

STEPHENSON HALLIDAY
ENVIRONMENTAL PLANNING · LANDSCAPE ARCHITECTURE

QUARRY DEVELOPMENT PLAN:

Concept Final Restoration Clonmelsh Quarry

FIGURE L2

0 100 200m

NORTH

Date	By	Paper	Scale	QA	Rev
SEP 2017	LD	A3	1:4,000	TC/DF	-

CLN-001K Concept Restoration.dwg

Marginal aquatic vegetation

Existing agricultural field

Proposed agricultural field restored to pre-developed landuse

Existing hedge retained undisturbed

Proposed native tree & shrub planting

GARRYHUNDON QUARRY

Proposed native field boundary hedge row in accordance with the historic field boundaries.

Existing field boundary hedge & trees to be retained

KEY

- Remedial EIA Site Boundaries
- Contours from site survey 2017 and dtm data @2m intervals
- Proposed Garryhundon Concept Final restoration contours @ 2m intervals
- Aerial photography dated 2011
- Existing native tree and shrub vegetation to remain undisturbed
- Existing agricultural grassland to remain undisturbed
- Proposed native tree and shrub vegetation
- Proposed calcareous grassland with intermittent bare areas of limestone habitat
- Proposed agricultural land restored back to historic field boundary
- Proposed non-agricultural grassland
- Proposed field boundary post & wire fencing and field access gates
- Proposed native hedgerow

Note:
The final restoration landscape profile for Garryhundon Quarry has conceptually been prepared and not incorporated 3D volumetric analysis.

Clonmelsh & Garryhundon Quarries

STEPHENSON HALLIDAY
ENVIRONMENTAL PLANNING • LANDSCAPE ARCHITECTURE

QUARRY DEVELOPMENT PLAN:

Concept Final Restoration Garryhundon Quarry

FIGURE L3

0 100 200m

NORTH

Date	By	Paper	Scale	QA	Rev
SEP 2017	LD	A3	1:4,000	TC/DF	-

CLN-001K Concept Restoration.dwg

STEPHENSON HALLIDAY
IRELAND
ENVIRONMENTAL AND LANDSCAPE PLANNING

Clonmelsh and Garryhundon Quarries

FIGURE L4

Landscape Context

KEY

- Clonmelsh and Garryhundon site boundaries
- Distance radii from Clonmelsh and Garryhundon site boundaries
- Administrative boundaries
- Viewpoint locations
  1) View from M9 overbridge, north of Clonmelsh
  2) View from L3044, north of Oldtown
  3) View from Scenic Route 5, north of Nurney
  4) View from Ballybar Upper Road
  5) View from R448 at Milford
  6) View from Milford Park
  7) View from Scenic Route 9
  8) View from Church at Nurney
  9) View from M9 overbridge, north of Ballybar Upper

0 1 2km

NORTH

DATE	BY	PAPER	SCALE	QA	REV
SEP 2017	CTG	A3	1:50,000	TC	-

CLN-005bG LVIA Plans A3.indd

STEPHENSON HALLIDAY
IRELAND
ENVIRONMENTAL AND LANDSCAPE PLANNING

Clonmelsh and Garryhundon Quarries

FIGURE L5

Landscape Character Areas with Scenic Routes, Views and Prospects

KEY

- Clonmelsh and Garryhundon site boundaries
- Distance radii from Clonmelsh and Garryhundon site boundaries
- Administrative boundaries
- Viewpoint locations

SCENIC ROUTES, VIEWS AND PROSPECTS

Carlow County Landscape Character Assessment & Schedule of Protected Views July 2015

Scenic views and prospects within 5km radius of Clonmelsh and Garryhundon site boundaries

26) Killyballyhue
27) South of Nurney
28) Newown
29) Leighlinbridge
30) Leighlinbridge
33) Milford

Scenic routes within 5km radius of Clonmelsh and Garryhundon site boundaries

5) Ballyryan
9) Tomard lower

LANDSCAPE CHARACTER AREAS

Carlow County Landscape Character Assessment & Schedule of Protected Views July 2015

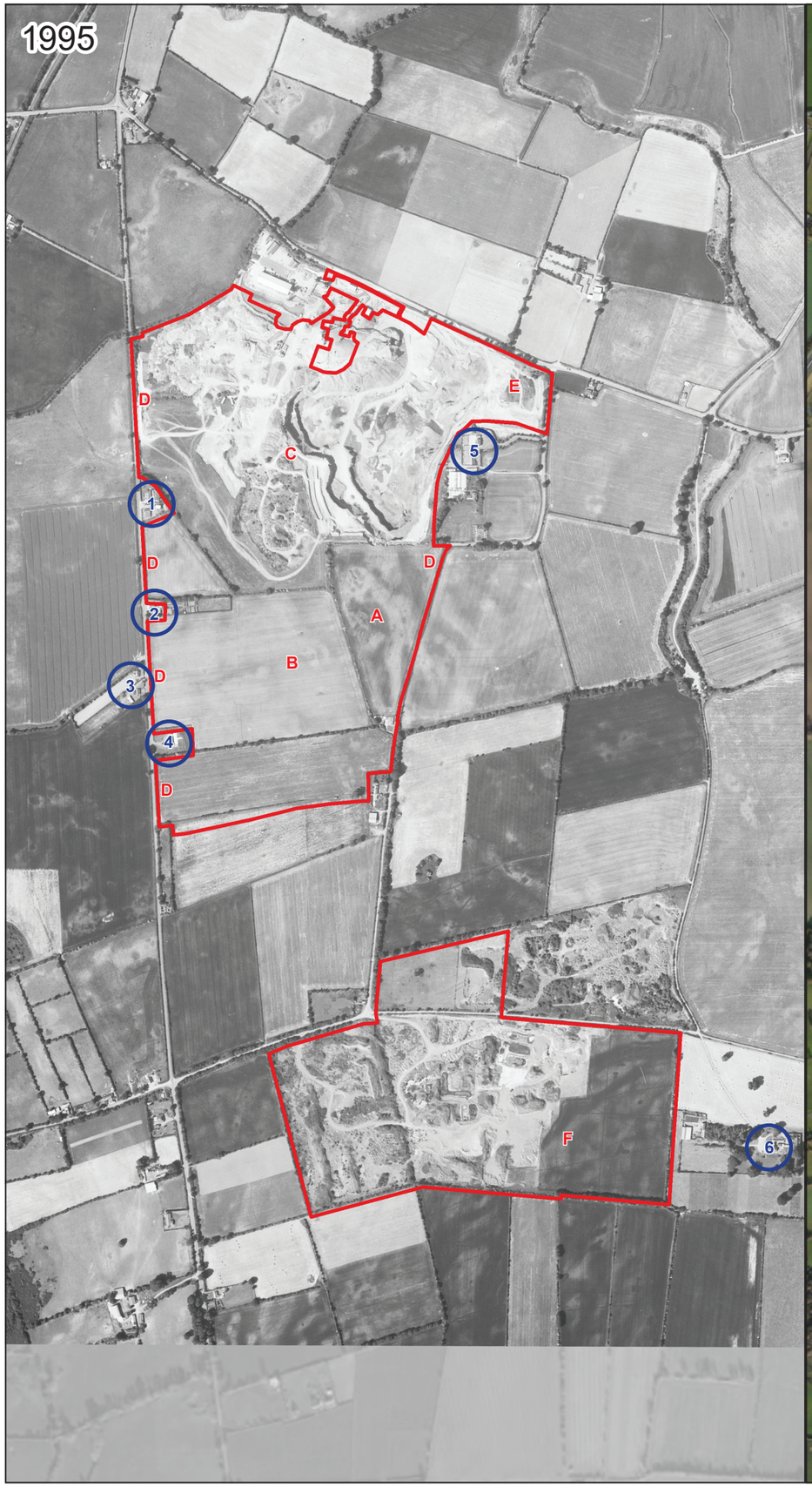
- Central Lowlands
- Killeshin Hills

0 1 2km

NORTH

DATE	BY	PAPER	SCALE	QA	REV
SEP 2017	CTG	A3	1:50,000	TC	-

CLN-005bG LVIA Plans A3.indd



STEPHENSON HALLIDAY
IRELAND
ENVIRONMENTAL AND LANDSCAPE PLANNING

Clonmelsh and Garryhundon Quarries

FIGURE L6

Aerial Photography 1995 & 2011

KEY

- Clonmelsh and Garryhundon site boundaries
- A — Works annotations (Refer to LVIA)
- 1 — Dwelling annotations (Refer to LVIA)

0 100 200 300 400 500m

NORTH

DATE	BY	PAPER	SCALE	QA	REV
SEP 2017	CTG	A3	1:10,000	TC	-

CLN-005bG LVIA Plans A3.indd

PHOTOGRAPH 1: VIEW FROM M9 OVERBRIDGE, NORTH OF CLONMELSH

PHOTOGRAPH 2: VIEW FROM L3044, NORTH OF OLDTOWN

PHOTOGRAPHY NOTES:

Camera:	Canon EOS5D Mk1
Lens:	50mm fixed
Date:	SEP 2017

STEPHENSON HALLIDAY
IRELAND
ENVIRONMENTAL AND LANDSCAPE PLANNING

Clonmelsh and Garryhundon Quarries			**FIGURE L7A** Site Photographs	
Date: SEP 2017	By: CTG	Ckd: TC	Paper Size: A3	Rev : -

PHOTOGRAPH 3: VIEW FROM SCENIC ROUTE 5, NORTH OF NURNEY

PHOTOGRAPH 4: VIEW FROM BALLYBAR UPPER ROAD

PHOTOGRAPHY NOTES:

Camera:	Canon EOS5D Mk1
Lens:	50mm fixed
Date:	SEP 2017

STEPHENSON HALLIDAY
IRELAND
ENVIRONMENTAL AND LANDSCAPE PLANNING

Clonmelsh and Garryhundon Quarries			**FIGURE L7B** Site Photographs	
Date: SEP 2017	By: CTG	Ckd: TC	Paper Size: A3	Rev : -

PHOTOGRAPH 5: VIEW FROM R448 AT MILFORD

PHOTOGRAPH 6: VIEW FROM MILFORD PARK

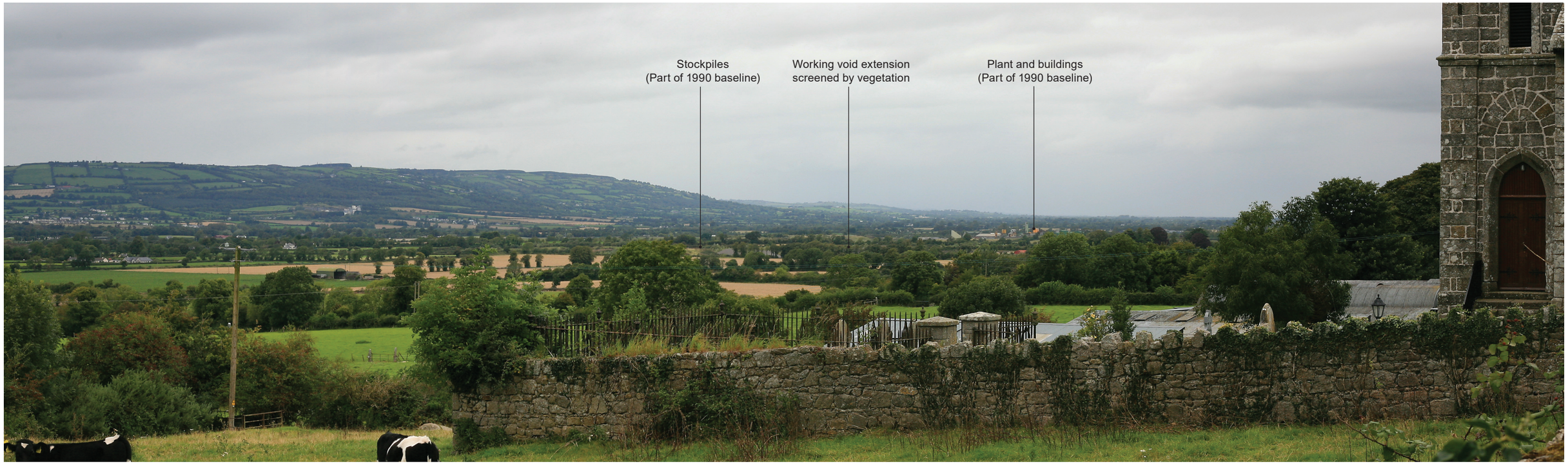
PHOTOGRAPHY NOTES:

Camera:	Canon EOS5D Mk1
Lens:	50mm fixed
Date:	SEP 2017

STEPHENSON HALLIDAY
IRELAND
ENVIRONMENTAL AND LANDSCAPE PLANNING

Clonmelsh and Garryhundon Quarries			**FIGURE L7C** Site Photographs	
Date: SEP 2017	By: CTG	Ckd: TC	Paper Size: A3	Rev : -

PHOTOGRAPH 7: VIEW FROM SCENIC ROUTE 9



PHOTOGRAPH 8: VIEW FROM CHURCH AT NURNEY

PHOTOGRAPHY NOTES:

Camera:	Canon EOS5D Mk1
Lens:	50mm fixed
Date:	SEP 2017

STEPHENSON HALLIDAY
IRELAND
ENVIRONMENTAL AND LANDSCAPE PLANNING

Clonmelsh and Garryhundon Quarries			**FIGURE L7D** Site Photographs	
Date: SEP 2017	By: CTG	Ckd: TC	Paper Size: A3	Rev : -

PHOTOGRAPH 9: VIEW FROM M9 OVERBRIDGE, NORTH OF BALLYBAR UPPER

PHOTOGRAPHY NOTES:

Camera:	Canon EOS5D Mk1
Lens:	50mm fixed
Date:	SEP 2017

STEPHENSON HALLIDAY
IRELAND
ENVIRONMENTAL AND LANDSCAPE PLANNING

Clonmelsh and Garryhundon Quarries			**FIGURE L7E** Site Photographs	
Date: SEP 2017	By: CTG	Ckd: TC	Paper Size: A3	Rev : -

13.0 INTERACTIONS

This rEIAR has been prepared to accompany an application for substitute consent for an existing quarry and processing area development over 81 ha. In two land uits at Clonmelsh and Garyhundon, Nurney, Co. Carlow.

13.1 Introduction

All environmental factors are inter-related to some extent. The European Communities Environmental Impact Assessment (Amendment) Regulations, 1998, reauire that an EIS describes the impacts and likely significant effects on the interaction between principal elements of the environment media: Human Beings, Ecology – Flora and Fauna, Soils, Geology, Water, Traffic, Air and Climate, The Landscape. The 2014 EIA Directive provides that certain elements be considered in assessing the impact of a development and this rEIAR has been prepared having regard to those elements and the 2017 EPA Guidance; "*Population and Human Health; Biodiversity, Land & Soils, Water, Air, Climate, Material Assets, Cultural Heritage, Landscape, Interactions.*" The rEIAR has organised to provide the following Information in accordance with the guidance over chapters 4 to 12. Tale 13.1 repeats table 1.1 to illustrate this:

Section 1 Context and Requirement for rEIAR	1.0 Introduction
Section 2 A description of the existing environment.	2.0 Description of the Site & Receiving Environment
Section 3 A description of the project.	3.0 Description of the Project
Sections 4 to 13 Identification of experienced / likely significant impacts during construction and operation of the development and a description of the measures employed / envisaged in order to avoid, reduce and, if possible, remedy significant adverse impacts.	4.0 Population & Human Health 5.0 Biodiversity 6.0 Land, Soils & Geology 7.0 Water & Hydrogeology 8.0 Air & Climate 9.0 Noise 10.0 Material Assets & Traffic 11.0 Cultural Heritage 12.0 Landscape
Section 14 Sets down the cumulative and in combination significant effects of the project and considers expected / experienced effects deriving from the vulnerability of the project to risks of major accidents and/or disasters that are relevant to the project concerned.	13.0 Interactions

Table 13.1 Summary Information contained within an EIAR & Chapter Headings of this rEIAR

This rEIAR has been prepared having due regard to section 177F(1) of the Planning and Development Act, 2000 as amended and therefore impacts identified, discussed and mitigated are generally those that have already occurred. In this case it has been estimated that the subject lands were actively extracted over the period 1940s – 2017. At no time, besides the day of the appointment of the Receivers has quarrying been suspended. In so far as is possible the felt and potential impacts of the existing quarry and the measures proposed to mitigate these impacts, and therefore their relationship with each other have been outlined in this rEIAR.

The comprehensive assessments undertaken as part of this rEIAR have revealed that there are a number of significant direct negative impacts environmental impacts. These are the permanent removal of the original agricultural land cover and the geological layer beneath.

The restoration of the lands will mitigate some of these direct negative impacts albeit that there are no significant public viewports into the subject site. Restoration is presented at Chapter 12 as a mitigation measure in accordance with EIA requirements. Conversely the support of associated quarry employment by the extraction of the subject lands over the period 1940s to today is a positive economic impact as was the supply of local aggregate and value add products to the local and regional construction industry.

13.1 Population & Human Health

Ultimately, all of the effects of a development on the environment impinge upon human beings, directly and indirectly, positively and negatively. Direct effects include such matters as air and water quality, noise and landscape quality. Indirect effects pertain to such matters as flora, fauna, services and road traffic.

There are minimal visual implications for the existing landscape in view of the subject site's backland location remote from public view and within a wider established quarry setting. Noise and vibration; aspects related to air and water quality; and the impact on climate and flora and fauna all record minimal to negligible experienced and potential impacts to the receiving environment for the same reasons of remoteness of sensitive receptors and established extraction setting. Evidence suggests that noise, dust, vibration and visual screening mitigation measures were in place when the site was quarried.

The site has no direct access to a public road. Social and travel patterns, pedestrian or otherwise, were not be disrupted by extraction onsite as no roads or pedestrian ways transverse the subject lands.

13.2 Biodiversity

The subject lands largely comprise exposed bedrock in Clonmelsh and part-recolonised sands at Garyhundon.

The site is not the subject of any conservation designations and is assumed here not to have had any direct or indirect impact on any designated or proposed sites for nature conservation. This matter has been specifically addressed under the companion rNIS submitted under separate cover.

Dust impacts on adjacent habitats and fauna are considered to have been minor during extraction as dust control will be in accordance with strict EPA guidelines.

13.3 Land, Soils & Geology

All stripped topsoil is stored within the site for visual screening and eventual restoration.

The removal of ands and gravels the limestone from the subject site to a deepest depth of approximately 30 metres is an irreversible permanent effect and results in the permanent alteration of the topography of the site. The rock on site is not geologically unique to the extent that is not indicated for special protection and its removal, subject to the environmental mitigation and health and safety measures set out in this rEIAR means the residual effect is visual and defined as moderate to minimal relative to the baseline situation.

13.4 Water

Extraction of material at this location has occurred to a depth below groundwater at Clonmelsh to about 25AOD and the lowest bench height of the subject site is 30AOD. It is not proposed to excavate any deeper than this bench height in the subject site or on adjacent lands.

13.5 Air & Climate

The use of the subject site as a quarry had no effect on the microclimate in the immediate vicinity of the site. Historic monitoring results for the wider area including the subject site indicate that operations, at their peak, did not generate

dust levels well in excess of limits imposed by planning conditions in accordance with EPA guidance.

13.6 Noise and Vibration

Noise and vibration emanate from the working of extraction machinery; as a result of the operation of the extraction process; and from the associated vehicular movements. Blasting was the primary method of recovering rock from Clonmelsh and therefore vibration and air over pressure impacts in excess of acceptable limits may have occurred but without histrionic blasting monitoring data it is impossible to attest to this.

In view of the depth of working and noise and vibration amelioration provided by the quarry void it is not expected that any future negative noise or vibration effects will occur with implementation of advised mitigation.

13.7 Cultural Heritage and Material Assets

Section 11.0 of this rEIAR notes the permanent removal of land cover and therefore the potential archaeological remains beneath. This mostly occurred ahead of the recording of monuments and thus a review of historic records indicated that the study area originally contained four removed archaeological monuments, all enclosures. This chapter records those other monuments in and around the subject lands for record.